The
Chemical Age

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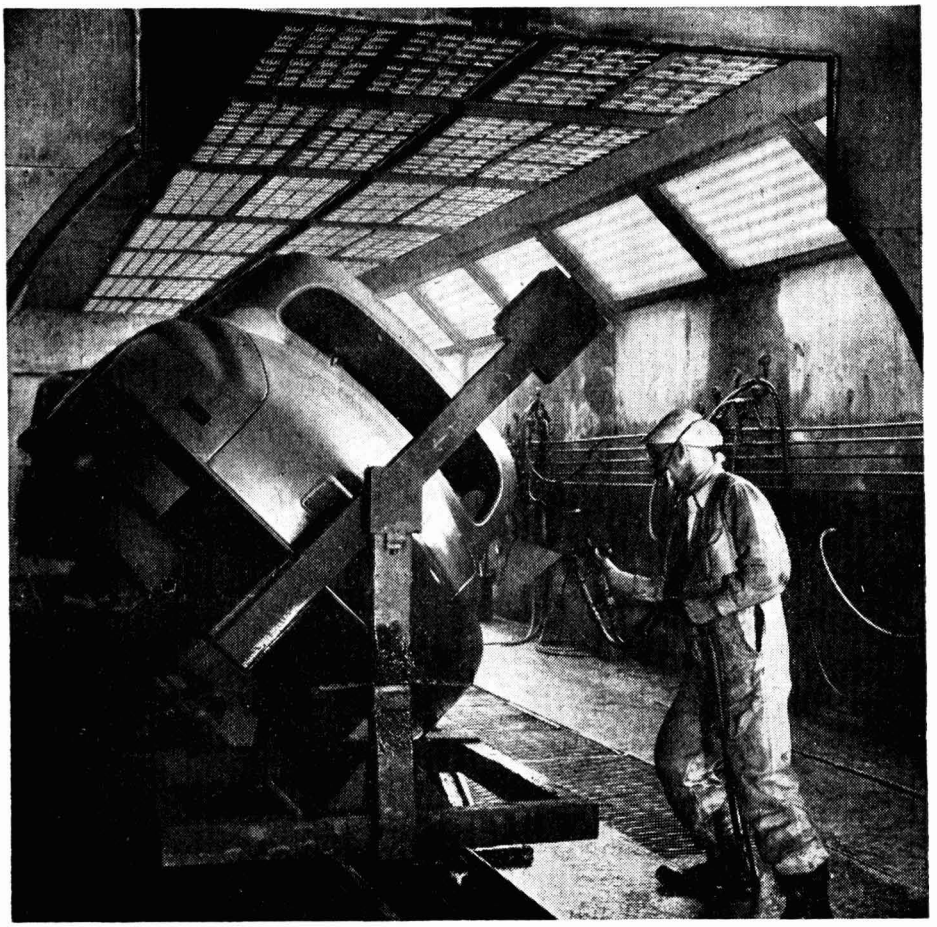

Rover Car Factory, Solihull. High intensity lighting in a body spray tunnel by fluorescent lamps in a glazed enclosure.

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Atom-cooked Plastics

'TO the making of molecules there is no end' is a reasonable enough paraphrase of another century's wisdom. Laboratory-planned and factory-made macromolecules have made their first impacts upon the everyday life of current generations; even the original introduction of re-shaped cellulose molecules falls within the memory of people who are still but middle-aged. Now, it seems, the story of synthetic polymers is taking a new turn; irradiation can partially transform their structure and change their properties. (THE CHEMICAL AGE **68**, 632). Moreover, this is a British discovery, made at Harwell by Dr. Arthur Charlesby. A recent Press comment that a new branch of the plastics industry may be developed (*The Observer*, 27 September) is not likely to prove an exaggeration.

Irradiation in an atomic pile is not the only means of applying this process. Any source of high energy radiation will bring about the same effects. Radioactive materials may be usable as sources of radiation. In the United States, where the appreciation of Harwell's discovery has been instant, a million-volt X-ray apparatus is being used by the General Electric Co. It seems probable, however, that as the industrial application of atomic energy makes progress the modification treatments for plastic substances will be based most economically and effectively upon atomic piles. During the exploratory phase a variety of radiation sources may be employed irrespective of costs, for the biggest rewards are likely to be won by the fastest pioneers.

The effect of irradiation is to induce the formation of additional cross-linking in polymeric molecules. A change in properties occurs when a radiation dose corresponding to approximately a single cross link per molecule has been given. Variations in the amount of irradiation produce varied degrees of change in properties. For a parallel technological development we must perhaps go as far back as Charles Goodyear's little rewarded discovery of rubber vulcanisation by sulphur. There, too, the properties of a polymer were modified by the inducement of cross-linking. Polyethylene has a normal melting point in the region of 115° Centigrade; short exposures to gamma rays and neutrons take the melting point up to 250°. The theory put forward by Dr. Charlesby is that some of the carbon-hydrogen bonds are broken—actually with the release of hydrogen—and the unsaturated carbon atoms that remain form new molecule-linking bonds. Irradiation changes polyethylene from a crystalline into an amorphous elastic substance, yet without loss of transparency. The irradiation-formed linkages hold the molecules together when normally, under the influence of heat, they would begin to dissociate and flow with increasing freedom. But not only heat stability is conferred. Solubility in organic solvents declines; resistance to attack by acids is increased. Between the two extremes—the non-irradiated plastic with its normal properties and the fully changed plastic with maximum development of different properties—there would seem to be a most flexible range of substances.

Not many of the polymers so far studied have failed to cross-link as a result of irradiation. Polyvinyl alcohol and chloride, polystyrene, and nylon have

all responded; so too, have, the natural complexes of rubber, neoprene, and gutta percha. On the other hand, polytetrafluoroethylene powders when irradiated; it is believed that the strength of the carbon-fluorine bond is too great and when irradiation breaks weaker carbon-to-carbon bonds shorter molecules are formed, i.e., there is de-polymerisation rather than cross-link formation. Poly*iso*-butylene is turned into a viscous liquid, probably because the methyl side groups repel each other, which again causes a more severe form of molecular disruption at the time the carbon bonds are weakened by radiation.

The acrylic class of polymers behave in a rather different, but no less promising way when exposed to radiation. Apart from a slight colour change Perspex appears unaffected by treatment; but on heating subsequently, there is steadily increasing internal bubble formation, the material expands remarkably, and a foamed substance about eight times lighter than the original is obtained. Among the changes in property is a considerably increased electrical resistance. The practical advantage of inserting irradiated Perspex into a cavity, knowing that it must swell and completely fill the cavity on heating, has innumerable potentialities.

But this remarkable behaviour of the Perspex group is not the only unusual physical property that irradiated plastics offer for new industrial applications. Irradiated polyethylene may have a much raised melting point, and when polyethylene articles are heated to their softening point and pressed into other shapes, they retain their new shapes on cooling, but when heated again they regain their original shape! An obvious application of this property in machine fabrication is to insert polyethylene into an inaccessible position in a shape that can be handled, knowing that it will on heating regain its former and pre-designed shape as required when in final position.

One practical use of irradiated plastics is already being put into action in the United States. Polyethylene bottles, owing to their low melting-point, cannot be steam sterilised. But irradiation for a few seconds produces sufficient cross-linking for the bottles to stand the temperatures of sterilisation. This may have early effects upon pharmaceutical packaging. In the long run, assuming that radiation sources become more widely available and cheaper, it may have repercussions upon the milk industry. The fact that natural and synthetic rubber are also cross-linked by irradiation treatment should not be ignored. Precise control over vulcanisation may bring new opportunities to the rubber industry. Degrees of difference in the property range for the same rubber would seem to be producible by variations in time of irradiation.

It is a little disheartening to learn that American industry has been speedier in recognising the huge potentialities of this Harwell discovery. The cynicism that 'the one thing man learns from history is that man never does' has a grim applicability. To quote from *The Observer's* recent comments: 'If British firms do not hurry, they will find that once again American industry has established an irreversible lead in the application of a discovery originally made in this country.' In the slack years between the wars, during the second war and its immediate aftermath, there perhaps was some excuse for our reluctance to grasp opportunities on the doorstep. There is no vestige of an excuse now. Vast sums of national capital and income have been invested in our atomic energy establishments and we surely cannot afford to disregard any of the secondary possibilities that emerge from so vast a research project.

Productivity Meeting

AT the invitation of the Board of Trade, the Institute of Cost and Works Accountants is arranging a public meeting at the Beaver Hall, London, on 22 October, at 5.30 p.m., to hear a panel discussion between members of a European team which visited America and produced the report, 'Cost Accounting and Productivity.' The report brings out some important aspects of productivity which, it is felt, can, with advantage, be more widely known. Sir Leslie Boyce, a past Lord Mayor of London, will preside. Mr. Ronald Parker, C.A., Finance Director of the Scottish Division of the National Coal Board, who led the team and was the only British delegate, will be a member of the panel, along with Mr. Paul Francin, the French delegate, and Dr. Henri H. van der Schroeff, the Dutch delegate.

Notes & Comments

Trade Barometer

SULPHURIC acid, one of the most vital of chemical primary products, has often been regarded as an index to production and as a trade barometer; certainly, during the past few years, it has suffered the chequered career appropriate to a product whose manufacture is dependent to a very great extent upon imported materials. Costs have recently increased considerably, but this trend was reasonably commensurate with the general rise in prices, until the sulphur shortage necessitated a temporary imposition of price control. Although the National Sulphuric Acid Association and other bodies interested in sulphur and its products are mainly concerned with the interests of the manufacturers, users have so far had no cause to complain of their treatment; but then, indeed, many manufacturers are themselves users, and consume the whole or most of the acid they produce. In manufacture, the tendency is toward the construction of large units. It seems now a far cry to the early days of the century when even a plant to make 10 tons a day was considered an economic unit; today the large contact and tower plants would not be profitable with an output less than 100 tons per day, and units of capacity 300 and (in one case) 500 tons a day are in operation or in course of construction.

An Economic Unit

THERE is, however, even today a demand at home and abroad for a small economic unit, which might produce as little as 5-10 tons a day; the saving, even if only on transport and distribution costs, might make the installation worth-while. In some cases, such as for accumulator acid, there would be additional savings in freight and containers. In the USA and Canada, liquid SO_3 and SO_2 are fast becoming bulk raw materials, and in both cases there is a considerable saving in freight; moreover, applications in specialised operations, such as sulphonation, may be developed. It is therefore pertinent to refer to a description in *Chemie Ingenieur Technik*, June, 1953, 285-291, of a pilot plant working on the Cathala process, an operation which may prove of great importance in this respect. The SO_3 produced is very pure and stable, and by working under low pressure and with high strength gas, a plant with a capacity as small as 10 tons per day may prove an attractive investment. Such a plant would probably suffice for the initial market in liquid SO_3 and would be a basis for evaluating the prospects of small unit plant for making or strengthening up sulphuric acid with liquid SO_3. In particular, it would be interesting to be able to substantiate the claim that a 50 per cent reduction in capital cost is possible, thereby avoiding increased production costs. We hope to publish up-to-date technical details shortly.

Methane in the Mains

THE simplest of the hydrocarbons is much in the news at the moment. Only a few weeks ago a DSIR Fuel Research paper revealed that considerable progress has been made towards the large-scale and economic synthesis of methane from hydrogen and carbon monoxide (see THE CHEMICAL AGE, 1953, **69**, 1785, 661-2). But naturally formed methane, more popularly known as firedamp, is being piped off from more than 20 coal mines, and in at least one case the National Coal Board is selling its methane to the Gas Board. There, at Whitehaven, 750 cubic feet a minute is said to be extracted from the pit concerned. Paradoxically, the Gas Board must reverse the reaction by which the DSIR synthesis is achieved. Methane is too high in calorific value for effective use on most gas-burning appliances, so part of the methane drawn from the pit is passed over a catalyst to form hydrogen and carbon monoxide. It is certainly strange that two new fuel developments in Britain should be concerned with the same reaction, but in opposite directions.

A Useful Raw Material

IT seems improbable that coal mines will be able to provide a really large amount of gaseous fuel for town gas

services. A pit must be 'gassy' and in the right place; the number likely to be developed along the Whitehaven lines cannot be great. But the Gas Council is seeking methane from other sources; prospecting for natural gas is currently taking place with some energy, particularly in Scotland and Yorkshire. The exploration of the potash deposits in Yorkshire would appear to have inspired some interest in methane, too, for Imperial Chemical Industries are prospecting for natural gas in the same area. However, their interest may well be more chemical than calorific—CH_4 is a useful raw material for several organic syntheses. Britain may hardly hope to emulate the United States with their rich reserves of natural gas, but it is good news that we are trying to use the native sources that we do possess. A gaseous fuel with a calorific value of 1,200 B.Th.U. per cubic foot should never run to waste.

Man-Made Fibres Fail

STRANGE things are happening in the American synthetic fibres field. At the beginning of August, US Chemstrand Corporation were promoting an immense campaign for Acrilan, and promising an output of 5,000,000 lb. by the end of the year; at the beginning of September, the new $30,000,000 plant at Decatur, Alabama, was virtually closed down. Du Pont is producing staple Orlon at considerably less than capacity; the construction of the Union Carbide and Carbon Co.'s proposed $30,000,000 plant for the manufacture of Dynel, at Draper, North Carolina, has been indefinitely delayed; and some forms of nylon are reported freely available for the first time in more than ten years. Dacron (I.C.I.'s Terylene, made by Du Pont) is, it seems, the only fibre to continue to hold high favour with consumers: 'the trade label it the fibre most likely to survive' (*Chemical Week*, 19 September, 78). The disfavour accorded to Acrilan has spread to all fibres with the 'acrylic' label; so much so that Union Carbide is carefully explaining in its advertisements that 'there is as much difference between Dynel and the acrylics as there is between wool and cotton.'

Few New Miracles

THE root of these troubles is generally acknowledged to be too rapid a development of the markets before the fibres had been sufficiently tested. Chemstrand, for instance, banked heavily on building up a demand for Acrilan by careful distribution of pilot plant quantities; when output from full-scale plant became available, however, processers discovered that the fibre was brittle and suffered from fibrilation—an Acrilan blanket was found to shed its pile and had to be abandoned. Du Pont, too, began by marketing Orlon which could be dyed only in pastel shades; when, by the incorporation of 6 per cent methyl acrylate, they had improved the dyeing properties, it was found that some other characteristics were also altered. That was in the spring: textile manufacturers were preparing full-scale production for autumn and winter, and could not afford the necessary alterations in machinery. Sales of Orlon were consequently low. Another factor of considerable interest is that the makers of 'conventional' materials, faced with the 'miracle' properties of the new fibres, have been forced to improve the properties of their own. Cotton, for instance, cyanoethylated by treatment with acrylonitrile, has been given increased receptiveness to dyes, permanent resistance to attack by mildew, bacteria, etc., and greater retention of strength after exposure to heat. 'It remains to be seen' says *The Financial Times* (1 October) 'whether man-made fibre producers will change any of their plans in the light of the bad Press some products have recently been getting. . . . Experience in the major American proving ground in the recent past seems to have shown that there are few new miracles in the textile industry after all.' A sweeping statement, but the reasons appear sound.

Calcium Carbide Factory

British Industrial Solvents, a division of The Distillers Company Limited, has taken a lease of the Ministry of Supply Kenfig calcium carbide factory as from 1 October.

Platinum Group Metals as Catalysts

Organic Syntheses & Gas Purification

IT is just 150 years ago that Wollaston announced his discovery of palladium, and the event is being commemorated by an Exhibition of the Platinum Metals, organised by the Institution of Metallurgists. This exhibition is to be held at Grosvenor House, London, W.1, and will be opened by HRH The Duke of Edinburgh on 19 October. The general public will be admitted freely on 22, 23 and 24 October, between the hours of 10 a.m. and 8.30 p.m.

Wollaston's outstanding work consisted not only of the discovery of palladium—and later rhodium—but also of the application of the platinum metals generally to industrial uses. At the time of the discovery of palladium, the phenomenon of catalysis was only just being recognised and in fact the term 'catalytic agent' was not in use until thirty years later when it was introduced by Berzelius.

First Use as Catalyst

The first publication dealing with the theory of catalysis was that of Clement and Desormes in 1806. The first reference to the use of a platinum group metal as a catalyst was in 1823 when Dobereiner created considerable interest with his lamp in which he caused a jet of hydrogen gas to ignite by directing it at a bundle of fine platinum wires.

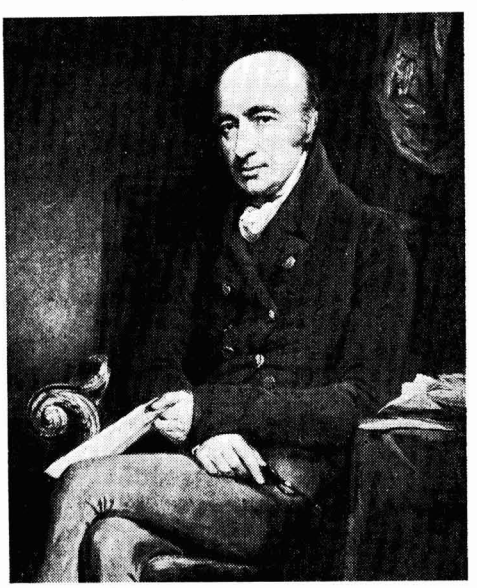
The first industrial application was foreshadowed in 1839 when Kuhlmann showed that nitric oxide could be reduced to ammonia in the presence of platinum. Today a major industrial process, namely the oxidation of ammonia to oxides of nitrogen for the manufacture of nitric acid, is based entirely on the use of platinum or, more often, a platinum/rhodium alloy as the catalytic agent.

Apart from this last-mentioned application, however, where the precious metal is in the 'massive' state, usually in the form of a wire gauze, the modern technical precious metal catalyst tends to take the form of a 'supported' or 'carrier borne' catalyst; the word 'supported' means that the catalytically active metal is supported or borne on the surface of a normally inactive carrier. The carrier itself has a large surface area and thus enables relatively small amounts of the metal to exhibit optimum catalytic activity.

The use of platinum metal catalysts in forms other than carrier-borne is somewhat limited, but brief reference will be made to (a) 'blacks' and oxide catalysts, and (b) colloidal catalysts.

All of the platinum group metals form what are called 'blacks', which are essentially mixtures of the finely divided metal contaminated with a small percentage of various oxides. The most common 'oxide type' catalysts are the oxides of platinum and palladium, although platinum itself is the only one of the precious metals whose oxide is used on a relatively large scale, when it takes the form of the monohydrate of platinum dioxide or Adams catalyst. One disadvantage in the use of the precious metal oxides is their relatively high cost as compared with that of the low percentage precious-metal-supported catalysts.

The platinum metals can all exist in



William Hyde Wollaston. An engraving made in 1824 by W. Ward, ARA, from a painting lately made by J. Jackson, RA.

colloidal solution, but their use is restricted and is really only of academic interest, owing largely to the difficulty of recovering a colloidal catalyst once the reaction has been completed.

Supported catalysts fall roughly into two groups, depending on whether the application is to a liquid phase reaction or to a gaseous phase reaction. In the former case a powder type supported catalyst is used, while in the gaseous phase reaction it is normal to employ a pelleted or granular base catalyst. The one notable exception to the use of a granular catalyst in a gaseous phase reaction is the well known catalytic cracking process where modern technique employs a powder catalyst under 'fluidised' conditions. It may well be that future development of the 'platforming' or platinum reforming catalyst will follow along similar lines.

As catalyst supports or carriers, a wide variety of materials can be used, ranging from relatively chemically inert substances such as charcoal, pumice, asbestos, various refractory oxides and silica gel, to compounds such as zinc carbonate and oxide, magnesium and barium sulphate, and calcium carbonate. The choice of any particular carrier for a certain reaction must obviously be influenced by the reaction medium and the possibility of chemical reaction with the carrier, e.g., the use of a zinc or calcium carbonate carrier in acid medium would be out of the question.

Influence on Catalysed Reaction

A further point, however, and one of probably greater importance, is the influence of the carrier on the catalysed reaction itself. In many cases it has been found that the selectivity of a particular catalyst is largely influenced by the carrier; i.e., where a choice of two or more reactions is open to the reactants, the more selective the catalyst, the less is the likelihood of the reactants taking part in undesirable reactions. Current thought on the mechanism of selectivity attributes the phenomenon to the pore size and pore distribution in the carrier.

The modern technical precious metal catalyst is highly active at atmospheric pressures and at room temperatures, or slightly above. It has, therefore, a great advantage over the base metal catalysts requiring elevated temperatures and quite high pressures for economic use. These advantages have been exploited in organic synthesis where many compounds unable to withstand elevated temperatures have been successfully prepared under the comparatively mild conditions obtaining with a precious metal catalyst. The antibiotic industry uses the platinum metals in a wide range of catalytically assisted processes.

Applications of Commercial Interest

Particular applications which are of commercial interest include the following:—

(a) Primary and secondary alcohols can be obtained by the hydrogenation of aldehydes and ketones using a platinum catalyst; an example typifying this process on an industrial scale is the production of a phenol from cyclohexanone. (USP. 2,503,641 and BP. 640,363.)

(b) When the vapour of certain aldehydes or ketones is mixed with ammonia in addition to hydrogen, the above reaction can yield the corresponding amine; the production of cyclohexylamine from cyclohexanone is one example.

(c) Acetylene can be hydrogenated to ethylene in the presence of a palladium catalyst at normal pressures and at a temperature of 250°. (BIOS/171 and 1058).

(d) The majority of nitriles can be hydrogenated fairly easily, using a platinum or palladium catalyst, to yield the corresponding amine.

(e) Compounds containing nitro groups are very easily reduced by hydrogen using a palladium catalyst, and a common method of assessing the activity of hydrogenation catalysts is based on the rate of reduction of nitrobenzene to aniline under closely controlled conditions.

(f) Recent work indicates the superiority of supported catalysts containing ruthenium for the hydrogenation of aliphatic keto groups and also for the high pressure hydrogenation of aromatic rings having attached amino groups. Ruthenium has also been used as a catalyst in the combination of ammonia with methane to yield hydrogen cyanide. (BP. 683,511).

(g) Rhodium catalysts have been found useful in the hydrogenation of unsaturated aromatic or hetero rings. Hydroquinone is easily reduced in the presence of a rhodium catalyst.

(h) A recent interesting application of a palladium catalyst is in the production of hydrogen peroxide by hydrogenation of

alkylated anthraquinones followed by controlled decomposition. (BP. 686,574).

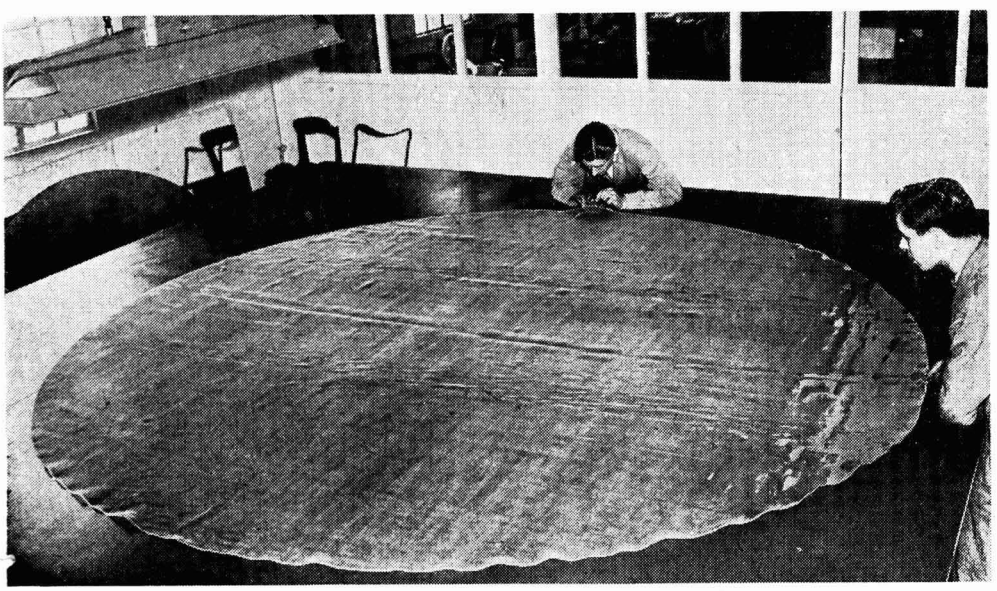
The majority of industrial hydrogenation processes require a supply of high purity hydrogen. Many other processes require gases free from oxygen, hydrogen and carbon monoxide; among such applications are atmospheres for sintering, annealing, welding and heat treatment of metals, and in the lamp and radio industries nitrogen, neon, argon and other rare gases are required in a very high state of purity and virtually free from hydrogen or oxygen. To meet these industrial requirements the 'Deoxo' gas purifier has been developed.

This catalytic purifier in its simplest form consists essentially of a highly active platinum metal catalyst which will bring about the combination of oxygen with hydrogen, at room temperature, to form water vapour; the water vapour is carried out of the purifier in the gas stream and can be removed by any efficient dehydrating agent. The catalytic process brings about almost complete removal of oxygen, leaving less than 1 ppm. in the uncombined state. In the same way, hydrogen can be removed by reaction with oxygen on the same catalyst and with equal efficiency.

The 'Deoxo' process has been applied to several other reactions of commercial interest and in addition to the combination of oxygen or hydrogen a second process allows for the oxidation of carbon monoxide to carbon dioxide, which can then be easily removed from the purified gas by any standard method. Yet a third application of the 'Deoxo' process is designed to combine carbon monoxide with hydrogen to yield methane; this latter process is of interest where industrial hydrogen, required for hydrogenation reactions, is contaminated by carbon monoxide, which would cause serious complications and probably inhibit the activity of the hydrogenation catalyst itself. In most cases the presence of methane in the hydrogen has little or no effect in any subsequent process.

From Schools to Industry

Speaking at the final session of the Headmasters' Conference in Cambridge last week, Sir Charles Morris, Vice-Chancellor of Leeds University, said that the study of physics and chemistry did not encourage boys to go into industry. It tended to make them want to hang about laboratories all their lives. The need was to fire the imagination of boys at school with the exciting possibilities of work in the technological field.



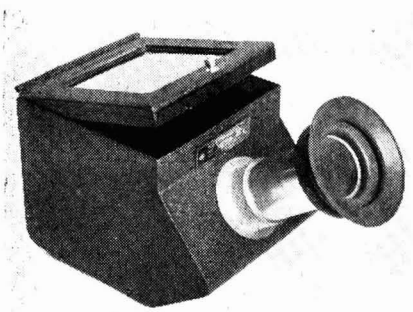
A platinum and rhodium gauze for a three metre diameter ammonia burner

A New Portable Fluoroscope

Use of Ultraviolet in the Sun's Rays

IT is now common practice to use the fluorescent properties of a material either to detect its presence or establish its identity. For instance, the presence of crude oil in the borings from a well may be detected during fluorescent inspection by oil prospectors. Minerals that are fluorescent may be identified by mineralogists in the course of a geological survey.

Actually, it was a request for portable fluorescent inspection equipment from a group of mineralogists that started the search for a simple fluoroscope. They contemplated using ultraviolet lamps and a viewing cabinet in extremely difficult country without roads or the electrical supply usually required. While the provision of batteries or a pedal generator might have sufficed, there was the risk of failure, the servicing required and extra weight to be considered.



Metropolitan-Vickers portable fluoroscope, with hinged window slightly open

In view, therefore, of the clear necessity for an extremely portable—and preferably non-electric—fluoroscope, it was decided to attempt to use the ultraviolet in the sun's rays by the application of a suitable filter.

A new fluoroscope (BP. 696,098), which is due to Mr. J. W. Walley, of the Research Department of Metropolitan-Vickers Electrical Company, Ltd., depends primarily on the fact that sunlight contains a useful proportion of ultraviolet. A daylight-absorbing but ultraviolet transmitting filter, such as that known as Wood's glass, is used to provide ultraviolet radiation for viewing the fluorescent material in a closed compartment. Fluorescent material then glows at a longer wavelength of visible light, this wavelength being characterised by the nature of the specimen.

In its simplest form the fluoroscope has been made by adapting the Wood's glass flasks used as light-excluding envelopes in the manufacture of the standard mercury-vapour discharge lamps. The neck formed a convenient hand grip without obscuring the bulb, and a rubber eye-guard was fitted around the opening to exclude visible light when viewing. The diameter of the spherical bulb was about 3.5 in., and the thickness of the glass about 0.03 in. In order to facilitate insertion and extraction of the specimen without contamination of the bulb, a removable tray was provided.

A more robust model consisted essentially of a steel box about 5 in. cube with a hinged window of Wood's glass at the top and an eye-piece tube entering the front side obliquely. The hinged window served as an ultraviolet filter and insertion door combined. The inspection tube was adjustable to maintain the specimen in focus, and a rubber eye-guard was again used for comfort and visible light exclusion. The Wood's glass in the window was about 3 in. sq. and about 0.2 in. thickness.

Following tests, it was concluded that a good proportion of the fluorescent inspection now proceeding with electrically produced ultraviolet rays would probably be quite satisfactory with natural ultraviolet irradiation, using the apparatus described. There are, no doubt, many other fields of application. For example, it could be used in the detection of grease in textiles or in forensic science and criminology.

Titanium Research

Numerous overseas inquiries from scientists, aircraft designers and commercial interests, are being received by scientists at Melbourne University, Australia, who are carrying out research on titanium, in conjunction with the Zinc Corporation Ltd. Last year Australian beach sands yielded titanium concentrates and zircon worth £630,000.

The Analysis of Cobalt

Part III—Gravimetric Methods*

TRICOBALTIC tetroxide is a common weighing form for cobalt. Brintzinger and Hesse[1] reported that results are often inaccurate because of the presence of cobaltous oxide. This can be avoided if the precipitate is heated to not above 900° in an electric furnace. Heating for longer times still yields satisfactory results if reducing gases are absent. If large quantities of ammonium chloride are present, ammonium sulphate must be added prior to the ignition.

For the determination of cobalt in manganese Fairchild[2] precipitated the latter as $MnNH_4PO_4.6H_2O$ in the presence of citric acid. The precipitate contained traces of cobalt, which could be determined by dissolving the precipitate in hydrochloric acid and comparing the blue colour of the solution with standards prepared from known quantities of cobalt. In the filtrate from the original precipitation the cobalt could be precipitated as the sulphide at *p*H 5.2. The washed cobalt sulphide was easily converted to sulphate by roasting to oxide, solution in nitric acid and evaporation with sulphuric acid. Excellent results were reported on samples containing 2-169 mg. of cobalt in presence of 100-125 mg. of manganese.

High Results Obtained

When cobalt is separated from aqueous solution by precipitation with sodium hydroxide and an oxidising agent, the cobaltic hydroxide formed occludes a little alkali and high results are obtained when the precipitate is converted by acids to cobaltous sulphate for weighing.[3] If the trivalent hydroxide is redissolved in concentrated hydrochloric acid and reprecipitated with hydrogen peroxide and trimethylbenzyl ammonium hydroxide, the precipitate contains only ashless impurities and can be converted to pure cobaltous sulphate.

Cobalt in nickel ores containing large amounts of iron can be determined by the procedure of Faleev[4]:—Heat 1-10 gm. of sample with 10 ml. of concentrated hydrochloric acid until evolution of H_2S ceases, add 5 ml. of nitric acid, evaporate to dryness and then repeatedly evaporate with 5 ml. portions of hydrochloric acid. Heat residue with 5 ml. of hydrochloric acid, dilute with 50-60 ml. of hot water, dissolve the salts, filter, and neutralise the filtrate with caustic potash. Filter the mixture and dissolve the precipitate in the minimum amount of 80 per cent acetic acid. To the solution (not exceeding 100 ml.) add 7-8 ml. of acetic acid and precipitate the cobalt as $K_3Co(NO_2)_6$. Allow the precipitate to settle for 24 hours and filter. The precipitate contains only small amounts of iron which are removed by dissolving and reprecipitating under the above conditions. Determine the cobalt by weighing as $K_3Co(NO_2)_6$.

Cumbers and Coppock Formula

Cumbers and Coppock[5] examined the cobaltinitrite and oxine methods for the determination of cobalt. They obtained a precipitate corresponding to the formula $K_2NaCo(NO_2)_6.6H_2O$ as follows:—To 10-15 ml. of solution containing about 0.5 gm. of cobalt, add 0.5-1 ml. of glacial acetic acid and heat to 60°. Add 1 ml. of reagent (30 gm. of sodium nitrite and 1.25 gm. of potassium chloride dissolved in 35 ml. of hot water and kept at 70°) for every 6.5 mg. of cobalt. After the reagent has been added, keep the solution at 60° for another 15 minutes. Cool, filter, wash the precipitate with a saturated solution of the complex salt and dry at 120°-130°. Alternatively, the precipitate may be washed several times with alcohol and then with ether and dried in a vacuum desiccator for 10 minutes.

Experiments with the cobalt salt of 8-hydroxyquinoline showed that the compound contains 1.75 molecules of water when dried at room temperature. Good results were obtained by washing the precipitate with a saturated solution of the complex salt in alcohol and then with ether, followed by suction drying.

A separation of cobalt and nickel has been achieved by Nenadkevich and Saltkova[6] who added cyanide ions to the acid solution to complex the cobalt. On addition of silver ions a precipitate of $Ag_3Co(CN)_6$ was obtained, which gave a good conversion factor for cobalt.

* Parts I & II—Qualitative, were published in THE CHEMICAL AGE, **69**, 77-80 ; 125-128.

Lamure[7] obtained good results by estimating cobalt as the complex $Co[Hg(CNS)_4]$, which contains 11.98 per cent cobalt. One part of a reagent containing 27 gm. mercuric chloride dissolved in 500 ml. water was added per part of cobalt, followed by two parts of a solution containing 30 gm. ammonium thiocyanate in 500 ml. water. After filtering, the precipitate was washed with 1-2 ml. of precipitant diluted with 50 ml. of water, followed by washing with 1-2 ml. of alcohol. The precipitate was dried at 90° for 10 minutes and then weighed.

Sierra and Carcales[8] also favoured precipitation as $Co[Hg(CNS)_4]$. They studied the optimum conditions for the precipitation and claimed that best results were obtained by precipitating with 25 per cent sodium thiocyanate at 0°-10°, in the presence of 10 per cent glycerol and alcohol.

Simultaneous Determination Method

A method for the simultaneous determination of cobalt and nickel has been described.[9] To the mixed metal solution (60-80 ml.) is added 1-2 ml. of pyridine. The solution is heated to boiling and 10 ml. of 10 per cent ammonium thiocyanate solution is added. While the solution is cooling, rose-coloured $CoPy_4(CNS)_2$ and violet $NiPy_4(CNS)_2$ separate. The cold solution is filtered, and washed with 30 per cent alcohol containing 1 gm. of ammonium thiocyanate and 15 ml. of pyridine per litre. The precipitate is then washed with an 8 per cent solution of pyridine in alcohol, followed by ether containing 1 per cent pyridine. It is then dried in a vacuum desiccator and weighed. The nickel is estimated on a separate portion of the solution by the well-known dimethyl-glyoxime method. The determination can be carried out in the presence of iron if Rochelle salt is added to prevent precipitation of ferric hydroxide.

1-Nitroso-2-naphthylamine and 2-nitroso-1-naphthylamine are excellent reagents for the determination of cobalt.[10] To 300 ml. of a solution containing not more than 40 mg. of cobalt, a slight excess of reagent (1 per cent in alcohol) is added, the solution boiled for 20 minutes and allowed to stand for 15 minutes. After filtering through a sintered glass crucible, the precipitate is washed first with dilute acid, then with dilute base and finally with hot water. It is then dried for 2 hours at 110° and weighed. Good results are obtained in presence of zinc, aluminium, and chromium.

Cobalt forms a complex with phenylthiohydantoic acid, but the complex does not constitute a satisfactory weighing form. Isibasi[11] carried out a thermogravimetric examination of the method, and recommended that the complex be ignited to Co_2O_3 at a temperature $>1,050°$. The method should be considered more as a means of carrying out separations of cobalt.

Anthranilic acid forms with cobalt a red precipitate of the formula, $Co(C_7H_6O_2N)_2$. Wenger *et al.*[12] have used this reaction as a basis for the micro estimation of cobalt. 10 ml. of reagent (a 2 per cent solution of anthranilic acid in dilute sodium hydroxide, the *p*H being adjusted to 6 with acetic acid) was added to 2 ml. of neutral or slightly acid solution containing 0.1-4 mg. of cobalt in a filter beaker. The beaker was placed in a copper heating block and heated to boiling. After allowing to stand for 10 minutes, the mixture was filtered, and the precipitate washed with 0.2 per cent sodium anthranilate solution and then with alcohol, dried at 120°-130° and weighed.

Takaki and Nagese[13] found that the compound 4-nitroresorcinol formed a sparingly soluble complex with cobalt. A similar complex was formed by the 1-methyl ether of 4-nitroresorcinol, the two complexes differing in the solubilities in certain organic solvents. Use may be made of these complex salts to determine cobalt in the range 5-20 mg.

Sky-Blue Precipitate

Addition of a solution of the medium salt of diphenylthiohydantoin to a neutral solution containing cobalt yields a sky-blue precipitate of formula $(NH.CPh_2.CO.N:CS)_2 Co.2H_2O$. If the mixture is boiled for 5 minutes, filtered hot, the precipitate washed with boiling water, and dried at 100°, the sky-blue colour remains, but if the precipitate is left in the liquid or in moist air for 2 hours, it becomes white by acquiring a further 2 molecules of water. Both precipitastes are converted at 210° to an intensely blue anhydrous compound. The reaction is very sensitive (1:500,000) and the complex can be used as a gravimetric weighing form for cobalt.

Another organic compound which gives a sparingly soluble salt with cobalt is 5-bromo-2-aminobenzoic acid. Shennan[15], using

(continued on page 758

Remote Indication of Pressures

New Electric Transducer System

AFTER three years' research and development work in close collaboration with workers at the research laboratories of the General Electric Company, Ltd., a new system for measuring pressures, temperatures and mechanical movements electrically, and indicating the results at a distance, has been introduced by Salford Electrical Instruments Ltd.

This new system is a development of the original electro-mechanical converter system and introduces a smaller transducer with a wide range of applications. These include the direct measurement of mechanical movements of 0-20, 0-50 and 0-100 thousandths of an inch by a spring-loaded stylus, the measurement of pressures, utilising a diaphragm or other pressure/mechanical conversion device, and, indeed, the measurement of any quantity which can be converted into a mechnical movement.

The instrument, which is of similar construction to the standard moving coil switchboard instrument with a 100° scale, may be located at any distance from the transducer, provided the resistance of any one conductor does not exceed 25 ohms. To prevent errors due to stray AC pick-up, all three conductors should run within the same cable or conduit. With the standard type of 3-core cable, the maximum distance between the transducer and the instrument is 1,000 yards, but greater distances are permissible.

Ten Transducers on to One Instrument

If desired, certain types of AC potentiometric recorder may be used in place of the instrument, while it is possible to switch the output of up to ten transducers on to one instrument.

The new system, used with a diaphragm assembly consisting of a beryllium copper capsule brazed into a suitable housing, will find obvious applications in gas works, water works, and oil installations, enabling measurements of low-pressure line pressures down to 10 in. water gauge to be taken at many selected points and read on indicating dials in a central control or operation room. It is particularly valuable where it is undesirable or inconvenient to run pipework into an indicating position. The transmitter is screwed into the pipeline at the most suitable point for pressure measurement (Fig. 1). This point, though ideal for measurement purposes, might otherwise be inconvenient, or even inaccessible for direct reading.

Of simple basic design, the system requires no valves, barretters or rectifiers. A change in electro-magnetic coupling at the transducer end is balanced by a change in electro-magnetic coupling at the instrument. The voltage between X and Y (Fig. 2) depends on the relative values of L_1 and L_2 and these depend upon the position of the core in the air gap, that is, on the position of the stylus.

The voltage induced in the moving coil from the electro-magnet depends on its angle of deflection. The voltage between X and Y is applied to the moving coil and since this is free to move it will take up a position such that the electrical torque is zero. Thus if any change occurs in the

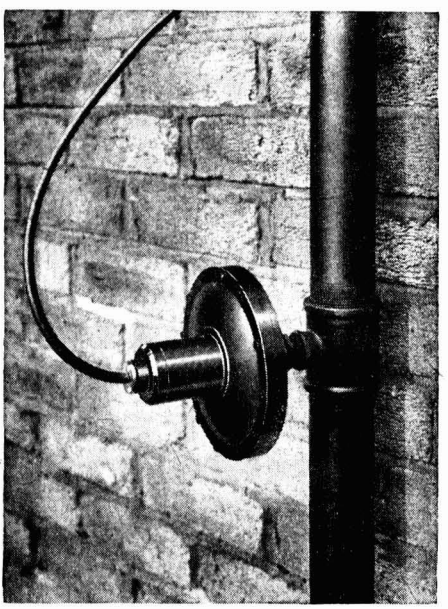


Fig. 1. The new remote indicating pressure transmitter can be screwed into a pipeline at the most convenient point for pressure measurement

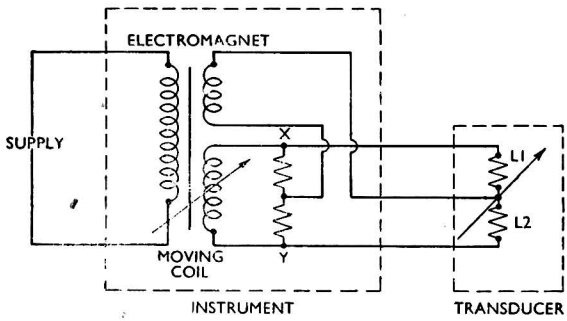


Fig. 2. The new transducer system for the remote indication of pressures, temperatures and mechanical movements

position of the core in the transducer, there will be a corresponding change in the position of the moving coil and therefore of the indicator pointer.

The magnitude of the voltages and currents in the circuit is of little consequence, and the system is, in fact, a form of balanced electro-magnetic servo system.

The system may be used on either a 230 volts or a 110 volts supply of 50 c/s. Measurements, however, do not depend to any appreciable extent on the input voltage or on the input frequency and the error with changes of voltage of ±15 per cent and of frequency of ± 7 per cent does not exceed 1 per cent.

The installation of the system is extremely simple: three wires from the instrument are connected to the transducer, and two further wires to the mains supply. In normal working conditions no maintenance or replacements are necessary.

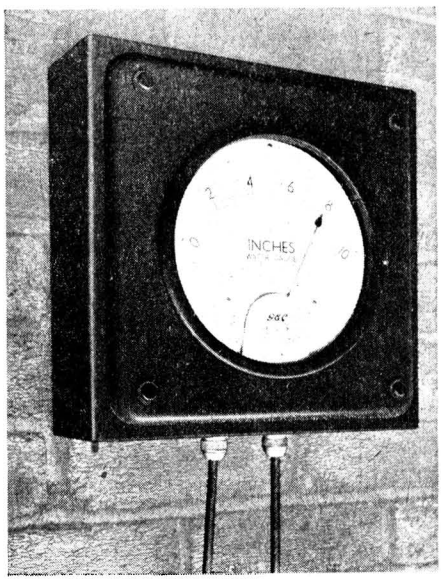


Fig. 3. The instrument can be mounted at any point up to 1,000 yards away

The transducer is compensated against temperature errors within the range 0-70°. That is to say, if the stylus is held at a definite position relative to the reference level, the indicator on the instrument will not move when the temperature of the converter head is changed within the limits of 0-70°. The overall accuracy of the system is better than ±1 per cent of the full scale deflection of the instrument. This accuracy is maintained with supply voltage variations of ±15 per cent, supply frequency variations of ±7 per cent and within the temperature range 0-70°.

The transducer itself measures 2 in. diameter by 2½ in. long. A fixing flange of 2¾ in. diameter may be attached if required. The instrument is 8 in. in diameter for flush mounting. The instrument weighs 9 lb. and the transducer (less any added conversion device) about 1 lb.

Tannery Effluents

A meeting of the Northampton Group of the Society of Leather Trades' Chemists will be held on Thursday 15 October, at 2.30 p.m. in the College of Technology, Northampton, when Dr. B. A. Southgate, F.R.I.C., Director of the Water Pollution Research Laboratory (DSIR), will read a paper on 'The Treatment of Tannery Effluents.' Further details can be obtained from W. G. Pebody, B.Sc., 'Mayfield', 19 Wellingborough Road, Olney, Bucks., the secretary of the Group.

Selenium : Its Uses & Recovery

The Paley Report & Some Further Recommendations

ONCE regarded as a mere scientific curiosity of little practical significance, selenium has recently become extremely important to industry and defence. For several years consumption has outstripped production and no alleviation of the existing shortage is in sight. The authors of the Paley Report state that selenium stocks were at their lowest level since the metal was first refined on a commercial scale. The gap between supply and demand may tend to widen still further as time goes on, because many new applications which have been developed are at present dormant on account of the high price of the metal, which at present is in the region of 25s. per lb. On the other hand, there appears to be little prospect of any appreciable expansion of production, because selenium is essentially a by-product metal.

Though native selenium occurs in association with native sulphur and metallic sulphides and the element is also a constituent of many minerals, there are known deposits in which selenium occurs in sufficient quantities to be economically extracted. Small quantities of the element are present in some pyritic ores, the bulk of the world output being recovered from the anode sludge left in electrolytically refining copper. There is also some recovery from sulphuric acid plants which burn pyrites.

America Produces Bulk

The bulk of the world output comes from the United States and Canada, which together produce about 1,000,000 lb. annually. In 1951 (the latest year for which world statistics are available) the United States produced 457,004 lb. and Canada 369,000 lb. The only other producers listed were Sweden (90,390 lb.), N. Rhodesia (9,772 lb.), Finland (3,146 lb.), and Australia (1,924 lb.). The largest importers were the United States (246,552 lb.) and the United Kingdom (191,656 lb.). Thus roughly three-quarters of the total world supplies are consumed by the United States, which obtains only two-thirds of its requirements from domestic ores. Britain's supplies are drawn mainly from Canada, which exported 370,473 lb. in 1951. Small quantities of selenium are also available from Sweden and Japan, but these are highly priced in comparison with the Canadian product.

Origin of the Shortage

The critical shortage of selenium has been brought about mainly by the development of radar and television and by the rapid expansion of the electrical and electronic industries in general. The importance of the metal to these industries is due to the property of its crystal, of passing a current in one direction but not in the other. This renders selenium an ideal material for the manufacture of metal plate rectifiers, which are employed in television, communications, battery charging, etc. In battery charging, for example, the rectifier reduces the current automatically as the battery voltage is increased and prevents battery discharge through the rectifier when the alternating current fails.

Formerly the biggest field of application was for colouring and decolouring glass. Many tons are used annually in the manufacture of red signal glass, red glass for motor car tail-lamps and other coloured glassware. Supplies to the glass industry, however, have been severely effected by the shortage; according to the Paley Report, this industry has been receiving only some 15 per cent of its needs.

The best known application of selenium is in the contruction of photo-electric cells, which is based on the fact that the electrical resistance of the metal varies proportionately with the intensity of the light falling on it. Despite its importance this field of usage is small in terms of consumption and accounts for only about one per cent of the total demand.

In the rubber industry selenium is used as a secondary vulcanising agent to increase resistance to heat, oxidation and abrasion, and to increase resilience. Small quantities are added to stainless steels and copper-rich alloys to improve machinability and to magnesium-manganese alloys to increase corrosion resistance. Encouraging results have been reported from the application of a protective layer of selenium to magnesium

alloys used for aircraft construction. The parts are immersed for a few minutes in a 10 per cent solution of selenious acid containing a little sodium chloride. This produces a film of selenium which is claimed to be very resistant to the corrosive action of sea water.

Used for Fire Proofing

Selenium has also been employed on a small scale for fire-proofing fabrics, wood and other materials. For example, wires insulating electrical cables can be coated, or the cotton and rubber covering can be impregnated with this material. A cable which has been so treated will not continue to burn when removed from a flame and will not catch fire as a result of a short circuit. Selenium may be used in place of sulphur as a catalyst for fat hardening, while the metal selenides act as hydrogenation and cracking catalysts for the conversion of heavy oils to motor fuels. A number of pigments containing selenium have been developed and some of them may become commercially important. As an insecticide, selenium is used for controlling insect pests in citrus fruits, grapes and ornamental plants.

Selenium was first obtained commercially from the mud deposited in the lead chambers of sulphuric acid plants burning Scandinavian pyrites and the copper ores of Mansfeld, Germany. Some selenium is still extracted from acid chamber mud, from the crude acid itself, or during the purification of the sulphurous gases in the contact process. In roasting pyrites the selenium content is oxidised to selenium dioxide, which is then reduced by the sulphur dioxide in the lead chambers to finely divided selenium, the latter being deposited as a red sludge.

In early recovery plants the selenium was recovered from the sludge by a dry roasting process, but the losses were considerable and the final product had a lead content of about 0.5 per cent, which rendered it unsuitable for use in photoelectric cells. This method has therefore been superseded by a wet purification process. Oxidation may be accomplished by three alternative methods, which are based respectively on potassium permanganate, sodium or potassium chlorate, and oleum containing 20 per cent of sulphur trioxide. In each case the selenium is dissolved while the lead and other impurities remain insoluble and are removed. The selenium is then precipitated by sulphur dioxide and is purified by distillation in a cast iron still containing 5-6 per cent silicon.

American copper refiners first became interested in the recovery of selenium about 1905, when commercial demand was still very limited; by 1910 the US output had risen to about 10,000 lb. annually. Canadian production dates from 1931, when the Ontario Refining Co., Ltd., started to recover selenium at Copper Cliff, Ontario. In 1943, US production reached a wartime peak of 635,581 lb., and in the same year Canada produced 374,013 lb.

In the usual pyrometallurgical process for treating copper ores, selenium and tellurium are concentrated in the blister copper in the form of selenides and tellurides of copper, gold and silver. Extraction is complicated by the simultaneous production of pure copper, selenium, tellurium, gold and silver. Difficulties are also presented by the tremendous variation in the composition of blister copper. Montana blister is low in selenium, but contains about 0.10 per cent tellurium; that from Arizona has about 0.15 per cent selenium, while the coppers of Eastern Canada contain up to 0.26 per cent of selenium plus tellurium. Some exceptionally rich slimes from the refining of eastern Canadian copper contain about 24 per cent selenium, but contents of 5 or 6 per cent are quite common.

The anode slimes are roasted and are then leached with dilute acid to recover their small copper contents. Some selenium and tellurium dissolve with the copper and the solution is therefore purified by boiling with metallic copper, the resultant slime containing copper selenide and telluride. The purified solution is returned to the electrolytic cells, while the slime is returned to the residue from leaching, which is then treated in the Doré furnace to recover the gold and silver content.

Method of Collection

Most of the selenium is volatilised in the furnace and is subsequently collected in the dust and sludges from the flues, water scrubbers and Cottrell precipitators. The flue dust and sludges are roasted in a special furnace at a low temperature. This oxidises the metallic selenium to selenium dioxide, which is collected in the cooler portions of

the flue in the form of pure crystals. These are dissolved in water, filtered and precipitated as selenium by means of sulphur dioxide gas. The remaining selenium and tellurium in the Doré furnace charge are removed by fluxing with soda ash or caustic soda and sodium nitrate. The soda compounds are leached out of the slag with water, giving a strongly alkaline solution of sodium selenite and tellurite. The latter is removed by precipitation as tellurium dioxide on the neutralisation of this solution with crude sulphuric acid. The selenium remaining in solution is recovered and mixed with that from the flue dust.

The element forms several allotropes, the ordinary one being a greyish metal with a semi-metallic lustre, which is crystalline. The selenium recovered as a by-product from copper refining is converted to the black modification, in which form it may be sold. If sticks or cakes are required, the black amorphous powder is melted under a sodium nitrate flux in cast iron pots, from which it is cast in the vitreous modification.

No satisfactory replacements for selenium in the electrical field appear to be in sight, though it is possible that substitutes can be developed from other photosensitive and semi-conductor materials. In the glass industry alternative materials are available, but most of them have undesirable characteristics. Since consumption is expected to go on increasing, it is important that supplies should be improved. The Paley Report cites five possibilities which are regarded as well worth consideration.

The first recommendation is that selenium should be recovered from smelting operations in plants which are not yet equipped to refine the material. An example is given of a company which does not recover selenium from 3,000 tons of ore processed per day but not electrolytically refined.

Better Recovery Possible

The report also emphasises that better recovery in plants already producing selenium could undoubtedly be obtained. It has been reliably reported that one of the largest producers in North America is obtaining only about one-third of the selenium present in the ores. The balance is lost during the smelting operations because of the inherent characteristics of the operation. It has been estimated that by modifying existing equipment and processes, this company alone could increase its output of selenium by about 300,000 lb. per year.

The principal reason for the low recoveries of selenium is, of course, that electrolytic copper refining plants were designed primarily for the most efficient production of copper, selenium being a by-product which was not even considered when the plant was first laid down. Hitherto little attention has been devoted to the development of improved methods of selenium recovery. Possibly the yield could only be increased by the installation of new equipment, and this might not be economic. Copper refiners will require to balance the initial and operating costs of improved selenium processes against the current market price of the metal.

A Third Possibility

A third possibility is the recovery of the selenium and tellurium contents of sulphur produced by roasting pyrites. If this could be achieved the production capacity of selenium could be considerably increased, but at present there is no known means of recovering the selenium from the sulphur economically.

A possible source of additional supplies is the newly developed copper deposits in the West, which are expected to be in production in the near future and might well contain selenium.

The last suggestion put forward in the Paley Report is the possibility of selenium 'farming.' Many areas in the West have seleniferous soils. Plants grown on these soils absorb selenium to such an extent that animals grazing on them suffer considerably from selenium poisoning. The proposal is that crops of a suitable type should be grown and harvested and that they should then be processed to extract the absorbed selenium. It is calculated that by selecting those plants which are best at accumulating selenium, on a yield of 1 to 2 tons per acre some 20 to 40 lb. of selenium could probably be obtained in an ash concentrate.

Though Britain has no copper sulphide ores and is therefore entirely dependent on imports for its selenium requirements, the possibility of increasing supplies from available sources is not being overlooked. Any selenium found in imported ores is evidently present because it could not be economically extracted in the country of supply, but it is conceivable that there might be some

stage during processing at which recovery might be effected. In a report published last year the Metals Economy Advisory Committee emphasised that the possibility of recovering selenium economically in Britain for imported ores should not be excluded without thorough investigation.

The reversion to pyrites as the starting material for the manufacture of sulphuric acid has provided a possible source of selenium which might well repay investigation. Flash roasting produces quantities of selenium which would be worth recovering. The metal is concentrated in wastes, dusts and muds, etc., which are left in certain parts of the plant. As in the case of copper refining, the problem is to develop a method which will not interfere with the primary object of the process, and which will be cheap and simple enough to be economic.

Production Control

Specialist Team's Recommendations

THE result of an investigation into the vigilant direction of manufacturing exercised in American industry—from finality of design to despatch—has just been published in the form of a productivity report entitled 'Production Control' (British Productivity Council, 21 Tothill Street, S.W.1. Pp. 138. 5s.)

'The fact that 36 productivity teams which visited the US made reference in their reports to the practice of production planning and control led to the thought that a study of this subject would be of great value to British industry.' The opinion was that 'the methods used had contributed in no small measure to the high productivity found in America'; American practice was therefore examined objectively against the background of the best British practice.

The team make the following recommendations: (1) Every firm in Great Britain should examine its present system of production planning and control in the light of this report; (2) Those firms which find they are not at present operating an effective system on the lines indicated should establish a system to meet their needs without delay; (3) It is no excuse for a small organisation to say it cannot afford production planning and control . . . (which) will undoubtedly result in increased productivity. However, the impression was gained that among the smaller firms production planning and control was not more widespread than among the smaller firms in Britain, only that it was more efficient.

In the formulation of the forecast and the production plan the team were impressed by the close co-operation which existed between design, sales and production. It appeared to be the aim of all firms to reduce the number of types of product to the minimum and thus obtain the longest possible production runs. Another particularly important feature was that plant and equipment were invariably installed to work on a two or three shift basis.

The comparative youthfulness of the executives met by the team, and the calibre of the men engaged in control were significant, and probably accounted for the vitality and sense of urgency of purpose which permeate the various levels of management and authority.

The Analysis of Cobalt

continued from page 752

a 1 per cent aqueous solution of the sodium salt of this acid as reagent, determined cobalt gravimetrically in presence of calcium, barium, strontium and magnesium, and obtained results within 0.25 per cent of the truth. The precipitate was washed with hot water and dried at 105°-110° for an hour. Most heavy metals also gave a precipitate with the reagent and interfered.

Duval[16] has examined 28 different gravimetric methods for cobalt by means of the automatic thermobalance, and concluded that the best weighing form was cobalt anthranilate. The precipitate is readily filtered and washed, and the thermogravimetric curve shows a good horizontal (loss <0.1 mg. per 201.5 mg. of precipitate) between 100° and 290°.

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The Automatic Bleed Unit

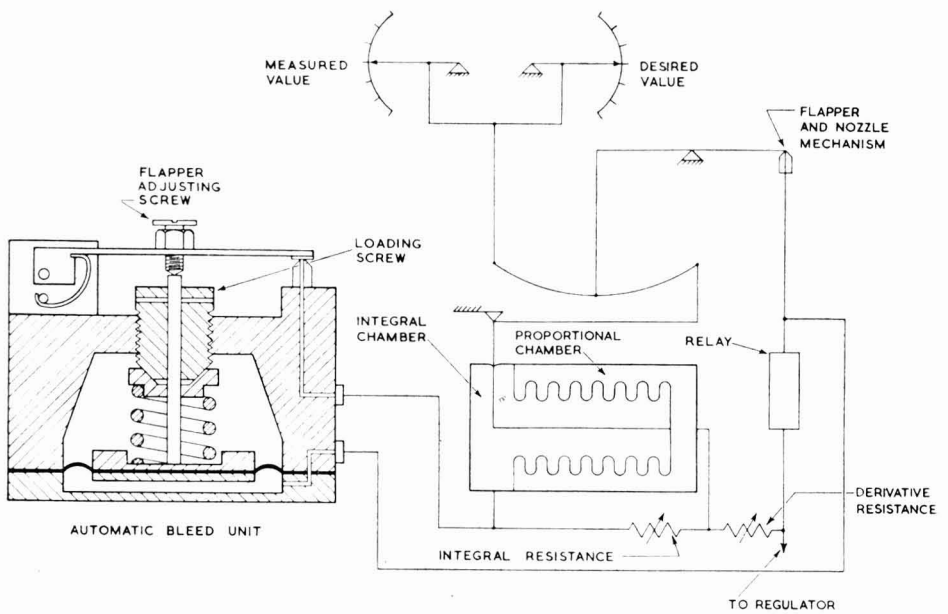
Elimination of 'Overshoot' in Batch Processes

CONVENTIONAL automatic controllers employing integral action may have some disadvantages when used on discontinuous or batch processes. An 'overshoot' of the measured variable tends to occur when the variable returns to its desired value after an interruption of the process.

The integral function of a controller is constantly in operation while the measured variable deviates from the desired value; in consequence, if there is a prolonged interruption of the process, the integral action will build up until it reaches its limit, when it will become 'saturated' and render the controller mechanism ineffective. In air-operated controllers this 'saturation' occurs when the integral chamber pressure reaches its maximum, and the deviation will then cause the flapper (of the controller detecting mechanism, normally a flapper and nozzle) to be held outside its normal working range. The flapper does not re-enter its normal working range until the deviation is eliminated, the plant regulator meanwhile being at the limit of its travel. When plant conditions return to normal and the measured variable rises in response to the plant regulator position, the controller is therefore unable to produce any corrective action until the measured variable has reached the desired value. An 'overshoot' of the measured variable may therefore take place and possibly result in damage to the plant or impair the operation of the process. In order to eliminate this 'overshoot,' a device has been developed by George Kent, Ltd., known as the Automatic Bleed Unit.

This unit is connected to the integral chamber of the controller and the controller nozzle line, so that when an interruption of the process occurs and the control pressure reaches its maximum, a 'bleed' of air from the integral chamber takes place, thus retaining the flapper within its normal working range and keeping the controller mechanism effective. This action will occur continuously until plant conditions return to normal. In consequence, control action begins while the measured variable is returning to its desired value, thereby greatly reducing the possibility of 'overshoot.'

The Automatic Bleed Unit essentially



Kent automatic bleed unit

consists of a cast body enclosing a flexible diaphragm. This diaphragm is constrained by an adjustable control spring, as shown in the illustration. When the control pressure, which is applied below the flexible diaphragm, reaches its normal maximum and overcomes the control spring, the pivoted arm is raised, opening the nozzle valve connected to the integral chamber of the controller, and bleeding air from the integral chamber to atmosphere. The control spring is adjusted to correspond with the upper limit of the control pressure range by means of the loading screw at the top of the cast body.

The Automatic Bleed Unit has been successfully employed in practice on control circuits for processes of the discontinuous type, including the control of open-hearth-furnace roof temperature. In this application the periodic furnace reversals result in a temporary fall in roof temperature, which is of sufficient magnitude in many cases to cause severe 'overshoot' on the return to normal operating conditions, if an Automatic Bleed Unit is not employed in the control circuit. Such 'overshoot' could in time jeopardise the safety of the furnace, by causing melting of the refractories in the roof. Another example of 'overshoot' elimination by this means is in automatic superheat control of boilers.

The Automatic Bleed Unit is a simple and reliable device which can be easily added to the standard Kent Mark 20 controller. It in no way detracts from the performance of the controller, nor modifies its response characteristics.

Harwell Isotope School

Another Extra Course Arranged

INTEREST in the continually growing use of radioactive isotopes throughout the world and the consequential demand from universities, hospitals and industrial organisations abroad for consignments for instruction, have forced the Isotope School at Harwell to introduce an additional course for the second time this year.

The school was started at the Atomic Energy Establishment two years ago to teach scientists, doctors and industrial research workers the techniques of using and handling radioactive materials. The series of courses planned for this year did not include one for July, but one had to be arranged and was filled. There is still such a heavy demand for places that another extra course will be held from 16 November-11 December, 1953. Applications to be considered for this course should be sent to the Isotope School, AERE, Harwell, Berkshire, as soon as possible.

More than 250 students have so far attended the school, from 20 different countries. Nearly half of them have been interested in industrial applications of isotopes, a fifth of them in medical work and the remainder in research of various kinds.

Isotopes are now being sent out from Harwell at the rate of 11,000 a year, of which 4,000 are exported.

Lectures and instruction at this school are given by members of the Atomic Energy Research Establishment staff. The school building, which is equipped with the latest apparatus, is just outside the security fence at Harwell. Students pay a fee of £40 for the course, and accommodation may be arranged for them, at an additional charge of £7 7s. a week, in a senior staff hostel near Faringdon.

Tinplate Prices Stabilised

THE Minister of Supply has, after consultation with the Iron and Steel Board, made an Order affecting tinplate and terneplate prices. As is said in the explanatory note to the Order, it increases the basic prices for tinplate and terneplate by 1s. 8d. per box and 6d. per box, respectively, and for the appropriate extras by corresponding amounts. In consequence, however, of the price changes resulting from the operation of the 'Automatic Variation Adjustments' for tin and lead, the maximum prices for tinplate and terneplate will remain unchanged. The purpose of the Order, which has been made on the recommendation of the Iron and Steel Board, is to continue temporarily the stabilisation of the maximum selling prices of tinplate and terneplate pending further examination of these prices by the Iron and Steel Board. The Order, the Iron and Steel Prices (No. 5) Order, 1953 (S.I. 1955, No. 1438) came into operation on 1 October. Copies are obtainable from HM Stationery Office.

Higher Exports from West Germany

New Petroleum Chemicals Plant to be Built

IN contrast with the decline in British chemical exports this year, official figures from the Federal Republic for the first half of 1953 reveal that West German exports of chemicals and allied products rose by about one-fifth compared with 1952. Total exports of chemical products—including plastics, rayon, soap and a few other groups not included in the British chemicals section—amounted to DM. 1,056,205,000 in January-June, 1953, compared with DM. 844,616,000 in the corresponding period of 1952. The German chemical industry sold about one-fifth of its production in foreign markets and accounted for one-eighth of all exports from the Federal Republic.

In assessing the importance of these figures it must be borne in mind that German chemical exports last year suffered a severe contraction—from DM. 2,113,913,000 in 1951 to DM. 1,772,538,000. They have, however, now regained the 1951 level and are expected to remain at this level during the remainder of the present year. Remarkable export gains have been recorded by German producers of nitrogen and potash fertilisers, pharmaceuticals and plastics. Shipments abroad of dyestuffs and intermediates improved this year, but are still far below the 1951 level, while foreign sales of paints and colours declined further.

Value of Exports

The most important groups of chemical exports in January-June, 1953 (1952 figures in brackets) were: Inorganic and heavy chemicals, DM. 278,799,000 (DM. 253,859,000); nitrogen fertilisers, DM. 103,720,000 (DM. 59,961,000); potash fertilisers DM. 54,194,000 (DM. 45,157,000); coal-tar dyes and intermediates, DM. 94,803,000 (DM. 78,962,000); paints and colours, DM. 64,149,000 (DM. 69,535,000); pharmaceuticals, DM. 105,377,000 (DM. 74,146,000); plastics, DM. 72,756,000 (DM. 67,604,000); photographic chemicals, DM. 15,714,000 (DM. 11,279,000); coal-tar products, DM. 42,942,000 (DM. 35,548,000). About 70 per cent of all West German chemical exports went to member countries of the European Payments Union.

What is likely to be one of the largest petroleum chemicals projects in continental Europe has been started by the formation of a new company styled Rheinische Olefinwerke GmbH at Wesseling in North Rhine-Westphalia by Badische Anilin- & Soda-Fabrik AG, Ludwigshafen, and Deutsche Shell AG, Hamburg. The new company is to start immediately on the erection of a large plant for the production of polythene and ethylbenzene from oil refinery gases which will be obtained from the petroleum refinery at Wesseling. Production is expected to start in 1955. The polythene production will be sold under Bayer's trade mark, 'Lupolen', while the output of ethylbenzene is apparently to be used largely in the manufacture of polystyrene.

Rising Plastics Production

The new plant will make a substantial contribution to the German plastics production, which is now nearing the 20,000 tons-a-month mark. In June it amounted to 19,160 metric tons, compared with a monthly average of about 16,000 tons in 1952 and just over 9,000 tons in 1950. Since the beginning of this year several important plastics manufacturing units have been brought into production. Thus Internationale Galalith Gesellschaft AG, Hamburg-Harburg, has extended its output capacity for polyvinylidene chloride, while Farbenfabriken Bayer AG, Leverkusen, has started production of silicone rubber and is going ahead with the construction of a methylchlorsilane plant.

Consumption per head of plastics in Germany is now believed to be higher than in any other country of Europe, but in view of the growing competition and the large number of new producing units coming into operation, it is felt that the German plastics industry will require larger export outlets in the next few years. In this connection great hopes are placed on the younger plastics, demand for which still exceeds supply. In other sections of the trade, however, notably in that serving the paint industry, increasing competition is already making itself felt.

A new polyamide fibre called Trelon will go into experimental production at

Thüringisches Kunstfaserwerk, Schwarza, in the Soviet zone of Germany early next year. The new fibre is said to be ready for commercial-scale production, but some considerable time may elapse before factory production starts. Trelon can be produced from basic materials derived from lignite via acetylene or from furfural from agricultural waste products like oat husks. It is claimed that the new fibre is softer and smoother than other polyamide fibres and their equal in mechanical strength. It will stand short exposure to temperatures above 100°; its melting point is reported to be 20° higher than that of Perlon.

Gold Coast Aluminium

Minister Unable to Give Impressions

A PRESS conference was held at the Gold Coast Office, London, on Tuesday, 29 September, at which Mr. K. A. Gbdemah, Minister of Commerce and Industry, outlined the present situation as regards the Volta River project for producing aluminium.

Mr. Gbdemah was speaking as leader of a delegation of Ministers and members of the Gold Coast National Committee which has been visiting Canada and this country. The National Committee was set up recently after the scheme had been criticised in the Gold Coast House of Assembly and in the Press for hastily committing the country to a project employing 15,000 to 20,000 people which might be controlled partly by the British Government and partly by private enterprise.

Mr. Gbdemah explained that the object of the committee was to examine the impact of the scheme on the people of the Gold Coast and the political consequences of accepting it. The delegation spent ten days visiting aluminium and hydro-electric plants in Canada and also visited the rolling-mills of the British Aluminium Company at Falkirk. Mr. Gbdemah said that the members could not yet give any impressions of their visit but they had been interested in such matters as the wages paid and the services provided for workers.

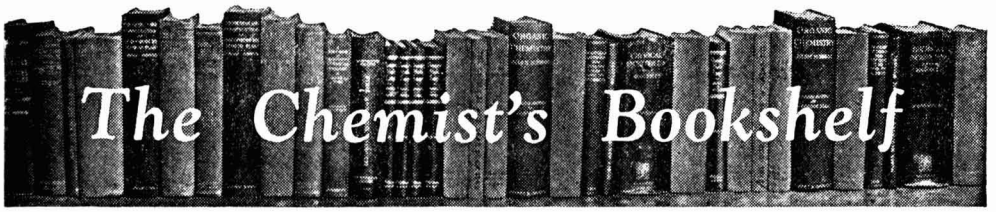
The eventual cost of the Volta River scheme, if it is implemented, will be £144,000,000, and the cost will be borne by the British and Gold Coast Governments along with Canadian and British aluminium interests.

Search for Potash

POTASH Company of America, big operator of potash mines and refinery at Carlsbad, Mexico, in its annual report reviews its exploration activities as follows: 'We have continued drilling in the area east of the Carlsbad operation and have encountered mineralisation. However, it is at a depth at least twice that of our present orebody and we do not now have sufficient information to make any definite plans for development. Also, during the year we have continued drilling in the province of Saskatchewan, Canada, and there again have found mineralisation. This mineralised zone lies at a minimum depth of 3,000 ft. and cannot be called commercial as yet. The physical difficulties of shaft sinking and mining at such a depth, as well as the other problems of operation, freight, marketing, etc., must be solved first. It is our purpose to continue exploring the possibilities of this area and should indications in the entire picture prove favourable, the next step would be to consider sinking a shaft. The possibility of adding substantial ore reserves in this area is attractive. At this time it appears quite possible that the exploration programme, either near Carlsbad or in Canada, will develop a commercial orebody permitting an auxiliary operation in addition to our present operation.'

Pentaerythritol

SHAWINIGAN Limited, Marlow House, Lloyd's Avenue, London, E.C.3, announce that pentaerythritol is now available from the plant of their associates, St. Maurice Chemicals Limited, of Canada, which was established in 1951 by Shawinigan Chemicals Limited, of New York City, to manufacture formaldehyde and pentaerythritol, the latter for the first time in Canada. The plant started production about the middle of 1953. Pentaerythritol is produced by reacting formaldehyde with acetaldehyde in the presence of an alkaline catalyst. The formaldehyde is produced from methanol, and the acetaldehyde is obtained from the Shawinigan Chemicals' plant at Shawinigan Falls. Pentaerythritol is manufactured at Varennes, a village on the south shore of the St. Lawrence River, about 12 miles from Montreal.



AN INTRODUCTION TO CHEMICAL ENGINEERING. By T. K. Ross. Sir Isaac Pitman & Sons, Ltd., London. 1953. Pp. 214 + x. 21s.

To the student who has a knowledge of physical chemistry this book will be of particular value when learning the fundamentals of chemical engineering. There are in all fifteen chapters, an appended bibliography, and a good index.

Process evaluation is chosen as the subject of Chapter I, particular emphasis being placed on the importance of material and heat balances. The methods employed in compiling these are illustrated by reference to the manufacture of caustic soda from aqueous sodium carbonate. Chapter II logically follows in sequence since it deals with materials handling. The various types of pump, fans, etc., are described and theoretical considerations concerning power requirements are outlined. A small section only is devoted to solids handling, which could profitably have been expanded.

Heat transfer is probably one of the most important aspects of any chemical engineering process, and Mr. Ross has implied this in his concise but adequate treatment of the subject. Radiation, conduction, natural and forced draught convection are dealt with separately, dimensional analysis being used to illustrate the interdependence of certain variables, as for instance in the Dittus-Boelter equation. A simple tube furnace, various heat exchangers and evaporation are used to emphasise the practical applications.

Size reduction forms the theme of Chapter IV, which gives simple sketches of crushing equipment and deals with theoretical aspects of the problem. Mention is also made of size reduction of liquids. A separate Chapter, V, has been devoted to mixing. This is a good idea since, until recently, little attention has been paid to this operation in spite of the importance of ensuring intimate contacting of surfaces in many physical and chemical processes.

Size separation and filtration follow logically after Chapter IV and V. In each case the author describes typical equipment, though not always with illustrations, and outlines the mathematical relationships involved.

Chapter VII deals briefly with the mathematics of diffusional processes and is followed by a treatment of crystallisation, humidification, drying, distillation, extraction and absorption in the remaining chapters. All these subjects are dealt with concisely, but lucidly, the only absence being that of worked examples.

Taking the book as a whole, it represents a useful addition to the published literature on chemical engineering. It may well form the basis of a chemical engineering course for students at both universities and technical colleges, and is good value for money. It could have been improved by the addition of a section on fluid flow, as distinct from fluid handling, and by the inclusion of more worked examples. The absence of set examples is no drawback to full time students since these can be devised by their supervisor, but their addition would be useful to anyone studying by themselves. On the other hand, such additions must necessarily increase the price of the book.—E.J.C.

FLUORESCENCE OF SOLUTIONS. By E. J. Bowen and Frank Wokes. Longmans, Green & Co., London. 1953. Pp. 91. 25s.

In the preface the authors state that this book is intended to be used by students and practical workers who require an elementary introduction to the subject of the fluorescence of solutions, and details of the methods by which fluorescence measurements can be made. The reader is referred to two other recent and more advanced books, 'Fluorescence and Phosphorescence' by P. Pringsheim (Interscience Publishers, 1949) and 'Fluoreszenz Organischer Verbindungen' by T. Förster (Vandenhoek and Ruprecht, 1951), for more detailed and theoretical accounts of work of specialists

in this field. In the present volume only the highlights of fluorescence theory are described, detailed mathematical proofs are avoided and a relatively larger amount of space is devoted to the practical side of the measurement of the fluorescent properties of solutions.

It has now become a fairly common analytical procedure to identify and estimate quantitatively small concentrations of fluorescent substances, and reference to this book should enable those engaged in such measurements to achieve greater accuracy and to interpret their results correctly. An elementary account of the theory of the absorption and emission of light is presented first, and the various practical factors that may influence the extent of fluorescence are discussed. The problem of the quenching of the fluorescence of solutions is of considerable importance in accurate quantitative measurements and this subject is discussed in some detail. A short account of the detection of fluorescence includes a description of the use of barrier layer photocells, emission cells, and photoelectric multipliers. A number of commercially available fluorimeters—instruments used to measure fluorescence—are described, and the problems involved in their use, including calibration, are discussed. In the final chapter consideration is given to the problems raised by the presence of significant amounts of interfering substances in the fluorescent solution, which may affect the accuracy of the results by making the fluorescence actually measured either greater or less than the true value. The general precautions to be observed in fluorimetric analysis are also mentioned.

This book will undoubtedly be of much use to all those engaged or interested in the measurement of fluorescence, but the price of the volume seems to be rather high in relation to its size and to the price of comparable works issued previously by the publishers.—G.S.E.

LEHRBUCH DER ORGANISCHEN CHEMIE. Band I, Zweite Hälfte. By F. Klages, W. de Gruyter, Berlin. 1953. Pp. xv + 453. Full cloth. DM.62.

This book completes Volume I (Systematic Organic Chemistry), the first part of which has already been reviewed in this journal (**68**, p. 182). Volume II (Theoretical and General Organic Chemistry) and Volume III (Dyestuffs, Natural Products and Biochemistry) will be available shortly.

Volume I is no catalogue of properties and reactions, but a lively exposition in which the reader is presented with the subject as a whole in a clear and convincing way. Remarkable unity is achieved, mainly by the use of a comparative approach and by intelligent classification of the subject matter (for example, pyrrolidine is discussed with the amines and not under pyrrole). Electronic theory is used extensively to relate the various classes of organic compounds, but a detailed consideration of theoretical topics is postponed to Volume II. Thus the student can learn to appreciate the value of modern theory without being bewildered and dismayed by the extended and often largely speculative discussions of reaction mechanisms, etc., which tend to obscure the general picture in many modern textbooks.

The section under review begins with a systematic survey of the organic compounds of nitrogen, sulphur and the remaining non-metals except oxygen and the halogens, which are discussed in the first half of Volume I. Two excellent chapters deal with organometallic compounds and cyclic compounds, including heterocyclics. There are also sections on free radicals and on compounds containing artificial isotopes—an unusual feature in a book of this sort. Volume I closes with a discussion of general methods of oxidation, reduction, synthesis and degradation which summarises much of the contents of the two parts.

The book can be recommended with confidence to those who would like a 'refresher course', as well as to undergraduates. The former may be distressed by the lack of references to the literature, but they will find that Professor Klages' stimulating organisation of fact and theory more than makes up for this deficiency. The latter will benefit from the care which has been taken to remove ambiguities and to correct popular misconceptions.

There are a few errors—on p. 803 *cis*-decalin is given the old 'boat' formula and on p. 912 we are told that glyoxylic acid is not oxidised by periodic acid. However, on the whole, the standard of accuracy is very high. Numerous charts and tables and attractive printing add to the clarity of the text and English readers will find Professor Klages' German easy to understand.—J.C.P.S.

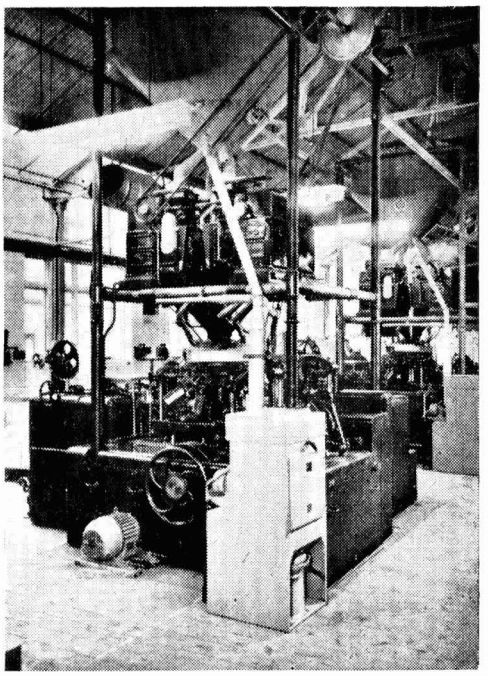
Unit Dust Control

MANY commodities when handled in bulk or otherwise make dust, and if not controlled become a nuisance both to men and machines. If the movement of, for instance, tea through a factory is briefly followed it will be seen how many dust-creating operations are involved. The sequence in some factories is that the tea is first emptied from the chest into a storage hopper, which feeds a magnetic roller for separating harmful metallic objects, and then conveyed by belt past a hand-sorting operation to the blending drums, or if necessary prior to this operation, through the tea cutter. When the tea is blended it is then ready for packing and is fed into large storage hoppers above automatic weighing and packing machines.

At each of these operations a fine dust is created which is detrimental to operators and machines, covering them in a brown deposit. This particular dust can also be valuable for extracting caffeine and is a worthwhile proposition for collection because it offsets the cost of the dust collection equipment.

This brief description of the handling of a well known commodity will be readily appreciated as being applicable to many other similar operations handling other materials.

For applications of this type Dallow Lambert & Co., Ltd., are putting forward their range of 'Drytex' and 'Dustmaster' unit dust collectors, which are being successfully used on many operations in the industry—in a well-known tea-blending factory in the Midlands, as well as on powder packing machines, they are used exclusively. The units are available in a complete range of sizes to cover a wide variety of dust problems, and have patent features. Dallow Lambert specialise in the manufacture of pneumatic dust collection equipment, and have technical staff fully equipped to advise on dust problems.



A Dallow Lambert 'Drytex' 20 series T25B unit applied to a tea-blending machine

Measuring Liquid Flow

THE already manifold peacetime uses for atomic energy have been increased once again through a technique devised by Dr. Melbourne L. Jackson, of the University of Colorado, for measuring complex liquid flow phenomena by the use of radioactive tracers. The measurement of very thin layers of moving fluids has always been complicated by the disturbances resulting from the presence of ordinary types of measuring instruments. This new technique permits the observation of flow behaviour of liquids without any physical contact between the liquid and the measuring device. Minute amounts of a radioactive tracer are introduced into the liquid stream and the resulting radiation detected by means of a Geiger counter. The radiation intensities are then used to calculate the characteristics of the flowing fluid.

The results of Dr. Jackson's work, including his suggested improvements in the theories of fluid flow, were presented in a paper on 'Liquid Films in Viscous Flow' before the national meeting of the American Institute of Chemical Engineers in San Francisco on 16 September.

• HOME •

Consultants Appointed

Dr. M. A. Phillips and Associates have been appointed technical advisers and consultants to Associated Fumigators Ltd., of 112 Victoria Dock Road, London, E.16.

Prices of Unrefined Oils

The Minister of Food has announced that there will be no changes in the prices of unrefined oils allocated to primary wholesalers and large trade users during the four-week period ending 31 October.

Magnesium Freed

The Minister of Materials, Lord Woolton, announced this week that the Ministry will cease to import or sell magnesium on 1 January next except for minor contracts which remain to be completed next year. Private importation will be permitted. The price at present charged by the Ministry for magnesium is £322 a ton.

Midlands Analytical Society

The second meeting of the new session of the Midlands Society for Analytical Chemistry will be held on 13 October, at 7 p.m. in the Mason Theatre of the University, Edmund Street, Birmingham. The subject chosen for discussion is 'Spectrochemical Analysis by the Porous Cup Solution, Spark Technique,' which will be presented by Dr. R. O. Scott of the Macaulay Institute for Soil Research.

I.C.I. Safety Week

Huddersfield works of the Dyestuffs Division of I.C.I., Ltd., is one of the largest and most modern of its kind in the Commonwealth and operates many complicated chemical plants and processes, yet its accident record is considered excellent. Nevertheless, the authorities consider it can be bettered, and with this in mind a Safety Week is being held this week, the 4,000 employees having been asked to concentrate more than ever on the prevention of accidents. An exhibition has been included in the programme, with special displays by the works fire brigade, first-aid teams and the Huddersfield Fire Brigade.

Explosion at Barry Works

In an explosion at the works of Albright and Wilson, Limited, Barry, Glamorganshire, last week, four men were injured. Two were detained in hospital.

Kainite from Russian Zone

As a result of the President of the Board of Trade, Mr. Peter Thorneycroft, visiting Peterhead recently, Scottish herring curers have received licences to import 30,000 tons of kainite from the Russian Zone of Germany. The kainite, imported in exchange for cured herring, has been sent to East Anglia, where it will be used as a fertiliser for sugar beet.

Oil Struck Near Nottingham

The discovery of more crude oil near the site of a previous find in Nottinghamshire was announced last week by a spokesman for the Anglo-Iranian Oil Company, parent company of the D'Arcy Exploration Company, Ltd., which carried out the tests. The site of the tests was at Plungar, 12 miles east of Nottingham, and the result was described as 'encouraging.'

New Diatomite Factory

The Minister of State for Scotland, Lord Home, last week opened the factory which has been built at Uig (Skye) to process the diatomite now being dug on another part of the island. The deposits contain, it is estimated, about 1,000,000 tons, and it is thought that 5,000 tons a year may be extracted. Work, which began four years ago, has involved the draining of Loch Cuithir, on the north-eastern side of Skye.

Improving Industrial Relations

In his presidential address at the Institute of Personnel Management Conference at Harrogate on 3 October, Mr. L. Gale, personnel director, Nobel Division, I.C.I., Ltd., appealed for a country-wide research at university level, into personnel management in industrial concerns, as a matter of urgency. They had been engaged in evolving technique and introducing schemes aimed at improving industrial relations for the past 40 years, he said, but he wondered at times whether they had been fully successful.

OVERSEAS

Indonesian Quinine

Quinine production in Indonesia is estimated at about 1,206 metric tons a year. As foreign demand for it has declined, production has been reduced until now it is only about one tenth of the industry's potential capacity.

Exports Freed

The Australian Government has removed the ban on the export of a large number of goods, including tin concentrates, tin ores, tin ingots, solder, bauxite, pig lead, manufactures of lead, zinc, zinc alloys and zinc ash, dross, dust and oxide.

World Tin Output

World mine production of tin in July is estimated by the Tin Study Group at 16,900 tons, compared with 13,900 tons in June. The big increase is mainly due to a jump in Bolivian exports. Figures so far available for August all show a decrease.

Gas in Welding Tests

To discover flaws in the welded joints of the metal columns of a new refinery which is being built at Geelong, Victoria, radioactive gas is being used by a big Australian refinery. Photographic films are attached to the outside of the columns. Rays produced by the gas penetrate them and register on the film, which is later developed. The resulting negative shows any weakness in the welding.

German Chemical Progress

An increase of more than 10 per cent in the turnover of Kali-Chemie, AG, chemical manufacturers, Hanover, in the first eight months of the current year, was reported at the recent annual meeting by the chairman, Dr. Reuleaux. He said rising exports contributed materially to this expansion. In the potash business, said Dr. Reuleaux, they could point to increased sales both at home and abroad. Their new potash flotation plant at Friedrichall was working satisfactorily and was yielding a high-grade product, mainly for export. The catalysis plant at Neinburg had been functioning smoothly and was fully up to expectation.

Belgian Nuclear Reactor

A nuclear reactor is to be built at Moll, Belgium, for scientific and industrial purposes. Construction is expected to be completed by the end of the year.

Gas-washing Tower from Germany

Shipped from Bremen to Melbourne, a German-built gas-washing tower is being assembled at Morwell, Victoria, as part of the gas-making plant in the State's brown coal utilisation project. The tower, 75 ft. high, cost £12,000 sterling.

Chilean Copper

According to reports circulating from Santiago, the Chilean Finance Minister has informed the Chilean Foreign Minister that a deal for the purchase of Chile's stocks of copper, amounting to about 100,000 tons, by the United States, has practically been concluded The price, it was said, would be 30 cents per lb.

Bauxite in Australia

Reports from Australia state that recent surveys have shown that at least 10,000,000 tons of good quality bauxite are available on Mach'nbar Island, in the Wessel Group, off the coast of Arnhem Land. Considerable areas of good quality bauxite ore have also been reported in Arnhem Land itself, but these have not yet been fully surveyed.

Chemical Exposition

The 24th Exposition of Chemical Industries, arranged to be held in the Commercial Museum and Convention Hall, Philadelphia, Pa., from 30 November-5 December, is heralded as the biggest event of its kind, the organisers claiming that it will occupy 40 per cent more space than the last such display, which was held in New York two years ago. The purpose of the exhibition is to acquaint the chemical and allied trades with the latest developments in large-scale production methods. Admission will be by invitation. The general public will be excluded. Further information is obtainable from the Publicity Department, 430 Lexington Avenue, New York 17, NY.

• PERSONAL •

MR. M. G. T. PRICE has resigned his directorship of J. C. & J. Field, Ltd., soap and candle manufacturers.

MR. G. C. DUTTON has been appointed chief accountant of Boots Pure Drug Company Ltd in succession to MR. A. JOHNSON, who has given up that position after being with the company 46 years.

PROFESSOR ERIC HUTCHINSON, professor of colloidal chemistry at Stanford University, California, is paying a brief visit to his parents at their home in Morton Lane, Morton, near Keighley. Educated at Bingley Grammar School and Cambridge University, Professor Hutchinson spent a little time at Sheffield before going to America some eight years ago. He returned to Europe this year with a party of university students on a Continental tour from mid-June to mid-September, and since their return to the USA the professor has been visiting the leading English universities.

MR. A. C. H. CAIRNS, B.A., B.Sc., A.R.I.C., who, as announced in THE CHEMICAL AGE last week (p. 723), has joined the board of Joseph Crosfield & Sons, Limited, is 43, and an old boy of Whitgift School, Croydon. He began his chemical career by obtaining an honours degree in chemistry at St. John's College, Oxford. From there he joined the laboratory of Lever Brothers, Port Sunlight, Limited, passing through the works and central technical department before leaving for war service at the ROF, Pembrey, in 1941. His academic achievements found an outlet in the field of explosives and it was research and investigation into these which resulted in his being appointed chief technical assistant to the Director of Ordnance Factories. Release by the Ministry was followed by his appointment as technical officer to the UK Soap Executive of Unilever Limited, after which, in 1947, Mr. Cairns became chemical sales manager of Joseph Crosfield & Sons, Limited, being appointed to the board of Industrial Soaps Limited as sales director in 1950. Mr. Cairns has also been appointed to the Board of William Gossage & Sons Limited.

MR. E. L. GRANVILLE has resigned from the board of Eucryl, Ltd., wholesale and manufacturing chemists.

MR. A. BAILEY, MR. S. R. DAWSON and MR. W. E. STOKES have been appointed junior directors of Timothy Whites & Taylors.

The British Welding Research Association has announced that DR. A. A. WELLS has now been appointed Chief Research Engineer and Head of the Engineering Research Station at Abington, near Cambridge, and that MR. R. P. NEWMAN will be Chief Administrative Officer of the Station.

At the recent National Conference of the Purchasing Officers' Association MR. H. H. C. WOOD was elected president for 1953-4. Mr. Wood is Chief Purchasing Officer and Stock Controller of The Igranic Electric Co., Ltd., Bedford, with whom he is just completing a continuous period of 25 years' service.

Other officers elected were: *Vice-Presidents*: Messrs. E. W. BEAUMONT (S. M. Wilmot & Co. Ltd.), P. C. CORRANE (Blackburn [Dumbarton], Ltd.), A. ELLIOTT (Churchill Machine Tool Co. Ltd.), A. ROCHESTER (R. & W. Hawthorn, Leslie & Co. Ltd.), F. J. WHITE (Chance Bros. Ltd.), and D. WRAGG (Thomas Firth & John Brown Ltd.). *Chairman*: MR. J. FERGUSON (United Ebonite & Lorival Ltd.). *Vice-Chairman*: MR. R. J. MITCHELL (Morgan Crucible Co. Ltd.). *Hon. Treasurer*: MR. C. F. HUEBNER (British Oxygen Co. Ltd.).

Obituary

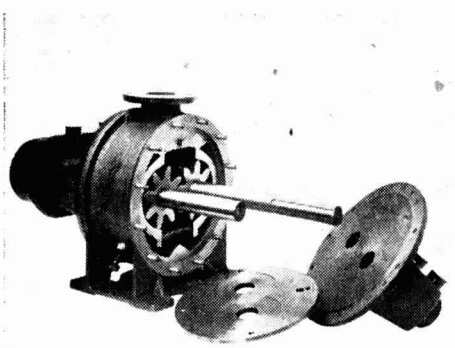
The death has occurred at Cambridge, Massachusetts, of DR. EDWIN JOSEPH COHN, aged 60, who had been Professor of Biological Chemistry at Harvard from 1935. He led research on the chemistry of proteins and with Dr. J. T. Edsall, of Harvard, wrote a number of papers on proteins. He was also particularly interested in the processing of human blood and helped to develop life-saving treatments widely used during the war.

Publications & Announcements

THE latest issue of 'Vacuum', a review of developments in vacuum research and engineering, published by W. Edwards & Company (London) Ltd., Worsley Bridge Road, Lower Sydenham, S.E.26—which, although dated July, 1952, has only just appeared—states that a method of producing waxes from sugar waste by vaccum distillation is being investigated and aims at capturing a market estimated at 38,000,000 dollars a year. Reference is also made to the possibility of freeze drying finding a new industrial outlet shou'd the present experiments on the uses of bacteria for sewage treatment prove successful. Original contributions to this issue are 'Measurement & Control of the Thickness of Thin Films', by Dr. K. M. Greenland; 'The Use of Multilayer High Reflecting Films for Reflection Multiple-Beam Interferometry', by Dr. S. Tolansky; and 'Analytical Distillation with a Micromolecular Still', by Dr. R. P. A. Sims.

* * *

DESIGNED to handle materials of high or low viscosity containing fine solids in suspension, such as asphalt, paints, etc., the Triton patent adjustable wear pump is made by Barclay, Kellett & Company, Ltd., Joseph Street, Bradford, Yorkshire. A positive pump depends for its efficiency upon the clearances of its moving parts and consequently, as wear takes place, the efficiency is rapidly reduced and the life of the pump correspondingly shortened. On the assumption that no practical materials have yet been produced to withstand abrasive action, this company has designed the Triton pump to take up the wear as it occurs. The adjustable features of this pump make it possible to maintain the most suitable clearances for the material handled, thus ensuring minimum wear, together with a volumetric efficiency figure (rate of discharge) which can be maintained without undue fluctuation.



Triton pump

* * *

PRODUCED to meet the growing demand for a pointer indicating type of *p*H meter suitable for routine and titration work, the Doran *p*H Indicator is described in List 110A published by Doran Instrument Company, Ltd., Stroud, Glos. Other primary considerations in the production of this meter were simplicity of manipulation, stability of setting over long periods, AC mains operation and a minimum of maintenance. No skill is required to take readings. List 113A, issued by the same company, describes the Doran Precision General Purpose DC Potentiometer, an improved model of their DC Potentiometer, E.4248, a number of new features having been introduced to meet the more exacting requirements of some users. This new instrument, state the makers, will be found to be of special value for general purpose voltage measurements, and the lowest range is particularly suitable for accurate temperature readings using thermocouples.

* * *

REPORTS in the August issue of Welding Research, the journal of the British Welding Research Association, are as follow: 'Hard Zone Crack Sensitivity and Strength of two Low-alloy Steels,' by C. L. M. Cottrell, M.Sc., J. G. Purchase and B. J. Bradstreet, B.Sc.; 'The Self-Adjusting Arc and Controlled Arc Welding Processes,' by W. G. Hull, A.I.M., and J. C. Needham, B.Sc.; and 'Impact Torsion Testing of Bolt Welds,' by H. E. Dixon, M.Sc., A.I.M. and J. E. Roberts, M.Eng., A.I.M. The Association's fourth annual school of welding will be held at Ashborne Hill, near Leamington Spa, Warwickshire, from 14-19 June next year.

NEW advantages for all colorimetric analyses in the laboratory, hospital or clinic are offered by Hilger & Watts Ltd., 98 St. Pancras Way, Camden Road, London, N.W.1, in their Hilger Biochem Absorptiometer. Simple to operate, this instrument has been compactly designed for use in the laboratory, gives accurate readings in a minimum of time and is easily maintained and cleaned. It can be used with less than 4 ml. of liquid in a 1 cm. cell. Convenience of reading is secured by using a reflecting galvanometer projecting a brilliant light spot with a hair line index on an opaque screen which is claimed to give a much wider angle of vision than the conventional translucent screen. The spot is clearly visible in full daylight.

* * *

MAGNIFIERS manufactured by Gowllands Limited, Morland Road, Croydon, are described and illustrated in a new list—No. 163H—issued by the company, who explain that they supply the distributing trades only and ordinary purchasers should be able to obtain the magnifiers from their regular scientific instrument or laboratory suppliers. The complete range of magnifiers manufactured by the company is covered by the list.

* * *

BAKELITE Laminated is built up from sheets of paper or fabric impregnated with Bakelite phenolic resin and formed into homogeneous panels under great pressure and at high temperatures. The resultant material is claimed to be resistant to heat, water and most chemicals, and to have excellent tensile, impact and cross-breaking strength. Its specific gravity varies, depending upon the grade, between 1.3 and 1.4. Its use for the production of general-purpose jigs and tools in all branches of the engineering industry is described in detail in a brochure, 'Bakelite Laminated for Jigs & Tools,' published by Bakelite Limited, 12-18 Grosvenor Gardens, London, S.W.1, who also recently issued another brochure, 'Bakelite Laminated in the Aircraft Industry.' 'Vybak' Industrial Rigid pvc Sheet' is the title of a new leaflet published by the same company. This material has been developed to meet the need in industry for a tough thermoplastic rigid sheet of exceptional chemical resistance which can be machined and fabricated by methods similar to those used for sheet metals. It has been found suitable for chemical plant fabrication, laboratory drains, etc. Warerite Limited (unit of Bakelite Ltd.), 18 Grosvenor Gardens, London, S.W.1, has published a brochure, 'Installing Warerite Laminated Plastics,' which is intended to provide architects and fabricators with information regarding the applications of Warerite veneered boards and Warerite panels for interiors.

* * *

'INSTRUMENTATION and Automatic Control of Soaking Pits' is the principal article in the latest issue of 'Instrument Engineer,' published twice yearly (price 2s. 6d.) by George Kent Ltd., Luton. The other contents are 'Corrosion and Silting in Water Meters', 'Training the Instrument Engineer,' 'New British Developments in Process Instrumentation' and the fourth part of the 'History of Flow Measurement by Differential Pressure.' There is also a book review and a select bibliography.

* * *

FROM the Alrose Chemical Company, Box 1294, Providence 1, Rhode Island, are obtainable copies of 'What's Doing,' the second bibliography published by this company, covering the 1952 literature on Sequestrene (ethylenediamine tetraacetic acid), as well as a number of earlier papers unfortunately not included in previous Alrose publications. There are in the eight pages more than 450 references to this useful chemical, also a list of the literature on Sequestrene available on request.

* * *

IT is well known that iodine deficiency in an animal's food, or the animal's inability to make proper use of iodine, may have serious consequences: reproductive failure or the birth of weakly offspring, stunted growth, goitre or 'big neck,' hairlessness or other abnormalities. Practical guidance on how to feed iodine to certain domestic animals is given in a booklet issued by the Chilean Iodine Educational Bureau. The animals, etc., for which recommendations are made are dogs, cats, rabbits, goats, foxes, mink, poultry, pigeons and cage birds. Copies of the booklet, 'Iodine for Small Animals,' may be obtained from the Bureau at Stone House, Bishopsgate, London, E.C.2.

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.)

BASOL, LTD., London, W., chemical merchants. (M., 10/10/53.) 2 September, charge, to Midland Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *£3,000. 22 February, 1950.

ROTAFLEX (GREAT BRITAIN), LTD., London, S.W., plastic manufacturers. (M., 10/10/53.) 4 September, £4,500 debentures; general charge.

New Registrations

Burnsway Ltd.

Private company. (523,743). Capital £1,000. Manufacturers of and dealers in disinfectants of all kinds, insecticides, antiseptic fluids, etc. Directors: H. Burns, Mrs. F. E. Burns, M. A. Greenway. Reg. office: 144 Streetsbrook Road, Shirley, Birmingham.

Esspro Ltd.

Private company. (523,773). Capital £100. Manufacturers, merchants, dealers, exporters and importers and engineers; to process, purchase and re-sell chemicals, metals, materials and merchandise of all kinds, etc. Directors: W. Richter, Mrs. C. Tauber. Reg. office: 110 Marlborough Road, Hornsey, N.19.

Lucian Landau Ltd.

Private company. (523,901). Capital £100. Manufacturers, importers and exporters of and dealers in chemicals, chemical plant and materials, gases, drugs, etc. First director: Lucian Landau. Reg. office: 6 Broad Street Place, E.C.2.

Carnegies of Welwyn Ltd.

Private company. (523,914). Capital £100. To acquire the business and undertaking carried on by Carnegie Chemicals (Welwyn) Ltd. at Welwyn; and to carry on the business of manufacturing chemists in all its branches, etc. Directors: R. B. Carnegie, D. M. B. Carnegie, Marjorie Carnegie, G. M. Cruickshank and R. F. McClean. Reg. office: 44 Tewin Road, Welwyn Garden City, Herts.

Technichem (Winton) Ltd.

Private company. (523,820). Capital £2,000. Manufacturing wholesale and retail chemists, druggists, herbalists, manufacturers of and dealers in perfumes, essential oils, etc. Directors: G. R. Bury, Miss G. Draper. Reg. office: 902 Wimborne Road, Bournemouth.

T. Spearritt & Co., Ltd.

Private company. (523,411). Capital £1,000. Pharmaceutical, manufacturing, dispensing and analytical chemists, opticians, druggists. Directors: T. Spearritt, F. R. Spearritt, J. Spearritt. Reg. office: 421 Scotland Road, Liverpool 5.

A. C. Harker & Co., Ltd.

Private company. (523,090). Capital £500. Oil merchants and factors, oil blenders, manufacturing chemists and druggists. Directors: A. C. Harker, Mrs. E. Harker, J. J. Thompson, Mrs. K. Thompson. Reg. office: Railway Goods Yard, Skipton.

Take-Me Products Ltd.

Private company. (523,611). Capital £100. Manufacturers of and dealers in detergents and cleansing materials. Directors. K. Gorney, Mrs. J. Gorney. Reg. office: 3a Denton Street, Manchester 15.

Agricultural Trading Co. Ltd.

Private company. (523,673.) Capital £3,200. To acquire the business of manufacturers of sulphur products carried on by J. Mitchell-Lewis and G. B. Maconchy, at Burley Laboratories, Burley, Hants; carry on business of manufacturers of and dealers in artificial and natural fertilisers. Directors: J. Mitchell-Lewis, G. B. Maconchy.

Company News

Monsanto Chemicals Limited

The directors of Monsanto Chemicals Limited have declared an interim ordinary dividend of 6⅔ per cent (4d. per 5s. unit), which is at the same rate as last year. A statement giving unaudited figures for the first six months of the year shows that net sales totalled £5,208,182, compared with

£5,175,802 for the first six months of 1952, and £9,954,289 for the whole of 1952; and the net income after estimated taxes was £223,665, as compared with £226,625 and £293,718 respectively. The figures relate to the company itself and do not include the earnings of subsidiary and associated companies.

Murex Limited

In the course of his speech at the annual meeting of Murex Limited, the chairman, Sir Arthur Smout, said that during the past year the pendulum swung, as was to be expected, in the opposite direction to that in which it swung the two previous years, and abnormal losses were incurred on stocks necessarily carried. These losses amounted, before taxation, to about £250,000, compared with fortuitous profits of nearly £500,000 in the previous year. After making various appropriations and providing for the ordinary dividend of 15 per cent, which the board recommended, the balance of the available group profits (£182,000) had been transferred to general reserve. The board was confident that the company would continue to obtain its share of the business offering and that the outlook would improve as industry adjusted itself to changing world conditions.

Redfern's Rubber Works, Ltd.

The shareholders of Redfern's Rubber Works, Ltd., have been informed that negotiations have been concluded for the company to take an interest in a small but growing rubber manufacturing company in Australia. This venture has been undertaken jointly with their good friends H. G. Miles, Ltd., trading as the Empire Rubber Company, of Dunstable. The investment is £20,000 from each company, making a total of £40,000 (£A50,000). The agreement does not include any payment for goodwill, and the funds will be wholly used to provide additional capital for the development of the established and profitable business of Associated Rubber Pty., Ltd., of Melbourne, to which the two British companies will also contribute technical knowledge and experience. Collaboration between Redfern's and Empire is limited to this Commonwealth development. The two companies remain completely independent and, indeed, keen competitors in the home market.

The Triplex Group

In his report to stockholders, Sir Graham Cunningham, chairman and managing director of the Triplex group of companies, which includes Quickfit and Quartz, Ltd., manufacturers of industrial and laboratory chemical glassware, of Stone (Staffs.), states that the year's profit for the group before taxation was £292,769, compared with £342,287, and the board recommends a 15 per cent dividend. Field-Marshal Viscount Alanbrooke has been nominated for election to the board of the parent Triplex Safety Glass Co. Ltd., and his name will be submitted to stockholders at the annual general meeting in London on 28 October.

Vacuum Oil Company Limited

The year 1952 was one of continuing expansion for Vacuum Oil Company Limited. In his statement accompanying the company's report and accounts for that year, Mr. J. C. Gridley, the chairman, reviews the progress made in the expansion programme planned and adopted in 1949/50. The largest single item in this programme is, of course, the Coryton refinery, but, in addition, the company has built a new grease plant at Birkenhead and established a network of coastal and inland terminals through which to distribute petrol and fuel oils. Expenditure on projects in course of completion increased during the year from £4,000,000 to nearly £12,000,000, with commitments still outstanding of £5,500,000. Fixed assets also increased by £300,000 as a result of the completion of the modernisation of the oil compounding and blending plant at Birkenhead, and the commissioning of the first vehicles of the fleet required for the distribution of petrol and other products. Part of the funds have come equally from Socony-Vacuum and Powell Duffryn, and the remainder from Finance Corporation for Industry, who have provided £4,725,000. The balance of profit for the year, after providing for taxation based thereon and transferring £38,500 to Taxation Equalisation Reserve in respect of benefit from initial allowances, amounts to £77,401, as against £306,332 for the previous year, the reduction being attributable to a number of adverse but not wholly unforeseen factors.

James Woolley Sons & Company, Ltd.

For the year to 31 March last, James Woolley Sons & Company, Ltd., manufacturing chemists, Manchester, declare group net profit, after all charges, amounting to £15,319. The dividend of 5 per cent compares with 10 per cent for the previous year.

Next Week's Events

MONDAY 12 OCTOBER

Society of Chemical Industry

London: Royal Institution, Albemarle Street, W.1, 7 p.m. Fine Chemicals Group. Joint meeting with Royal Institute of Chemistry (London Section). Professor A. Albert (Australian National University): 'A Fresh Approach to Heterocyclic Chemistry.'

Institution of Works Managers

Manchester: Grand Hotel, 6.45 p.m. S. Waugh: 'Man Management.'

Incorporated Plant Engineers

Dundee: Mathers Hotel, 7.30 p.m. Representative of Kelvin and Hughes Ltd.: 'Factory Instrumentation.'

TUESDAY 13 OCTOBER

The Chemical Society

Southampton: Municipal College, Anglesea Road, 7 p.m. Joint meeting with Portsmouth and District Chemical Society. Dr. J. S. Dunn: 'The Manufacture of Sulphuric Acid from Anhydrite.'

Belfast: Queen's University, 7.15 p.m. Joint meeting with SCI. Dr. E. S. Hedges: 'Recent Research on Tin and its Compounds.'

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Plastics and Polymer Group. H. L. Toor and S. D. Eagleton: 'Adiabetic Compression and Expansion of Polystyrene' and 'Energy Conversions in the Flow of High Polymers: Applications to Injection Moulding.'

Belfast: Agriculture Lecture Theatre, Elmwood Avenue, 7.15 p.m. W. E. Hoare: 'Tin, Tin-plate and Tin Coatings'; film: 'Modern Electro-tinplate Manufacture.'

Midlands Society for Analytical Chemistry

Birmingham: The University, Edmund Street, 7 p.m. Dr. R. O. Scott: 'Spectrochemical Analysis by the Porous Cup Solution, Spark Technique.'

Institute of Metal Finishing

London: Charing Cross Hotel, W.C.2, 2 p.m. Annual meeting, induction of J. W. Cuthbertson as president, presidential address. Presidential reception, 7.30 p.m., followed by annual dinner.

Institution of Works Managers

Birmingham: Grand Hotel, 7 p.m. C. D. Law: 'Training for Management: the Line of Succession.'

Liverpool: Adelphi Hotel, 6.30 p.m. L. L. Goodman: 'Mechanical Handling.'

Preston: Victoria and Station Hotel, 7.30 p.m. Opening meeting and dinner. Discussion: 'Some Case Studies.'

Wolverhampton: Goodyear Tyre and Rubber Company, 7.30 p.m. Works visit.

Incorporated Plant Engineers

Manchester: Engineers' Club, Albert Square, 7.15 p.m. Colin Troupe: 'The Plant Maintenance Team's Visit to the USA.'

Purchasing Officers' Association

Woolwich: Shakespeare Hotel, Powis Street, 7 p.m. Films: 'Atomisation', 'Oil and Industry', 'Grease'.

WEDNESDAY 14 OCTOBER

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Food Group. R. G. Tomkins: 'Unsolved Problems in the Production of Food. 1—Fruit and Vegetables'.

Newport, Mon.: Technical College, Clarence Place, 7 p.m. Joint meeting of South Wales Section with RIC. H. Baines: 'Colour Photography.'

Institute of Fuel

Manchester: Engineers' Club, Albert Square, 2 p.m. Joint meeting with National Smoke Abatement Society (North West Division). A. C. Monkhouse: 'Atmospheric Pollution'.

Royal Statistical Society

Newcastle-on-Tyne: 18 Louvain Place, 7 p.m. (tea, 6.45 p.m.). North East Group. D. Newman (Ministry of National Insurance): 'Applied Sampling.'

Incorporated Plant Engineers

Nottingham: Gas Showrooms, Parliament Street, 7 p.m. HM Factories Inspector: 'The Works Engineer and the Factories Act.'

Purchasing Officers' Association

Middlesbrough: Cleveland Scientific and Technical Institution, Corporation Road, 7.30 p.m. D. Wragg: lecture.

THURSDAY 15 OCTOBER

The Chemical Society

London: Royal Institution, Albemarle Street, W.1, 7.30 p.m. Dr. J. S. Anderson: Tilden Lecture—'The Mechanism of Reactions Between Gases and Solids.'

Bristol: The University, 7 p.m. Joint

[continued on page 776

Next Week's Events

continued from page 774

meeting with RIC and SCI. Professor F. E. King: 'Synthesis of Simple Peptides.'

Society of Chemical Industry

London: 11 Chandos Street, Cavendish Square, W.1, 6.15 p.m. Microbiology Group. E. F. Gale: 'Actions of Antibiotics in the Bacterial Cell.'

London: Institution of Structural Engineers, 11 Upper Belgrave Street, S.W.1, 6 p.m. Road and Building Materials Group. A. J. Lyddon: 'Coated Macadam—its Manufacture and Uses.'

Edinburgh: North British Station Hotel, 7.30 p.m. E. A. B. Birse: 'River Pollution.'

Stockton-on-Tees: William Newton Schools, Junction Road, Norton, 7.30 p.m. Joint meeting of Newcastle-on-Tyne Section with RIC (Tees-side Section). R. P. Linstead: 'New Developments in Macrocyclic Compounds.'

Chadwick Public Lectures

London: Royal Society of Arts, John Adams Street, Adelphi, W.C.2, 5.30 p.m. C. J. Regan: 'Air Pollution.'

FRIDAY 16 OCTOBER

Royal Institute of Chemistry

London: Holborn Restaurant, High Holborn, 7 p.m. for 7.30 p.m. Fifth annual dinner and dance.

The Chemical Society

Dundee: United College, St. Andrew's University, 5.15 p.m. Professor J. Read: 'Chemistry at St. Andrew's: an Historical Survey.'

Society of Chemical Industry

Liverpool: The University, 7 p.m. H. R. Leech: 'A New Group of Chemical Reagents—the Halogen Fluorides.'

Exeter: University College, 5 p.m. Joint meeting of South Western Section with RIC and CS. A. J. P. Martin: lecture.

Institute of Physics

Manchester: The University, 6.45 p.m. Dr. H. Lipson: 'A Physicist's Approach to Crystal Structure Determination.'

SATURDAY 17 OCTOBER

Institution of Chemical Engineers

Birmingham: The University, Edmund Street, 3 p.m. W. G. Daroux: 'Some Aspects of Chemical Engineering in the Manufacture of Man-made Fibres.'

Market Reports

LONDON.—An active trade is passing in most sections of the market, and there has been a steady call against contracts from the textile, paint and other home consuming industries. Prices on the whole show a firm undertone. There has been little change in the volume of export trade in chemicals but shipments to the Commonwealth countries have been on a good scale.

Business in the coal tar products market has been reported as fairly steady with a seasonal falling off in the demand for pitch and refined tar. The recent improvement in the volume of export inquiry for cresylic acid and phenol has been maintained.

MANCHESTER.—The textile and allied trades of Lancashire and the West Riding have maintained a reasonably steady demand on the Manchester market for heavy chemical products during the past week and in the aggregate a fair quantity against contracts is being absorbed by other leading home users. On the export side new bookings have been on a moderate scale. Prices generally have been maintained, with little change from recent levels to be recorded. Except in one or two directions, including basic slag and the compounds, business in the fertiliser market has not yet got into its stride after the seasonal dullness.

GLASGOW.—As far as general chemicals are concerned there has been a slight falling off in demand during the past week. However, trade has not by any means been quiet and on the whole the period has been quite satisfactory.

Analysts' Ordinary Meeting

An ordinary meeting of the Society of Public Analysts and Other Analytical Chemists (organised by the Physical Methods Group) will be held on Friday, 23 October, 1953, in the Lecture Hall, Southampton University, at 5 p.m. The subject of the meeting will be 'Paper Electrophoresis' and papers will be presented by F. H. Pollard, B.Sc., Ph.D., Roy Markham, M.A., Ph.D., and A. L. Latner, M.Sc., M.D., F.R.I.C.

I.C.I. Oil Prospecting

BILLINGHAM Division of I.C.I. Ltd. will have to carry out extensive exploratory work before it is possible to make any industrial assessment of the outcome of the company being granted a petroleum prospecting licence covering 142 sq. miles in the North Riding and Durham, as briefly announced in THE CHEMICAL AGE last week (p. 721). So far, exploration by the Division has been restricted to land owned or leased by the company under or near the Billingham works, but it will now be possible to make a thorough geological survey of a much greater area. Although the licence refers specifically to petroleum, it is understood it will enable the company to investigate other natural resources in the area. Large reserves of anhydrite are at present being mined 800 ft. below the Billingham works. The company has another licence permitting it to prospect for methane over an area of 169 sq. miles around Eskdale in the North Riding.

Metal Experts Visit USA

THE latest uses and production methods in powder metallurgy are being studied by a team of experts who recently arrived by air in New York. The team, whose mission has been organised under the technical assistance scheme of the Organisation for European Economic Co-operation, comprises 28 participants from seven European countries: Belgium, Denmark, France, Germany, Italy, the Netherlands and the United Kingdom. Divided into four groups, they are visiting industrial undertakings all over the U.S. during their five-weeks tour. They are studying American methods of converting metals in their raw state into fine powder, which after being pressed in a die under high pressure and being heat-treated in a furnace, from a material equal to, or even stronger than, those made by the conventional methods of casting or forging; this material is especially useful in the manufacture of very small parts and engineering components. On completion of their tour the experts will report on possibilities of increasing European productivity in an industry which has reached a high degree of development in the US.

CLASSIFIED ADVERTISEMENTS

BUSINESS OPPORTUNITY

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

SITUATIONS VACANT

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

SENIOR SCIENTIFIC OFFICERS; SCIENTIFIC OFFICERS; PATENT EXAMINER AND PATENT OFFICER CLASSES. The Civil Service Commissioners invite applications for permanent and pensionable appointments to be filled by frequent competitive interviews. The scientific posts are in various Government Departments and cover a wide range of scientific research and development in most of the major fields of fundamental and applied science. In biological subjects the number of vacancies is small: individual vacancies exist at present for candidates who have specialised in palaeobotany and foraminifera. The Patent posts are in the Patent Office (Board of Trade), Admiralty and Ministry of Supply.

Candidates must have obtained a University Degree with first or second class honours in an appropriate scientific subject (including engineering) or in mathmatics, or an equivalent qualification; or for scientific posts, possess high professional attainments. Candidates for Senior Scientific Officer posts must, in addition, have had at least three years' post-graduate or other approved experience.

AGE LIMITS: Senior Scientific Officers, between 26 and 31, but specially suitable candidates under 26 may be admitted. For Scientific Officers and Patent Classes, between 21 and 28 during 1953 (up to 31 for permanent members of the Experimental Officer Class competing as Scientific Officers). Inclusive London Salary Scales: Senior Scientific Officers (men), £917-£1,075; (women) £681-£917; Scientific Officers (men), £440-£812; (women) £440-£576; Patent Examiner and Patent Officer Classes (men), £440-£760; (women) £440-£576. Women's rates under review. Somewhat lower rates in the provinces.

Further particulars from the **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, TRINIDAD HOUSE, OLD BURLINGTON STREET, LONDON, W.1,** quoting No. S.53/53 for Senior Scientific Officers and S.52/53-S.128/53 for the other posts. Completed application forms to be returned on or before 31st December, 1953. 23429/80/JLH.

ANALYTICAL CHEMIST required as assistant in modern laboratory of works manufacturing a high quality inorganic product in Pembrokeshire. Age 25-35. Salary according to qualifications and experience. Housing assistance can be given if required. **BOX No. C.A. 3269, THE CHEMICAL AGE. 154, FLEET STREET, LONDON, E.C.4.**

SITUATIONS VACANT

ABLE, technical **SALES REPRESENTATIVE,** aged 35/40, operating from London, capable of discussing clients' requirements at executive level, required by expanding company, specialising in anti-corrosive linings for plant and structures in the chemical and other process industries; a good connection is desirable but not essential. The post offers an outstanding opportunity to a chemical engineer with drive and ambition who would like to apply his knowledge in the promotion field. Apply, giving full details in own handwriting to **BOX No. C.A. 3270, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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

CHEMISTS required by Ministry of Supply, R.A.E., Farnborough, Hants., for:—

(1) Physico-chemical research, with particular reference to greases, lubricants and hydraulic fluids. Experience in handling test equipment for such materials and interest in rheological phenomena, desirable.

(2) Research and development of materials, particularly textiles, plastics and adhesives. Relevant experience, e.g., mechanical testing of materials, desirable.

Minimum qualification—Higher School Certificate (Science) or equivalent, but Degree or H.N.C. in Chemistry may be an advantage. Salary within range, Assistant Experimental Officer, £264 (age 18),—£576. Women somewhat less. Appointments unestablished. Application forms from **M.L.N.S., TECHNICAL & SCIENTIFIC REGISTER (K), 26, KING STREET, LONDON, S.W.1,** quoting F.493/53A. Closing date 7 November, 1953.

CHEMISTS required by Ministry of Supply, Atomic Weapons Research Establishment, Aldermaston, Berks., for work on: Analysis—gases, organic compounds (microcombustion techniques), metals (trace impurities); radio chemistry; chemical services, including testing of effluents and control of chemical processes. Minimum qualification—Higher School Certificate (Science) or equivalent, but further training in chemistry to H.N.C., A.R.I.C., or Degree may be an advantage. Salary within ranges: Experimental Officer (min. age 26), £649-£799, or Assistant Ex. Officer, £264 (age 18)—£576. Women somewhat less. Appointments unestablished. Housing accommodation may be available within reasonable period for married officers. Application forms from **M.L.N.S., TECHNICAL AND SCIENTIFIC REGISTER (K), 26, KING STREET, LONDON, S.W.1, QUOTING F.485/53A.**

FOR SALE

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

FOR SALE

C. BARBER, LTD.

TWO "Hormann" 30 cm. Stainless Steel **FILTER PRESSES.**

STORAGE BINS in stainless steel, cylindrical with covers. 40/12/14/10 gallons capacity.

Cannon Steam Jacketed Enamel-lined **PANS,** 10 and 25 gallons. All new and unused.

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

WELDED VESSELS of all types, in mild steel or stainless. Fabricated to customers' specifications.

Manlove Alliott 25½ in. square C.I. **FILTER PRESS,** plate and frame type, 13 chambers, arranged for washing. Excellent condition.

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600

STEAM DRIVEN GENERATING SETS

665-kVA. (500-kW.) Steam driven Alternator Set by **BELLISS & MORCOM/SIEMENS,** for 5000/3/50, 77 amps. Steam pressure 150/155 lb. Speed 333 r.p.m.

625-kVA. (500-kW.) Steam Alternator Set by **BROWETT LINDLEY/L.D.C.,** for 400/440/3/50, 4 wire, with 230/250 volts line to neutral. Speed 333 r.p.m. Steam pressure 165 lb. sq. in., against 15 lb. back pressure. Makers advise would operate with steam at 180 lb. sq. in. against 20 lb. back pressure.

Two 420/470-kVA. Steam Alternator Sets by **BELLISS &MORCOM/MATHER& PLATT,** for 400/440/3/50. Speed 375 r.p.m. Steam pressure 150 lb. sq. in. against 15/20 lb. gauge back pressure.

313-kVA. (250-kW.) Steam Alternator Set by **BROWETT LINDLEY/BRITISH WESTINGHOUSE,** for 400/3/50, 4 wire. Steam pressure 100 lb. sq. in., 5 lb. back pressure, or up to 140 lb. sq. in., exhausting to 15 lb.

250-kW. Steam driven **GENERATING SET** by **ASHWORTH & PARKER/MET-VICK.,** for 115 volts D.C. Steam pressure 120 lb. sq. in., exhausting to 26 in. vacuum. Speed 400 r.p.m.

250-kW. Geared Turbo Generator Set by **BELLISS & MORCOM/CROMPTON PARKINSON,** for 207/230 volts D.C. Speed 1,000 r.p.m. through reduction gear. Multi stage Turbine designed for steam at 290 lb., 550 deg. F. superheat, plus 25 per cent overload for two hours when running at 6,000 r.p.m.

250-kVA. Steam driven Alternator Set by **BELLISS & MORCOM/HARLAND,** for 400/3/50, 360 amps., 0.8 p.f. Steam pressure 140 lb., 12 lb. back pressure.

240-kW. Turbo Alternator Set by **W. H. ALLEN/L.D.M.,** for 400/3/50. Speed 600 r.p.m. through reduction gear. Steam pressure 150 lb. sq. in., 5 lb. back pressure, or alternatively 200 lb. sq. in., 15 lb. back pressure.

Two 187½-kVA. Steam driven Alternator Sets by **BROWETT LINDLEY/BRUCE PEEBLES,** for 400/3/50, 4 wire. Speed 428 r.p.m. Designed for use with steam at 180 lb. exhausting against 7½ lb. back pressure, utilising steam superheated 150 deg.

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