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Standardisation

THE importance of standardisation in industry and commerce should need no preaching so far as scientists are concerned. However, scientists play only a part in industry and that is not always a controlling part; even in branches which are predominantly technical by nature, a lack of standardisation will often have been encountered, a needlessly wasteful and muddling state of affairs that in the end scientists as well as others in industry become used to and accept as 'normal'. Science itself is well equipped with standards, not merely by national acceptance but by international acceptance. The gram and the litre mean the same weight or volume from Turin to Texas. The yardsticks of science were standardised at an early stage and with extraordinarily little fuss and argument. Lack of standardisation in a few scientific or industrial-scientific fields is a new development and largely a consequence of rapid growth. Because standardisation is an accepted principle and routine to the scientist, he is apt not to realise the great lack of it in industry or else to accept that position as an incurable symptom of the commercial outlook. Either attitude is regrettable, for the scientist, more than any other class of worker in industry, should be able to explain and establish the case for standardisation.

As standardisation is largely a matter of definition, what it implies itself must first be defined. Like productivity it is an awkward word whose detailed meaning varies with context. There are six basic types of standard—of quality by specification, e.g., the plant-food content of fertilisers; of size and form, e.g., screw threads, bolt nuts; of length, weight, time, and temperature, an obvious field but one in which there are still extraordinary variations; standards of ratings, e.g., motor horse-power specifications; standards of practice, dealing with the installation or use of articles; and, last but often far from least, standards of nomenclature or description.

The fear that rigid standardisation may inhibit progress or handicap an individual firm's expansion has more reality for some of these types of standard than for others. Standards of size and form for widely used articles such as screws and standards of dimension for all goods cannot be rationally opposed. Nor should there be objection to standards of rating (where performance can be reliably measured). Standards of quality and standards of practice, however, carry the risk of impeding progress. Adherence to common standards of quality throughout an industry may make it far harder for a product of new and improved quality to be accepted; similarly, codes of specified practice may leave no room for better methods to be introduced.

The answer to these objections is that standards must be periodically reviewed in the light of technical developments. A glaring case is the continued operation of the 1926 Fertilisers and Feeding Stuffs Act, a legal code or system of standardised specification which penalises by omission some important fertiliser developments of the past twenty years. When standards are set by legislation, it seems that periodical reviewing is far too slow and infrequent.

Objections to standards of description

and nomenclature are often as violent as they are illogical. In competitive fields it is natural enough for salesmanship and advertising to place emphasis upon small points of difference. With consumer goods, the public is often courted with differences that are in fact insignificant or mere variations in verbal description. In such cases standardisation is opposed as a restriction upon enterprise and commercial freedom, and progress towards standardisation is apt to be sluggish. Progress made since the war in this country through the general acceptance of a code of advertising practice by the advertising profession particularly in the specific field of medical or ethical goods is certainly gratifying. It must be recognised, however, that the pace of progress, at any rate in the consumer-goods field, depends upon public opinion. Where variations of description involve public health, the serious need for standardisation that cannot mislead even by implication is readily recognised; a *laissez-faire* or *caveat-emptor* attitude is apt to prevail where the performance of goods is unlikely to involve social as well as economic consequences. In any case, serious misrepresentation is constantly held in check by the common law in this country.

Standardisation cannot therefore be discussed and advocated as some magical overall panacea for better production and fairer dealing. It must be steadily advanced, type by type, field by field. It must not be opposed in a field where it is urgently required by arguments that apply to other fields where the need is more debatable or where the function of standardisation is of a different nature. To quote from a recent publication by the British Productivity Council (BPC Action Pamphlet No. 4, 1955); 'whether we like it or not, it is a fact that other countries are busily engaged in preparing their own national standards, and many are incorporating them into their legal codes. The completion of these standards is almost always followed by a demand that imported goods shall conform to them.' Dependent as much as we are upon export trading, we cannot lag behind other countries in developing standards for if we do we cannot take a significant part in the development of international standards.

This is not to say that as a country we have been laggardly or indolent in these matters. The British Standards Institution is the oldest of its kind in the world. However, it originated largely as a committee for engineers and for its first thirty years of existence it was almost wholly concerned with 'engineering' goods and activities. It was the product of a period when Britain dominated world trade in engineering. In other fields and now in another age when British products are faced with much more varied competition, BSI standards cannot as easily rule the roosts of international trade. The impressive widening of BSI activities in recent years must be allied with the similar widening of other countries' standardisation. We can easily fall behind or fall out of step in a march that this country first started.

The chemical industry is in a fortunate position for chemical descriptions have the same meaning in most parts of the world. Variations of standards for purity or variations in standard methods of analysis produce most of the problems, but these are not problems that cannot be solved where there is the will for discussion and co-operation. Where new organic complexity or old customs of commerce have set up variations in nomenclature, sound efforts have been made for standardisation by the ABCM in recent years. Effective development, however, is not aided by official stimulations and there is no compulsion upon manufacturers to adhere to recommended standards. This is a weakness that displays itself more awkwardly in less scientific branches of industry; in the chemical industry standardisation is stimulated by the market which is so largely an inter-industry market whether at home or overseas.

Those who have lingering doubts about standardisation should study the recent BPC booklet referred to above and also two new documents issued by PEP, 'Standards in Industry' and 'The British Standards Institution'. All three were first published last month and each of them deserves the closest study. Standardisation is a much under-rated theme of vital importance to industrial production and export trading.

Notes & Comments

Factories Act Appeal

ONE section of the Factories Act requires all floors, steps, staircases, passages, and gangways to be 'of sound construction and properly maintained'. A sub-section provision requires that if a staircase is 'specially liable' to cause accidents, a handrail must be provided on both sides. A worker who fell and broke his leg as the result of a greasy spot on a three-inches wide strip of smooth surface on an otherwise well 'dimmocked' staircase claimed damages for negligence. On one side the handrail was so close to the wall that it could not be gripped quickly. Containers of grease were frequently carried down the staircase as it led to the factory stores. In the first hearing the firm was found guilty of a breach of the relevant Factory Act regulations and damages of over £500 were awarded. Upon appeal, however, the award was disallowed. The smooth strip on the top step was well known and there had never been an accident in the 15 years' history of the staircase; it was therefore not a staircase that could be said to be 'specially liable to accidents.' Grease was habitually issued in safe containers so there was no reason to suppose that spots of grease frequently occurred on the steps of this staircase—the fact that this accident had been caused or part-caused by one such spot of grease did not prove that grease was regularly a hazard on the staircase and thus a known special risk requiring a double handrail. No complaints about the dangers of this staircase had been made to the welfare committee. For these reasons the employers won their appeal; there being no previous evidence to show that permanent protection against special risks was required, the appeal judges said that nothing had been done or left undone in breach of the Factory Act regulations.

Records Essential

THIS decision is of wide interest to manufacturers, not because an appeal against an award of damages has been disallowed but because it is clear that inverted circumstances—where the hazards of a staircase, etc., have been previously demonstrated or pointed out by complaints—would be likely to count just as strongly as evidence of negligence. Accidents of this type seem to have a legal relationship to the dog and his first bite! Once a dog has bitten or shown a disposition to bite without provocation, the legal doctrine of 'scienter' operates—the owner knows a risk exists and he must take precautions accordingly. Complaints about hazardous conditions that are put forward officially should not be lightly treated even though investigation may seem to show them to be trivial or exaggerated. A careful record of action taken, or reasons for taking no action, should be preserved.

Starting from an End-point

WHAT seems to us to be a little known legend of chemical discovery has recently been told in *Canadian Chemical Processing* (1955, **39**, [8], 74). Early in the first world war, acetylene was being hydrated with a catalyst to give acetaldehyde; the acetaldehyde was then oxidised to acetic acid. This was being done at a Canadian plant as part of the drive for acetone. The oxidation of acetaldehyde was dangerous if peracetic acid formed and accumulated; as a precaution samples were frequently withdrawn from the reaction kettles to check acidity content with phenolphthalein. However, it was observed that numerous samples, after titration, lost the pink colour produced by the excess of alkali run in from the burettes. The fading end-point was considerably discussed by the factory chemists. Air oxidation of unchanged aldehyde was first assumed to account for the production of additional acid, but it was gradually realised that residual acetaldehyde could not account for the fading end-point in every case. It was then suggested that the presence of acetic anhydride would account for the phenomenon—for the slow hydrolysis of acetic anhydride would explain why the end-point of titration also slowly shifted. Distilla-

tions of samples from the reaction kettles showed the presence of small fractions of acetic anhydride—undoubtedly the result of a side reaction. All this might have seemed of academic importance, but acetic anhydride was in great demand for the then youthful rayon process. The acetic anhydride sideline reaction was closely studied for conditions and catalyst influences and it was soon converted into a 50 per cent yield process. A major commercial-scale process, the subject of a number of patents, thus emerged from curiosity among chemists.

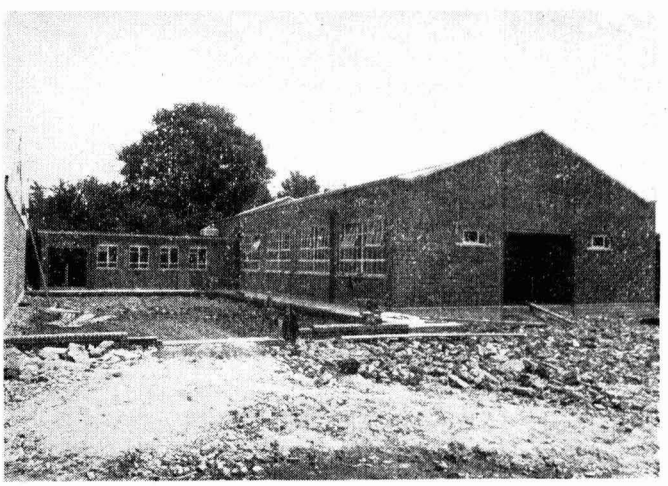
Sodium Security

A PIECE of research that is somewhat 'out of the blue' is likely to revolutionise the handling of metallic sodium. It was found at the Stamford Centre, Ontario, Canada, that sodium and polythene will not react nor does any adhesion occur. This means, as experiments have confirmed, that sodium encased in polythene can be stored without any problems of reaction with the atmosphere or with the container walls and without the development of adhesion to package surfaces. It should be added that this Canadian discovery has been made the subject of a patent and the rights have been assigned to the Du Pont organisation. Whether polythene encasement is suitable for metallic potassium remains to be reported. Theoretically there is nothing intrinsically new about this method of protective packing for both sodium and potassium have long been stored safely in liquids containing no oxygen, e.g., naphtha, petroleum, etc. Polythene as a macro-molecular hydrocarbon should prove to be a particularly inert medium. Supplies of sodium for industrial use may well be more conveniently packed in polyethylene, but the traditional liquid hydrocarbon immersion method may remain the accepted means of packing laboratory supplies. The outer skin of polythene film has to be removed and for many laboratory uses of sodium it must surely be far simpler to withdraw sodium from liquid immersion.

Industrial Accidents

THE number of workpeople killed in industrial accidents in June was 105, of whom 19 were in the chemical and metallurgical industries. A more detailed analysis shows that clay, stone, cement, pottery and glass works were responsible for four of these deaths; chemicals, oils, soaps, etc., seven; metal conversion and founding, seven; textile, printing, bleaching and dyeing, one.

Seven cases of lead poisoning were reported for June, together with 20 cases of epitheliomatous ulceration (skin cancer) and 46 cases of chrome ulceration. No cases of aniline poisoning were reported.



The office and warehouse accommodation of Griffin & George Limited, laboratory furnishers and manufacturers of scientific apparatus, in Ealing Road, Alperton, will be almost doubled by the autumn. The photograph shows the new staff canteen which is the first section of the new extensions to be completed. The existing canteen has been absorbed in the new office accommodation and when this is vacated work will begin on the reconstruction of the ground floor of the south wing, over which new office accommodation is already being built.

UK Sulphuric Acid Returns

Figures from 1 April to 30 June

THE production of sulphuric acid and oleum, excluding Government plants, in the United Kingdom from 1 April to 30 June was 638,310 tons, representing 81.8 per cent of the production capacity. Of this 201,940 was chamber and tower, 436,370 contact. The summary of monthly returns issued by the National Sulphuric Acid Association is:—

CONSUMPTION OF SULPHURIC ACID AND OLEUM
UNITED KINGDOM, 1 APRIL TO 30 JUNE

Trade Uses	Tons 100% H_2SO_4
Accumulators	2,680
Agricultural purposes	530
Bichromate and chromic acid	3,537
Bromine	2,767
Clays (Fuller's Earth, etc.)	3,121
Copper pickling	833
Dealers	3,380
Drugs and fine chemicals	4,513
Dyestuffs and intermediates	20,220
Explosives	8,390
Export	698
Glue, gelatine and size	112
Hydrochloric acid	15,695
Hydrofluoric acid	2,991
Iron pickling (incl. tin plate)	29,499
Leather	1,278
Lithopone	4,311
Metal extraction	1,068
Oil refining and petroleum products	15,010
Oils (vegetable)	2,720
Paper, etc.	1,901
Phosphates (industrial)	153
Plastics, not otherwise classified	8,383
Rayon and transparent paper	65,765
Sewage	3,147
Soap, glycerine and detergents	11,220
Sugar refining	166
Sulphate of ammonia	67,648
Sulphates of copper, nickel, etc.	5,180
Sulphate of magnesium	527
Superphosphates	119,066
Tar and benzole	5,837
Textile uses	4,833
Titanium dioxide	56,679
Unclassified	48,702
Total	522,560

SULPHURIC ACID AND OLEUM
(*Tons of* 100% H_2SO_4)

	Chamber and Tower only	Contact only	Chamber, Tower and Contact
Stock 1 April 1955	24,395	39,530	63,925
Production	153,265	368,634	521,899
Receipts	20,742	34,422	55,164
Oleum feed	—	1,481	1,481
Adjustments	−107	+708	+601
Use	87,261	158,419	245,680
Despatches	83,821	245,023	328,844
Stock 30 June 1955	27,213	41,333	68,546
Total capacity represented	201,940	436,370	638,310
Percentage production	75.9%	84.5%	81.8%

Pyrocatechin Violet

TITRATIONS of a large number of cations with a solution of the disodium salt of ethylenediamine tetra-acetic acid is possible using Pyrocatechin Violet as a complexometric indicator.

Pyrocatechin Violet forms coloured complexes with many cations, e.g. bismuth, thorium, zirconium, nickel, cobalt, manganese, magnesium, zinc, cadmium, calcium, aluminium and others. The formation of these coloured complexes is however dependent on the pH of the solution. Bismuth and thorium are best titrated in acid solutions, while nickel, cobalt, manganese, magnesium, zinc and cadmium go better in well buffered alkaline solutions.

Chemapol, of 9 Panská, Praha, Czechoslovakia, who are the developers of this product, have produced a small booklet describing the uses of Pyrocatechin Violet in analytical chemistry. The colour change obtained with this indicator is claimed to be as sharp as that obtained with the best neutralisation indicators.

Patent applications are being made in this country by Chemapol.

RAW MATERIALS
(*Tons*)

	Pyrites	Spent Oxide	Imported Sulphur	Recovered, H_2S and Filter Cake	Zinc Concentrates	Anhydrite
Stock 1 April 1955	159,833	136,233	47,232	7,285	74,410	1,238
Receipts	130,303	63,646	56,504	6,251	38,596	76,860
Adjustments	+3,637	+759	+967	+26	+280	+12,799
Use	120,407	69,356	58,399	5,931	54,191	82,477
Despatches*	2,754	6,440	1,840	483	—	—
Stock 30 June 1955	170,612	124,842	44,464	7,148	59,095	8,420

* Including uses for purposes other than sulphuric acid manufacture.

IN THE EDITOR'S POST

The Quantometer

SIR,—The letter on the subject of the Quantometer from Mr. R. L. Shackley and published in your issue of 16 July (p. 134) shows a surprising lack of confidence in his own company's pioneering spirit in the matter of technical developments, for Steel, Peech, & Tozer, where the Quantometer is installed, is one branch of The United Steel Companies Ltd., and the Ore Mining branch at Colsterworth, which employs Mr. Shackley, is another.

The Quantometer is used as a control instrument and determines selected elements in plain, carbon, low alloy and highly alloyed steels in one minute, the time stated in the article. In the case of our instrument, Ni, Cr, Sn, Cu, Mo, Al, Ti, V, Pb, B, Si, Mn and P. are included in one group and are recorded in sequence at intervals of 2.6 seconds. Highly alloyed steels have also been analysed in a similar time, which is, of course, quite unapproachable by chemical methods.

It should be realised that the time of 10 minutes quoted includes transit of the sample from the melting shop, which is over a mile away, the preparation of the sample and the return of the analytical results to the melting shop in writing. The time of nine minutes mentioned by Mr. Shackley as required to obtain carbon, manganese, sulphur and phosphorus figures 30 years ago on Tees-side is rather quicker than practical steelworks' chemists would expect for accurate determination, but I doubt if even he would suggest that the 13 elements mentioned above could be determined manually at anything like the rate of operation of the Quantometer.—Yours faithfully,

D. MANTERFIELD.

Chief Chemist,
Steel, Peech & Tozer.

* * *

'Organic Reagents for Metals'

SIR,—I wish to thank you for the opportunity of replying to Mr. Yardley's letter in your issue of 16 July (see p. 134) in which he took exception to a criticism made by myself in reviewing 'Organic Reagents for Metals'. In my original review I maintained that the Karl Fischer reaction was inaccurately represented by the equation:

$$I_2 + SO_2 + 2H_2O \rightarrow 2HI + H_2SO_4 \quad \ldots\ldots \text{(A)}$$

since the true equivalence of the reagent is such that only one molecule of water reacts with one molecule of iodine. I therefore suggested the skeleton equation

$$I_2 + SO_2 + H_2O \rightarrow 2HI + SO_3 \quad \ldots\ldots \text{(B)}$$

I hasten to assure Mr. Yardley, that contrary to his assertion, I did read the relevant text. Like every other analytical chemist, I am quite well aware that the stoichiometry is not simple. I agree that neither equation has the merit of enabling the young analyst to prepare an exactly standard solution of Fischer reagent, but the equation proposed in the monograph (A) conveys an entirely false picture of the basic mechanism and water equivalence of the reagent. The Fischer reagent contains iodine, sulphur dioxide, pyridine and methanol. When the latter solvent is eliminated from the preparation and the reagent is titrated with water to the colour change, the reaction proceeds according to skeleton equation B, viz:—

$$I_2 + SO_2 + H_2O \rightarrow 2HI + SO_3$$

The SO_3-pyridine compound has actually been isolated (**1**). When methanol is present the reaction proceeds further, but water is not involved.

$$SO_3 + CH_3OH \rightarrow CH_3HSO_4 \quad \ldots\ldots \text{(C)}$$

It is exceedingly dangerous to draw analogies between reactions in aqueous and non-aqueous solutions simply for convenience, and I maintain that it is unwise to do so when it introduces wrong ideas of the fundamental mechanism and stoichiometry of the reaction.

In conclusion, I should like to point out two things. Firstly, the equivalence of standard preparations of the reagent is usually of the order of $H_2O/I_2 = 0.8$. This is much nearer to the 1/1 equivalence proposed by skeleton reaction B than the 2/1 equivalence of equation A. (The student therefore has a better guide for preparation of the reagent.) Secondly, a stoichiometric reaction is possible. The two solution techniques used independently by Johansson (**2**) and by Seaman, McGomas and Allen (**3**) prove that the basic equivalence in the absence of parasitic side reactions is exactly 1/1.

In future issues of this otherwise valuable monograph the basic situation would be

[*continued at bottom of page 272*

Natal's Chemical Industry

Wide Range of Products Comes from One Factory

MANUFACTURE of basic chemicals in Natal is almost entirely confined to the factory of African Explosives & Chemical Industries Ltd. situated at Umbogintwini on the South Coast some 15 miles from Durban. The factory first started up in 1909 as an explosives factory controlled by Kynoch Ltd. of Birmingham. After a period of competition for contracts to supply mining explosives, a merger took place in 1924 whereby all the South African explosives factories came under unified control. It was decided that the new company, owned jointly by De Beers Consolidated Mines and Imperial Chemical Industries Ltd., should concentrate explosives manufacture at its plants at Modderfontein in the Transvaal and at Somerset West in the Cape. The Umbogintwini factory then entered into the production of a range of chemicals, sulphuric acid, fertilisers, stock dips and sprays.

The new paper industry and the large rayon pulp factory being erected at Umkomaas, some 15 miles further down the coast, will create a strong demand for supplies of chlorine and caustic soda. At the same time African Explosives decided that the time was ripe to begin local manufacture of a range of chlorinated solvents and plastics. These factors decided the company to undertake a £2,000,000 expansion scheme which is now nearing completion.

Made in South Africa

The new plant will be housed in seven groups of buildings with a total floor space of 137,000 sq. ft. The scheme necessitated clearance of 20 acres of bush on the factory site in order to construct an efficient road and rail track system between the various plant sections. A considerable proportion of the new plant has been manufactured in South Africa, including pressure vessels of a type not previously constructed in that country.

The basic feature of the new plant will be a large battery of electrolytic cells for chlorine, hydrogen and caustic soda production. The raw material used will be common salt, ample supplies being available in the country. However, purification of local salt is necessary for efficient cell operation and in order to minimise initial teething troubles it may be desirable to import high grade salt at first. Chlorine will be compressed and liquefied while most of the caustic soda will be sold as 45 per cent liquor. Some of the output will, however, be combined to form a solution of sodium hypochlorite. Several thousand tons of hypochlorite liquor will be marketed annually to meet the strong demand for this commodity as a germicide and bleaching agent for domestic purposes and in the textile, laundry and food industries.

HCl Manufacture

Another section of the new plant will be devoted to hydrochloric acid manufacture. Hydrogen and chlorine will be burnt together and the acid gas will be absorbed in water in glass towers. The estimated production of hydrochloric acid will be up to 1,000 tons annually.

A further section of the plant will manufacture chlorinated solvents which have hitherto had to be imported into the Union. Trichlorethylene and perchlorethylene will be made by reacting chlorine with acetylene. These solvents are widely employed for degreasing and dry-cleaning purposes.

Another development is the manufacture of polyvinyl chloride—PVC. This is consumed on a scale of some thousands of tons annually by South African industries producing items such as hose, cables, telephone wire, belting, paints, leather cloth, etc. PVC will be made in a section of the plant especially designed to ensure maximum cleanliness as any dirt in the product could ruin the insulating properties which are such an important factor in the use of the plastic by the electrical industries.

Chlorine, hydrogen and acetylene will be carefully reacted under fully automatic control to form vinyl chloride gas. This is condensed by refrigeration and stored under pressure. A polymerising unit where moderate heat and pressure are applied then produces polyvinyl chloride in the form of either fine granules or minute hollow spheres. Finally, a compounding plant will blend the PVC with pigments and plasticisers. The finished material issues as small

chips which can be ultimately fused together by gentle heat and then extruded or spread for whatever purpose may be required.

Quite apart from the expansion scheme described for chlorine derivatives, extensions are also being made at Umbogintwini to the sulphuric acid plant in order to increase output. Raw material is iron pyrites.

Associated overseas companies have supplied their available knowledge to ensure smooth operation of the new plants. A team of specialists will be brought to the Union to assist in starting up and to train the permanent South African factory staff. It is anticipated that most of the plant will be brought into production by the end of 1955.

Solway Sulphuric Acid

Supplies Available for Industry

AT the London office of Marchon Products Ltd. last week, Mr. Frank Schon, chairman of the company and of Solway Chemicals Ltd., gave a progress report on the Solway project in Cumberland for the manufacture of sulphuric acid from anhydrite.

In May, 1952, Mr. Schon announced arrangements for constructing at Whitehaven, Cumberland, a plant to manufacture high grade sulphuric acid to be sponsored by Marchon Products Ltd. at a cost of £2,000,000, the operating company, a subsidiary of Marchon, to be known as Solway Chemicals Ltd. Both the anhydrite mine and the plant are now operating, although some aspects of the project have changed in the interval.

The final cost of the project may be nearer £3,000,000 than the estimated £2,000,000 of which the Treasury will have subscribed £2,350,000; and the situation regarding the disposal of sulphuric acid above the needs of Marchon requirements has also altered.

The sulphuric acid and cement plant consisting of two interchangeable units—one completed, the other to be operating shortly—have now a capacity of 100,000 tons of sulphuric acid and 100,000 tons of cement a year. The cement output has been taken care of by a long term agreement with Associated Portland Cement.

As to the disposal of 50,000 tons of sulphuric acid above Marchon requirements, Mr. Schon said there were no shareholders in the company committed to buy sulphuric acid, and that the company had got to sell it. 'Four years ago when we set out to build the Solway plant', he said, 'we thought they'd be waiting for us'. Mr. Schon then referred to 1951 when the availability of sulphuric acid was affected by export restrictions. The Solway plant is a unit of the National Sulphuric Acid Plan framed to deal with the anticipated shortage of sulphur.

While Mr. Schon spoke enthusiastically of the production of sulphuric acid from indigenous raw materials, he tempered his comments with caution and said that in three or four months he could give a more comprehensive outlook of the Solway project. He felt, he said, that sulphuric acid could be produced there economically.

It was 12 years ago that Mr. Schon began making firelighters in a shed on a working capital of £1,000. To-day his companies employ 1,700 employees, and the capital of of Marchon Products Ltd. is about £10,000,000.

Nitrate of Soda Prices

PRICE changes of Chilean nitrate of soda for agricultural and industrial purposes have been announced by the Nitrate Corporation of Chile Ltd. Starting 1 August they are: Chilean granulated nitrate of soda (16 per cent nitrogen) in lots not less than six tons (agricultural) per ton—

August/September	£26 5s.
October/November	£26 10s.
December/February	£26 15s.
March/June	£27 0s.

The industrial price of Chilean refined granulated nitrate of soda (over 98 per cent) in lots of six tons and over is £27 10s. a ton.

In The Editor's Post

[continued from p. 270]

made perfectly clear to the young analyst by placing equations B and C side by side.

Respectfully yours,

T. S. WEST.

Birmingham.

REFERENCES

(1) Mitchell & Smith. 'Aquametry,' Interscience N.Y. 1948 p.42.
(2) Johansson, – Svensk. *Papperstid.* 1947, 50, 124.
(3) Seaman, McGomas and Allen. *Analytical Chemistry.* 1949, 21, 510.

Separation of Aromatics*

Other American Methods

by P. W. Sherwood, Research Engineer, New York

TWO commercial installations use liquid SO_2 extraction for the separation of B-T-X aromatics from other hydrocarbons in catalytic reformate. The process is an outgrowth of the Edeleanu process for lube oil refining, in which liquid SO_2 serves as preferential solvent for higher aromatics.

Three fundamentally different approaches may be taken to render sulphur dioxide extraction an efficient means of aromatics recovery (**10**):

1. Suitable fractions may be treated with liquid sulphur dioxide at very low temperatures. This approach takes advantage of the increase in selectivity for aromatics which occurs as the temperature is lowered. However, the method calls for extensive refrigeration and aromatics yield is adversely affected by a decline in their absolute solubility in liquid SO_2 at low temperatures.

2. Selectivity may be raised by mixing sulphur dioxide with a light paraffinic hydrocarbon (propane or butane). Some recent work indicates a highly favourable effect of BF_3 or SO_3 when added to liquid sulphur dioxide as solvent promoter (**11**).

3. Finally, the selectivity may be raised by subjecting the extract to a backwash with paraffinic hydrocarbon boiling considerably above or below the desired aromatic fraction and thus permitting ready separation by subsequent distillation.

B-T-X Recovery Unit

A process (**12**) incorporating the last-named feature is the basis for a B-T-X recovery unit which was taken on-stream during 1954 at Continental Oil Company's Lake Charles, La. refinery. The feed to the unit is a light catalytic reformate containing somewhat less than 50 per cent aromatics. The reformate is inhibited by DBPC to prevent resin formation during pre-extraction storage or in the extraction process itself.

The naphtha feed to the extraction unit must be thoroughly dried by passage through activated alumina. It is then chilled to −32° C, at which temperature it is fed to the mid-section of the Raschig ring-packed extraction tower. Here it is scrubbed countercurrently with liquid sulphur dioxide which is introduced at the top of the tower. The primary extract passes into the lower tower section where it is contacted, also countercurrently, with a heavy paraffinic oil. The purpose of this wash is to displace lower-boiling paraffins from the extract, thus yielding an easily separable mixture of high-boiling paraffins and low-boiling aromatics, dissolved in liquid SO_2. At design conditions, 100 bbl feed reformate are treated with 154 bbl liquid sulphur dioxide and 70 bbl backwash oil.

Overhead Constitution

The light phase leaving the extraction column as overhead contains 6 volume per cent liquid sulphur dioxide and 52 per cent heavy wash oil. The remainder is the raffinate proper; i.e. the non-aromatic portion of the feed naphtha.

Contained sulphur dioxide and heavy wash oil are removed and recovered for recirculation. The separation takes place in two relatively simple distillative splitters. The solvent-free raffinate contains only 0.5 volume per cent aromatics, a measure of the completeness of aromatics recovery which is possible in this process. The raffinate is caustic-washed and stored for sales. It has the properties of a valuable paraffin solvent and is a source of isohexane and isopentane.

We now direct our attention to the extract which leaves the bottom of the extraction column. This stream contains the bulk of SO_2 fed to the tower, in which the aromatics concentrate and some heavy paraffins (from the wash oil) are dissolved. Sulphur dioxide is recovered in two distillation towers in series. The first tower is operated at 200 psi, while the pressure of the second column is set by the condense temperature (as determined by available cooling water). This arrangement permits more efficient utilisation of the refrigerant effect of vaporising SO_2.

After sulphur dioxide removal, separation must be made of the heavy paraffins, derived from the wash oil, and the aromatic product

* *Continued from last week's issue. pp. 225-230.*

mixture. This is accomplished in a conventional fractionation tower. The aromatics stream, taken overhead, must be caustic washed for the elimination of residual SO_2. It is then ready for the isolation of its desired components.

At Continental's plant, the first step in this separation is a primary distillation in which an impure (*ca.* 98.5 per cent) benzene is taken overhead. This benzene is further purified by azeotropic distillation, using methanol as entraining agent. In this step, hydrocarbon impurities are taken overhead with the methanol leaving as bottoms a 99 per cent benzene. This material meets specifications for manufacture of detergents (dodecyl benzene sulphonate type). It can be upped to nitration-grade benzene by clay treating (for improvement of acid wash colour).

The bottoms product of the primary benzene still is a toluene-xylenes mixture, containing 2.3 per cent benzene and 2.2 per cent non-aromatics. Purification of toluene and xylenes is possible by distillative methods.

Ratliff and Strobel (**12**) report that, in this process, benzene recovery is 98.4 per cent and toluene-xylene recovery is 99.7 per cent. They estimate direct operating costs at 25.8 cents/bbl charge at Continental's plant where the daily (design) feed is 3,570 bbl reformate to yield 300 bbl benzene and 1,330 bbl toluene-xylene. The first cost of the plant is stated to be $2,660,000.

4. *The Arosorb Process*

This is a process for the isolation of aromatics by type. It is practiced commercially at Sun Oil Company's Marcus Hook refinery.

The method is based on the preferential adsorption of aromatic hydrocarbons on silica gel. The adsorbent is provided in fixed-bed towers, each of which is operated cyclically.

Here is how the system works for the separation of benzene and toluene from paraffins and naphthalenes: Feed passes through the silica gel bed for about 30 min. During this period, the aromatic hydrocarbons are retained by the adsorbent. A 'push liquid' (butane or pentane) is then passed through the bed for some ten minutes to purge unadsorbed hydrocarbon material from the adsorber case. Finally, a stream of xylenes is taken through the bed to desorb benzene and toluene. This phase lasts for *ca.* 40 minutes. The adsorbent is then ready to receive fresh feed again. 'Push liquid', desorbent, saturated fraction and benzene-toluene are separated by distillation.

Harper *et al.* (**7**) have reported performance in aromatics concentration from a catalytic reformate containing a total of 27 per cent aromatics (11 per cent benzene, 16 per cent toluene). For such a mixture, the ultimate gel capacity is 0.026 gal. aromatics per lb. silicax gel. Actually, controlling capacity is at the bed outlet, where the depleted liquid must be in equilibrium with the adsorbent. This reduces theoretical capacity to 0.01 gal. aromatics per lb. silica gel and actual capacity to 70-80 per cent of this value. Silica gel must be protected from moisture, sulphur, and nitrogen, all of which poison adsorption capacity.

From equilibrium data reported by Harper, it is calculated that 1,000 bbl/day of this reformate may be treated on *ca.* 30,000 lb. silica gel. With it, there will be used 370 bbl/day push liquid and 1,250 bpd desorbent. Recovery is 85 per cent of the aromatics in straight pass. However, some of the final effluent (say the last 10 per cent) during the adsorption phase may be recycled to boost recovery to 95 per cent. This type of operation raises the amount of required push liquid and desorbent appreciably and must be justified on economic grounds. Product purity may be 95-99 per cent, with the higher purities obtained at reduced throughput. For 99 per cent purity, throughput is 0.025 gal. per lb. silica gel.

5. *Purification of p-Xylene*

Separation of *p*-xylene from the aromatic C_8-fraction of reformate constitutes a special problem. Its boiling point (138.2° C) is too close to that of *m*-xylene (139° C) and ethyl benzene (136° C) to permit distillative separation. *O*-xylene, with a boiling point of 144.2° C is the only C_8-aromatic (in reformate) which can be satisfactorily isolated by close fractionation.

No extraction or azeotroping method has been found for the separation of *p*-xylene. Yet, a supply of this hydrocarbon in 95 per cent purity is needed as source for terephthalic acid. To-day, the entire demand is met by fractional crystallisation of *p*-xylene from the undiluted C_8-mixture. Annual US production capacity, using this approach, grew from 2,000,000 lb. in 1950 to an estimated 70,000,000 lb. in 1954 (**13**).

Separation by crystallisation is made possible by the high freezing point (13.2° C) of *p*-xylene and its correspondingly low solubility in hydrocarbons at low temperatures. A mixture containing 20 per cent *p*-xylene will begin to crystallise at −40° C. Precipitation may be continued by further cooling to −72° C. This is the eutectic point for *o*-xylene and *p*-xylene and precipitate obtained at lower temperatures will be a mixture of these two hydrocarbons; *p*-xylene solubility at −72° C is 5.7 mole per cent.

A Typical Feed

A typical feed to Humble Oil and Refining Co.'s *p*-xylene unit contains 15.8 per cent *p*-xylene (**13**). Starting with this material, maximum possible recovery is limited to *ca.* 53 per cent of the amount initially present. This low possible yield, coupled with high refrigeration requirements (and difficulties in satisfactory crystal formation) are the chief shortcomings of to-day's commercial processes. Considerable developmental work in progress is directed toward overcoming these drawbacks.

The crystallisation of *p*-xylene is carried out at Standard Oil Co. of California by use of an internal refrigerant. Such a system avoids concern with fouling of heat exchange surfaces by product crystals, but it requires a system for separation and recovery of the internal refrigerant. Humble Oil and Refining Co. chose indirect refrigeration for its *p*-xylene crystallisation process. Heat exchange fouling is overcome by continuous scraping of the crystalliser surfaces.

The feed to Hubble's *p*-xylene separation unit is an aromatic C_8 concentrate obtained from hydroformed naphtha by SO_2 extraction followed by fractionation. The separation process (**13**) calls for two crystallisation stages. In the first stage, the liquor is cooled (in two successive steps) to −70° C, and the resulting slurry is centrifuged. The retained crystals are of 80 per cent purity, they are melted and recrystallised with a minimum temperature −18° C. A final centrifuging step yields 95 per cent *p*-xylene as solid phase and a mother liquor, containing 45 per cent *p*-xylene, which is recycled to the primary crystallisers.

In the foregoing, we have considered the processes for aromatics recovery and separation which have shown their economic soundness in actual commercial operation. There is, at present, considerable developmental activity in this field, and several processes, which are still in the laboratory or pilot plant stage, have aroused recent interest. They will be briefly reported here.

1. *New Solvents for Aromatics Extraction*

Very good phase relationships and high selectivity for aromatics is exhibited by oxydipropionitrile and thiodipropionitrile. A recent study by Skinner (**15**) shows these solvents of even higher specific extraction ability than diethylene glycol (Udex solvent). However, only the thio-compound retained its high solvent power in the presence of moisture, an important aspect of operational ease. Following are results obtained in two-stage extraction of a Platformate cut boiling in the C_8 range and containing initially 53 volume per cent aromatics.

Solvent	*Aromatics Content (solvent-free basis), vol. per cent*	
	Extract	*Raffinate*
TPDN (anhydrous)	96	40
Diethylene glycol (anhydrous)	91	45
TDPN (7.5 per cent water) ..	96	42
DEG (7.5 per cent water) ..	94	47

An important aspect is the substantially higher aromatics yield which is possible with TPDN, at comparable extraction conditions. With this solvent (7.5 per cent water), the extract contained 19.2 wt. per cent of the feed. This compares with 8.1 per cent of the feed contained in aqueous DEG at comparable two-stage extraction conditions.

Arnold and Lien (**12**) have shown that addition of $AlCl_3$, boron trifluoride, or SO_3 to liquid sulphur dioxide promotes the de-aromatisation ability of the solvent by some 50 per cent. The immediate applicability of this finding is to the de-aromatisation (and, incidentally, desulphurisation) of aromatic distillate fuels. But it may also possibly lead to improvement of existing processes for aromatics recovery by sulphur dioxide extraction.

2. *Thermal Diffusion*

This new process takes advantage of molecular configuration for its separating ability. It is believed (but insecurely established) that the controlling physical characteristic is specific heat of the separant mixture's components. This property is, in turn, a function of molecular structure.

In thermal diffusion, the solution to be separated is placed between two vertical surfaces held at different temperatures. After this condition has been maintained for some time, it is found that a concentra-

tion gradient will develop across the fluid; i.e. some types of molecule accumulate preferentially at the hot wall, while others aggregate at the cold surface. At the same time, thermal convection currents are set up which result in upward movements at the hot surface and downward movement at the cold wall. Composition of liquid withdrawn at the top of the column differs therefore from the feed as well as from the bottom product.

Laboratory application of this method has in recent months been reported for the dearomatisation of lube oils and for the separation of cyclohexane from benzene. The process is, however, very slow and thermally inefficient. Eventual application to aromatics recovery will therefore probably rest in systems which are difficult to resolve by more conventional means, such as high-boiling aromatic isomers.

3. *New Approaches to p-xylene Separation*

In our discussion of commercial *p*-xylene isolation, we have noted the low yield to which existing fractional crystallisation processes are limited.

Since the primary end use of *p*-xylene is its oxidation to terephthalic acid, various processes are under study by which the mixed xylenes are oxidised to a mixture of toluic or phthalic acids. The resulting acids, or at least their methyl esters, can be separated by fractional distillation. Unfortunately, such processes yield large amounts of isophthalic acid (by oxidation of *m*-xylene) which has only a very limited market at this time.

A promising approach to the isolation of *p*-xylene as such is under development by California Research Corp. It involves the precipitation of a co-ordination compound of *p*-xylene with carbon tetrachloride.

Egan and Luthy (**14**) have reported the solubility characteristics in the system *p*-xylene/*m*-xylene/carbon tetrachloride. They found that the optimum amount of CCl_4 to be added to a *p*-*m*-xylene mixture for maximum recovery of *p*-xylene is one mole per mole *p*-xylene plus 1.2 moles per mole *m* xylene. Such a system must be cooled to *ca.* −76° C for precipitation of the *p*-xylene—CCl_4 complex, before other materials begin to co-precipitate.

The process may be executed by adding carbon tetrachloride to a xylene cut. The solution is crystallised to a minimum temperature of −67 to −76° C. After centrifuging, the crystals are washed with CCl_4. They are then melted, recrystallised and centrifuged (note that the freezing point of the pure *p*-xylene/CCl_4 complex is −3.9° C so that the secondary crystallisation may be effected at −18° to 3° C). The secondary crystals are melted and distilled for separation of CCl_4 recovery. Secondary mother liquid is recycled to primary crystallisation.

An important aspect of the process is that the presence of non-aromatic impurities (in the C_8 range) does not interfere. They have the effect of diluent and serve to reduce the ideal amount of CCl_4 needed, without serious effect on yield. The feed may therefore be close xylenes fraction from catalytic reformate. Pre-concentration of aromatics as such is not needed.

The method has been applied by Egan and Luthy to a reformate containing 18 per cent *p*-xylene. Crystallisation at −76° C (in the primary stage) at a CCl_4:xylenes volume ratio of 0.6 gave a *p*-xylene yield of 90 per cent.

REFERENCES

(9) Harper, J. I., *et al.*, *Chem. Eng. Prog.*, 1952, June 276.
(10) Anon., *Oil in Canada*, 1954, Aug.
(11) Arnold, R. C., and Lien, A. P., *Ind. Eng. Chem.*, 1955, 234.
(12) Ratliff, R. H., and Strobel, W. B., *Pet. Eng.*, 1954, Nov. C-26.
(13) Haines, H. W., *et al.*, *Ind. Eng. Chem.*, 1955, 47, 1096.
(14) Egan, C. J., and Luthy, R. V., *Ind. Eng. Chem.*, 1955.
(15) Skinner, D. A., *ibid.*, 222.

More Olympia Exhibits

AT the Engineering Marine & Welding Exhibition at Olympia, London, from 1 to 15 September, Babcock & Wilcox Ltd. will be displaying four of their latest products for the first time. Among them will be the Steambloc packaged boiler which is automatically oil-fired, but which can also be supplied for gas-firing. A booklet just issued by the company giving detailed illustrations of the Steambloc describes it as entirely self-contained, and available either as a steam or hot water boiler in evaporative capacities ranging from 1,500 to 18,000 lb. per hr. (from and at 212° F), or equivalent heating output in B.Th.U.

Featured among exhibits for boiler cleaning will be the Babcock shot-cleaning system (Broman-Ekstrom patents) for cleaning horizontal tube surfaces.

Great Progress Claimed in Hungary

Three Big Chemical Combines

THE changing map of Hungary bears three names which, it is claimed, are going to make its chemical industry one of the biggest in Europe and play a vital role in raising the standard of living. Pét, Kazincbarcika, Tiszapalkonya—the big three of to-morrow—were mere hamlets yesterday.

All three are the sites of chemical combines which in the next few years will be producing many times the present national output of farm fertiliser. Built, or being built with them, are the three largest power stations in the country.

Before the Liberation in 1945 Hungary's chemical industry lagged far behind the standards of even those countries with only a modest industry. Standing in the shadow of the great German chemical industry its activity was limited to processing, finishing and packing, with no basic production.

The programme of industrialisation and the gradual switch-over to large scale farming developed in the last ten years made the development of the industry a necessity.

Factory Reconstructed

A start was made at Pét, where a factory had been in existence for 22 years. The old factory was reconstructed and enlarged, and at nearby Inota workers built what was, when it was completed at the end of 1953, the largest power plant in Hungary.

At the beginning of this year a £3,000,000 scheme for modernising and further extending the Pét plant was announced. By this autumn it is hoped to have the enlarged plant in full production at a new output rate 50 per cent greater than the old.

Meanwhile, 140 miles to the north-east, in the valley of the winding Sajó River, the builders were at work on number two of the big three—the Trans-Sajó chemical works at Kazincbarcika.

The new plant, claimed to be the largest in Central Europe, is due to begin production this year and will eventually turn out annually double the entire 1954 output of the Hungarian nitrogenous fertiliser industry.

It will draw its power from the Borsod power works at nearby Berente, the first of whose six 44,000 HP turbines is already in production. Like the station at Inota the steam for the turbines comes from boilers fired by pulverised low-grade coal.

To house its thousands of workers an entirely new town for 45,000 inhabitants is being built up on the hill slopes overlooking the industrial valley.

Number three of the big three is going to be the Tiszamenti chemical combine beside the Tisza River, a few miles below where the Sajó flows in. Construction work is to begin here next year.

The factory is to make some of its fertiliser from natural gas to be piped from Rumania, 50 miles away to the east, under a mutual assistance agreement between the two countries. A new town will be built on the spot to house the thousands of workers to be employed in the chemical plant and in the nearby power works.

This power station, of 200,000 kilowatt capacity, is in an advanced stage of construction. It will be the biggest ever built in Hungary.

Daily it will consume 6,000 tons of pulverised soft coal brought from the Borsod region, at first by rail and later by canal to be cut from the Sajó River. Wagons on arrival will be tipped and the coal taken by conveyor through classifiers to the boilers—untouched by human hand.

Water for cooling the condensers will be pumped from the Tisza River at the rate of 1,000,000 cubic metres a day by a pump station sunk in the bed of the river 40 ft. down so as to ensure supplies even in the driest seasons.

East German technicians and East German equipment were used at the Borsod power works; Czechoslovak experts are fitting turbines and machines at Tiszapalkonya, made in Czechoslovakia.

New Company to Prospect in Assam

An oil company in which the Indian Government will hold one-third of the capital and the remainder to be held by the Assam Oil Co. is to be formed for prospecting for oil in Assam.

Polarographic Symposium

First Meeting of Society

THE first symposium of the Polarographic Society was held in the Chemistry Department of the University of Leeds on 25 May. In its emphasis on the design of polarographic instruments, this meeting was believed to have been the first of its kind to be held in the UK.

In most cases, authors explained the essential principles of the circuits employed in their instruments. C. Wontner described a simple manual polarograph and demonstrated its use in obtaining current/voltage curves. These could be plotted with surprising speed because of the semi-automatic location of the voltage scale in a series of 10 mV steps. By virtue of a magic-eye null-point detector, the manual polarograph described by G. O. Jolliffe measured the true maximum current and so eliminated assumptions about the detector's equation of motion.

A pen recording polarograph, which possessed a photovoltaic amplifier of very short time constant was described by E. A. Wood and Mrs. B. Lamb. The design of an associated condenser/resistance differentiating unit for use in derivative polarography was also explained. G. L. Young dealt with a pen recording instrument involving a different type of amplifier and paid special attention to the theoretical aspects of an attachment, which enabled the instrument to record true derivative peaks by the AC polarographic method of Breyer and Gutmann.

Equations Explained

After dealing with the rather differently shaped waves encountered in cathode ray polarography, G. F. Reynolds continued to outline the theory by explaining the equations of Randles and Sevcik. Apart from being more sensitive than conventional instruments, the Chemical Inspectorate, Randles type, single-sweep polarograph could also be operated with greater speed and simplicity. In its resolution of closely spaced steps and compensation for a preceding step, the instrument's normal performance was between that of the 'conventional' and the 'derivative' polarograph. However, the incorporation of a derivative circuit enabled it where necessary to achieve the resolution of the derivative polarograph together with a much greater sensitivity. Mr. Reynolds expressed the view that in general, the sensitivity and applicability of the cathode ray polarograph was then given by of the square-wave polarograph at its present stage of development.

The design principles of a single-sweep cathode ray polarograph was then given by H. W Rowe-Leete, who also dealt with the electronics in terms of block diagrams.

By way of a contrast to these purely instrumental contributions, Mrs. N. Luthy read a paper on the application of the polarograph to pyrimidine chemistry with particular reference to the detection of the -S-S- bond.

Hot Top Heating

Boost of Steel Output

THE ever increasing demand for stainless and high alloy steels calls for constant review of methods by which output may be boosted within the limits of existing plant. Every phase of manufacture from raw material to the finished product has to be examined for possible improvement in technique, and elimination of waste.

Wastage from ingot pipe is one of the points in production where obvious savings can be made and considerable attention has been given to different means of reducing the volume of the hot top to this end.

A popular method is to prolong fluid conditions in the ingot head by an external heat source and the latest development of this, using oxy-fuel gas heating, has shown some outstanding advantages and a consistent increase in output.

The results to date confirmed by findings in this country and in America, show that 10 per cent improvement in yield is general through reduction of the hot top to half its previous size and complete solidification to sound metal, all of which is acceptable for subsequent working.

Oxygen/Propane has been established as the most suitable gas mixture. This flame is neutral to most steels at oxy/fuel ratios between 3.25 and 4 to 1 and the available temperature of 2,780° C is adequate for the purpose.

The equipment required for the process has been developed by British Oxygen. It is extremely simple, consisting merely of a blowpipe with a suitable nozzle head and a quick acting gas control valve.

Creep Strength

Increase by Oxide Addition

STABLE oxides of certain metals dispersed in molybdenum produce compositions with greater creep strength than those of conventional molybdenum alloys, Battelle Institute, Columbus, Ohio, has found. Using powder-metallurgy methods, Battelle metallurgists have created molybdenum oxide compositions with creep lives more than twice as long as those of ordinary molybdenum alloys at temperatures of 1,800 to 2,000° F.

This improvement in creep strength—or the ability to withstand high stresses at elevated temperatures without deforming—was accomplished without altering room-temperature properties of molybdenum. Most effective strengtheners among the oxides studied were the hard, stable, insoluble oxides of zirconium, titanium and chromium.

Battelle Experiments

Battelle experiments on the conventional alloys of molybdenum, made by powder-metallurgy methods, showed that those made with silicon, chromium, aluminium, and tungsten have the best creep lives at temperatures of 1,800° F.

The research on the creep properties of molybdenum alloys at temperatures of 1,800 a paper prepared by W. L. Bruckart and Dr. R. I. Jaffee and presented at the annual meeting of the American Society for Testing Materials at Atlantic City, New Jersey, 30 June.

Outstanding among oxide additives were zirconium oxide and titanium oxide, while silicon was the best alloying metal. At 1,800° F, some of the oxide additions increased the 100 hour creep rupture strength of molybdenum almost fourfold. According to Jaffee, present research at Battelle suggests that further increases in molybdenum creep life may well come from compositions including both metallic and oxide additions.

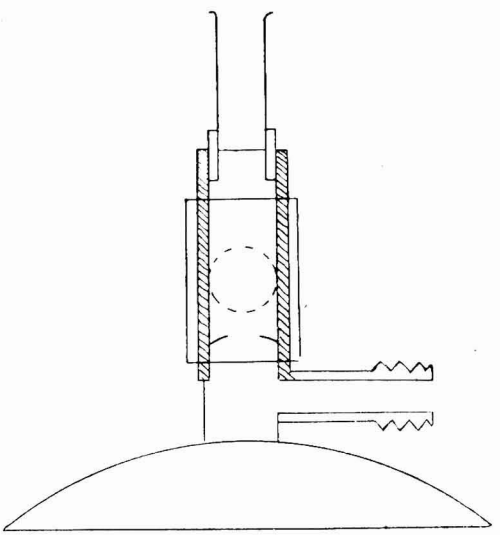
When molybdenum alloys are exposed to elevated temperatures, they need protection against oxidation. For that reason, the research also included experiments on the effects of cladding materials on creep properties. It was found that nickel cladding has no effect on creep life. A protective coat of nickel limits total elongation of molybdenum parts to between seven and nine per cent, somewhat lower than for unclad molybdenum. This amount of ductility, however, is still sufficient for most high-temperature applications.

Simple Micro-Burner

AN EASILY constructed, inexpensive micro-burner may be made from the simplest materials using a method described in a communication from Mr. P. Sleightholm, of the Technical College, Blackburn.

The brass chimney of a normal Bunsen burner is cut off just above the air control valve. A one cm. length of medium walled rubber tubing (7 mm. external diameter, 1.5 mm.-thick walls) is fitted on to the end of a three cm. length of Pyrex glass tubing (6-7 mm. external diameter). The glass tubing with rubber end downwards is fitted inside the top of the cut down chimney. The air regulator is used in the normal way and it is found that a non-luminous flame may be maintained indefinitely. The rubber joint keeps very cool even after the burner has been in use for several hours continuously.

Provided the jets are in reasonable condition, says Mr. Sleightholm, old Bunsen burners may be converted to micro-burners very successfully. It is sometimes possible to obtain spare chimneys when purchasing new burners, and, in this case, some can be cut down.



Cylinder Labelling

by Henry Allen, The Yale & Towne Manufacturing Co., British Division

'WHAT'S in that cylinder? ' is a query that ought never to be spoken in a factory which has adequately framed a set of codes of safe working practice. For meticulously careful marking of all containers is a basic necessity of industrial accident prevention technique.

How to mark cylinders so as to ensure safe handling has, indeed, been a matter which has had international consideration and some standards of identification for various materials have already been established. Where such standards exist and apply, the problem is considerably eased for the official whose responsibility it is to cover safe working in the unit.

It is now accepted that nothing beats the written word as a clear and comprehensible and most nearly infallible technique. There was some considerable experiment with the use of colour codes, which are now generally accepted as less effective than the written word.

An indefinite number of colour combinations would have to be devised, whereas there are only seven basic colours. This would mean inevitably that use would have to be made of various shades within one colour and there at once potential difficulties arise. It has already been proved that many paints and colouring materials change colour when exposed to some atmospheres.

Human Visual Acuity

That might be a technical difficulty which could be overcome but there remains the unalterable fact of divergence and differences in human visual acuity. Colour perception in individuals shows wide variations.

Furthermore there is another human factor implied in the use of a colour system for marking containers. All those handling the containers would have to know what each of the manifold colour combinations indicated. The use of colour would involve the possibility of error in the identification of containers.

Yet colour has its value and should be used in container marking for secondary purposes, such as are involved in good housekeeping.

Of the materials which make up the contents of the kind of container that must immediately be identifiable anywhere, gases and chemicals comprise the two chief groups. Some 60 types of compressed gases are stored in containers. In international use, each type can be hazardous unless its qualities and characteristics are known. The need for accurate marking is thus of primary importance.

Recommended Standards

For that reason the International Organisation for Standardisation has drawn up a set of recommended standards covering compressed gas containers. It urges that containers shall be legibly marked and that marking shall be by means of stencilling, stamping or any other means not readily removable. Furthermore, since details are important in this kind of world standard, it is recommended that the marking shall be located at the valve end, and that the height of the lettering shall be not less than one twenty-fifth of the diameter of the container.

Language is obviously of immense importance in this matter of marking containers holding contents that may be hazardous and all statements made on the container must be simple, concise and must carry the same connotation to all readers. It may be thought advisable to list the hazards when the material is potentially dangerous and also to outline precautions to be taken in handling. But warnings are generally to be avoided—a point emphasised by the Association of British Chemical Manufacturers which has devoted considerable research to the problem of container labelling. Internationally, a formula has been established on the agreed abbreviations for identifying chemicals and to some extent those fixed, brief designations obviate any difficulty that might arise purely from language obscurity.

Where containers moving only within one country are concerned, the system of marking can be more elaborate but standardisation is as important here as with inter-country movement. Greater elabora-

[*continued on page 285*

Occupational Diseases

Lessons taught at the Industrial Health & Safety Centre

NOWADAYS the occupational hazards commonly encountered in the chemical and associated industries have become well known and the majority of employers and workers are familiar with the main principles of prevention. Yet nowhere is familiarity more liable to breed contempt than in a factory or works.

From this aspect alone a visit to the Industrial Health and Safety Centre at Horseferry Road, London S.W.1, is well worth while. There is a grisliness about some of the exhibits in the section dealing with industrial health, which may come as a salutary shock to those who incline to complacency in their attitude to health and safety, whether their own or that of their workers. Apart from gaining a realistic insight into the nature and effects of the various occupational hazards, visitors to the Centre are shown simply and concisely how these hazards arise, their nature, and how they can be prevented. Even for experienced health officers a visit to the upper storey of the Centre can serve as a valuable refresher course.

Silicosis Most Dangerous

Among the most widespread industrial diseases is silicosis, which apart from asbestosis, is by far the most serious of the pneumonoconioses. The silicotic is specially liable to be attacked by tuberculosis and it is largely through the development of this complication that the disease so often proves fatal.

Silica gives rise to a very fine dust and the particles which reach the lungs are seldom more than 1/5,000 in. in diameter, the vast majority being less than a quarter that size. The effect on the lungs is illustrated by a series of photographs.

Silicosis and other forms of pneumonoconioses occur in occupations associated with the production of fine dust. The most important in Great Britain are the mining of coal, ganister and certain ores; the quarrying and dressing of stones containing a high proportion of quartz; the manufacture of pottery, silicon, abrasive soaps, polishes, etc.; the grinding and sandblasting of metals; some foundry processes and the crushing or grinding of materials containing quartz, chert or flint.

The application of radiography is the most important factor in the differential diagnosis of the disease, but it must be taken in conjunction with ordinary clinical methods, as otherwise it is liable to be misleading. The changes produced in the lungs by the inhalation of silica dust are associated with the formation of fibrous tissue in nodular form and of such density that they can be recognised by X-ray photography.

The effects of silicosis are illustrated by a series of actual radiographs showing the lungs of workers in various industries at different stages of the disease. The examples include a retort setter 55 years old, who had been exposed for 30 years to the inhalation of dust of free silica in setting refractory retorts. The X-ray examination showed reticular nodulation over both lung fields, but there was no evidence of tuberculosis.

Another interesting radiograph is that of an emery grinder aged 45, who was exposed for 26 years to the dust of emery during grinding, sieving and packing. Abnormal X-ray appearance was discovered during a mass radiography survey. The examination showed generalised fine reticulation throughout both lung fields. Emery is opaque to X-ray, however, and in its pure form so far as is known does not cause fibrosis of the lungs. This man was not disabled and his lung function tests were quite normal.

The chief means of preventing silicosis are summarised as follows:

(1) Replacement of harmful material by a less toxic one.

(2) Dust suppression or control by:
(i) Ventilation—general or local.
(ii) Enclosing the process.
(iii) Changing the process.
(iv) Isolating the process.
(v) Wet methods—water or oil.
(vi) Electrostatic precipitation.
(vii) Good housekeeping.

(3) Personal protection of the worker by:
(i) Dust respirators.
(ii) Breathing apparatus.

Industrial Safety

Respirators have only a very limited protective value and their use should not be regarded as a substitute for dust suppression and control.

Skin diseases are exemplified by an awesome display of afflicted hands, arms, and other parts of the body. The most impressive exhibits are those illustrating epitheliomatous ulceration or cancer of the skin, which is caused by contact with pitch, tar, bitumen (rarely), mineral oil or paraffin. One exhibit is the arm of a man over 70 years old, who had been employed in a tar works for 38 years, the last ten years of his working life being on an anthracene filter press. This worker had 20 warts excised, the first 21 years ago and the last six after he had finished working.

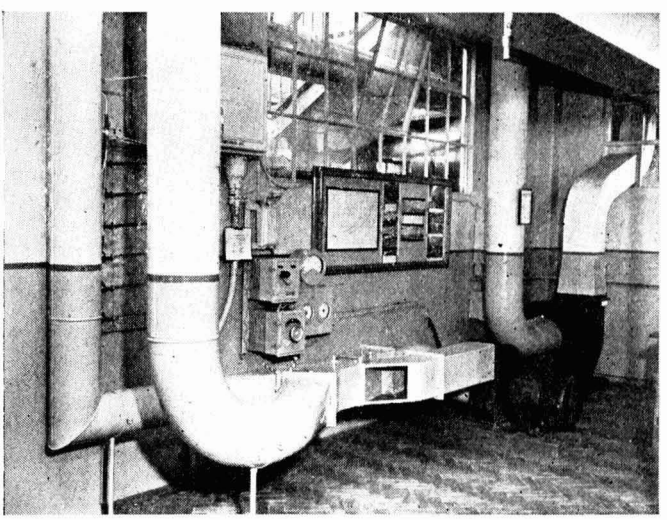
Cancer of the skin can be prevented by the following measures:

1. Use of a non-carcinogenic substance. Where this is not practicable skin contacts with skin carcinogens should be reduced to a minimum.
2. Provision and use of washing facilities, augmented if necessary, by special skin cleaners.
3. Provision of suitable protective clothing, which must be properly cleaned and maintained in good order.
4. Periodic medical examination and immediate treatment of early signs of skin damage including warts.

Due prominence is accorded, of course, to dermatitis. A typical exhibit is the hand of a chemical labourer, aged 60. The condition, which had lasted for 18 years, started after two years' work with arsenical preparations. Another hand represents a special type of dermatitis due to exposure to Rontgen rays. The signs include (1) absence of the natural creases of the skin (atrophy); (2) red areas due to dilated blood vessels (telangiectasis); (3) brown pigmentation; and (4) inflammation merging gradually into normal skin.

A drawing showing the layers of the skin helps to explain how dermatitis is caused and how it can be prevented. Roughly speaking, the skin is divided into two layers, one being the cellular epidermis with an outer horny layer and the other the *Corium*, which is mainly fibrous tissue supporting the blood vessels. The outermost layer is made up of horn cells with the orifices of the sweat and sebaceous glands and the hair follicles. It is the function of the epidermis to give the skin its power of resistance to the entrance of poisons and irritants. As long as it remains in good condition the worker has some protection against industrial dermatitis.

The thickness of the epidermis varies in different parts of the body. Where it is relatively thin, as at the wrists and between the fingers, it requires special protection in circumstances where dermatitis is known to occur. It is also noteworthy that the horny layer contains a waxy substance which gives the skin its waterproof properties and pre-



Demonstration ventilation plant at the Industrial Health & Safety Centre to illustrate good and bad designs of ducts

vents the absorption of water and other substances dissolved in water. Hence the risk involved in the use of substances such as petrol, benzol, etc., which act as fat solvents, for in this way the natural fat of the skin is dissolved, thereby eliminating the first line of resistance, which the undamaged epidermis affords.

The keratin of the horn cells is capable of withstanding a 50 per cent solution of mineral acids for a time, but is readily dissolved by a weak solution of potash and alkalis.

Natural Protection

It is evident that the secret of success in the prevention of dermatitis must lie in preserving the natural protective properties of the outer layer of the skin. The epidermis can only be a protection when it is intact—i.e., with no break, however small, in its continuity. Abrasions, cuts and burns all destroy its protective character. The value of prompt first aid treatment for such injuries, however trivial they may seem, is thus apparent.

If the epidermis is kept in a healthy condition and protected, where necessary, by gloves or sleeves against the action of irritants, there will be no risk of industrial dermatitis. Cleanliness, prompt removal of irritating substances, and attention to injuries are essential. The natural protection afforded by the horny layer may be enhanced by such simple measures as the daily use of a skin cream where possible.

A range of Swarfega hand-cleaning equipment and a selection of barrier creams to be used before work, made by various manufacturers, are displayed at the Centre.

The dangers of unskilled treatment are indicated by the hand of a worker who neglected to seek skilled first aid for a caustic alkali burn. A wet dressing was applied and merely increased the action of the alkali. The burn would not have been so severe if the hand had been washed at once in a dilute solution of a mild acid (e.g., acetic, boric, etc.), which would have neutralised the alkali, or if the wound had been flooded with water.

Lead poisoning is almost always the result of inhalation of dust or fumes, but sometimes it is contracted by swallowing dust or spray. Lead tetraethyl, used in the doping of petrol, can be absorbed through the unbroken skin.

A blue line at the gums merely indicates the presence of lead in the system, but is not necessarily a sign of lead poisoning. Other symptoms include anaemia; habitual constipation and attacks of colic; and arthalgia, or pain localised near the large joints—generally knee, elbow or shoulder. Attacks of vertigo, persistent headache, tremor, numbness or impairment of muscular action are significant. The most typical effect on the nervous system of inorganic lead poisoning, however, is paralysis of the extensor muscles of the fingers and wrist. Interstitial nephritis (chronic kidney disease) may occur in advanced cases.

Industrial Safety

The following are among the main causes of lead poisoning in occupations associated with the chemical industry:

Manufacture of white lead—dust arising from dross from molten metal in the manufacture of wickets, from emptying the stacks, from handling the corrosions, from the drying stores, and from grinding and packing dry white lead.

Manufacture of red lead—dust from furnaces and in packing.

Tinning of metals—lead chloride vapour evolved by the chemical reaction between the hydrochloric acid used in cleaning and the molten mixture of tin and lead.

Manufacture of indiarubber—lead oxide dust at incorporating rolls.

Manufacture of paints and colours—dust produced in grinding and in manufacturing the dry lead colours.

Seven methods of prevention are listed at the Centre. These are:

1. Substitution of non-lead for lead materials.
2. Locally applied exhaust ventilation to remove dust and fumes.
3. Removal of lead paints by a wet process with waterproof sandpaper, pumice, etc.
4. Cleanliness of tools and workrooms; damping of floors and materials to prevent dust.
5. Provision and use of protective clothing.
6. Periodical medical examination of persons employed in lead processes to detect signs of absorption.
7. Provision of messrooms and prohibition of food or drink in the workrooms.

There are some ten codes of regulations

bearing on the lead risk, and some of these codes require periodic medical examination of the workers by the district appointed factory doctor or by a duly qualified medical practitioner appointed by written certificate of the Chief Inspector of Factories.

An example of equipment for handling lead is a dross container lent by Fry's Metal Foundries Ltd. The dross is deposited in an upper chamber, the cover of which closes automatically. When cool the dross is caused to fall into a bay in the lower chamber by the operation of side levers. When the bay is full the upper chamber is lifted off; this permits the bay to be closed, tied and removed with the minimum escape of dust.

In 1893 the prevalence of lead poisoning resulted in an inquiry by a Home Office departmental committee. Special rules were introduced the following year and remained in force until 1911, when they were replaced by new regulations. The effect of these measures is indicated by a graph showing that since the second world war the number of cases of lead poisoning reported from white and red lead works has ranged from one to four a year compared with 377 in 1900. The number of cases reported from all sources in 1900 was 1,058, and during the last four or five years the reported figure has remained fairly stationary around the 50 mark.

Safety Notebook

INDUSTRIAL accident prevention is not merely a humanitarian task undertaken by the kindhearted to prevent other people from being killed, says the Industrial Safety Division of the Royal Society for the Prevention of Accidents. On an average three people are killed every working day in British factories, and a vast number receive injuries of varying severity. It is estimated that the loss to the nation is not less than £80,000,000 per year.

Industrial accidents bring losses to the employer, the worker, the worker's family and to the community at large. But it is the worker himself who loses most by an accident—an accident which he could probably have avoided had he developed a habit of working safely.

With the object of encouraging all workers—but particularly young workers—to 'start a safety habit today' and to remember that 'safety habits last a lifetime', a campaign is being launched by the Industrial Safety Division. During the first week of the campaign (24-29 October) it is hoped to introduce these two slogans into every factory, large and small, throughout the United Kingdom.

Managements will be asked to keep these and similar slogans constantly before their workers and to do all in their power to foster safe working.

Throughout the United Kingdom there are some 50 local industrial accident prevention groups who will be organising special functions in connection with the campaign. Many of them will be supported by the local civic head and Chamber of Commerce. Individual works safety officers will carry the campaign into their own factories.

The Society has a very sincere belief in its ability to help industry in the task of reducing the number of accidents at work. For this reason a special effort will be made during and following campaign week to increase the number of firms subscribing to the Society's industrial division, thereby becoming entitled to all the services the division has to offer. Though most of the larger industrial concerns in Britain, numbering about 5,000, are members of this Society, there are still 235,000 smaller factories and workshops which have little or no safety organisation. It is hoped that this year's campaign will bring many of these smaller concerns to appreciate the value of membership of this Society.

* * *

FOR the second consecutive year Union Carbide was presented the National Safety Council's Award of Honour on the basis of its 1954 safety record, which surpassed

the Corporation's all-time record set in 1953. The 1954 award was given, as usual, for a reduction of frequency and severity rates below par rates established by the Council. During 1954 the accident frequency rate for Corporation employees of 3.02 disabling injuries per million man-hours worked was 44 per cent below the par rate. The severity rate of 0.58 days lost per thousand labour hours worked was 38 per cent below.

In addition to the Corporation's award, several individual plants have received Awards of Honour. A total of 133 awards were received from the National Safety Council in recognition of plant, home, and off-the-job safety programmes, and 118 awards were received from national, state, and local agencies.

* * *

NU-SWIFT Ltd., of Elland, Yorkshire, are marketing a new 'wet' water composite pressure charge for use in first-aid fire fighting on porous materials such as cotton, upholstery, woodshavings, straw and hay.

It has been found that surface tension prevents plain water from spreading and penetrating into porous materials and therefore hinders the cooling of hot spots, which in the case of deep-seated fires is more important than the extinction of surface flames.

The Nu-Swift 'wet' water concentrate is of the non-ionic type and is contained in a plastic bag. This bag is burst when the extinguisher is operated and the concentrate is immediately mixed with water before being forced out of the hose by pressure of carbon dioxide.

The use of 'wet' water on deep-seated fires is claimed to bring about an increase of 50 per cent efficiency over ordinary water.

* * *

HUMAN behaviour is responsible for 70 to 80 per cent of all industrial accidents, according to a report published by New York University's centre for safety education.

Although, says the report, much is known about the relationships of safety engineering, diseases, disorders and physical working conditions to accidents and injuries, statistics indicate that these factors account for only 20 to 30 per cent of industrial mishaps.

Safety Notebook

The report, entitled 'The Human Element and Industrial Accident Prevention', says that although the physical environment contributes to accidents, the social and psychological climate does to an even greater degree. Factors of morale and job satisfaction tend to assume greater importance in the minds of workers than financial considerations.

This study is intended as a guide and reference work for safety engineers, personnel directors, researchers, training directors, industrial psychologists, safety supervisors, college and university instructors, and industrial physicians.

* * *

THE effectiveness of a borax/boric acid solution for flameproofing fabrics was proved during the recent 500 mile car race at Indianapolis. One of the drivers crashed and his car burst into flames but, according to Dr. C. B. Bohner, medical director of the speedway, his life was saved because his overalls had been fireproofed in this way.

The driver escaped burns on 90 per cent of his body and was, in fact, burned only where his clothing was either torn or did not cover him.

A recommended solution is 10 oz. of borax and 8 oz. of boric acid to a gallon of hot water.

Cylinder Labelling

continued from p. 280

tion may well provide opportunity to indicate action to be taken in the case of accident or leakage (always a major hazard) but since any first-aid measure must be effective with means quickly available, possibly under circumstances remote from surgical and clinical amenities such instructions must be very simple.

The first essential is to operate a marking system that achieves the two major aims of identifying and of denoting a hazardous material. And that broad principle goes both for the international trade and for the use and location within one factory of containers.

MOLECULAR VIBRATIONS. By E. Bright Wilson, Jr., J. C. Decius & Paul C. Cross. McGraw-Hill Book Company, New York & London. Pp. xi + 338. $8.50.

This book gives a clear and thorough account of the mathematical methods now used in the study of the vibrations of polyatomic molecules. Methods of increasing mathematical subtility and power are introduced progressively and sufficient illustrative examples are included in the text of most chapters to enable the conscientious reader to distinguish sharply between a benign but hazy acquiescence in the formulae being developed and the clear understanding necessary in order to apply them to concrete cases. The last chapter but one is devoted to the vibrational analysis of benzene, the final calculations being carried out with the numerical values of the frequencies. Other chapters give brief theoretical outlines of such topics as infra-red vibration selection rules and intensities, the Raman effect and depolarisation ratios and intensities thereof. On the more empirical side several tables of values of force constants are given and there is a brief discussion of the merits and defects of the various approximate force fields used for polyatomic molecules. The book has a large mathematical appendix.

The mathematical treatment makes extensive use of matrices and elementary group theory and although an outline of most of the necessary parts of these methods is given in the text and in the appendices, previous acquaintance with these methods will be found a very considerable advantage.—A. D. E. PULLIN.

CORROSION IN PACKAGING. The Printing, Packaging & Allied Trades Research Association, Leatherhead, Surrey, and the Institute of Packaging, London. 1954. Pp. 92. 21s.

In the spring of 1954 a course of lectures entitled 'Corrosion in Packaging' was arranged by the Department of Applied Chemistry of the Northampton Polytechnic, London E.C.1. Many requests have been made for copies of these lectures and in consequence it has been decided to issue them in book form.

There are five lectures in all: 'General Principles of Corrosion' by W. H. J. Vernon, 'General Principles of Packaging of Corrodible Articles' by J. J. Ferriggi, 'Corrosion Prevention in Packaging' by D. Clayton, 'Barriers and Desiccated Packs' by D. J. Evans, and 'The Selection of the Packaging Method' by F. A. Paine.

The incorporation of these five lectures in one volume should provide a handy source of information for anyone concerned with the packaging of materials.—J.P.S.J.

A HANDBOOK OF HARD METALS. By W. Dawihl. HM Stationery Office, London. 1955. Pp. viii + 162. 25s.

This is a translation in a reduced form of Dr. Dawihl's book 'Handbuch der Hartmetalle'. This reduction has been made possible by removing or condensing all information which is either well known in the industry or has been previously published in English.

The work of translation was carried out by three firms, Hard Metal Tools Ltd., Coventry, Metropolitan-Vickers Electrical Ltd., Manchester, and Murex Ltd., Rainham.

The first part of the book, chapters one to 10, deals with scientific principles and the second part with the technical production of hard metals. It has not been possible to obtain the manuscript of the third part of the book, dealing with the manufacture and application of tools, but this is being published in two volumes by Springer-Verlag, Berlin.

As a guide to the preparation and properties of hard metals this book should prove of the greatest value.—J.M.

HOME

British Biochemists in Red Zone

According to a Soviet Zone news agency two British biochemists, Dr. R. L. M. Synge, of the Rowett Research Institute, Aberdeen, and Mr. N. W. Pirie, of the Rothamsted experimental station, are visiting research institutions in the Soviet zone of Germany.

Changed Name

Mactaggart & Evans Ltd., of Sondes Place Research Institute, Dorking, Surrey, have changed their name to—Sondes Place Research Laboratories Ltd. The address and telephone number remain unaltered.

I.C.I. Offer to Water Board

When suggesting that the Tees Valley Water Board should build two new impounding reservoirs in the Pennines, I.C.I. made a tentative offer to meet part of the cost, which, with ancillary works, is estimated at about £12,000,000. I.C.I. will need vast quantities of water at their Wilton works, near Middlesbrough.

Raising Octane Value

Rapid technical advances are taking place in the petroleum industry to raise the octane value of fuel. Recent modifications have taken place 275 ft. above ground inside the main column of the T.C.C. thermofor catalytic cracking unit at the Coryton refinery of the Vacuum Oil Co. Ltd. to improve the performance of this unit. The steel frame and dead hard castings were supplied by Birwelco Ltd., and installed during the programmed shut-down of the plant.

Combating Atmospheric Pollution

When atmospheric pollution on Tees-side was referred to at a meeting of Stockton-on-Tees Town Council it was reported that a letter on the subject had been received from Imperial Chemical Industries Ltd. (Billingham Division). The letter stated that I.C.I. had in some cases gone further than the Beaver Report in dealing with atmospheric pollution from their works. The works, however, were so large that occasional emissions due to mechanical breakdowns were impossible to avoid. The firm invited members of the Corporation Health Committee to visit I.C.I. works to see what measures were used to combat atmospheric pollution.

To Extend Activities

To extend their activities in the field of chemical cleaning for industrial and marine equipment, Houseman & Thompson Ltd., of Newcastle-upon-Tyne, have opened a factory at Smeaton Street, Willington Quay, Northumberland.

Experiment to Meet Rayon Needs

Experimental plantings of bamboo in the West of Scotland have been made to test the area as a potential source of bamboo for the pulp industry. The rayon industry, anxious to find a home source of supply—spruce is too costly and in too much demand, and straw not available in the quantities needed—considers bamboo is chemically suited for its needs.

On National Telex Network

The Staveley Iron & Chemical Co. Ltd. has been connected to the National Telex network; their Telex number being 54—211, and the answer-back code Stavex Chestfld. The company's telegraphic address is Staviron Chesterfield Telex.

Open Days at Teddington

An exhibition of the work being carried out at the Chemical Research Laboratory, Teddington, Middlesex, may be seen during three open days to be held from 27 to 29 September. Industrial organisations desiring to attend should apply to the director not later than 31 August.

Grant to Seaweed Institute to End

The Development Commission has accepted the recommendations of the Advisory Council on Scientific Policy regarding The Institute of Seaweed Research at Inveresk and grant aid will be ended within the next 12 months. It is considered that a stage has been reached when the exploitation of seaweed resources should be undertaken by industry rather than by an institute financed by public funds.

Chemical Workers

The number of people employed in the chemical industry has increased from 498,800 to 512,800 in the 12 months ending May 1955. The increases, according to the *Ministry of Labour Gazette*, July 1955, have been spread over the whole of the industry and not confined to any one particular branch.

OVERSEAS

New Source for Drug

A source of reserpine, an important drug, has been discovered by plant officers of the Australian Commonwealth Scientific and Industrial Research Association, in *Astonia Constricta* or 'bitter bark'. Hitherto the the principal source of the drug has been the rauwolfia plant which grows in India.

First Year at Aden

On 29 July, British Petroleum celebrated the first anniversary of their Aden refinery which was built on a sandy waste after nearly two years' intensive work. Since opening, the refinery has refined about 3,500,000 tons of crude oil. Main units at Aden are two distillation units, a transformer, an autofiner and an SO_2 plant.

Pembina Oilfield Second

Figures released by the Alberta Petroleum & Natural Gas Conservation Board shows that the Pembina oilfield, 80 miles southwest of Edmonton, has become Canada's second largest production region. With 308 wells capable of production, the Pembina field yields 49,037 barrels of oil a day.

India Plans for More Aromatics

Plans for stepping up India's production of essential oils and aromatic chemicals will be discussed at a symposium at Dehra Dun from 6 to 9 October. Organised by the Council of Scientific & Industrial Research, the symposium will consider all essential oils and aromatic chemicals.

Foreign Proposals to be Considered

Foreign firms who have proposed building fertiliser plant in the Bhakra-Nangal area, India, are to have their proposals considered by a committee of technical experts headed by the chief industrial adviser to the Government of India. Selection of a firm to build a plant for producing 200,000 tons of ammonium nitrate a year is expected to take place about three months after the committee presents its report to the Government.

Pakistan Science House

Dr. Bashir Ahmed has announced that Pakistan plans to establish a science house at a cost of Rs.1,000,000, half of which sum has been collected through voluntary donations. The science house will provide for a library of 250,000 volumes.

Canada Petroleum Record

Canadian production of crude petroleum in the first quarter of this year topped all previous records, rising to 28,596,438 barrels as against last year's corresponding total of 21,824,064. Natural gas production also reached a new high in the quarter, amounting to 44,159,963,000 cubic feet against 38,311,368,000 a year ago.

Titanium Dioxide Duty

The Indian Government's resolution on the Tariff Commission's report on continuance of protection to the titanium dioxide industry has been published. The Government has accepted the Commission's recommendation that protection granted to the industry should be continued for another two years until December, 1957. Revised rates of protective duty on titanium dioxide, namely 44 per cent, *ad valorem* (preferential), were brought into force on 2 July.

W. German Synthetic Fibre Production

Production of fully synthetic fibres in West Germany last year increased by 48 per cent. With continued expansion, still further gains are anticipated in the manufacture of Perlon, Terylene, nylon, acrylic and other fibres this year. The annual Perlon production capacity is rated at 10,000 tons. Eight companies are producing Perlon in Western Germany.

Sugar Research at Battelle

The Sugar Research Foundation, Inc., has signed a contract with Battelle Institute, Columbus, Ohio, continuing a programme initiated earlier this year on the development of chemical derivatives of sugar for agricultural applications. One objective of the research is the formulation of pesticides based on the use of sugar as a starting substance for chemical synthesis.

I.C.I.'s American Venture

I.C.I., in partnership with Columbia-Southern Chemical Corporation of Pittsburg, are planning to produce titanium 'sponge' in the US, it was learned at time of 'going to press'. The project is for a $10,000,000 plant at Natrium, West Virginia, producing 5,000 tons of titanium annually.

PERSONAL

MR. J. A. E. REISS, a vice-chairman and a managing director of the Associated Portland Cement Manufacturers and its subsidiary, the British Portland Cement Co., has been elected deputy chairman of both companies. Mr. Reiss is the chairman of the Cement Marketing Co.

The RIGHT HONOURABLE OSBERT PEAKE, minister of Pensions and National Insurance, has appointed MR. NORMAN J. CAMPBELL, S.S.C., director of the National Paint Federation, to be a member of the Industrial Injuries Advisory Council which advises the minister on proposals for regulations and on other matters referred to it by him.

DR. R. R. H. BROWN has been appointed chief superintendent of the blasting department of I.C.I.'s Nobel Division in succession to MR. H. G. RICKARD. Dr. Brown joined I.C.I. in 1934, and since June 1953 has been chief superintendent of the propulsive department. His successor in this department is DR. A. C. HUTCHINSON who joined I.C.I. research at Ardeer in 1939. Other I.C.I. changes are: DR. R. V. SEDDON works superintendent at the Powfoot factory of the Nobel division who takes over the management of the works. He succeeds MR. E. OWEN who has left to take up duties as technical manager of Suez Contractors (Ammunition) Ltd.

MR. C. S. TOSELAND, C.B.E., the Board of Trade and Ministry of Supply controller for the London & South-eastern Region, retires on 1 September. He will be succeeded by the Midland Region controller, MR. BARRY KAY, C.B.E. Mr. Kay will be succeeded at Birmingham by MR. A. N. HALLS, M.B.E., of the London headquarters' staff of the Board of Trade.

In order to commemorate his services to the Lampblown Glassware Industry, the Council of the BLSGMA presented an engraved glass goblet to MR. H. H. ZEAL during the evening of 25 July. The presentation was made after an informal dinner party at the headquarters of the Glass Manufacturers' Federation, 19 Portland Place, London W.1, at which Mr. Zeal was the principal guest. Mr. Herbert H. Zeal, senior director of the British firm of thermometer manufacturers, G. H. Zeal Ltd., is a son of the founder. Educated at Merchant Taylors, and starting work in the industry in 1902, Mr. Zeal has taken a close interest in the British Scientific Instrument Research Association and for some time has served on the Council of the Scientific Instrument Manufacturers' Association. For many years he has been a member of the Council of the BLSGMA and latterly president. Over many years, Mr. Zeal has represented the industry in various Government inquiries, and on Government deputations. He has taken an active part in the work of the British Standards Institution.

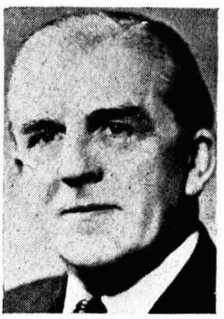
MR. WILLIAM LEE SIMS has been appointed president of the Colgate-Palmolive Co. His place as vice-president, and that of president of the subsidiary, Colgate-Palmolive International, has been taken by MR. RALPH A. HART.

As mentioned in our issue of last week (see p. 236) a new company is being formed to take over the manufacturing and marketing activities in the UK and Eire of all Shell's chemical interests. The company is to be called Shell Chemical Co. Ltd. and is to have an authorised capital of £10,000,000. Chairman of the company will be MR. F. A. C. GUEPIN, a managing director of the Shell Petroleum Co. and of the Bataafsche Petroleum Maatschappij and a director of many other companies connected with the Royal Dutch/Shell Group. The vice-chairman is to be MR. W. F. MITCHELL,

F. A. C. Guepin

W. F. Mitchell

L. H. Williams



E. le Q. Herbert

B.Sc., a Canadian who graduated from Queen's University, Toronto. Previously general sales manager of Shell Company of Canada, Mr. Mitchell is now head of Chemical Industry Administration, which is the department of the Shell Petroleum Co., London, which is responsible for the development of Shell's world-wide chemical interests outside the US and Canada. Managing director of the new company will be MR. L. H. WILLIAMS, who was once general manager of Shell Chemicals Distributing Company of Africa Limited but returned to London in 1950 as deputy commercial manager of Shell's Chemical Industry Administration. MR. G. H. W. CULLINAN, who is to be commercial director and deputy to the managing director, has been general manager of Shell Chemicals Ltd. since its formation in 1946 and previous to that was general manager of the Shell Company of East Africa Limited. MR. E. LE Q. HERBERT, who will be executive director manufacturing, has been general manager of Shell Refining and Marketing Co. since 1952 and responsible in this capacity for the administration of all Shell's oil refineries in the UK. Other directors include DR. M. A. MATHEWS, MR. F. MACKLEY and SIR ROBERT ROBINSON, O.M., F.R.S. Dr. Mathews, before joining Shell's Industrial Development Management in 1947, was with H.M. Fuel Research Station, Imperial Chemical Industries and Anglo-Iranian Petroleum Co. Ltd. Mr. Mackley joined Shell in 1923 and after laboratory and refinery experience in several countries became manager of Stanlow refinery. In 1950 he came to London as assistant general manager of Shell Refining and Marketing Co. Sir Robert Robinson was until recently Waynflete Professor of Chemistry at Oxford and was president of the Royal Society 1945/40. He won the Nobel Prize for Chemistry in 1947.

On 1 August MR. C. S. HADFIELD took over duties as treasurer of Shell Petroleum and Anglo-Saxon Petroleum, and MR. J. G. VAN DEN BOSCH deputy treasurer of these companies. MR. G. B. HUISKAMP is taking up an appointment with the Royal Dutch/Shell Group at The Hague.

The Distington Engineering Co. Ltd. announces that MR. J. M. L. HOWELL has been appointed sales manager.

The reconstitution of the Board of Shell Refining & Marketing Co. Ltd. is: MR. J. W. PLATT chairman of the board, and MR. E. LE Q. HERBERT managing director. The other directors: MR. J. A. BERRIMAN, MR. J. GRANT, MR. F. MACKLEY, MR. C. R. MIDDLETON, MR. F. J. STEPHENS, MR. R. W. J. SMITH and MR. W. S. THOMPSON.

DR. F. D. S. BUTEMENT, B.Sc., Ph.D., F.R.I.C., has been appointed to the newly established post of senior lecturer in radiochemistry in the Department of Physical and Inorganic Chemistry at Liverpool University. Dr. Butement has been principal scientific officer at Harwell since 1951.

SIR GEOFFREY HEYWORTH, chairman of Unilever, Ltd., on whom a barony was conferred in the Birthday Honours this year, is to take the style and title of Baron Heyworth of Oxton in the County Palatine of Chester.

DR. R. H. PETERS, head of dyeing research for I.C.I., is to be the new professor of textile chemistry at Manchester's College of Technology. The appointment, approved by Manchester City Council on 27 July, is subject to the agreement of the University Council.

DR. ARNO C. FIELDNER of Washington, D.C., retired from the Bureau of Mines after more than 48 years. Inventor, author and developer of techniques used in testing and analysing coal, coke and gas, Dr. Fieldner holds many awards for scientific achievements in his field. Except for two years spent in directing resarch for the Army's chemical warfare service during World War I, he has served continuously in the Bureau of Mines since 1910.

Will

MR. JOSEPH PEARSON POSTLETHWAITE, of Newbold, Derbyshire, joint managing director of Coalite & Chemical Products, left £11,448 gross (£9,018 net).

CBMPE Report

SPEAKING to members of the Council of British Manufacturers of Petroleum Equipment at the close of his three-year term of office as chairman, Mr. Douglas Wilson, of the United Steel Cos., Ltd., said: 'It seems the industry is running at something like £100,000,000 a year, and there is every reason to expect that this figure will not only be maintained, but is likely to be increased.'

Mr. Wilson, who retired on 1 August, has been succeeded as chairman by Mr. G. V. Sims, managing director of Le Grand Sutcliff & Gell Ltd. In his report, just released, on the work of the Council of British Manufacturers of Petroleum Equipment in 1954/55, Mr. Wilson says there are 'enormous opportunities in the petroleum industry which is far from being a declining business.'

For the first quarter of this year the value of orders for oil equipment and materials received by British companies totalled £32,773,500.

Paying tribute to the value of exhibitions, Mr. Wilson said: 'We believe we can recognise a degree of quickened interest in council publications and other services in the Middle East since the council interested itself in the Baghdad Fair. Now we shall turn our thoughts to an all-out effort for the joint Chemical and Petroleum Engineering Exhibition at Olympia, London, from 9 June to 3 July, 1958, in conjunction with the British Chemical Plant Manufacturers' Association.'

Gas Board to Buy Segas

THE North Thames Gas Board has recently placed an order with The Power-Gas Corporation Limited for a Segas catalytic oil gas installation at their Uxbridge works. The plant will consist of two Segas units each producing 1,500,000 cu. ft. of gas per day and will be complete with all necessary ancillary equipment. A single waste heat boiler will serve both units, and a separate oil-fired boiler will be provided to supply the balance of steam requirements.

A low-pressure steam system incorporating a steam accumulator will take the exhaust steam from the exhauster and air blower to provide process steam to the plant.

The project includes foundations, building, oil storage tanks, relief gasholder, electrostatic detarrer and naphthalene washer. Provision is made for the re-circulation of cooling liquor over a cooling tower from the direct contact washer cooler. It is expected that the plant will be in operation by the end of 1956.

Automatic Control Conference

AT the joint conference on Automatic Control in the Process Industries which will be sponsored by The Institution of Chemical Engineers and The Society of Instrument Technology at Caxton Hall, Westminster, London, on 4 October as reported in THE CHEMICAL AGE last week, nine papers will be presented. They will cover a number of aspects of automatic control in relation to the design and operation of process plant.

Authors of papers to be read are: R. S. Medlock (Fundamentals of Automatic Process Control), J. McMillan (The Dynamics of Process Plant), B. W. Balls & A. H. Isaac (Automatic Process Control & Chemical Engineering), B. O. Smith & W. A. Goldstein (Automatic Control Applications in Industry), W. A. J. Preece (The Temperature Control of Large Storage Tanks), N. C. Underwood (Automatic Control in the Pulp & Paper Industry), S. W. J. Wallis (The Economics of Process Control), and A. J. Young (The Development of Modern Control Technique & the Pattern of Future Development).

There will be morning and afternoon sessions for the presentation of papers, followed by discussions. Members of the sponsoring societies who would like more details are invited to apply to their respective secretaries.

Home Office Notice

Attention is drawn to the Poisons List Order, 1955 (S.I. 1955 No. 1134), and the Poisons Rules, 1955 (S.I. 1955 No. 1135), which were made by the Secretary of State on 22 July 1955, and which come into operation on 15 August 1955. The effect of these Statutory Instruments is to add methylpentynol to Part 1 of the Poisons List and the First Schedule to the Poisons Rules. Copies of the Poisons List Order, 1955 (price 2d.), and of the Poisons Rules, 1955 (price 2d.) may be obtained from Her Majesty's Stationery Office or through any bookseller.

Publications & Announcements

A NEW kiln gun shell with 18 per cent more muzzle energy is now being offered by the arms and ammunition division of Olin Mathieson Chemical Corporation, New York, at no change in price. The shell, called Western 8-gauge Super-X Industrial Shell, generates a muzzle energy exceeding 8,900 pounds, and is designed to deliver maximum smashing power at the clinker ring. Because it causes faster breakdown of rings, and requires fewer shots per ring, the new shell should sharply reduce kiln-cleaning costs, claims Mr. J. T. Boone, divisional sales manager. This peak-power industrial shell has been made possible through the utilisation of the exclusive Western sealed gas chamber and its patented 'cup wad'. It incorporates a three-ounce alloy lead slug, compounded for maximum hardness and penetration, and special smokeless powder and matched wadding.

* * *

BETWEEN 20 April and 21 May, 1953, a Technical Assistance Mission (No. 127) travelled through Great Britain, Sweden, Germany, Italy and France. They visited university and industrial laboratories, pilot plants, ore dressing plants at mines and smelters. The report of this mission has now been published by OEEC, 2 Rue Andre Pascal, Paris 16e, under the title 'The Mining and Dressing of Low Grade Ores in Europe'. The report discusses the situation with regard to low grade ore in each of the countries visited and makes recommendations for research and the interchange of knowledge. Descriptions are given of the processes used for the extraction of various ores and of the methods adopted for mining them. A comprehensive bibliography is included at the end of each section.

* * *

CONTROL of water supplies to boilers was originally carried out in relation to the level in the drum only. With increasing size and pressure it becomes necessary to develop control gear which responds more rapidly and accurately than the older designs. It has been found that best results are obtained by taking into account not only water level variations but changes in the flow of steam and water. Therefore it becomes necessary to use what is commonly known as three element feedwater control. James Gordon & Co. Ltd., Dalston Gardens, Stanmore, Middlesex, have devised the Hagan system of three element control, which, they claim, embodies special features. Their catalogue, H.54, which has recently been published, describes the working of this system and some of the results obtained with it. Charts recording the level of water in high pressure boilers show practically no variation even with large changes in the demand for steam.

* * *

ULTRASONICS LTD. have issued details of a Minisonic self-contained homogeniser for laboratory and small batch production which uses the Rapisonic principle of emulsification by ultrasonic cavitation. The machine, designed as the result of three years experience gained with the production model, makes possible the transfer of a product from the laboratory stage straight into full-scale production without altering the manufacturing technique, claim the makers. It also offers the opportunity of making emulsions by ultrasonic means to those who use only small batches. No premix vessels or ancillary plant are required, and the Minisonic is so constructed that it is a completely self-contained unit. Emulsions can be prepared to any given formula in batches up to one gallon. The continuous phase in the primary funnel can be re-circulated via the vibrating element using the flexible hose, and the disperse phase can be introduced through the inner funnel at a regulated speed. All parts in contact with liquids are fabricated in 18/8 quality stainless steel or corrosion-resistant alloys.

* * *

AN ADDITION to the range of Stabilflo control valves is announced by Foxboro-Yoxall. This new valve, the VSB, is designed for controlling flowing media at temperatures down to minus 200°C, and was originally developed for the low temperature separation of hydrocarbons by liquefaction. Its use has been extended to the handling of liquid air, liquid oxygen and liquid nitrogen streams as well as for other liquids flowing at low temperatures. The design of this valve makes use of a stainless steel sleeve to surround the valve, thus holding the gland at atmospheric temperature and preventing icing up.

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.)

COLE CHEMIST (BRISTOL) LTD.—21 June, mortgage to Martins Bank Ltd. securing all monies due or to become due to the bank; charged on 314 Gloucester Road, Bristol, with plant, fixtures, etc. *£498. 23 August, 1954.

Satisfactions

LIFEGUARD PRODUCTS LTD., London W., manufacturers of disinfectants and insecticides.—Satisfaction, 29 June of debenture registered 10 October, 1951.

COALITE & CHEMICAL PRODUCTS LTD. (formerly Low Temperature Carbonisation Ltd.), Bolsover.—Satisfactions, 21 June of trust deed registered 15 July, 1927, and 24 August, 1933.

New Registrations

Shirley Organics Ltd.

Private company (552,404.) Capital £3,500. To carry on the business of manufacturers of and dealers in artificial manures and fertilisers, etc. Subscribers each with one share: E. O. Davis and J. Mills. The first directors are to be appointed by the subscribers. Solicitors: J. D. Langton & Passmore, 8 Bolton Street, London W.1.

Company News

Thomas De La Rue & Co. Ltd.

At the annual general meeting of Thomas De La Rue & Co. Ltd., the chairman, Mr. Bernard Clement Westall, C.B.E., M.A., said: 'The plastics division had a good year. There was a substantial increase in the turnover, both home and export. During the year the basis of our selling organisation was broadened in the home market so that our Formica material can reach industry and the public more readily.' The company's profit for the year, after taxation, increased to £286,787, and the board recommended a final dividend of 22 per cent, making 30 per cent for the year.

Smith & Walton

Smith & Walton, makers of paint, enamel and varnish, announce a provisional agreement under which the interests of Ashley United Industries, manufacturers and retailers of wallpaper and paints, will be merged with those of the company.

W. J. Bush & Co.

In 1954, W. J. Bush & Co., chemical manufacturers, report a satisfactory increase in overall trading which could have produced a higher profit figure but for more intensive competition, particularly in overseas markets. In view of the enhanced cost of plant and equipment the company has considered it desirable to increase the reserve against this by an allocation of £120,000, bringing the total to £450,000. Under a development programme £234,967 has been expended on fixed assets at home and abroad during the year; this figure including further expenditure on the new plant at Isando, near Johannesburg.

Borax Consolidated

Borax Consolidated have announced that the company has concurred in an agreement reached between its financial advisers and Model Roland & Stone, in association with Robert Benson, Lonsdale & Co. Some months ago Model Roland & Stone were trying to obtain control of Borax, now they have joined the group of city firms acting as financial advisers to the company.

The A.P.V. Co.

With the exception of a small loss incurred by an Italian subsidiary, all subsidiaries of the A.P.V. Co. worked profitably in the last year. The chemical industry department recorded its biggest ever order in the year; sales of standard products increased, and a lot of work was in progress in the companies' factories in connection with the development of atomic

energy. The consolidated net profit of the group, before providing for taxation and staff bonus, was £359,538, an increase of £139,431 over the previous year. The final dividend now recommended will bring the total distribution for the year to 10 per cent, which is the same rate as that which has been paid for the past two years. Recently the directors formed a new Canadian company, A.P.V. (Canada) Equipment Ltd., Toronto, which has taken over all assets of Walker-Wallace Ltd. who have been A.P.V.'s Canadian agents since 1929. The new company, a wholly owned subsidiary, will continue to manufacture equipment for the dairy and brewing industries and to extend its services to other industries catered for by the parent company, namely the food, chemical and allied industries.

Gas Purification & Chemical Co.

The Gas Purification & Chemical Co. announces that 89.5 per cent of the capital of Modern Machine Tools has been acquired in respect of the issue of 201,325 new 2s. ordinary shares. Quotations for and permission to deal in these new shares is being sought. Completion date has been fixed for 2 September.

Warner-Lambert Pharmaceutical Corp.

Certificates of shares of the Warner-Lambert Pharmaceutical Corp., of New York, are to be introduced on the Amsterdam stock exchange.

The Pyrene Co.

The Pyrene Co., makers of fire-fighting equipment, has acquired control of High Pressure Components, manufacturers of high pressure valves and couplings, and an associated company, Sun Engineering, Richmond.

Sadler & Co.

The chairman and managing director of Sadler & Co., Mr. C. Norman Sadler, in his statement, said the results of the half-year have again responded satisfactorily to the board's policy of general reorganisation in works and in offices and are better proportionately than results for the preceding year. During the period all major plants, other than those affected by the fire of 14 January, 1954, have been operating to capacity. The Evenwood Coke Ovens & By-Products plant have again had a successful half-year's working and the supply to the Gas Board maintained. With reference to the fire in 1954, the anthracene department has been completely re-equipped, while the re-building of the refined naphthalene department is progressing and should be in full production soon. The results for the half-year being satisfactory the directors recommend a five per cent dividend for the half-year, less tax.

Market Reports

LONDON.—The shorter working week and seasonal influences have made for quiet conditions in almost all sections of the industrial chemicals market. Nevertheless, there has been some inquiry for near-by delivery and a steady interest in new export business. The tone generally is good. Price reductions with effect from 25 of July have been announced for *n*-butyl alcohol (£143 per ton) and butyl acetate (£159 per ton) for 10 ton spot purchases. B.I.S. has introduced new types of price schedules for solvents depending upon the size and type of each delivery. Copper sulphate quotations are dearer. The coal tar products market is again without feature and there has been no change in the position of the creosote oils or the light distillates. All quotations are firm.

MANCHESTER.—Seasonal conditions have again been very much in evidence on the Manchester chemical market during the past week. Deliveries against contracts have naturally been adversely affected by suspensions to works closed down for their annual holidays. This has also resulted in a falling off in the number of inquiries and in the volume of new business placed by home users, though the export movement keeps up fairly well in the region of what it was before the serious interruption caused by the dock strike. Trade in fertilisers is quiet in most sections. In the market for the tar products a fair demand is reported for most of the light and heavy products.

GLASGOW.—The Glasgow Fair Holidays are still effecting the Scottish heavy chemical market which in general has been rather quieter during the past week. Prices on the whole are steady although some increases have to be reported. Considerable activity has again been shown with regard to materials for export, both in orders and inquiries received.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

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

AN IMPORTANT organisation of very high standing, handling world-wide sales of specialised natural insecticides, requires young man with good personality, energy and initiative, to assist department head in sales development. Applicants must have technical and commercial qualifications and experience in the insecticide field would be of advantage. Successful applicant would be based in London, with possibility of overseas travel. Salary dependent upon experience, with good scope for advancement. Write, **BOX JL/191, c/o 95, BISHOPSGATE, E.C.2.**

ENGINEER, CHEMICAL ENGINEER OR CHEMIST with Engineering, Chemical & Technical Sales experience for developing and marketing Petroleum Chemical Plant, required by **THE POWER-GAS CORPORATION LTD., STOCKTON-ON-TEES.** Age about 30 years. The appointment will be confirmed on a permanent basis if satisfactory after a trial period of twelve months. It is anticipated that the post will involve periodic journeys abroad and in making the appointment emphasis will be placed on ability to grasp new ideas and techniques, together with initiative and commonsense.

HOME OFFICE: CHEMISTRY INSTRUCTOR. The Civil Service Commissioners invite applications for this permanent post at the **FIRE SERVICE COLLEGE, DORKING.** Duties include instruction to Fire Brigade officers in Chemistry, Physics, and on interpretation of results of current research in fire problems. Age at least 31 on December 31st, 1955.* Candidates must be graduates of a British university in Chemistry, preferably with Physics as subsidiary subject. Experience of lecturing an advantage.

Inclusive salary scales for 45½ hour week: £736-£906 (men), £651-£794 (women). Women's scale being improved under equal pay scheme. Exceptionally a starting salary above minimum according to qualifications and experience.

Particulars and application form from **SECRETARY, CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, 30, OLD BURLINGTON STREET, LONDON, W.1,** quoting No. S4494/55. Completed applications must be returned by August 17th, 1955.

* Candidates under 31 on December 31st, 1955, may be considered, but must apply by the above date through the open competition, quoting No. S4494/94-95/55. 7138/130/7/55/SD.

MECHANICAL or **CHEMICAL ENGINEER** of independent and original outlook required by firm of Process Engineers in South England, for research and development work on heat transfer, distillation, evaporation and similar problems. Degree or equivalent essential. Industrial experience, not necessarily in this field, an advantage. Rented housing available, if required. Write, stating qualifications, experience and salary required. **BOX No. C.A. 3422, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

CHEMISTS, capable of occupying responsible positions in Australia, required by **LEWIS BERGER & SONS (AUSTRALIA) PTY. LTD., SYDNEY.** Minimum qualifications B.Sc. Age 30-40. Senior posts require at least 8 years' experience in the Paint, Varnish and Lacquer Industry. Applicants must have had service in a position of responsibility calling for organising ability and initiative. Suitable applicants will be interviewed in London during July or August. Apply in strict confidence, giving full details, to **PERSONNEL OFFICER, BERGER HOUSE, BERKELEY SQUARE, W.1.** marking applications "Australia."

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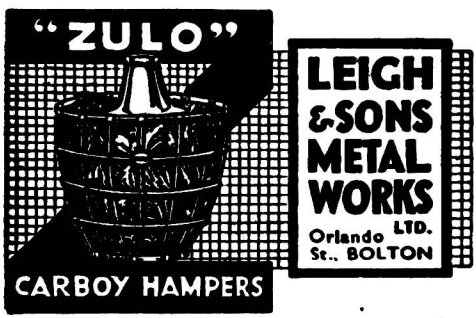

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