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The Egg & You

THERE is something fundamental about an egg. It may become a chicken, an omelette, or a political weapon; it is both a way of life and a way of living. The price of an egg can become a subject of angry and far-reaching disputation. A few years ago a vivacious lady wrote a best-seller with an egg production background called 'The Egg and I'. Taken for granted as a basic form of food for thousands of years, the egg is stoutly established in the fabric of everyday existence. Yet the chemical and physical properties of eggs have received genuinely detailed scientific study only in fairly recent times. A new DSIR publication, 'Eggs and Egg Products' (from HMSO, 1955, 106 pp., 4s. net), a joint report from the British Food Manufacturing Industries Research Association and the DSIR's own Food Investigation Organisation, deserves wider readership than the specialised food industry range for which it is intended. For if the egg is so fundamental, its chemistry is surely interesting.

There are few natural entities more complex in make-up. On the second page of this report we are told that 'by carefully opening an uncooked egg' nine separate tissues can be identified, and of these the yolk is the ninth! Uncooked eggs are rarely to be opened with as much delicacy of touch! The shell itself also has four separate layers. Most of us think of the white of an egg as albumin, but in fact this part of an egg is composed of three classes of proteins, albumins, globulins, and glycoproteins. Much more is now known about these proteins as a result of applying electrophoretic analysis. To date, nine different specific proteins have been identified in egg-white. After devoting some 14 pages to the chemical diversity of egg-white the writers of this report start their discussion of the yolk by remarking that 'it is characterised by complexity'. The Victorian curate's diplomatic and sub-divided verdict upon his tea-time egg with the bishop was at least an early appreciation of the egg's heterogeneous possibilities. The yolk, in addition to two classes of proteins, contains lipids—true fats of triglyceride type, phospholipins, and sterols. The fat-soluble vitamins, A, D, E, and K, are all present in the yolk; eight members of the water-soluble vitamin B complex have also been identified. Folic acid is also present. Only vitamin C seems to be distinguished by non-appearance.

Mineral elements are present in great diversity. Both in the white and the yolk phosphorus, calcium, magnesium, chlorine, potassium, sodium, sulphur, and iron are regularly to be found. Twenty-one other mineral elements have been identified as trace constituents, 17 of them invariably being present, four of them apparently only occasionally. We are told that 'further work requires to be done before the presence of minerals such as molybdenum, chromium, and rubidium may be regarded as established'. The American greengrocer who cashed in some years ago upon the chlorophyll craze by advertising that 'our lettuces contain chlorophyll' might well be imitated by any grocer who cares to study this survey of egg composition.

However, the chemistry and physico-chemistry of an egg becomes far more interesting when it is kept, whether with or without the application of means of

preserving freshness. An egg is not intended to be static. An egg-shell has several thousand minute pores—it is designed to allow the interchange of oxygen and carbon dioxide between the egg and the atmosphere yet to restrict loss of water by evaporation and prevent the entrance of micro-organisms. The *p*H of a newly-laid egg is about 7.9. But carbon dioxide diffuses out and in some three days or so the *p*H rises to 9.3. By maintaining a partial pressure of carbon dioxide in the surrounding atmosphere, this change in *p*H can be retarded. Another change that occurs when an egg is kept is the thinning of the thicker egg-white, but the cause of this is still not fully understood. After six months' cold storage at 32°F about one quarter of the thick white has liquefied; the same extent of thinning is found after two weeks' storage at 77°F. It is a change of considerable significance commercially; for the appearance of a poached or fried egg is below accepted standard if the thick white has thinned appreciably before cooking.

The ability of egg-white—or, indeed, for some purposes, of whole egg—to foam when beaten is an important property both in the kitchen and commercial bakery. Several pages of the report are devoted to this matter, and there seems to be a good deal of controversy among the world's egg scientists as to the best way of measuring foaming power and foam stability. Adjusting the *p*H of egg-white can alter its foaming power—broadly, the higher the *p*H (up to 11) the easier the beating. But foam stability seems apt to go the other way. No one could have supposed that so much scientific research had been carried out in the cause of meringues. These are no longer days when a Mrs. Beeton could say in confident simplicity, 'take half a dozen eggs and whip them'. There are more than 40 references to scientific papers in the part of the report that is concerned with egg-beating!

The preservation of eggs is probably the most important economic aspect of egg chemistry. The world's eggs are still produced seasonally even if breeders through the ages have raised the original jungle fowl's annual output of 20 to 25 eggs to a 200-250 performance. Whole egg preservation is largely a matter of cold storage, with humidity control as an essential secondary influence.

A temperature of 29-32°F and humidity of 75-85 per cent (or even 90 per cent if there is good ventilation to offset the risk of mould-growth) are basic conditions for successful long-term storage. The use of carbon dioxide in the storage atmosphere, either in small amounts such as 2-2½ per cent or above 60 per cent, is sometimes added to cold storage. In the higher concentrations moulds cannot grow so the need for humidity control is greatly reduced; on the other hand, the dangerous thinning of the egg-white is stimulated. Oil-dipping before storage is now considerably practised. The rate of evaporation through the shell pores is substantially reduced, but whether another major claim for oil-dipping—a reduction in the rate of internal change—is genuinely sound seems open to argument. The freezing of de-shelled whole egg has become a large-scale operation today—even a medium-sized plant will freeze 200,000 eggs per day. The rejection of dubious eggs is a vital step in this method of preservation. Frozen whole-egg is much preferred by the bakery trade to forms of dried egg. Egg-drying is now generally entrusted to the spray-drying process; but spray-dried whole egg has only half the aerating power of fresh egg or frozen egg. During the war it was found in this country, however, that the addition of sucrose or lactose before drying prevented this loss of aerating power.

So much for some scattered comment on this DSIR report about eggs. Before we dipped into the report we had a touching faith in the simplicity of the egg. Indeed, the main item of our technological knowledge was concerned with the importance of timing the 'boiling', an operation not always conducted with accuracy in the kitchen owing to the feminine habit of observing the clock from totally different angles. But now the egg is a simple thing no longer. Its arrival on the breakfast table, boiled or fried or poached, is simple only if it was produced by back-garden hens. Its journey from any other source and through the channels of trade has been a travel-tale of science.

Notes & Comments

Fertiliser Subsidies Increased

FOR three years farmers have been able to apply for subsidy payments to assist their purchases of most nitrogenous and phosphatic fertilisers. This scheme was introduced swiftly when the total withdrawal of fertiliser subsidies (1950/51) brought about a serious contraction in use. Even so, fertiliser usage has not continued to increase each year at the confident rate of the 1940-1950 period. The subsidies have now been raised substantially, and with particular emphasis upon nitrogen. Thus, the new subsidy (as from 1 July) on sulphate of ammonia is £5 16s. per ton as against £3 12s. previously; on superphosphate it has advanced from £4 10s. to £5 4s. Offsetting this stimulus to higher usage, there are rises in fertiliser prices due to increased labour, transport, fuel, and bagging costs; but these increases are unlikely to be nearly as large as the increases in subsidy grants. The net effect is that fertilisers will cost farmers less, very much less for nitrogen, a little less for phosphates. Recent surveys of farming practice have shown that all crops except sugar-beet receive less than adequate dressings of fertiliser. The Ministry of Agriculture could hardly create a greater incentive to put this situation right. The continued absence of a subsidy for potash fertilisers has received some criticism, but it seems to be the official view that sufficient potash is being used in relation to the amounts of nitrogen and phosphate now generally applied. In any case, potash is far from a costly fertiliser; its price per ton has to be considered in the light of its high concentration, e.g., muriate of potash contains 60 per cent potash (K_2O). Except on seriously deficient land the cost of potash application per acre is attractively low. Will there now be a sharp rise in farm fertiliser consumption? Or shall we continue to use much less per acre than Dutch, Belgian, and Danish farmers, who incidentally receive little or no subsidy assistance?

Food Additive Law

AMERICAN politicians are grappling with the thorny problem of food additives. They want to create powers to prevent the use of dangerous or possibly dangerous additives yet without hampering the use and development of beneficial and safe additives. Technical legislation is always difficult, for any law that deals in marginal shades is far from easy to enforce; and so often the underlying science that has to produce the main evidence for enforcement is exceptionally marginal, with more chance that samples will fall within the borderline ranges than in the definitely 'good' or 'bad' sectors. Law must be definite. It must fix clear boundaries between the considered right and the considered wrong. Yet little enough is yet known about so many modern food additives.

Policeman Rôle Possible

CONGRESSMEN have yet to decide what kind of control over additives is needed. The original idea was to give the Food and Drugs Administration a 'licensing' control. That is to say, a manufacturer wanting to use a specific additive would be obliged to prove to FDA that it was not harmful, and it would then be for FDA to permit or prohibit its use. Now there seem to be second thoughts, and it is being argued that FDA's rôle should not be that of a licensing authority but far more that of a policeman. A new bill is to be put forward which will allow a manufacturer to use a food additive in his products even if FDA approval has been refused. It would then be open to FDA to obtain an injunction in the courts, but to do this FDA would have to prove that the additive was in fact harmful or potentially harmful. Is it a clearer task for the law to consider whether an additive is harmful than for an expert body to consider whether a manufacturer has proved it non-harmful? Not only is the onus of proof changed; the judges of proof are also changed. Surely

at some stage, wherever onus of proof is placed, the evidence of harmful or non-harmful effects must be judged by some expert body? As science becomes more complex, so its ability to be comfortably blended with common law decreases. But the obvious solution, to have scientific 'courts' to deal specially with complex scientific problems, would be opposed by public opinion in most democracies. There would be an outcry that science was being placed above the law.

South African Coke

Installation of New Plant

A CONTINUOUS and steadily rising demand for metallurgical coke exists in the Union, principally from the giant ironworks of the South African Iron and Steel Industrial Corporation situated at Pretoria and Vanderbijl Park. To meet this demand new batteries of modern coke ovens have been installed. These ovens are of the top-charged, fast-coking type with full recovery of by-products. Some of the Natal collieries also have adjacent coke oven installations and the old type of Beehive ovens giving a coke yield of only about 56 per cent of the coal charged, are gradually being replaced by more modern types with a higher coke yield and by-product recovery. The largest single colliery coking plant in the southern hemisphere, designed to produce 39,000 tons of high grade coke a month, is situated in Natal.

Coking Coal Reserves

While the best coking coal reserves are located at Klip River and Vryheid in Natal, the large coal deposits at Witbank in the Transvaal can also be converted into good coke when mixed with straight coking coal. This coal, derived from the upper No. 5 seam of the field, is known as 'blend' coking coal and after careful preparation to eliminate all materials not possessing desirable coking properties, large quantities of Witbank coal are thus blended and coked.

Typical analyses of Natal oven cokes show an ash content of 14.8 per cent, volatile matter 1.4 per cent and sulphur content from 0.7 to 1.5 per cent depending on locality. Transvaal coke has a higher ash content of about 18.2 per cent with one per cent volatile matter and about 0.8 per cent sulphur.

An appreciable demand for metallurgical coke arose in 1934 when ISCOR started production and at the same time a growing demand was created from other consumers such as metal foundries. In a 20 year period of operation, ISCOR has purchased about 12,742,000 tons of coking coal for its own use of which 2,797,000 tons were straight coking coal from Natal and 9,945,000 tons of blend coking coal from the Witbank area of the Transvaal. In addition, over 1,000,000 tons of ready processed coke were purchased from Natal producers to supplement its own coke production. The total present annual production of metallurgical coke in South Africa is about 1,566,000 tons. Proved reserves of straight coking coal as reported by a recent government coal commission were 159,750,000 tons in Natal and in addition there are 171,373,000 tons of blend coking coal in the Transvaal.

Apart from the big coking plants, there is also a certain amount of coke produced in the Union at gasworks located in the cities of Johannesburg, Cape Town, Port Elizabeth and Grahamstown. This amounts to some 80,000 tons annually.

By-products Readily Absorbed

By-products of the coke industry are readily absorbed by South African consumers. Thus in a recent year the coke ovens yielded some 45,000 tons of crude tar, 1,700,000 gal. of benzol and 7,807,000,000 cu. ft. of gas. Refining of crude tar is carried out by ISCOR and at Waschbank in Natal. Products such as benzene, solvent naphthas, ammonia liquor, creosote oil, naphthalene, road tars and pitch are manufactured.

The coking industry as already explained is based on the coal fields of Natal and the Transvaal. No coke ovens exist in the Cape Province (apart from gasworks) where indeed the only coal seams are of a very poor quality. The Orange Free State possesses coal of medium grade in the Cornelia-Coalbrook field lying to the South-West of Vereeniging and although no coke plants are located on this field, it is this site where the giant new SASOL plant is now coming into operation, producing petrol from coal on scale of some 55,000,000 gal. annually. The SASOL works will require about 7,000 tons of coal daily when in full production.

New British Petrochemicals Developments

Plant Expansions at Grangemouth

AS mentioned briefly in last week's issue, British Petroleum Chemicals Ltd. has announced that orders have now been placed for several new plants which will double the make of olefines and diversify the list of petroleum chemical products which they make. The original cracking and gas separation plants and the synthetic alcohol plant having operated successfully at above design capacity, it has been decided to build new units which are essentially duplicates of the existing ones.

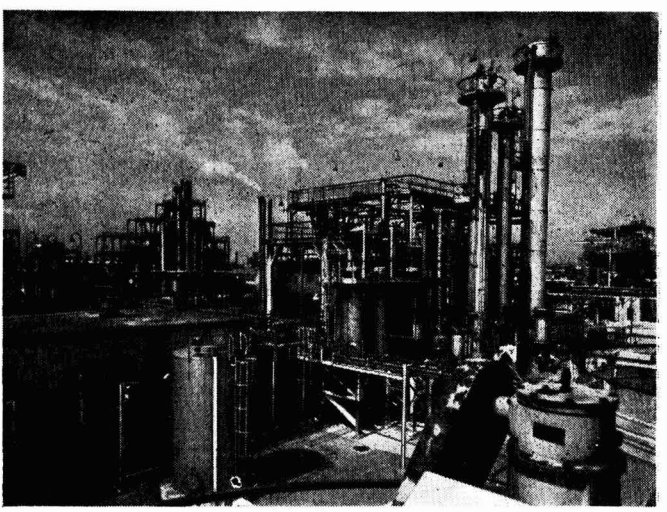
One new unit, treating another stream from two gas separation plants, will extract butadiene, and another innovation will be the production by catalytic means of a polymer of propylene. Some of this polymer will be the feedstock to another new unit being erected for Grange Chemicals Ltd., where it is reacted in the presence of another catalyst with indigenous benzene to produce an alkylate, dodecylbenzene. In addition to meeting the feedstock requirements for the above plants, the new capacity for ethylene and propylene polymer will provide surpluses of these materials for sale as such.

This major expansion, together with the necessary offsite facilities, is expected to cost over £8,000,000. The new units are scheduled to be commissioned at various times between the last quarter of 1955 and the first half of 1957.

In 1951 production of chemicals from petroleum was commenced by British Petroleum Chemicals Ltd. in a plant adjoining the newly expanded Grangemouth refinery of the British Petroleum Co. Ltd. The primary process is the cracking of a petroleum fraction, the main products being ethylene and propylene.

British Petroleum Chemicals Ltd. produces synthetic ethyl alcohol from the ethylene, and converts the propylene to isopropyl alcohol (used as an intermediate for acetone and general chemical manufacture). Other quantities of ethylene are piped to the adjoining plant of Forth Chemicals Ltd., which commenced in 1953 the production of styrene monomer, the raw material from which the plastic polystyrene is made. Plans for expansion of the Forth Chemicals' plant have already been announced.

In addition to ethylene and propylene, the mixture of hydrocarbons produced in the cracker contains a number of other potentially valuable compounds. One of these is polymerised in a small plant to make dicyclopentadiene, which is sold for use particularly in the preparation of synthetic drying oils for the paint industry although another important use is for insecticides. Until now, the remaining compounds have not been extracted.



A general view of the British Petroleum Chemicals plant at Grangemouth showing the No. 1 Ethanol Plant (centre), the No. 1 Cracking Unit (left background) and the isopropyl unit (extreme right)

The expansion aims at:

(a) increased production of ethylene and propylene (and corresponding increase in the amounts of by-product hydrocarbons) by provision of a second cracking unit and a second gas-separation plant. The amount of ethylene available will satisfy the needs of the various Grangemouth plants and leave some surplus for sales to other users.

(b) extraction of butadiene, by the provision of a new unit to treat a C_4 stream drawn from the two gas-separation plants.

(c) increased ethyl alcohol production, by duplication of the existing plant.

(d) polymerisation of part of the propylene to tetrapropylene in a new 'tetramer' plant. This plant will satisfy the requirements of the detergent alkylate plant, and will provide in addition a surplus for sale.

The alkylate plant of Grange Chemicals Ltd. will convert tetrapropylene and benzene into dodecylbenzene, by a catalytic process.

The original (1951) British Petroleum Chemicals plant was designed and constructed by Stone and Webster Engineering Corporation and its UK affiliates, E. B. Badger & Sons Ltd. A contract has already been placed with Stone and Webster for the design and construction of the extensions, with the exception of the butadiene separation plant, which will be built and engineered by the Kellogg International Corporation. These plants are scheduled for completion between June 1956 and June 1957.

Grange Chemicals' plant is also being designed and built by Stone and Webster Engineering Corporation, and is scheduled to begin operation in the last quarter of 1955.

All the off-site facilities are being designed and constructed by the British Petroleum Co. Ltd., who are acting as managers of the whole project.

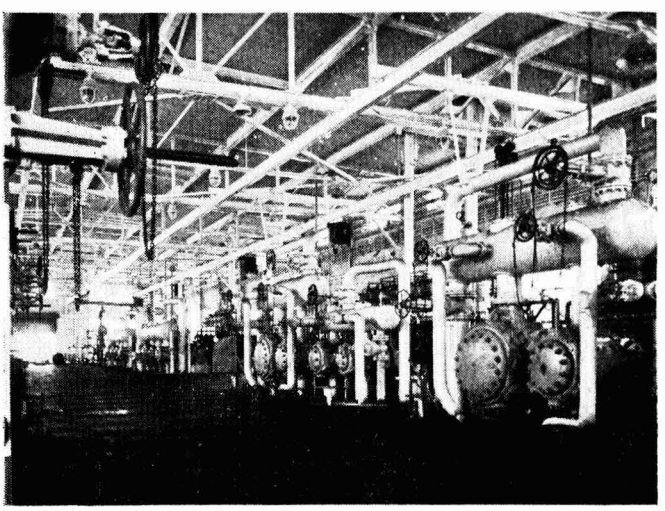
Press Visitors Welcomed

WELCOMING members of the Press at a visit to the Grangemouth plant of British Petroleum Chemicals Ltd. on 27 June Sir Graham Hayman, chairman of the management committee, The Distillers Co. Ltd., said:—

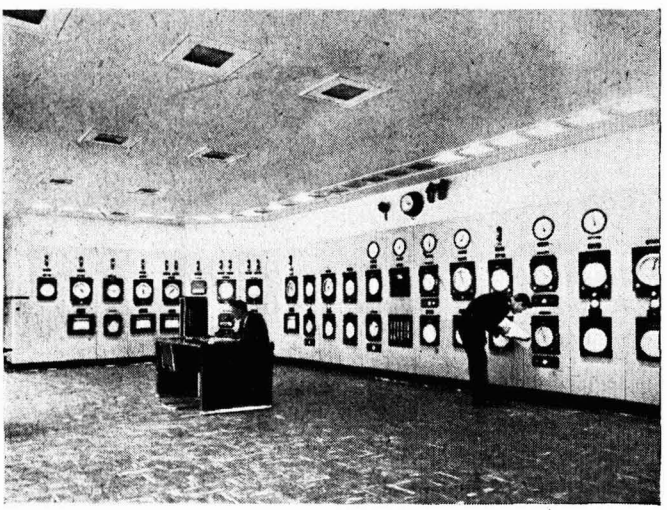
'It was about 1930 that The Distillers Co. Ltd., through its subsidiary, British Industrial Solvents, pioneered the production in the United Kingdom of a number of important synthetic organic chemicals based on industrial alcohol, derived by fermentation of molasses. These operations were expanded considerably over the ensuing years and made a major contribution to the British chemical industry.

'During the past 20 years, however, the use of petroleum in the United States as a source of chemicals has developed at a rapid rate, and opened up not only additional chemical raw materials, but alternative and better methods of producing others. The Distillers Company, in pursuance of its plans for progress in the chemical industry, accordingly decided to develop in the petroleum chemical field.

'The British Petroleum Company, formerly known as the Anglo-Iranian Oil Com-



The interior of the compressor house of No. 1 Cracking Unit



One of the main control rooms

pany, with the wonderful position which it had secured for Britain in the world oil industry, felt that this was a relatively small but important outlet for petroleum in which it should be interested. This decision had a marked influence on the success of this enterprise because of the wide range of technical knowledge in construction and plant operation which the British Petroleum Company was able to contribute. Accordingly, in 1947, the two companies decided to join together in the formation of British Petroleum Chemicals Ltd.

'It was decided to concentrate first on comparatively large units for two basic products, namely ethyl alcohol and iso-propyl alcohol, for which a market was assured. The next development, in association with Monsanto Chemicals Ltd., was to build the first plant in the United Kingdom to make monomeric styrene, an important material for the manufacture of plastics and synthetic rubbers. This plant is now being increased to more than double its original capacity.

'You are probably aware of the phenomenal development of synthetic detergents, or as they are sometimes called, synthetic soaps. In association with the Oronite Chemical Company, a subsidiary of Standard Oil of California, we are installing plant for the production of the basic intermediate for these detergents.

'This, then, is a very brief outline of the position to date. The fundamental step we are now taking is to duplicate practically the whole of the existing capacity in so far as it concerns the oil cracking plant, the gas separation unit and the synthetic alcohol production. In addition, we are installing plant for the extraction of butadiene, an important constituent of synthetic and special purpose rubbers. The total programme will involve roughly £8,000,000, and by stages, should be completed early in 1957.

'Britain's position in the world and the preservation of a reasonable standard of living for its people, depends on a thriving and expanding industry at home and a high volume of exports. Petroleum chemicals are a very good illustration of expansion in productivity of industry. Before the last war, the industry just did not exist at all in this country, but since the war, some £44,000,000 have been spent on petroleum chemical plant, and a further £22,000,000 is currently under construction, or planned for the immediate future. Of these totals, our enterprise at Grangemouth represents a significant proportion. This does not, of course, by any means represent the total investment which arises as a result of these new ventures inasmuch as the availablity of the basic products has led to consequential investment in new plant by the consuming industries through the whole lengths of the production line.

'Although, as I have already said, the products of the petroleum chemical industry to some extent are in replacement of less economic or outmoded processes the bulk of the output is in the form of materials not previously made or in some cases, not even known. These, therefore, represent a posi-

tive addition to the variety and quantity of materials available to consumers at home and in the export markets.

'Historians are apt to write of the industrial revolution as though it were some single event, like the revolt of the American colonies, but the truth is that the path of our industrial progress is one of continuous development, change and improvement. This is particularly true of the chemical industry. From what I have already said, you will appreciate that the young and growing petroleum chemicals industry requires heavy and continuing investment of capital and of skilled manpower at all levels. It also calls for a wide knowledge of technical marketing in order to assure outlets for its products.

'I believe that the plant you see here to-day, which has been operating during the past four years, justifies our claim that its technical performance compares favourably with any similar operations in the world, and with that background of knowledge and experience, we have a sober confidence in the success of the new expansion and the benefit that it will bring to the British economy'.

Institute of Ceramics Ltd.

Membership Divided Into Three Classes

THE interim council of the newly formed Institute of Ceramics Ltd. was confirmed in office at Federation House, Stoke-on-Trent, recently. Officers elected were: Dr. A. T. Green, O.B.E. (president), Mr. L. Bullin (hon. treasurer), Dr. W. L. German, Professor A. L. Roberts, Mr. G. N. Hodson, M.B.E. (vice-presidents), and Mr. G. H. Stewart (secretary).

Founded to serve the industries it represents, the Institute of Ceramics Ltd. will also establish and maintain standards of professional conduct among ceramic technologists, as well as to help improve the knowledge of those in or about to enter the ceramic industry. Membership of the Institute is divided into three classes: Licentiate (L. I. Ceram), Associate (A.I. Ceram), and Fellow (F.I. Ceram). The Institute will keep a register of qualified technologists, and later a register of professional appointments available.

The suggestion that an institute be formed embracing the three major branches of ceramics—pottery, refractories, and heavy clay—was first made before the war, but no steps were taken to form one. It was only as recently as May this year that the ceramic industry was accorded formal recognition as a profession. It was the British Ceramic Society which led the way to the formation of the Institute by sounding the opinions of similar bodies. After an exploratory meeting the British Ceramic Society appointed representatives to serve on a committee and invited other organisations to do the same.

These were: British Pottery Manufacturers' Federation, National Federation of Clay Industries, Institute of Clay Technology, Refractories Association of Great Britain, and the Institute of Clayworkers. The committee formed from representatives of these organisations met several times and drew up a memorandum, articles of association and by-laws for the projected Institute of Ceramics Ltd.

At the recent confirmation of the first council of the Institute, the following were elected honorary Fellows of the Institute in recognition for outstanding contributions to the industry: Mr. H. Halliday, O.B.E., F.C.I.S.; Col. H. Johnson, D.S.O., T.D., J.P., D.L.; Mr. H. J. Plant, J.P.; Mr. E. Simpson; Lt.-Col. C. W. Thomas, C.B.E., T.D.; and Mr. F. West, M.I.Mech.E., M.Inst.Gas E.

Will also Show Expansion

ON their stand at the Engineering & Welding Exhibition at Olympia, London, from 1 to 15 September, G. A. Harvey & Co. (London) Ltd. will show a varied range of their products. The approved manufacturers to the American API/ASME Code, which enables them to compete favourably with American firms for overseas orders of certain types of petroleum refinery plant, the company will portray this work in a picture exhibition.

The exhibits on view will outline the expansion undertaken by the company recently, especially in meeting the requirements of the engineering and marine engineering industries. There will also be an extensive range of Harco perforated metals and plastics displayed, and innumerable patterns needed for all kinds of sifting, filtering and grading of such diverse materials as coal, stone, cereals, food products, and fine chemicals.

Fuel Research 1954

Investigations on Coal & Synthetic Fuels

DETAILS of the chemical structures developed during the maturing of coal, and in particular of the change in character of these structures which commences at a carbon content of about 90 per cent, have been revealed by work done in the last few years at the Fuel Research Station, says the annual report, 'Fuel Research 1954', which may be obtained from HMSO, price 3s.

As the coal matures the oxygen content falls steadily while the carbon content increases. Up to about 90 per cent carbon the hydrogen remains practically constant and then begins to fall rapidly. This corresponds to the formation of condensed ring structures which have been shown by X-ray studies to be present. Oxidation breakdown now suggests that in the early stages of maturing (below 90 per cent carbon) there is an increasing development of six membered aromatic or hydro-aromatic structures of relatively simple types. Further maturing gives condensation of these compounds to more complex fused ring structures.

Coal which has been ground can be separated into fractions of different densities and the question arises as to whether the fractions have different chemical constitutions or not. Two low rank coals had previously been investigated and in each case the fractions of different densities gave similar distributions of oxidation products.

Essential Similarities Found

It was decided to extend the experiments to coals of higher rank and two specimens, one a dry steam coal and the other an anthracite, were separated into fractions of different densities and the more important fractions oxidised by alkaline potassium permanganate. The results show that there is essential similarity between all the fractions, as was found for the lower rank coal.

Minor constituents of coal are of the greatest importance. Coals free from arsenic and lead have to be used where there is any possibility of foodstuffs coming in contact with the hot gases from the burning of coals. Small amounts of boron and phosphorus will cause troublesome deposits in the tubes of water-tube boilers.

On the other hand some trace elements in coal are of considerable value. In certain cases, notably gallium and germanium, coal is their main source.

Germanium is of rapidly increasing importance in the electronics industry and a study is being made of those processes which occur during the utilisation of coal and coke whereby it is concentrated in some of the by-products. An investigation has been made of germanium in the coke, tar and liquor obtained from the carbonisation of coal. In each instance up to 90 per cent of the germanium remained in the coke. The temperature attained by the charges varied from about 800° C to 1,100° C. Under reducing conditions at these temperatures up to 90 per cent of the germanium remained in the coke. This means in effect that the concentration of germanium in the coke is higher than in the original coal.

Germanium Extraction Difficult

Attempts have been made to find out how some of the minor elements are combined in the coal. Germanium, it was found, cannot be extracted from coal by water, dilute acid or dilute ammonia. It seems unlikely therefore that it is present as a simple compound such as the oxide or sulphide.

Spectrochemical analysis is an attractive alternative to classical methods for the analysis of ash. A small sample can be used and the saving in time is appreciable. However, spectrochemical methods are thought to have a lower accuracy and reproducibility than orthodox methods and tests have been carried out to devise a method which is both sufficiently accurate and consistent.

Many of the physical and chemical properties of the sample to be analysed affect the emission of the spectrum lines and so influence the accuracy of the determination. It is usual to add spectroscopic buffering materials in order to reduce this effect and lithium carbonate, graphite and mixtures of these two substances have been tried, but none of them completely eliminates the effects of differences in the physical states or chemical compositions of the samples under analysis.

The irregularities are reduced by selecting an appropriate internal standard element

for measuring a particular constituent. Barium, beryllium, cerium, cobalt, tungsten and zirconium have been tested and cobalt, barium and beryllium appear to be the most generally useful.

Coal can be used in two ways as a source of oils and chemicals. In the first the complex coal structure is broken down into the required smaller and simpler molecules. The second is to break the coal down into the simplest possible molecules and then to build up into more complicated molecules as desired.

Fischer-Tropsch Synthesis

This second procedure is used in the Fischer-Tropsch synthesis in which coal is gasified to produce a mixture of carbon monoxide and hydrogen. The product gas is then passed over a metal catalyst at a temperature between 150 and 400° C and at pressures up to 50 atm. In this way hydrocarbons are formed ranging from methane and light oils to heavy oils and waxes.

The process so far developed would be uneconomic in this country although in certain parts of the commonwealth where coal is cheap and petroleum products are expensive its application might well be feasible.

The synthesis reaction is exothermic and the nature of the products is sensitive to temperature changes. It is therefore important to establish the best means of controlling the reaction on an industrial scale. Although some of the preliminary work was done on the small scale (10 to 50 cu. ft. of gas per hour), work on a much larger scale is necessary for assessing the suitability of a certain reaction system or reactor design for full scale application. During the past two years experimental runs in a pilot plant treating 2,000 cu. ft. of gas per hour have been carried out using the fluidised-catalyst system.

The effect of the composition of the gas on the reaction has been investigated. Preliminary results suggest that the mixture $H_2/CO = 3$ has an apparent overall activation energy of about 14.5 K.cal. per mole, a value lower than that recorded for mixtures containing less hydrogen. As the proportion of carbon monoxide in the synthesis gas increases, the utilisation ratio (the ratio in which carbon monoxide and hydrogen are consumed) approaches the ratio of the gases. The selectivity of the synthesis also improves, as is shown by the increases in the proportion of liquid hydrocarbons in the total hydrocarbon product.

Producer gas does not appear to have an adverse affect on the life of a mill scale catalyst. In a typical example the conversion was 70 per cent and showed no significant change over a period of 32 days. There was no change in the proportion of methane formed but the mean molecular weight decreased with time, the proportion of wax falling from 46 to 33 per cent.

In addition to the work being carried out at the Greenwich laboratories, many extramural investigations are being made. The constitution of coal is also being studied at Birmingham University under the supervision of Professor Stacey G. Ward. Oxidation of coal under atmospheric conditions followed by alkaline extraction yielded humic acid which was then further studied.

Humic acid is oxidised smoothly with 20 volume hydrogen peroxide at 30° C, the product being a mixture of non-volatile water soluble acids (subhumic acids), carbon dioxide, almost equal quantities of formic and acetic acids, and traces of volatile carbonyl compounds.

It is proposed that work should be undertaken at Imperial College, London, under the supervision of Professor D. M. Newitt on the effect of pressures up to 15,000 atm. on coal at temperatures of 150 to 200° C. It is hoped to effect quickly changes that in the normal way would take long periods of time.

Thermal Decomposition of Kerosene

A team at Oxford under the supervision of Professor Cyril Hinshelwood is studying the thermal decomposition of paraffins. The mechanisms of these reactions is complex and their elucidation involves problems of fundamental interest to physical chemistry.

It is known that chain reactions are involved but the actual course of the reaction has not as yet been determined. It is possible that simultaneously processes occur in which molecules of hydrocarbon rearrange themselves and split in a single act into final reaction products.

This team is also studying the effect of inhibitors on the thermal decomposition of paraffins. So far the results obtained have been of a rather contradictory nature, but the balance of evidence is in favour of decomposition reactions not involving chains.

Electricity in the Chemical Industry

I.C.I. Expert Addresses Power Convention

MORE than 2,000 delegates representing 38 organisations attended the five-day British Electrical Power Convention which ended at Brighton on Friday, 1 July. At The Dome on Thursday, 30 June, the delegates heard Mr. Gordon Nonhebel, B.A., B.Sc., F.R.I.C., F.Inst.F., fuel technologist and head of the fuel economy section of I.C.I., present a paper 'The Use of Electricity in the Chemical Industry'. In the preparation of his paper Mr. Nonhebel said he had taken the viewpoint, not of the electrical engineer, but of the chemical plant manager and his associates, the plant designer and the maintenance engineer.

'I have endeavoured to find out what difficulties have arisen from electrical equipment and I point to them as a challenge to suppliers of electrical equipment and to the suppliers of electricity itself. Some of the difficulties have arisen from inadequate analysis, by both the user and the suppliers, of the requirements to be met in day-to-day operation of a chemical factory, and which can be avoided in the future by the right form of consultation during the design stage of a plant between electrical engineers, process managers, maintenance engineers and the equipment suppliers'.

A Challenge

The paper, comprising 15 sections, plus appendix defining flameproof enclosures and the classification of hazardous gases and vapours, is to be reprinted and sold at cost by the British Electrical Development Association. In his review of equipment, Mr. Nonhebel, by mentioning some of the difficulties to be met, has issued a challenge to the suppliers of both electricity and electrical equipment, and has made suggestions for investigation and research.

After delivering his paper, Mr. Nonhebel heard three delegates reply to it. They were Major H. E. Knight, of the East Midlands Consultative Council; Dr. S. Whitehead, M.A., D.Sc., of the British Electrical & Allied Industries Research Association; and Mr. W. A. Gallon, B.Sc., of the South Wales Electricity Board. All agreed that there was a challenge which the electrical industry could meet and eventually overcome, although feeling 'that in a chemical factory the chemists were supreme and the engineer a servant so that production conditions can carry on.'

Sir Harry Railing, D.Eng., Hon. M.I.E.E., President of the Convention, said: 'I do not take part in discussions, but I recommend we work closer together.' In his presidential address, Sir Harry told delegates: 'It is an important insurance for any country to stockpile a certain percentage of plant for energy production as it is to stockpile food or raw materials. The life of every section of industry, indeed that of the nation, depends as much on electric power as it does on food'.

Food for Thought

There was no doubting that Mr. Nonhebel's paper had given the delegates food for thought. It was comprehensive, direct and to the point, and had a challenge in every other sentence. In dealing with reliability, Mr. Nonhebel stressed that equipment should be designed for easy maintenance and accessibility of parts, points not always given sufficient consideration by those responsible for installation of chemical plant. In the heavy chemical industry in particular, reliability was most essential, he said, specially in plants where processes were continuous. The designer of electrical equipment therefore should make it his business to find out from the customer both the average and the most onerous conditions under which the equipment is to be used. 'The chemical manufacturers themselves are often remiss in this respect, but the point to be stressed is that they often need the help of the electrical machine designer in formulating their exact requirements. It is a problem of both sides knowing the right questions to ask'.

Dealing with electrical instruments, Mr. Nonhebel said their most important contribution to process efficiency was perhaps in the application of computers to process control. Much has been said about the automatic factory in the last 20 years, but little of this has been based on solid grounds. Nevertheless, the electrical engineer can accelerate progress towards this

end by providing the process engineer with measuring and control equipment which is more rapid in response, more consistent in use, and, above all, absolutely reliable.

Safety Conscious

Saying that the chemical and oil refining industries are, and must be, constantly 'safety conscious' in the design, operation and maintenance departments, he said they must also apply this in full force to electrical equipment. Mr. Nonhebel discussed the most suitable electric drives in dangerous areas. 'There has always been controversy throughout the chemical and oil industries about these. Here the oil industry regarded flameproof motors as satisfactory provided they are well maintained, but in refineries abroad flameproof motors are difficult to service with semi-skilled labour available, and totally enclosed but forced ventilated motors designed to avoid sparking are installed. This arrangement is being considered for parts of many refineries here'.

Mr. Nonhebel pointed out that no electric motor has so far been certified for Group IV conditions and consequently steam drives for pumps and fans are a necessity. A point that needed emphasis is the need for safe dustproof motors for use in areas where dust explosions could arise. The flameproof motor is not dustproof. No electric trucks have yet been certified flameproof for Group III hazards, Mr. Nonhebel went on. 'But I cannot believe that the difficulties are insurmountable', he added.

The paper ended with a review of the electrical needs of the chemical industry. Among these were the need for continued improvement of reliability of equipment; some form of stand-by for parts of many continuously running factories; greater impetus to the installation of small to medium sized back-pressure generation sets by standardising combinations of boilers and turbo-generators; closer technical consultation between designers and suppliers of electrical equipment and the smaller chemical manufacturers; research and development on variable speed AC motors and on corrosion resistant metals for their commutators; safer portable equipment and designs for electrically driven valve operation gear, and of inductance furnaces.

Sweden's Chemical Future

'SWEDEN's chemical industry needs more capital and research facilities', delegates at the recent annual general meeting of the Swedish Chemical Industry Bureau in Stockholm were told by Professor Ingvar Svennilson, head of the Institute of Industrial Investigation which has completed a survey of the country's chemical industry.

The investigations, conducted in collaboration with executves and technicians, revealed that Sweden's rapid development in the chemical trades should be continued, but should now be devoted to quantity production with the aim of competing in foreign markets. To do this it was recommended that Sweden expand the organic base industry and corresponding processing plants in the pharmaceutical and plastics fields.

Professor Svennilson said that although Sweden lacked raw materials, the possibility of importing coal and oil is good, and the ample supply of capital and the possibilities of mobilising technical know-how should stimulate the development of a large chemical industry.

TI at Geneva

TUBE Investments Ltd. will be showing a wide range of exhibits at the United Nations Conference on Peaceful Uses of Atomic Energy, opening at Geneva on 8 August.

Apart from components already developed in the commoner metals such as stainless steel and aluminium, some specialised new products will be shown. These include tubes made from uranium, niobium, vanadium, tantalum, beryllium, thorium and zirconium.

The company say that they have developed special techniques for the fabrication of these metals, some of which only became available in sufficient quantities in the last few years.

Also to be shown are a 5 ton seamless stainless steel dissolver shell, 17 ft. long, with a 30 in. bore for processing uranium, a zirconium tube with a wall thickness of only three thousandths of an inch, and a uranium bar bonded with an outer sheath of zirconium.

The first British rolling mill designed specifically for uranium work was built by TI, but this will not be on show.

The Future of Acetylene

Dr. R. Holroyd Addresses BAA Luncheon

THE annual luncheon of The British Acetylene Association was held on Thursday, 30 June, at the Connaught Rooms, London, when the principal speaker was Dr. R. Holroyd, the director in charge of research for Imperial Chemical Industries Ltd.

In introducing Dr. Holroyd, the president, Dr. F. H. Peakin, said that the BAA had always had the good fortune to have as their guest at their annual gathering a man of eminence and this year good fortune had continued. Dr. Holroyd was a member of the main board of directors of I.C.I. [the company which he (Dr. Peakin) had the honour to serve] and was in charge of research matters. In such a company this was a position of great distinction and onerous responsibilities and was only entrusted to a man of wide experience and solid achievements in the organising and application of industrial science.

Dr. Holroyd's own particular field, in which he was internationally respected, had been that highly important one where the technologies of the fuels, coal and petroleum, interpenetrate those of synthetical organic chemistry on the industrial scale. Those notable achievements at Billingham and the winning of motor fuel from coal and from creosote, the production during the war of special aviation fuels and now at Wilton the large-scale manufacture of olefines from petroleum, had been the scene of his endeavours.

Dr. Holroyd's Address

In proposing the toast 'The British Acetylene Association' Dr. Holroyd said that for a great many years he had had a great regard for acetylene and for people who were always devising new methods of production. This respect for acetylene sprang from the first acetylene lamp he had had as a school boy for he had learned a great deal and had gained something of the outlook of the chemical engineer from this lamp. The co-ordination of effort by users and manufacturers, particularly in the chemical field and particularly from the long term point of view, was extremely important and he would like to see it extended.

Saying that he would like to dwell a little on the rapid growth in the importance of acetylene, and therefore of calcium carbide, as raw materials for chemical synthesis, Dr. Holroyd continued:—

'I understand that, when your Association celebrated its jubilee in 1951, some papers were read on changes in the industrial uses of acetylene during the Association's lifetime. These changes are now progressing at an accelerating pace and it may be of interest to review them.

'Since the beginning of the century, the illuminating, engineering and some chemical uses of acetylene had raised the consumption of calcium carbide from the small beginnings of the (then new) material to some 64,000 tons a year immediately before the war. All of this was imported, as home manufacture had not taken root profitably.

War Provided Stimulus

'The war provided a stimulus for the existing uses and some new ones—especially the manufacture of polyvinyl chloride and the consumption of carbide in Great Britain now is about three times the 1938 figure, about 180,000 tons a year.

'The bald statement of such a tonnage does not perhaps convey very much and it is interesting to see how this material stands in its relationship to some other raw materials. This quantity of carbide has a value of well over £5,000,000 sterling a year. This can be put alongside some other well known raw materials, thus:—

Elemental sulphur	£5,000,000
Pyrites	£2,000,000
Industrial ethyl alcohol	£7,000,000
Benzole (except motor fuel)	£3,000,000
Ammonia	£15,000,000
Sulphuric acid	£20,000,000

'It is evident that carbide now ranks in magnitude of value with the traditional heavy chemicals and in fact is exceeded only by a few.

'Since carbide is not used in our country for calcium cyanamide fertiliser, virtually the whole of it is converted into acetylene—some 50,000 tons a year of this gas at present—for a variety of uses.

'It is interesting to note that the British production of ethylene gas by the cracking

of oil has only recently overtaken that of acetylene gas, exemplifying the changes in basic raw material which we use for the rapidly growing aliphatic chemical industry —vegetable materials tending to give way to coal and the carbide derived from it, and more recently to petroleum.

'British production in two factories is rather more than 100,000 tons a year and will doubtless grow. The rest of our needs have been imported and it seems likely that this country will be an importer of some part of its carbide requirements for many years to come.

Coal & Carbide Linked

'If thermal electric power were used for all our carbide, over 500,000 tons of coal would be needed, including that for the lime and for the furnace. This serves as a reminder that to base some of our chemicals on carbide is to base them on coal except insofar as we import the product by hydro-electric power. Imported carbide is thus a minor way of importing electric power or coal in concentrated form. With the present prospects for coal, one cannot look ahead without some doubts to continued reliance on it as a source of such an important material as carbide.

'One is conscious also in this regard of the low thermal efficiency of the conventional carbide process—only about 10 per cent of the energy in the fuel used for electricity and as feed to the furnace appears as calcium carbide. Little progress had been made before such developments as the closed furnace to recover the reaction gases, and it seems possible that some reduction in the cost of carbide, and hence of acetylene, might be obtained by renewed attention to this question.

'With these considerations in mind, it is natural to touch upon the prospects of acetylene being made in this country from materials other than carbide. The impediments are not primarily technical but economic. The special conditions which have justified manufacture of acetylene from hydrocarbons in Germany, US and Italy have been the availability of cheap raw material or the possibility of integrating acetylene production with that of other chemicals. The modern chemical plant turning out a series of products in predetermined proportion presents problems of control, both technically and commercially. In contrast, the acetylene generator backed by a store of carbide is a completely flexible source not lightly to be given up.

'In the chemical industry, and in organic chemicals in particular, there is a constantly shifting economic pattern of competition between different products which can be used for a given purpose and between different ways of making a given product. Therefore the emphasis on the most suitable products to make from carbide changes with time and circumstances. Some countries have used much greater quantities of carbide as a raw material, e.g. for cyanamide, for acetone and even for ethylene, than Great Britain.

'There is no doubt that acetone and some other solvents can be made more cheaply from olefines, but the very rapid growth of demand for polyvinyl chloride has pushed production of this resin in this country up to something like 60,000 tons a year, needing over 70,000 tons a year of carbide. There seems little chance of any new production of the polymer from ethylene instead of acetylene which, under most circumstances, is the cheaper method. Although the products of the Reppe syntheses are finding industrial development more slowly than was at one time expected, monomeric vinyl acetate is now being made in this country and will doubtless be followed sooner or later by acrylonitrile.

'In short, carbide and acetylene are thus assured of a place in the rapid further growth which synthetical organic chemistry seems likely to achieve in the decades to come.

Growing Importance

'My remarks have been intended to illustrate the growing importance of this part of the field of your Association's endeavours. It began its work only a few years after the industrial introduction of carbide and has continued it for over half a century. I feel confident that it will continue for a long time to come to provide a forum where men from the carbide and acetylene industries may meet, where common problems of safety, standardisation and intercourse with similar bodies abroad may be discussed'.

Replying on behalf of the Association, Dr. Peakin said that the BAA existed because it filled a need. Dr. Holroyd had illustrated the size and importance of the carbide and acetylene industries. These products had to be made and bought and sold, and packed and transported and used and they could

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Mechanical Engineering Research

Progress Made on Heat Transfer Work

THE work carried out in the Mechanical Engineering Research Station at East Kilbride, Glasgow, during last year is reviewed in the report for 1954 now available from the Stationery Office, price 3s. The research covered during the year was extensive, while at the same time new buildings were occupied and a start made on the design for the new plasticity division. No fewer than 34 papers arising from the research programme were published, and 15 lectures were given by staff members.

Heat Transfer Problems

Work on heat transfer problems, heat exchange apparatus and applied thermodynamics was hampered by lack of facilities owing to delays in the construction of the heat transfer laboratory. Despite this, progress was made, and the effect of sudden changes in pipe section on the heat transfer coefficient is being investigated. An abrupt convergence was found to have little effect, but an abrupt divergence could cause as much as a threefold rise in the heat transfer coefficient immediately after the change of section. Research on heat and mass transfer in the presence of chemical phase changes is being carried out under extra-departmental contracts, and a technical registry developed to collect information produced by the division or received from other sources. A bibliography was prepared comprising 900 references to work on heat transfer, heat exchange apparatus, thermodynamics, and allied subjects.

In the study of the mechanics of fluids the factors which determine venturimeter coefficients are being studied to see whether higher accuracy can be obtained. The standard codes of various countries are based on limited knowledge of the effect on venturimeter coefficients of such factors as the absolute accuracy of static pressure measurements, the roughness of internal surfaces of the meter and the up-stream pipeline, and the velocity distribution up-stream and at the throat of the venturi. These factors are being studied in a circuit where flows up to 1 cu. ft. per second can be measured volumetrically to within ¼ per cent.

Work was also undertaken on diffusers for converting the kinetic energy of a fluid flowing at high speed into pressure energy by retarding the flow. The effects on suitably-defined efficiencies of most factors controlling flow were studied; only surface roughness not receiving systematic attention. Resin bonded fibre-glass diffusers of 5, 7.5 and 10° included-angle are to be used to study the effects of surface roughness on flow. Four sizes of glass beads are to be used to produce controlled surface-roughness and the results will be correlated with those obtained from concrete and cast-iron diffusers.

Experimental work on plastic properties under hydrostatic pressure had two main objects. The first to obtain data on the behaviour of materials under hydrostatic pressure, and the second to check the range of validity of the assumption, commonly made in mathematical theories of plasticity, that the yield stress of material is independent of hydrostatic pressure. The work to date has been concerned mainly with producing and measuring high pressure fluids. It is proposed initially to carry out tension, compression and torsion tests under pressures up to 100 tons per sq. in.

The applications of extrusion in industry have been based on experience gained from trial and error rather than from understanding of physical processes involved. Research was undertaken in the temporary laboratories to obtain information on the mechanism of plastic deformation of metals in the extrusion process. Experiments on extruding rods, hooker tubes and tubular containers in 99.5 per cent pure aluminium, and rods in E.R.H.C. copper and 70/30 brass and mild steel were undertaken.

Monsanto Argentina

The formation of Monsanto Argentina has been announced and it is hoped that with Government approval construction of the plant will begin immediately. This plant will be the first to provide polystyrene for the Argentine plastics moulding industry, and production is expected to start in 1956.

Hardening without Cyanide

Carbonitriding Process has Great Advantages

THE cyanide salt bath has long been used as a method of imparting superior wear resistance to steel, but it brings with it the problems of handling, storage and disposal of highly toxic chemicals with which all those involved in metal treatment are only too familiar. Any process which can obviate the disadvantage of using molten cyanide salts is therefore of very great interest. The carbonitriding process not only avoids the use of cyanide but also involves lower operating costs and greater flexibility. It is a process which could with advantage be more widely exploited in many industries, bringing with it as it does the ability to control case depths precisely.

Special Atmosphere Supplied

In carbonitriding a special atmosphere is supplied to the furnace which allows both carbon and nitrogen to be absorbed by the steel in a ratio that can be controlled precisely. The atmosphere used consists of the normal gas carburising atmosphere plus the addition of cylinder ammonia as a source of nitrogen. The nitrogen lowers the critical temperature of the steel, thus permitting progressvely lower case hardening temperatures—a particular advantage in the case of parts liable to distortion.

The nitrogen also decreases the 'critical cooling rate' of the steel so that oil quenching can replace water quenching without any loss of surface hardness. Furthermore, due to the presence of nitrogen the case shows greater resistance to wear than a carburised case of equal hardness. However, since the atmosphere used for carbonitriding is the same as that used for gas carburising but with controlled ammonia additions, the process should be considered as complementary to rather than competitive with gas carburising.

The essential equipment employed in the carbonitriding process comprises an atmosphere generator (preferably one in which the neutral atmosphere obtained from an endothermic generator is enriched with propane) and a furnace of suitable design. The recent production of the EFCO-Lindberg Carbonitriding Furnace, which is available through Electric Resistance Furnace Co. Ltd., Netherby, Queens Road, Weybridge, Surrey, is an important step forward in this respect. The furnace design incorporates a number of interesting features. Thus, a new type of radiant tube heater is used which eliminates the necessity of shutting down to replace a tube when this fails. Instead of the conventional heavy horizontal radiant tubes this furnace incorporates eight light-weight thin-wall vertical tubes weighing only 29 lb. each.

Efficient quenching in carbonitriding is an essential feature of the process, if maximum hardness on the work is to be obtained. The design incorporates its own oil cooling system which eliminates the necessity for an external cooler and furthermore as the oil is not circulated from the tank to an external cooler, air is not introduced into the oil and the work is perfectly bright on leaving the furnace. This type of quench tank eliminates the necessity for expensive excavation and piping, and distortion of the parts is minimised because quenching takes place within the furnace atmosphere. Heated charges are not exposed to the air, as is necessary when work must be transferred from the heating chamber to a separate quench tank.

The purge chamber is immediately above the quench tank and in front of the heating chamber, allowing the charge to be thoroughly purged of air in the furnace atmosphere.

The furnace is a multi-purpose unit and in addition to carbonitriding can be used for carburising, bright hardening, and bright annealing.

Chance Memorial Lecture

In the Mechanical Engineering Lecture Hall of the University of Birmingham on 14 July, Mr. H. V. Potter, B.Sc., F.R.I.C., M.I.Chem.E., F.P.I., chairman and managing director of Bakelite Ltd., will give a lecture on 'Welfare in Industry'. Sponsored by The Society of Chemical Industry (Birmingham & Midland Section), the lecture, one of the Chance Memorial series, will deal with conditions in industry from the 17th to the 20th century.

The Rôle of Plastics

The Plastics Institute's Presidential Address

IN his presidential address at the annual general meeting of the Plastics Institute held at Birmingham on 5 July, Dr. V. E. Yarsley took for his subject 'The Rôle of Plastics in a Balanced National Economy'. He referred to the many occasions in the past when attempts were made to assess the future for plastics, when 'Whither Plastics' was a favourite title for papers and even books. To-day it would be more accurate to say not the future for plastics but the future with plastics, indeed he thought it would now be more difficult to envisage the future without plastics.

Surveying technological development over the past half century one of the main difficulties had been that it had gone forward rather in a series of jerks, so that the co-ordination of one development with another had been difficult. As Sir Lawrence Bragg had said, the real progress came when man dropped his pre-conceived ideas and 'became humbly submissive in the face of science'.

Dr. Yarsley said that his generation was fortunate in that it would see the beginning at any rate of the co-ordination of many developments in many fields of technology, a period in which individual technologies would get into step. A stage had been reached when, as David Sarnoff had said recently, 'whatever the mind of man visualises, modern science can turn into fact'.

Second Industrial Revolution

The intensive technological research of the war and post-war periods had materialised in the second industrial revolution. But how different had been this revolution of the 1950's compared with that of 200 years ago. Wisely guided, this new forward surge might carry mankind as near to Utopia as could be imagined, and in this he was confident that the fusion of atoms coupled with their fission would play a dominating part.

The fission of atoms had given us power unlimited, or would virtually do so; footloose power and power at an economic price. The fusion of atoms to give the giant molecules, which we called plastics, would be able to utilise this new-born energy to give mankind new materials to meet the increasingly stringent demands of our time. Much had been accomplished in this direction, but what had been done was but the prelude of what could yet be accomplished. The fission and fusion of atoms could shape the future of mankind.

It was natural, of course, for any technologist to be enthusiastic for his own particular branch of applied science, but he did not think that the picture he had painted of the future potentialities of and for plastics was over-optimistic or born of wishful thinking. A decade ago they had been optimistic, in many cases over-optimistic, for plastics, and for a time their products had been looked on as near magical, which they obviously had not been able to sustain. They had learnt their lesson and had profited thereby. But to-day they knew more of the fundamentals of polymer building and in consequence they could see more clearly the pattern for the future.

New Standards of Living

This could be one in which the new energy and the new materials could act as an equalising agency to create new high standards of living throughout the world. With them they would be able to attain to the happy state in which the distinction between the 'haves' and 'have-nots' disappeared from the nations of the world, always providing, of course, that the nations applied themselves and utilised their opportunities with assiduity and zeal.

In Britain there was a goodly heritage in this second industrial revolution. Though not overblessed with raw materials, chemical synthesis would enable us to make best use of those we had. Thereby we would be able to convert our coal into useful materials of construction instead of burning it wastefully and polluting the air of our cities. Plastics manufacturers would also be able to consolidate their position by the cultivation and wider utilisation of nature's perfect polymer-cellulose. They had a chemical industry which ranked in the forefront among the nations of the world, as they could count many notable developments to their credit.

While it was quite true that their prestige record was high and their products were acclaimed in the markets of the world, never-

theless they would not be able to spurn lightly, as in the past they had been prone to do, the publicity value of production statistics. It was useful for other nations to know what they had achieved, it was helpful for other industries within their own land to know what they had done and could achieve. Dr. Yarsley thought many of those present would agree with him on the vital importance of statistics, complete and reliable, and if possible on an internationally accepted basis, so that they could all talk the same language. The need for this was most urgent.

There had been a time when established industry in this, as in other lands, viewed the fledgling plastics with mistrust. Time had shown that plastics had been the allies rather than the enemies of traditional materials, and could in many cases co-function with them to achieve superior results. It should not be assumed that Utopia was round the corner, far from it. They knew that the difficulties ahead were many, but at any rate they had a clearer picture of the way ahead. Many of them who had grown up with plastics on many occasions had had cause to deplore the fact, when it was a question of supplying performance data or production statistics, that it was an industry without a past. They should console themselves that they were an industry with a future. And when they looked forward, as they had done, and had seen the wonders that could be, they would hope that wisdom might prevail in the councils of the nations of the world, so that as with the years they progressed with the fission and fusion of atoms, 'atoms for peace' would, indeed, bring polymers in and for plenty.

Wage Increases

PRINCIPAL changes of rates of wages affecting the chemicals and allied trades reported during May are paints, varnish and lacquer manufacture, increases of 5s. 6d. a week in basic national minimum rates for men over 21; youths and boys proportional increases.

In the coke manufacturing industry workers employed at coke oven plants attached to blast furnaces got increases in basic rates of 12.47d. a shift for adult workers, 9.35d. for 18's and under 21's, and 6.24d. for under 18's. These increases being subject to the percentage addition of 75 per cent, and apply to workers in Scotland, Lancashire and South Wales. The increases affected employees of firms which are members of the Iron & Steel Trades Employers' Association.

Workers in Cumberland, South Durham, Cleveland, Lincolnshire, and Northants were granted increases which back-dated to 24 April. They were, payment for period from 2 a.m. Sunday to 10 p.m. Sunday increased from time-and-half to double time—in those cases where earnings are not consequently increased by a minimum of 10s. a week of five-and-half shifts for adults, or proportionately for younger workers, rates to be adjusted to provide such increases.

Monsanto at Olympia

AMONG exhibits to be featured on the Monsanto stand at the Engineering, Marine & Welding Exhibition, and the Foundry Trades Exhibition, to be held at Olympia, London, from 1 to 15 September will be Aroclors and Pyroclor, fire-resistant heat-transfer media and electrical insulating fluids.

Aroclor 1242 for capacitors, and the use of Aroclor 1254 in capacitors, together with Pyroclor transformer coolant were prominent on the Monsanto stand at the recent British Electrical Power Convention in Brighton. There for the first time at an exhibition Monsanto showed the suggested uses for Pyroclor coolant at temperatures higher than normal.

At Olympia other products to be featured will be Monsanto Silesters (ethyl silicate), and Sytons (silica sols). Silesters will be displayed as bonding agents in investment casting, and in the manufacture of precision piece moulds by the Shaw process. New developments will display the use of Sytons for investment casting, and Silesters for stonework preservation.

Penicillin Research

Scientists at two Government research stations in the South of England have been experimenting with penicillin on crops. Experiments on cherries, apples, potatoes, and tomatoes have been successful and, as with pigs, inches have been added to growth. This was announced at a penicillin exhibition now being held in a London West End store.

I.C.I. Paint Laboratories

Extension to Slough Development Section Opened

THE opening on 28 June of the new extension to the Development Laboratories of I.C.I. Paints Division at Slough reflects the growing realisation of the importance of development work in industry.

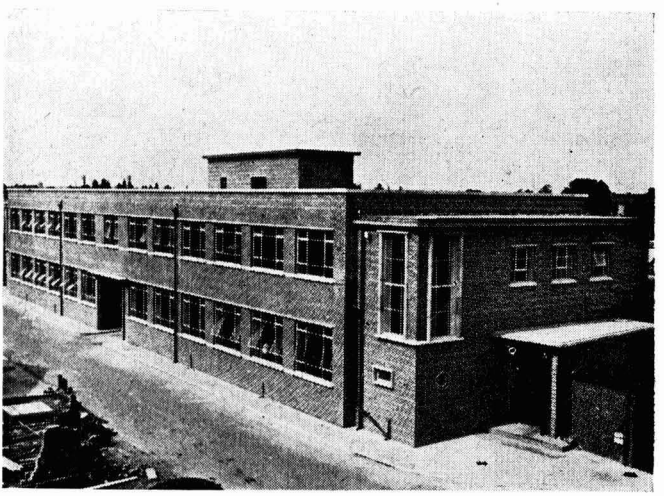
There have been many suggestions in the past that we in Britain are, in general, slow to make available the results of research to manufacturing industry. The new laboratories are designed to expedite this process, and not only that, they will help to provide a vital two-way link. By maintaining contact with the paint-consuming trades and industries, they will also ensure that the urgent day-to-day needs of those industries, so far as finishing materials are concerned, are given active consideration, and the Division's research programme thus kept in the closest touch with the problems and realities of the day.

The Paints Division of I.C.I. is said to spend more than any other paint company in the country on research, development and technical service. In placing major emphasis upon the importance of this work the Division is following the policy of I.C.I. as a whole, for the Group's expenditure on research and development alone amounts to over £8,000,000 a year.

The Paints Division Development Department's function is to apply research discoveries to the improvement of industrial and decorative paint products and processes. It has laboratories at the two main manufacturing sites of the Paints Division—Slough, Buckinghamshire, and Stowmarket, Suffolk. In addition, it operates a large exposure 'farm' at Stowmarket for assessing the performance of paints when exposed to the weather.

The Department has a staff of over 150, divided into sections of from six to 10 men, each under the direction of a senior graduate. Each section deals with paints devised for a particular industry or group of industries. The specialised knowledge of the requirements of particular industries which each section acquires is of considerable importance—for practically all paint-using industries require paint with a different balance of properties. Over 2,000 types of paint may be manufactured regularly during the year, and in the case of large individual paint-users finishes are often made to fit into a tight manufacturing schedule.

The Development Department maintains the closest contact with all the paint-using industries, either directly or through the Divisions Sales and Technical Service representatives. The information thus obtained on the requirements of paint-users is vital if the development chemist is to provide the paint products necessary to keep pace with the general developments in industry. The



A view of the exterior of the new Development Laboratories

View along first floor corridor showing Frenger ceiling with recessed lighting fittings

Department's main source of inspiration, however, is its associated Research Department, which is constantly carrying out work on new polymers, resins, pigments and solvents.

The Research Department also studies the chemical and physical problems arising in either the manufacture or use of paint, and provides a constant flow of new information to the Development Department. The substantial and progressive improvements in paints over the past 20 years is partly the result of novel ideas and partly of the cumulative effect of a large number of minor improvements.

The tempo of modern industrial production could not be supported with appropriate paints if there had not been a complete revolution in paint technology. This revolution has affected speed of drying, number of coats, durability, appearance, and involves improved resistance to chemical agents, including modern detergents and fats.

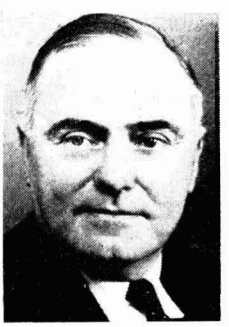
The new wing of the Development laboratory at Slough will double the existing accommodation for the Development Department. Staff will be housed on two floors, designed so as to give a considerable degree of flexibility in internal arrangements. For this purpose, internal columns have been eliminated, extensive use is made of demountable partitioning.

In addition to the latest laboratory scale paint-making machinery, paint-testing equipment and photographic laboratories, the new block has two testing rooms in which the atmosphere is automatically controlled to within narrow limits. These testing rooms make it possible to study the behaviour of paints under a variety of climatic conditions. In one room, the atmosphere can be controlled at any temperature in the range 0° C to 40° C and relative humidity 50 per cent to 95 per cent at any temperature in the range. In the second room there is no humidity control, and the temperature may be controlled between outside ambient and 40° C.

One of the more interesting features of the construction is the structural frame. Before a final decision was reached various alternatives were investigated, and the present construction was adopted to achieve freedom from internal supports.

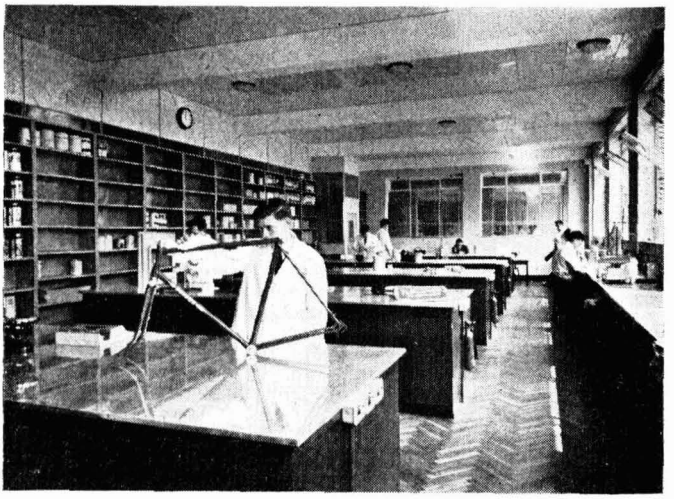
Basically, the structure is a precast concrete framework on continuous strip foundations. All main beams are prestressed and the columns are of normal reinforced concrete construction.

There is no need for mechanical ventilation in most of the building and generally ventilation is by means of the opening windows. However, in certain rooms there is a nuisance from the fumes arising from open solvent baths and quantities of paint, and mechanical ventilation is provided with ducts in the roof space and low level extract ducts formed in the floor. In cold weather, heated air admitted through this system will supplement the normal ceiling heating to allow for the increased air movement required for ventilation of these spaces. The



Mr. C. Paine, Development Director for I.C.I.

Laboratory for the development of new industrial paints



plant for this small plenum system is located in the existing building and the quadrangle.

The provision of ceiling heating, as opposed to a more traditional form, has various advantages, including the absence of obstructions on internal walls and the incidental acoustic ceiling effect. Frenger Ceilings Ltd. erected the installation through G. N. Haden who were the main heating contractors. The ceiling is heated by low pressure hot water from a calorifier installation fed with steam from the main factory supply. Main headers above the corridor ceilings supply grids of piping in the rooms to which two-foot square perforated light gauge aluminium panels are clipped. Above the grid piping is a fibeglass blanket. The whole installation is thermostatically controlled by means of an electronic control system.

The services installation to the laboratories is restricted to cold water, electricity and compressed air and the piping generally is concealed beneath the false ceiling with some electric conduit chased in the ground floor to island benches. Electric lighting fittings also are recessed in the ceiling and their position may be altered if required for flexibility. It is the intention to position weathering racks for paint trials on the main roof, so it was decided to adopt the form of promenade decking laid by Permanite. This is a built up roofing surfaced with 1 in. thick precast concrete tiles. Some accommodation is provided on the roof for panel examination. A one ton goods lift gives access to each floor and the roof.

The installation of the two rooms with temperature and humidity control was designed and erected by the Carrier Engineering Co. Ltd. The necessary plant and instruments are accommodated in an adjacent room on the ground floor. The rooms are heavily insulated with 4 in. of asphalte sealed cork and will be lined with aluminium sheeting.

The laboratory furniture installation was designed generally as a combination of interchangeable units and aluminium faced blockboard tops. These were manufactured by the Joinery Department of the General Contractors for the whole work, Holland & Hannen & Cubitts Ltd.

First Copper Oxides

A total of 60 tons of copper oxides will shortly be sold on the Israeli market by the Makhteshim chemical enterprise at Beersheba. It represents the first quantity of copper oxides produced in Israel, as well as the monthly capacity of the enterprise. It is also sufficient to satisfy the yearly local demand for this agricultural pest killer. Other types of agricultural pest killers will be produced by Makhteshim, and it is expected that the enterprise will be able to satisfy all local demands. Altogether, 140 workers, chemists and engineers are employed by Makhteshim.

Research schemes sponsored by the UNO between now and 1960 will cost £8,000,000.

Direct Chlorination Process Preferred

Pechiney Build New Perchloroethylene Plant

ALTHOUGH acetylene is still widely used as a raw material for production of chlorinated solvents, it has begun to lose ground, at least in the case of perchloroethylene, to the light hydrocarbons.

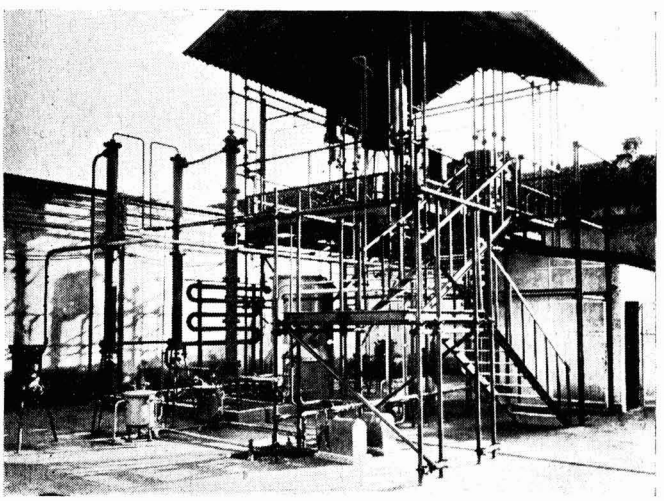
Perchloroethylene, used largely in the manufacture of dry cleaning and degreasing agents, will constitute the major product of a new plant to be designed and engineered by Scientific Design Co. Inc., New York, for Pechiney, one of France's principal chemical manufacturers. This plant will be based on the direct chlorination of ethane, methane, or propane. Its HCl by-product is earmarked for an expanded programme in vinyl chloride production.

In cases where the by-product HCl can be disposed of profitably, the new method of perchloroethylene preparation has some oustanding advantages over the acetylene process. First, the light hydrocarbons used to make a lb. of perchloroethylene cost the manufacturer only about 25 per cent as much as the equivalent in acetylene. Unless circumstances are favourable, it is sometimes necessary to manufacture acetylene internally if the perchloroethylene is to bear a price that can compete successfully in the open market. This, of course, would involve a heavy investment in capital equipment—an investment not demanded by a natural gas reactant.

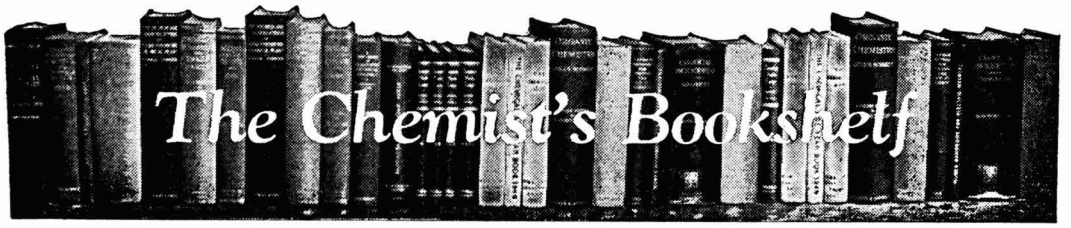
Second, there are four steps in the manufacture of perchloroethylene from acetylene: acetylene to tetrachloroethane, to trichloroethylene, to pentachloroethane, to perchloroethylene. When ethane, methane or propane are used, only one step is taken—the reaction of the gas with chlorine. Less equipment, less maintenance, and lower labour costs are the benefits.

Pechiney's new plant, at St. Auban, will be the first in France to employ the direct chlorination process. According to Scientific Design, fundamental engineering and design features will be based on a study made by SD of a pilot installation of Montecatini, Italy's chemical giant. Data obtained from Montecatini will be adapted to Pechiney. Principal differences will be the larger scale production and the purity of by-product HCl, which must be higher when used in the manufacture of vinyl chloride. Alterations will also be made to meet a changed set of market conditions—a problem familiar to SD, and one they have attacked or are about to attack in roughly a dozen propects on both sides of the Atlantic.

The perchloroethylene to be produced by Pechiney will have a bright future if its recent marked growth in popularity continues. Production in the US in 1953 was 160,000,000 lb., an increase of 33 per cent over 1952.



Pilot plant of Montecatini. Data gathered here was later adapted in part by SD for the Pechiney plant



FLUORINE CHEMISTRY. Volume II. Edited by J. H. Simons. Academic Press Inc., New York; Academic Books Ltd., London. 1954. Pp. x + 565. $13.50.

It is more than four years since the first volume of this work appeared, and three of the sections are essential continuations of material included in the earlier volume—that on halogen fluorides (14 pages) by H. J. Emeleus, that on organic compounds containing fluorine (108 pages) by P. Tarrant, and that on fluorocarbons (115 pages) by J. H. Simons and T. J. Brice. New sections are those on complex fluorides (39 pages) by A. G. Sharpe, on the analytical chemistry of fluorine and fluorine compounds (160 pages) by P. J. Elving, C. A. Horton and H. H. Willard, on organometallic fluorine compounds (13 pages) by H. J. Emeleus, and on the infra-red spectra of fluorocarbons and related compounds (56 pages) by D. G. Weibler.

The names of the authors of the various sections are in themselves a guarantee of the quality of the contents of the book. The documentation throughout is comprehensive, and many useful tables and other data are included. Undoubtedly this must be regarded as the first source to which anyone should turn for information on any aspect of fluorine. The present volume, like its predecessor, is a valuable addition to the reference literature. Authors, editor and publisher are to be congratulated on the way in which they have worked together to produce it.—CECIL L. WILSON.

CHEMISTRY OF CARBON COMPOUNDS. Volume III. Part A. Edited by E. H. Rodd. Elsevier Publishing Company, Amsterdam; distributed by Cleaver-Hume Press Ltd., London. 1954. Pp. xxiv + 686. £5 15s.

The earlier volumes in this series having been concerned with aliphatic and alicyclic compounds, it is now the turn of aromatic compounds to receive attention. Volume III is divided into two parts, IIIA being devoted entirely to benzene derivatives, while IIIB will cover pseudo-aromatic compounds, multicyclic aromatic compounds and certain of the more highly substituted derivatives of benzene; heterocyclic compounds are reserved for volume IV.

It is fitting that Professor C. K. Ingold should have been asked to write the introductory chapter on the historical development of the theories of aromatic character and of electrophilic aromatic substitution and thus to set the stage for the wealth of information which is to follow. The discussion of general mechanisms is carried on by Professor D. H. Hey and Dr. G. H. Williams who have dealt with nucleophilic and homolytic aromatic substitutions, while Dr. N. Campbell provides an interesting summary of methods available for synthesis of the benzene nucleus.

With the exception of two chapters written by Dr. Z. E. Jolles and Dr. J. Chatt, which are concerned with nitrogen derivatives of anilines, and aromatic metal and metalloid compounds, respectively, the remainder of the text has been contributed by Dr. W. J. Hickinbottom, who is to be congratulated on the scholarly manner in which he has accomplished his monumental task. It is clear that he has carried out a long and detailed survey of the mass of published literature on virtually all of the main groups of benzenoid compounds and has then selected for us the most important and typical examples to illustrate the salient features of this complex field.

The book is a worthy member of this valuable series of reference volumes, but it is hoped that in the future the editor will not adhere too rigidly to his declared intention of dealing only with established knowledge and thus excluding discussion of the more profound theories of organic chemistry. —E.J.B.

The Quantometer

Rapid Analysis of Steels

ACCURATE analyses of steel samples are being made in a laboratory at the works of Steel, Peech & Tozer and the results conveyed back electronically to the melting shop in less than ten minutes. This rapid analysis has been made possible by the installation of an American-designed Swiss-made instrument known as a Quantometer.

The instrument, which is the first to be installed in a British steelworks, is now working nearly 24 hours a day on production checks. Time taken for the actual analysis of a steel sample is only one minute, yet the accuracy of the results compares favourably with those obtained by slower, traditional methods. The Quantometer is housed in a specially air conditioned room, where temperature and humidity are controlled to close limits.

Grating Spectrometer Used

A 1.5 meter grating spectrometer is used in which the Rowland circle is mounted vertically. This covers a spectrum range of 2,000-7,000 A. with a dispersion of 6.95A/mm. in the first order and 3.5A/mm. in the second order. A recording console contains the measuring circuits, power supplies, attenuators, automatic timers and switching mechanisms, and also controls the sequence of operations in the various steps of the analysis.

The sample itself is used as the electrode, with a counter electrode of pure graphite. Normal conditions are a measured gap of 3 mm., a pre-integration time of 5 seconds and an integration time of 20 seconds.

Pre-selected lines in the resultant spectrum are isolated by the respective slits and focused by mirrors on to multiplier phototubes. The photocurrents in each case charge a condenser with a very high dielectric constant. A selected iron line is included as an internal standard. When the voltage of this iron line reaches full-scale deflection the exposure is automatically terminated and the charging of all condensers ceases. A stepping switch selects the other condensers in sequence and records the charge of each on a chart. The height of this step represents the concentration ratio of each element concerned. The instrument is pre-calibrated against standard samples.

Anti-Static Agents

PLASTICS have excellent electrical characteristics, but it seems that a price has to be paid for this. Due to the presence of surface charges set up during manufacture or by polishing or normal handling many plastics tend to pick up dust from the atmosphere and to hold this dust tenaciously.

The degree of pick up varies with the nature of the material, polystyrene appears to be the worst, followed by methyl methacrylate and polythene.

The Armour Chemical Division believe that they have at least a partial answer to this problem in Arquad 18-50 per cent, a 50 per cent solution of a quaternary ammonium salt in isobutyl alcohol. The 50 per cent solution is diluted to 1 per cent with tap water and the article to be treated is dipped in this solution. On drying an anti-static mono-molecular layer is formed which will last under normal conditions for a year or more.

Arquad is best applied to moudings straight from the press but if this is not possible it recommended that the article be cleaned with some non-ionic detergent.

The Future of Acetylene

continued from page 84

be dangerous materials. Their field was one of complexities—technical and legislative because authority must regulate such potentially dangerous materials. They hoped that the Association stood for common sense amid these complexities on behalf of members, large or small, in industry, and on behalf of local authorities as well.

Outlining the activities of the BAA, Dr. Peakin said that delegates had been sent to the meetings on the Continent of the CPI which was tackling with success some technical problems of great interest to the carbide industry such as the factors which influence the reactivity of carbide, the pros and cons of dry generation of C_2 H_2 and most recently, the means which could be adopted to reduce dust emission from carbide factories.

In conclusion, Dr. Peakin paid tribute to the British Industrial Solvents Division of the Distillers Company and the British Oxygen Company for maintaining the stability of the finances of the Association through contributions.

• HOME •

Foremen Visit Firm's Exhibition Stand

Two groups of foremen (16 in all) employed by Quickfit & Quartz Ltd., manufacturers of interchangeable laboratory glassware, of Stone, Stafford, visited the companys' stand at the recent British Instrument Industries Exhibition at Earls Court, London, as part of the firm's staff relations policy.

Babcock & Wilcox Get Atomic Contract

Contracts for extending Britain's atomic power supply system by several million pounds have been placed with Babcock & Wilcox Ltd., suppliers of the steam plant for the original station at Calder Hall. The new contracts cover what is in effect three new Calder Halls. Eight steam towers each 80 ft. in height, will be supplied to a new station to be known as Calder Hall 'B'. Two further installations totalling 16 towers, will be supplied to a power station at Chapelcross near Annan in Dumfriesshire.

Gasworks Explosion

An explosion in a 200,000-gal. tank of ammonia at Beckton gas works, London, on 29 June is believed to have killed 16-year-old Peter Clark, of Harold Hill, Essex. It was thought he might have been flung into the Thames by the blast. Police dragged the river and the tank. Four men were injured by the explosion.

RIC (Tennis & Dancing)

The London section of the Royal Institute of Chemistry will hold a tennis tournament and dance on 16 July at the sports ground of the University of London (King's College), Lavender Avenue, Mitcham, Surrey. Tickets for the tennis tournament (2s. 6d.), and the dance (3s. 6d.), can be obtained from Dr. W. D. Raymond, Colonial Products Laboratory, Imperial Institute Building, South Kensington, London S.W.17.

Duty Application

The Board of Trade is considering an application for an increased protective duty on sodium hydrogen glutamate. Those wishing to make representations should do so in writing, addressed to the Board of Trade, Industries & Manufactures Division, 1a Horse Guards Avenue, London S.W.1, not later than 23 July.

Chemical Trade Figures

The Ministry of Labour's records show that 503,000 people were employed in the chemicals and allied trades in this country at the end of May. Of this total 356,000 were men, 147,000 women. By far the biggest number of these (210,000), were engaged in chemicals and dyes. Among male workers only two per cent were aged 65 and over, and of all 24 industries listed, this was equalled only by the gas, electricity and water trades.

Grammar School Training Scheme

The Kestner Evaporation & Engineering Co., London, has asked the Duke's Grammar School, Alnwick (Northumberland) to take part in a training scheme for youths wishing to enter the chemical industry. Mr. J. A. Reavell, the chairman of the company, was a pupil at the school. The proposed training will consist of a two-years' course of practical experience and attendance at a technical college to study for the National Certificate in Chemical Engineerng.

Plasticiser Costs

Owing to continued increases in the price of phthalic anhydride, British Industrial Solvents announce that the prices of certain plasticisers in the 'Bisoflex' range are increased with effect from 1 July. The increases are: 'Bisoflex' 791 by 1½d. to 2s. 2½d., 'Bisoflex' 91 by 1½d. to 2s. 1d., dimethyl phthalate by 1¾d. to 1s. 9¼d., diethyl phthalate by 1½d. to 1s. 11¾d., and diamyl phthalate 3d. to 3s. 1¾d. per pound.

'Pyrex' Price Changes

It is announced by Q.V.F. Ltd., of Stone, Staffs, that certain price changes, effective from 1 July, have been made for James A. Jobling's range of 'Pyrex' pipeline. In certain cases primary costs have necessitated price increases, but in others it has been possible to make price reductions owing to increased efficiency and revision in production costings.

Metal Box Lease Building

The Metal Box Co. Ltd. have concluded arrangements to lease the greater part of a new building to be erected in Baker Street, London. Due to be completed by December next year, it will provide head offices for the company of about 120,000 sq. ft.

• OVERSEAS •

1,000,000 Gallon Alcohol Plant

Saugbrugsforeningen, one of Norway's largest timber-processing organisations, has constructed a plant to produce 1,000,000 gal. of 96 per cent proof alcohol a year.

Westphalian Rubber Project

A new synthetic rubber plant which will raise the German Federal Republic's yearly production to about 30,000 tons is being built at Huels in Westphalia. In 1954 the total rubber consumption amounted to 144,000 tons, of which 127,000 tons were natural rubber. More than 20 German factories produced 4,744 tons of latex in 1954.

New Chemical Plant

Hooker Chemicals Ltd., of Vancouver, Canada, has announced that it will start construction shortly on a $11,000,000 chlorine-caustic soda plant in north Vancouver. The decision to proceed with the construction of this first chemical plant of its kind on the BC Coast was announced by R. Lindley Murray, president of Hooker Chemicals and of Hooker Electro-Chemical Co. of Niagara Falls, NY. Clearing of the 75-acre site will start shortly. The plant is expected to be in operation early in 1957.

Uranium Plant in Production

The $2,500,000 plant designed to make Canada self-sufficient in pure uranium supplies, at Port Hope, Ontario, has started production. Previously Canada shipped uranium ore to the US for processing.

Swedish Pulp Production

Production of chemical pulp in Sweden last year was a record, totalling 2,825,000 tons. Of this 1,550,000 tons was sulphite pulp; about 1,280 tons sulphate pulp.

Zinc Oxide Factory

The zinc oxide factory being built at Sao Paulo by Tennant Importacoa e Exportacao Ltda. in conjunction with other Brazilian interests, is nearing completion. An initial capacity of 500 tons a month is planned; the bagging and other facilities being designed for a monthly production of 1,000 tons. The Durham process will be used, and British and Canadian engineers will give technical assistance in the early stages. The factory should maintain an output sufficient to meet Brazil's total requirements.

US Expects Record Plastics Sales

Current indications are that the volume of plastics sales in the US this year will surpass those of 1953, a record year. Increases from 15 to 25 per cent are estimated. One company has reported a 35 per cent increase for the first six months of this year.

Mexican Fertiliser Production

Mexico's production of fertilisers rose by 462 per cent in the five years 1950-54. Imports rose by 275 per cent—from 15,474 tons to 58,097 tons. The overall increase in consumption during the five years was 397 per cent. Nacional Financiera, a Government agency, anticipates that three new fertiliser plants will be constructed during the next few years, but states that the Mexican market can absorb immediately another 150,000 tons a year, chiefly of chemical fertilisers.

British Laboratory Glassware in Vienna

Quickfit & Quartz Ltd. will exhibit a comprehensive range of British laboratory glass apparatus at a five-day meeting of microchemists which starts in Vienna next Tuesday, 12 July. Their Vienna agent, Dr. Carl Plank, of Jordangrasse 9, Vienna 1, organised the exhibits.

Potash Syndicate Sterling Loan

At the recent annual conference, the management of Kali Chemie, the West German fertiliser company, told shareholders that difficulties preventing a settlement of the Potash Syndicate Sterling Loan would be overcome this year.

Government Quinine Factory

When opening the new Government quinine factory in the Annamalai Hills, Mr. Spri Prakasa, Governor of Madras, said that through the factory the country would achieve self-sufficiency in the manufacture of quinine.

West Bengal Oil Deposits

Preliminary surveys carried out by the India Stanvac Projects—a joint enterprise of the Standard Vacuum Oil Co. and the Indian Government—have revealed the possibilities of oil deposits in the West Bengal basin. An application has been made to the Government (holders of 25 per cent of the shares) for a licence for exploring oil.

• PERSONAL •

The Geigy Co. Ltd. have appointed MR. L. R. DOWSETT, M.A. (Cantab.), to the new post of sales manager (plastics & chemical division). He will operate from head offices at Rhodes, Middleton, Manchester. Mr. Dowsett was previously sales manager for this division in the London area. He is succeeded in the London office by MR. G. H. MANN, B.A.(Cantab).

After 44 years with Babcock & Wilcox Ltd., MR. R. J. GLINN, M.I.Mech.E., has retired. He has also retired from the board of the Calorizing Corp., of which he has been a director since 1928. After leaving University College, London, with honours in mechanical engineering, he joined Babcock & Wilcox Ltd. as an apprentice in 1911. Mr. Glinn has been a member of the Institute of Mechanical Engineers since 1915, and has given two papers and served on the council. He was a member of the Admiralty Committee on Boiler Corrosion, and of the Industrial Water Committee of Investigation set up by the British Iron & Steel Research Association. He has also served on a number of committees of the British Standards Institution.

MR. ERNEST MYERS, Durham Divisional Coal Preparation Engineer for the National Coal Board, has retired after 50 years in the coal, coking and by-product industries. Mr. Myers has served as president of the Coke-Oven Managers' Association, and chairman, vice-chairman and secretary of the Society of Chemical Industry.

MR. GEORGE HOLTON, president and chairman of the Socony Mobil Oil Co. of New York, who retired from the company on 1 July, made the following appointments to take effect after his retirement: MR. B. B. JENNINGS to be chairman, and to continue as chairman of the executive committee and chief executive officer of the company; MR. ALBERT NICKERSON to be president. MR. PAUL V. KEYSER to be a member of the board and vice-president; MR. AUSTIN FOSTER to be a director and to continue as general counsel; and MR. LAWRENCE KING and MR. HERMAN SCHMIDT to be associate general counsel.

The Texas Company has announced the election of MR. JAMES W. FOLEY, B.S., as executive vice-president of the company. Mr. Foley joined the Texas Company in 1932, and after serving abroad with the Bahrain Petroleum Co. Ltd., in which Texaco has a 50 per cent interest, he held various senior positions in the domestic producing department.

At a meeting of the board of directors held on 28 June, DR. J. W. BARRETT, B.Sc., D.I.C., F.R.I.C., A.M.I.Chem.E., was appointed a director of Monsanto Chemicals Ltd. Dr. Barrett joined Monsanto in 1941 as a group leader in the then research department. He was appointed assistant director of research and development in 1950 and later the same year became general manager of the development division. In 1954 he was appointed a member of the company's executive committee. As a director he will continue his present responsibility for the company's research and development activities. He is also a director of Monsanto (Soil Conditioners) Ltd., Monsanto Plastics Ltd., and Monsanto Phosphates Ltd.

MR. W. B. H. GALLWEY has been appointed managing director of Union Carbide. He has also been elected a member of the board of Gamec and appointed its managing director.

DR. WALTER J. MURPHY, editor of the American Chemical Society's journals *Chemical & Engineering News, Industrial & Engineering Chemistry, Analytical Chemistry* and *Journal of Agricultural & Food Chemistry*, is arriving in England on 10 July. Dr. Murphy will attend the annual meeting of the Society of Chemical Industry at Birmingham, (11-16 July), the meetings at Zurich of the International Union of Pure & Applied Chemistry (21-27 July) and the United Nations Conference on Peaceful Uses of Atomic Energy which opens at Geneva on 8 August before leaving for Washington on 11 August. In between these engagements Dr. Murphy will visit London, Paris and Germany.

MR. J. W. FOLLETT, a director of the

Triplex Safety Glass Co., has been appointed sales director.

SIR HAROLD WEST, C.I.Mech.E., F.I.I.A., J.P., managing director of Newton Chambers & Co. Ltd. has announced his intention to retire. This news was told by the chairman, MR. P. G. ROBERTS, M.P., when the Thorncliffe management met recently. The board has appointed MR. P. J. C. BOVILL (an assistant managing director and general manager of the chemicals division) a member of the board with effect from 1 July with a view to his eventually succeeding Sir Harold as managing director. Sir Harold West joined Newton Chambers Co. Ltd. in 1919. Badly wounded in the First World War, Sir Harold became senior technical assistant to the Surveyor General of Supply at the War Office from 1917 to 1919. He was knighted for industrial and educational services in June, 1948. He became managing director of Newton Chambers & Co. Ltd. in 1941, and vice-chairman from 1953. Another company announcement is that of MR. S. L. WAIDE, B.A., to be general manager of the chemicals division. Mr. Waide, an Ulsterman who entered industry with Shell-Mex & B.P. Ltd. in 1934, took over his new duties last Monday.

Obituary

SIR HAROLD TEMPANY, C.M.G., C.B.E., F.R.I.C., an authority on tropical agriculture and editor of *World Crops*, died at his London home last Saturday aged 73. Sir Harold, educated at the County School, Richmond, Surrey, and at University College, London, spent a long and distinguished career in the colonies.

His first overseas post was in 1903 as an assistant agricultural chemist in the Leeward Island. Later he became superintendent of agriculture there. In 1917 he went to Mauritius as director of agriculture and in 1924 became the first principal of the Mauritius College of Agriculture. From 1929 to 1936 he directed agriculture in the Strait Settlements and Federated Malay States.

In 1936 the Colonial Office appointed him assistant to its agricultural adviser. In 1940 Sir Harold succeeded Sir Frank Stockdale as agricultural adviser. He retired from the service in 1946, the year in which he was knighted.

Before and after his retirement, Sir Harold held many other offices. He was chairman of the commission of inquiry into the Uganda Cotton Industry in 1938; made a member of the board of governors of the Imperial Institute in 1942; of the governing body of the Imperial College of Tropical Agriculture from 1941 to 1946; and of the Chemical Council from 1940 to 1943. In 1950 he was awarded a silver medal of the Royal Society of Arts. He was the author of numerous technical papers and reports. His books include 'Principles of Tropical Agriculture' (with G. E. Mann), and 'Soil Conservation Practice in the Colonial Empire'.

Will

PROFESSOR CHARLES OLDEN BANNISTER, of 69 Albion Street, New Brighton, Professor Emeritus of Metallurgy in the University of Liverpool, left £11,346 (net £11,251).

Glue Laboratory

LEICESTER, Lovell & Co. Ltd., manufacturers of Casco synthetic resin and casein glues, have opened a new laboratory building at North Baddesley, Southampton. This is said to be another stage in the overall expansion programme of the company.

The building contains the research laboratory, the technical service laboratory, offices, stores, power house and a special reaction room. The laboratories are designed to have the maximum amount of floor space and are planned so as to be capable of longitudinal expansion. The routine control laboratory, remains in the former laboratory building which is closer to the works.

Safety Measures Pay

EFFECTIVE safety measures have enabled the US coke industry to reduce injuries by nearly 90 per cent during the last 37 years, reports the Bureau of Mines, a Department of the Interior. The total man-hours worked at coke-ovens dropped 37 per cent between 1918, the industry's worst year for injuries, and 1952, the year for which figures are given in the bulletin.

In 1918, 7,865 men were killed or injured, and the combined fatal and non-fatal injury rate was 78.53 per 10,000,000 man-hours. By 1952 the number killed or injured had declined to 554. This represents a 93 per cent reduction in the number of injuries, and an 89 per cent drop in the injury-frequency rate.

Publications & Announcements

ROYAL Doulton Potteries, Doulton House, London S.E.1 have produced a new 'Corundum' grade of porous ceramic for the filtration of liquids and gases under exceptionally arduous conditions. Seven standard pore sizes are produced, ranging from 27 to 750 microns. This new material is claimed to possess good chemical inertness, high abrasion resistance, increased mechanical strength and resistance to thermal shock and fatigue. A 36-page catalogue giving further details may be obtained from the manufacturers.

* * *

W. C. HOLMES & Co. Ltd. the Huddersfield engineers announce production of the re-designed Holmes-Western valve. Designed for use in the gas industry, the valve is linked with more than 50 years' work in this field, beginning when the rights of the Holmes patent rotary scrubber washer were exchanged with the Western Gas Construction Co. of America for the patent rights of the Western gas valve, known to-day as the Holmes-Western valve. The re-designed valve embodies advantages of new materials, modern production methods, and progressive development. In the re-design of the range of valves standardisation has been effected so that components are interchangeable. The spindles of all valves are of stainless steel to a specification which has proved in service to be highly resistant to corrosion in crude gas conditions. To meet the safety recommendations of the Institution of Gas Engineers for the safe opening of gas works plant the vent plugs are of a size to ensure free discharge to atmosphere of any gas which may pass the faces.

* * *

THE US Information Service has just released the first issue of *Atoms for Peace Digest* which it will publish every two weeks. It is planned to present two or more illustrated features on the peaceful uses of atomic energy, and news items covering atomic developments in this field in the US. Publication is timely, coinciding with announcements that home heating by atomic energy is but a year or so distant, that atomic railway engines may be operating within 10 years, and that the US Government is to build two atomic-powered merchant ships. It has also been stated that private industry in the US will spend $390,000,000 on nuclear research in the next four years, of which $300,000,000 will be used for developing atomic furnaces. This first issue outlines President Eisenhower's new atomic power plan, illustrates the latest US atomic electricity developments, and the 'Atoms for Peace' exhibition now touring Britain, among other features.

* * *

THE dangers to the natural flora and fauna of the countryside that may arise from the use of toxic chemicals in agriculture, and the precautions to be taken in their use are dealt with in the third report of a working party under the chairmanship of Professor Zuckermann. This completes the survey of matters associated with the use of toxic chemicals in agriculture. In late 1952 there was a number of casualties to wild birds and animals in fields sprayed with organo phosphorus insecticides, demonstrating the risks attached to the use of these chemicals. The working party does not consider that further legislation is needed at present. It does recommend, however, that the interdepartmental advisory committee should keep under review the dangers to wild life arising from the use of toxic chemicals in agriculture. Many animal deaths have arisen from a lack of care and co-operation, and the adoption of the precautionary measures described in the report is strongly recommended. Suitable warnings should be given on the containers of toxic materials, and the advertising and labelling of rodenticides should not convey the impression that they are harmless to animals other than rats. The report 'Toxic Chemicals in Agriculture —Risks to Wild Life' is published by HMSO, price 1s. 6d.

* * *

'MATCH any colour, mass produce any shape—it can be done with Lustrex'. And to prove it, Monsanto Plastics Ltd. have issued a striking coloured booklet, lavishly illustrated showing the various tests Lustrex is given for strength, colour consistency, dimensional stability, mouldability, as well as its versatility of use ranging from football studs to radio cabinets; office equipment to toys.

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.)

NATIONAL CARBONISING CO. LTD., London E.C.—3 June, £1,000 debentures, part of a series already registered. *Nil. 13 January, 1955.

PURE CHEMICALS LTD., London E.C.—20 May, £6,453 charge and £2,695 mortgage (Sec. 97, 1948 Act), to City of Liverpool; charged on specified properties at Kirkby Trading Estate, with fixed plant and fixtures. *£8,156. 17 June, 1954.

Increases of Capital

ALLIED COLLOIDS (MANUFACTURING) CO. LTD., chemical manufacturers, by £35,000 beyond the registered capital of £40,000; HUBRON RUBBER CHEMICALS LTD., by £25,000 beyond the registered capital of £50,000; E. R. SQUIBB LTD., manufacturers of drugs and chemicals, increased by £50,000 beyond the registered capital of £150,000; ZINC ALLOY RUST-PROOFING CO. LTD., by £50,000 beyond the registered capital of £65,000.

Company News

Johnson & Matthey

Johnson & Matthey, metal refiners, etc., report an effective increase of 2 per cent in the ordinary dividend. Profits, before tax, have risen by over £620,000 to £1,732,074 for the year to 31 March last, and after higher British taxation charge the net balance is up from £556,011 to £887,524. A final dividend of 6 per cent makes 9 per cent on the £3,987,435 ordinary capital as increased by a 200 per cent free scrip issue, compared with the equivalent of 7 per cent represented by the 1953/54 total of 21 per cent on the old capital.

Whessoe Ltd.

The value of production in the year to 31 March by Whessoe Ltd., makers of capital plant for the oil, gas and chemical industries, did not fall as was partly expected. Plant fabricated at the works was erected on 100 sites in Britain. One of eight firms linked with Nuclear Power Plant, Whessoe built, among others, two reactor vessels for the first nuclear power station at Calder Hall. The AGM of the company will be held on 26 July in London. Profit for the year after providing for depreciation, directors' remuneration and bonus to employees is £624,366 compared with £693,846 and £467,606 in 1953/54 and 1952/53 respectively. Taxation is lower and the available net balance of profit is £319,366 against £273,846 and £152,606 in those years respectively. In January an interim dividend of 5 per cent was paid on the then ordinary stock of £600,000. The directors recommend a final dividend of 15 per cent on the present ordinary stock of £1,000,000.

Saint-Gobain S.A.

The progress made by Saint-Gobain SA, of Paris, manufacturers of glass and chemical products, last year paralleled the upward surge of the French economy. New plants started production, and the investment programme continued. Capital expenditure for the year amounted to Frs.3,666,000,000. This was stated at the AGM held recently in Paris. The French glass industry went ahead, and total output was 834,000 tons, which represented a production increase of 9 per cent. The company shared in this advance, particularly with fibre glass, and in association with a French company and the Corning Glass Works, a US firm, is building a new plant at Bagneaux. Production in the chemical division showed a steeper rise. Total tonnage delivered by the company's plants exceeded the previous year's figures by 20 per cent for inorganic chemicals used by industry, and by 43 per cent for organic chemicals. Sales of sulphuric acid rose by 13 per cent, and soda-hydrosulphide stood out among sulphur derivatives with an increase of 67 per cent. The balance sheet at 31 December, 1954, totalled Frs.57,447,231,806, an increase of

Frs.3,126,983,587 over the preceding year. The profit and loss account showed a net profit after the usual appropriations of Frs.1,258,588,145, which together with the balance of Frs.148,037,292 brought forward from the previous year, amounts to Frs.1,406,625,437. The resulting balance of Frs.1,083,788,770 will be disposed by distributing dividends amounting to Frs.426 net per share of Frs.3,000 and Frs.710 net per share of Frs.5,000.

British Glues & Chemicals Ltd.

Consolidated profits for the year ended 31 March of British Glues & Chemicals Ltd. is £860,126 (£676,896), after all charges other than United Kingdom tax, amounting to £406,000, leaving a net profit of £454,126 (£317,896). After deducting £40,370 profit retained by subsidiary companies, the profit dealt with in the accounts of British Glues & Chemicals Ltd. is £413,756 (£333,183). To this is added £63,668 balance of profit brought forward from the previous year, making £477,424 available for appropriation. Appropriations are: £165,000 to general reserve; £50,000 to replacement reserve; £13,266 to write down loose plant, tools and equipment to the nominal figure of £1, and £55,8000 contribution to pension scheme. The directors recommend on the preference stock a half-yearly dividend of four per cent, making eight per cent for the year; and on the ordinary stock a final dividend of 15 per cent, making 20 per cent for the year (last year 20 per cent on smaller capital).

Benzol & By-Products

At the extraordinary general meeting of Benzol & By-Products held on Monday, 4 July, it was resolved that the company should go into voluntary liquidation, and that the liquidators should be Mr. M. Board, of Cobden & Co., and Mr. T. Whittam, of Hargreave Brown & Benson. The chairman, Mr. N. E. Webster, announced that with regard to the board's circular of 11 June, it was now apprehended the liquidators would be in a position to pay at least 15s. per ordinary share during July, together with a proposed total payment of 31s. 11d. per share to preference holders.

Richard Costain Ltd.

At the annual general meeting in London recently, Sir Richard Costain, C.B.E., chairman and joint managing director, said that Costain John Brown Ltd., an associate company, was continuing the expansion of its chemical engineering business and had obtained contracts from the Government and several chemical firms.

Electrodialysis of Sea Water

The Netherlands Institute for Applied Physics Research announced last week that its research efforts into the desalination of water by means of electrodialysis are to be taken up internationally on a much enlarged scale. Britain, Australia, South Africa, and probably the United States, are reported to be participating in this international effort. France is also reported to be interested, and talks on still wider participation are going on with a number of other countries.

Market Reports

LONDON.—The home demand for industrial chemicals continues to be well maintained with activity spread over most sections of the market. Export trade inquiry remains good, and with the end of the dock strike the steady expansion in overseas trade in chemicals, as shown in the May returns, may well continue. Prices generally are firm at recent levels. As from 1 July, potassium carbonate calcined 96/98 per cent was increased to £74 per ton for 1 ton lots ex store. Owing to the higher cost of phthalic anhydride, the makers of certain plasticisers in the Bisoflex range have been increased. Dimethyl phthalate is 1¾d. per lb. and diethyl phthalate is 1¼d. per lb. dearer. Active trading is again reported in the coal tar products market with naphthalene firm on a difficult supply position.

MANCHESTER.—Annual holiday stoppages at consuming works continue to exert the usual seasonal influence on the demand for heavy chemical products in Lancashire and West Riding areas, but in spite of this a reasonably steady flow of inquiry has been reported on the Manchester market during the past week, with actual replacement business in the alkalis and other leading lines on a fair scale. Prices are on a firm basis pretty well throughout the range. As usual at this time of the year fertilisers, with a few exceptions, are a quiet trade, but in the tar products section steady trading conditions are reported.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

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

A. BOAKE, ROBERTS & CO., LTD., CARPENTERS ROAD, LONDON, E.15. manufacturers of Industrial and Fine Chemicals, have vacancies in their Production Dept., for **CHEMISTS & CHEMICAL ENGINEERS** to manage manufacturing plants. Applicants should possess an honours degree in chemistry or chemical engineering, or should be members, by examination, of an appropriate professional institution: in addition, they should have some years' industrial experience, preferably in chemical plant control. Initial salary will be in accordance with age and experience, but will not be less than £750 per annum. The prospects of advancement are excellent, as the company is undertaking a programme of development and expansion. Applications should be addressed to **THE WORKS DIRECTOR.**

A. BOAKE, ROBERTS & CO., LTD., CARPENTERS ROAD, LONDON, E. 15, manufacturers of Industrial and Fine Chemicals, require the services of **SHIFT CHEMISTS** for plant control and supervision. Academic qualifications will be an advantage, but are less essential than industrial plant experience. The work is interesting and varied, and the appointments will be progressive, with every opportunity for advancement. Initial salary will be in the range of £600 to £700 per annum. Applications, plainly marked "Shift Chemists," should be addressed to **THE WORKS DIRECTOR.**

INDUSTRIAL CHEMIST required by leading container closure manufacturers in Midlands. Progressive position requiring knowledge metal printing, varnishing, stoving, and metallurgy, associated with food packaging industry, Maximum age 35 years.—Written applications, with details of experience previous appointments, etc., to **P. A. METAL CLOSURES LTD., BROMFORD LANE, WEST BROMWICH, STAFFS.**

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

CHEMICAL PLANT MANAGER is required by well-known and progressive Chemical Manufacturing Company in S.W. Lancashire. The successful applicant will probably be between 23 and 35 years of age; hold a University degree or an equivalent qualification; have had some industrial experience; possess unlimited energy, drive and the personal qualities required to manage effectively.

The initial salary will be commensurate with age, qualifications and experience, in the range £650 to £850 per annum.

Please send full particulars of qualifications, positions held, age, etc., quoting Ref. P.52, to Personnel Manager, **BOX No. C.A. 3417, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

THE DISTILLERS COMPANY LIMITED.

THE COMPANY has the following vacancies for staff in its Research, Development and Production Units situated at or near London, Hull, Cardiff and Liverpool.

(a)– CHEMISTS—research, production and control
(b)– CHEMICAL ENGINEERS—design and development, production control
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(d)– MYCOLOGISTS—production and control
(e)– PHARMACISTS—production and control

These posts involve work on organic chemicals, plastics or antibiotics. Applicants should have good professional qualifications and preferably some experience. Realistic salaries, opportunities for advancement. Non-contributory pension scheme and good general conditions of service. **Apply: Staff Manager, The Distillers Co., Ltd. 21 St. James' Square, London, S.W.1. Please quote: Ref. 35/55.**

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

MINISTRY OF HOUSING AND LOCAL GOVERNMENT: INSPECTOR OF ALKALI, ETC. WORKS. The Civil Service Commissioners invite applications from men for one pensionable post as Inspector under the Alkali, etc. Works Regulation Act 1906. Candidates must be university graduates in science or technology and preferably also Corporate Members of the Institution of Chemical Engineers, or Fellows or Associates of the Royal Institute of Chemistry, but exceptionally a candidate possessing other appropriate qualifications and of outstanding ability may be admitted. A wide working experience of the heavy chemical and related industries is essential. Age at least 35 on 1st May, 1955. Salary Scale (London) £1,280 (at age 37) with a deduction of £45 for each year below that age—£1,525. Remuneration for a 45½ hour week in London approximately £1,420 (at age 37)—£1,658. Provision for starting pay above the minimum for an outstandingly qualified man.
Application form and particulars from **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, 30 OLD BURLINGTON STREET, LONDON, W.1,** quoting No. 8448/55. Applications to be returned by 16th August, 1955. 6856/120/6/55/FW

GRADUATES in **MECHANICAL** and **CHEMICAL ENGINEERING** required for progressive positions in the Research, Design and Production Divisions of THE POWER-GAS CORPORATION LIMITED. Training given to men without previous industrial experience. Apply to:—**STAFF PERSONNEL MANAGER, PARKFIELD WORKS, STOCKTON-ON-TEES.**

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY, ALDERMASTON, BERKS, requires an **ASSISTANT EXPERIMENTAL OFFICER** to assist in experimental work on the explosive properties of airborne dusts of high explosives. Applicants should possess a Higher School Certificate in science subjects, including physics or chemistry, or equivalent qualification. Some previous experience of handling high explosives an asset but not essential.

Salary £310 p.a. (at age 18)—£685 p.a. (male). The successful applicant will be required to join the Authority's contributory superannuation scheme. Housing accommodation will be available within a reasonable period for married officers who live outside the radius of the Establishment's transport facilities or alternatively the Authority may be able to assist successful applicants in the purchase of a house. During this period a lodging allowance may be payable.

Requests for application forms by **POST CARD** to **SENIOR RECRUITMENT OFFICER, A.W.R.E., ALDERMASTON, BERKS.** Quote reference 704/WGE/38.

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

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CAST-IRON PIPES, 1,200 yds. 10 in. and 400 yds. 8 in., **NEW.** Also most other sizes, up to 24 in. bore.
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13 Totally enclosed **SOLUTION MIXERS,** 12 ft. long by 6ft. 6 in. diam. Capacity 10,000 litres, construction mild steel plate, with dished ends and heavy glanded spiral type Agitators motorised 400/3/50. Mounted on mild steel stands. Vessels have top manway 18 in. diam. and 7 in. by 2 in. diam. bottom outlet. W.P. 70 lb.
TROUGH MIXER by Werner Pfleiderer, twin Z Blades. Trough 2 ft. 8 in. by 2 ft. 8 in. by 2 ft. 2 in. Hand tilting.
Rubber lined **BALL MILL** by Boulton, 28 in. long by 22 in. diam. steel outer casing with filling hole. Motorised 400/3/50. In cast iron frame.
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NEW PORCELAIN AND SILEX LINED BALL MILLS, capacities ranging from 9 gallons to 260 gallons.
NEW STAINLESS STEEL STORAGE VESSELS AND TANKS, capacities ranging from 8 gallons to 1,000 gallons.

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DEHNE FILTER PRESS—26 cast-iron plates, 25 in. by 25 in. 2 in. centre hole; screw 3½ in. diam.; 2 columns 3½ in.; overall 9 ft. by 3 ft. 4 in. by 4 ft. high.
Good condition.
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FOR SALE 600 lb. size Young **HORIZONTAL DRY POWDER MIXER;** mild steel body 69 in. by 26 in. by 27 in.; bottom outlet; spiral type blades; roller bearings; gearwheel, pinion and fast and loose pulley drive: fully reconditioned, new body fitted. Price £65/-/- **BOX No. C.A. 3418, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

TWO BRAND NEW STERILISING VESSELS—7 ft. long by 3 ft. diameter.
One S. J. WERNER MIXER with pan approx. 2 ft. by 2 ft. of the tilting type.
Two steam jacketed CAST-IRON FILTER PRESSES—each with 38 s.j. plates and 39 frames, cake size 2 ft. 4 in. square.
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Three Single-effect EVAPORATORS by Scott with pumps and motors.

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WANTED, 2 Horizontal Hydraulic Stearing Hotplate Presses, containing approx. 30/40 Hotplates 2'/2' 6" square. Write giving full details to **BOX NO. C.A. 3415. THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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PATENTS & TRADE MARKS

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THE proprietor of British Patent No. 621480, entitled **"VITREOUS COMPOSITIONS OF MATTER, AND METHODS OF MAKING THE SAME"** offers same for license or otherwise to ensure practical working in Great Britian. Inquiries to **SINGER, STERN & CARLBERG, 14 E. JACKSON BLVD., CHICAGO 4, ILLINOIS, U.S.A.**

THE proprietor of British Patent No. 621897, entitled. **"METHOD AND APPARATUS FOR SEPARATING GASES OR VAPORS FROM MIXTURES THEREOF"** offers same for license or otherwise to ensure practical working in Great Britain. Inquiries to **SINGER, STERN & CARLBERG, 14 E. JACKSON BLVD., CHICAGO 4, ILLINOIS, U.S.A.**

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