

P. 48/46/55

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LV
No. 1411

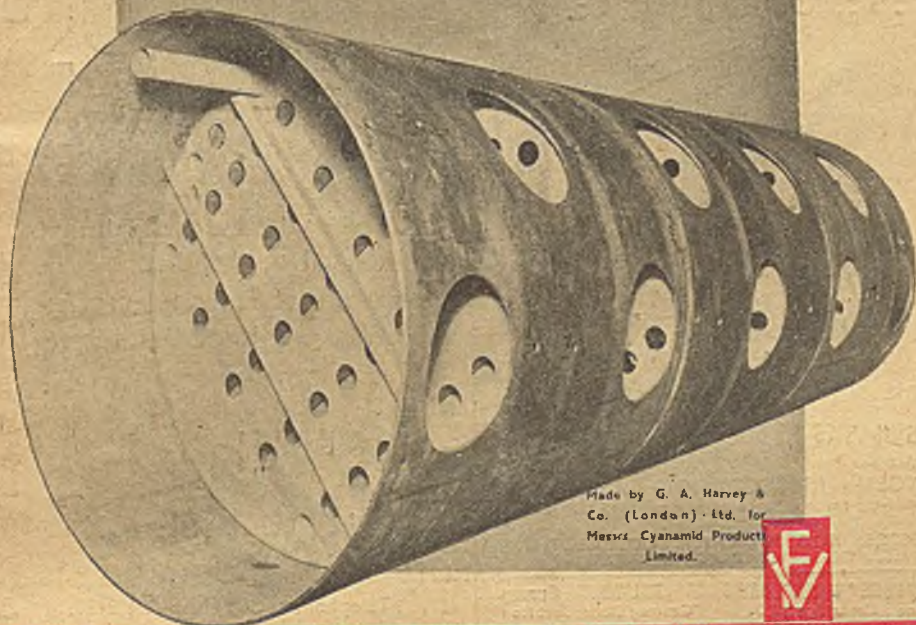
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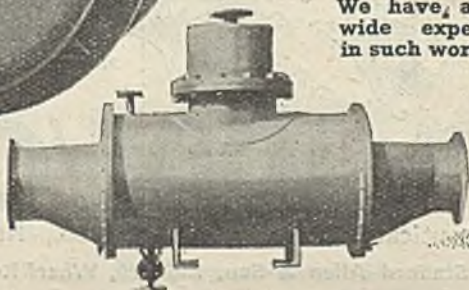
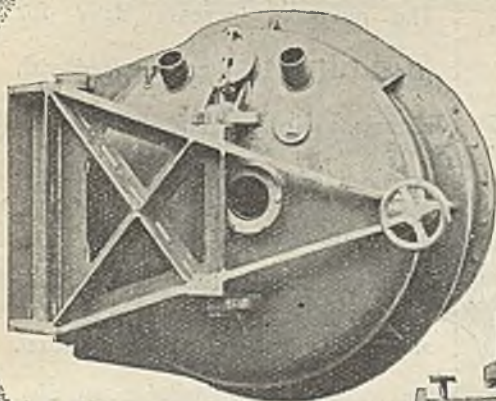
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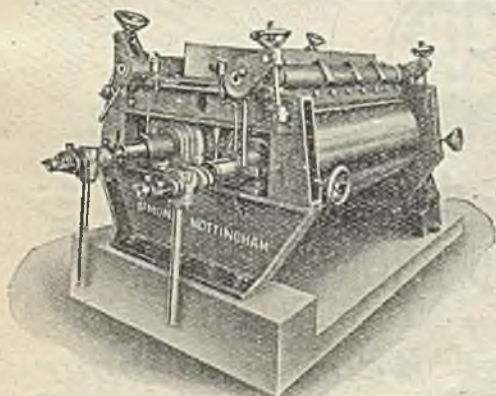
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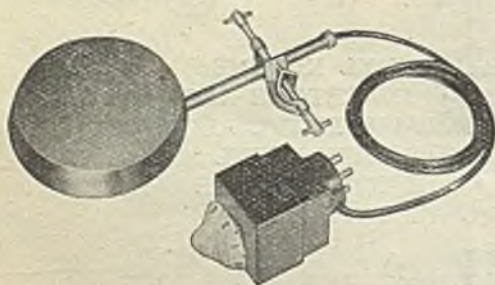


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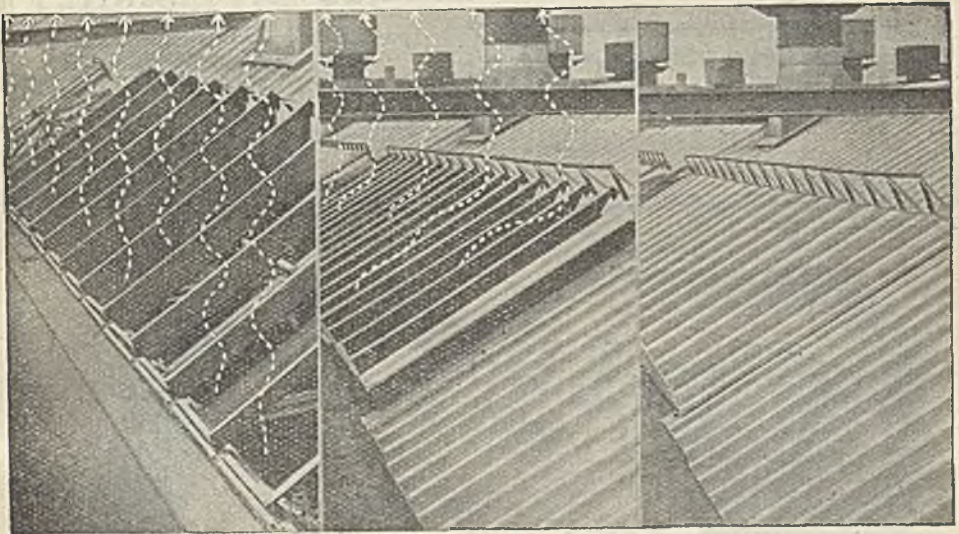
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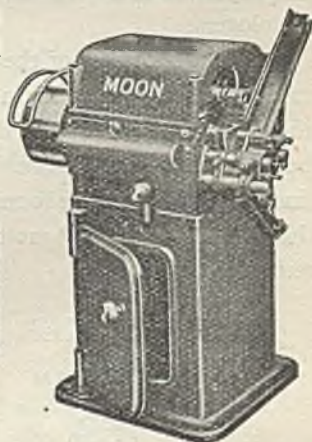
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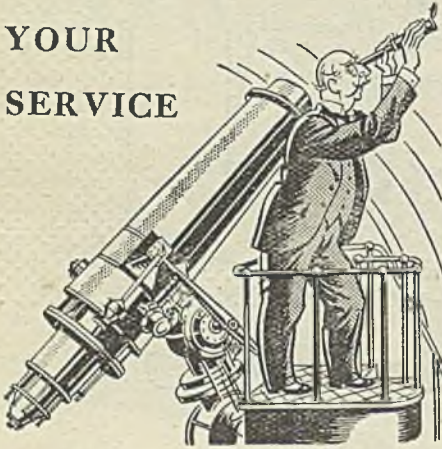
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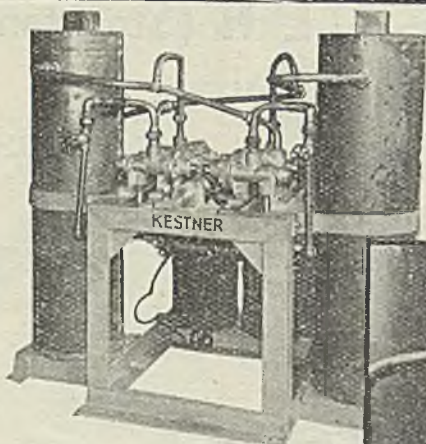
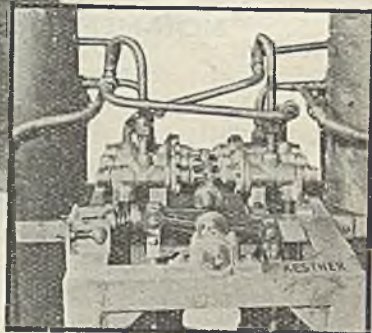


Illustration left: Drying Unit.

Illustration below: Close-up of the Automatic Regenerator and Change-over Valves.



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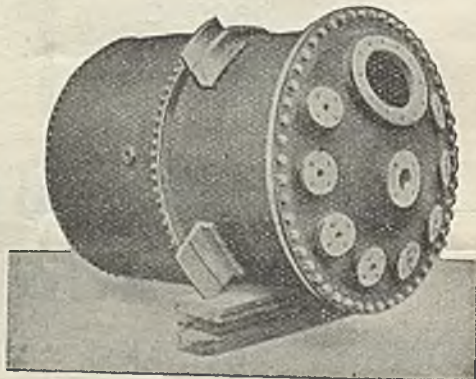
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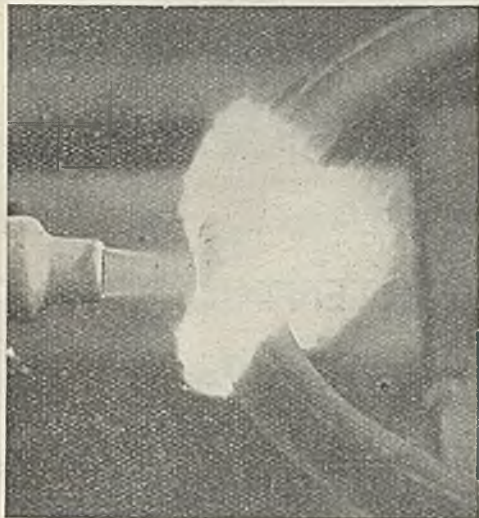
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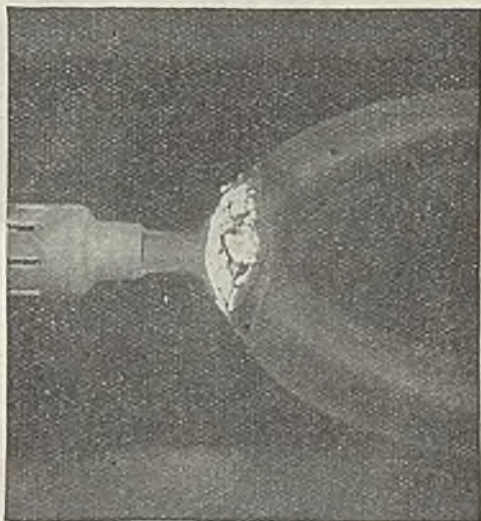
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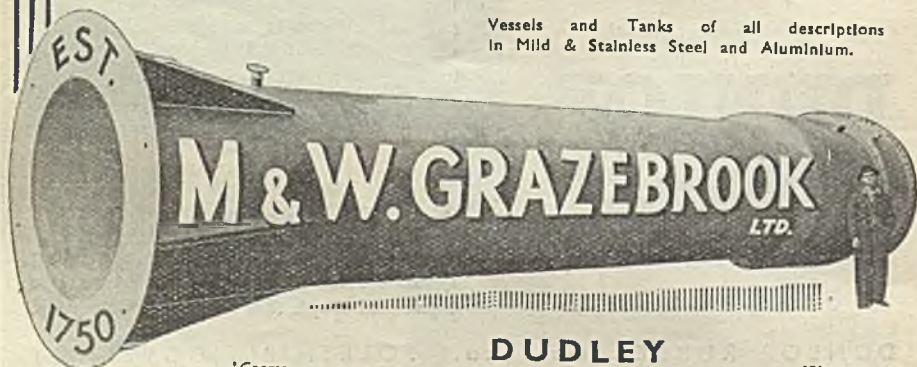
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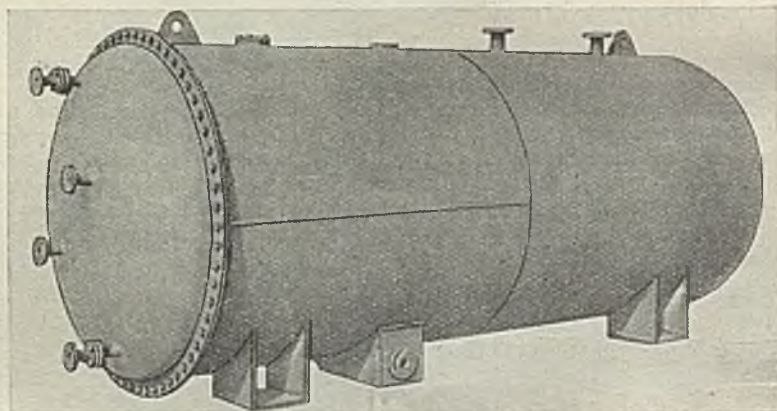


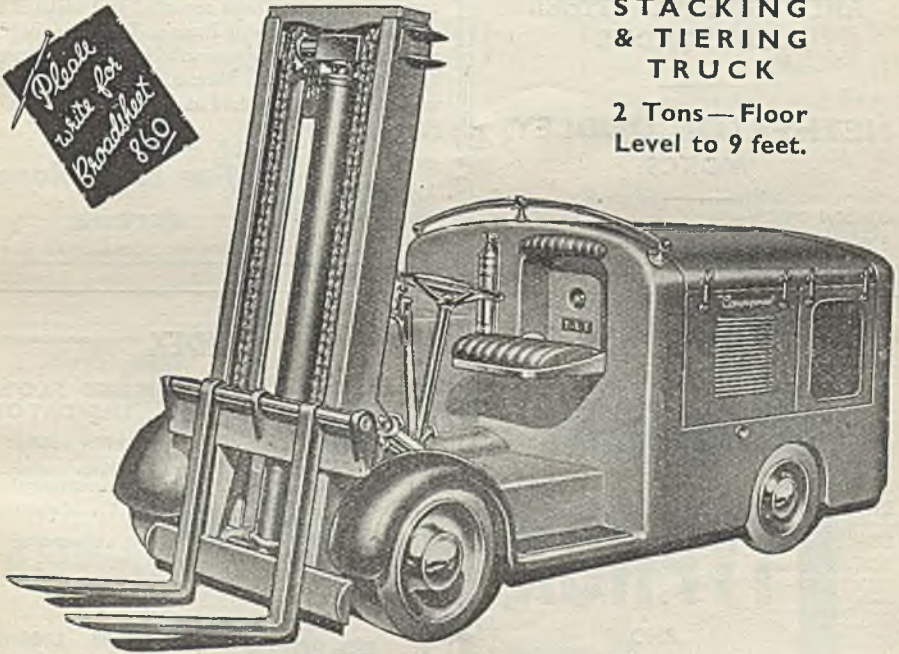
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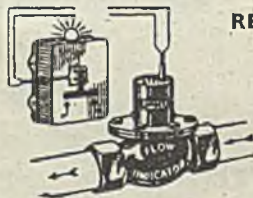
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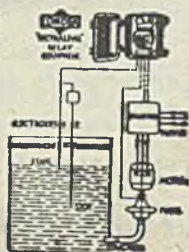
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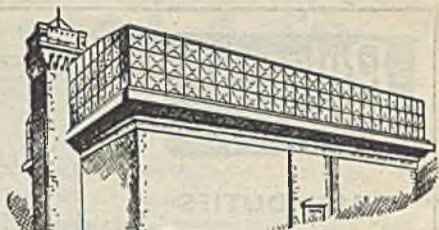
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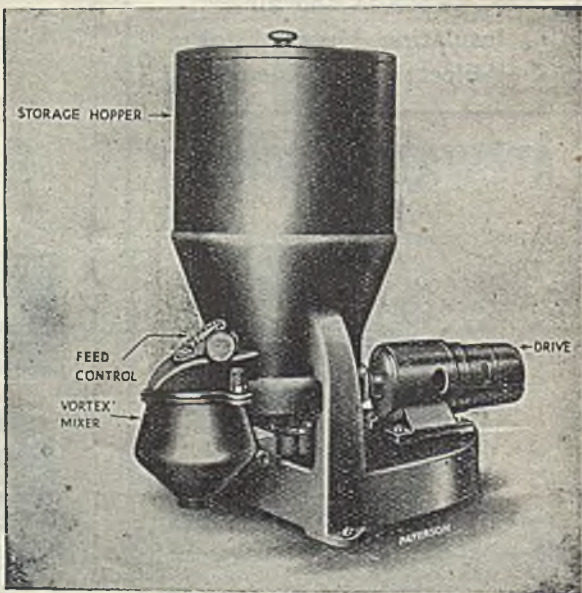
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More About Carbon Black

THE importance of carbon black during the present century has been considerable and it may well have been its significance during the late unlamented war that has been responsible for two papers on the subject this year. One, the address to the S.C.I. by Mr. Alan Speedy, was the subject of our leading article on April 13. The other has lately been delivered by Major W. H. Cadman to the Royal Society of Arts. Major Cadman's paper adds considerably to our knowledge of the history and uses of this material and brings out the not unimportant fact that its major use, in connection with rubber, was a British discovery. The story goes that in 1914-18 a rubber compounder in Britain accidentally added 30 per cent. of carbon instead of 3 per cent. and as a result found he had made a superlatively good tyre.

This story, however, appears to be more than a little apocryphal. It appears far more likely that the discovery was made at Silvertown about 1910 as the result of intentional research into the subject. A test-piece, containing 100 parts by weight of rubber, 10 of sulphur, and 30 of carbon black, was vulcanised by S. C. More on January 1, 1904, and led to a discovery which, according to Dr. H. J. Stern, "must rank among

the greatest of modern times." Certainly it made possible the development of modern road transport, because without this addition rubber is unsuitable for tyres. The result has been that U.S. production of carbon black has leapt from 3000 tons in 1900 to 500,000 tons in 1945.

The carbon black position has changed materially with the coming of synthetic rubber. For compounding with natural rubber, channel blacks are effective and easy to use. They are difficult to use with synthetic rubber, whereas the soft furnace blacks are much easier. Consequently, the demand for furnace blacks increased rapidly during the war. Moreover, since 30 parts of furnace black are equivalent to 10 parts of channel black, the use of furnace black could be regarded as extending the availability of rubber.

A matter of considerable interest is the future of the carbon black manufacturing processes. Important though the product is, and high though its price may be, it is still an inefficient method of using natural gas. Even in the United States, home of prodigality in many things, natural gas is used primarily and most extensively for fuel purposes, both industrial and domestic. The history of carbon black manufacture has

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shown that this operation is discontinued and the plant removed elsewhere when fuel pipelines are laid to handle the gas; carbon production is always subsidiary to the use of natural gas as a fuel. It would seem that either the processes in use must be improved considerably in regard to their yield, or some process must be developed in which carbon black is a by-product. Production in Great Britain has not been very favourable in the past, since we have had no source of methane available that could be used for the purpose; and it is unlikely that any such source will ever be available here. Synthetic methane now under investigation by the Fuel Research Station and the Gas Research Board could not be sufficiently cheap for the purpose, and we are driven to use much heavier hydrocarbons. The difficulty is then immediately to produce a black having the necessary physical properties. There is use for quite a remarkable range of blacks, having diverse properties; but the several grades of black as produced by the various processes are not interchangeable. Consequently we may be reaching a difficult period when production from natural gas will be reduced—Major Cadman mentions that whereas there were 62 carbon black plants at work in 1928, there were only 49 in 1941, due to U.S. legislation—and there will be nothing to take its place.

There have been three attempts to make carbon black in this country. The first was in 1908, through the use of coke-oven gas, enriched with benzol and naphthalene, by an impingement process using rotating plates. This was started by Reckitts, of Hull. A larger plant was erected by the same firm at Thornhill coke ovens in 1911 to manufacture 500 tons a year. Here the plant was operated on coke-oven gas stripped of benzol, but enriched with naphthalene. The yield was about 1 lb./1000 cu. ft. of gas from the crude coke-oven gas, and about 5 lb. when the naphthalene enrichment was used. This process was of undoubted value, but it was closed down in 1933 because by then it had become uneconomic. Work has lately been conducted at the Chemical Research Laboratory, Teddington, and has (according to Major Cadman) been brought to a successful outcome. The report, which was privately circulated during the war, led to no industrial development, so far as we know. Preheated coal gas or other carrier, enriched with the vapours of liquefied tar, pitch, or petroleum residue, was passed

through a heated burner-tube to six burners, where it burnt in a controlled supply of air. The flames from the burners impinged on a slowly revolving iron roller from which the black was removed by wire brushes. Yields of up to 50 per cent. of the weight of crude oil were claimed. Again, this process depends upon whether the value of the materials used is small enough, and it may not be an economic method. We do not think the economics of the method have been worked out, but from the information given by Major Cadman the material produced was highly satisfactory for its purpose.

We are driven to the conclusion that carbon black is best manufactured in this country by a process in which the black is a by-product. The only process of this character in existence, so far as we know, is that to which we referred in the previous article as the Severn Valley process, which Major Cadman mentions as "a British Process, invented by Leon B. Jones of the Jones Gas Process, Ltd." Mr. Jones was an American resident in this country, but the process has been wholly developed here. In it carbon black is made by a thermal decomposition process in the presence of steam as a by-product of gas manufacture. There are two plants, one at Cheltenham, one at Gloucester, with a capacity of 2000 tons a year, and another at Swindon gasworks. No doubt, being a thermal black derived from aromatic materials, the product would have its own field of usefulness and might not be equally satisfactory for all the uses to which carbon black is put.

The rubber industry uses 90 per cent. of the total production, and printing ink about 5 per cent., while the other 5 per cent. goes to the paint, plastics, dry cell, and battery manufacturers, and to various other industries. "Assuming that the rubber used in 1948-9 is equally divided between synthetic and natural rubber, the carbon black required would be only about 1100 million lb. (based on an average of 21 lb. per 100 lb. of natural rubber, and 42 lb. per 100 lb. required by synthetic rubber)." The conclusion is reached that some of the less economical American plants will have to close down unless new uses on a sufficiently large scale are found for colloidal carbon. Major Cadman believes that ultimately, when natural gas is exhausted, carbon black will be made from acetylene produced by water power or atomic energy.

NOTES AND COMMENTS

Science News for the Public

AT the meeting held at the Royal Institution in London last Monday, organized by the British Association in connection with the Royal Society's Empire Scientific Conference, the question of the dissemination of scientific information was discussed by a number of speakers well qualified to give their opinion, the whole scheme having been prepared by no less an authority than Sir Richard Gregory, F.R.S. To provide a summation of the conference in all its details would require more space than we are able to afford, but there are certain points affecting the technical Press which are of great interest. The popular Press is advised, for example, to make greater use of the technical journals, as these deal usually with the application of scientific information and are as a rule not beyond the general reader. Scientific publications, on the other hand, as Sir Henry Dale has said, have developed a "slang" often unintelligible even to experts, and completely so to the layman. This is the "jargon" against which we have so often inveighed in these columns. The cautious summaries of public lectures are too often distorted by the Press simply to infuse a little life into them, and this process is regarded by the scientists as a betrayal, when, for example, a clause qualified by a "perhaps" is converted into an affirmation. Official or inspired announcements also require careful sifting before they can be regarded as of true news value.

An Institute of Information

SIR RICHARD GREGORY'S survey of the whole problem comes to the conclusion that some definite step is required to correlate all these sources of information. "The social hierarchy that has grown up among scientists," he states, "is responsible for a certain caution and conservatism about publicity," while at the same time "the media for disseminating news and information, whether scientific or not, have also become socially elaborate." Therefore there is scope for a new kind of popular expositor—one with a sufficient knowledge of the existing social organization of science and with the ability to grasp enough of a particular specialism to be able to make a story of informative value to the public. To attain contact between the agencies

responsible for the dissemination of scientific information and the original sources of scientific knowledge, something in the nature of an *Institute of Scientific Information* is needed. Its functions would be to keep records of scientific research; to be in touch with scientific workers in every field; to provide the Press with lists of points in pure science; to keep the Press and broadcasting authorities supplied with official scientific news; and to advise on all matters concerned with the publicity of science, even issuing pronouncements on highly controversial questions. There is at the moment in this country no learned body to which any pressman or other inquirer can go to discover either the location of scientists or the kinds of research in progress in any field. It does not seem out of place to suggest that the British Association should be the parent and pilot of such an institution, in view of the type of work it has done in the past.

The Future of British Coal

HOWEVER gloomy may be the immediate prospects of coal production in the United Kingdom, it does not appear that we need have any serious fears that the supply will give out within the next hundred years. This is the main conclusion to be drawn from the new Fuel Research Survey Paper No. 58 issued by the D.S.I.R., and entitled *Rapid Survey of Coal Reserves and Production: a First Appraisal of Results* (H.M.S.O.; 9d.). The reserves dealt with, it should be noted, are not the *total* reserves, but those readily available within the next century. A new feature of the report is that it classifies the reserves for each coalfield into types of coal. The properties of 20,000 million tons of coal still in the ground are described and reference is made to a further 15,000 million tons that can be got at when eventually required. The general position, then, gives no cause for alarm; the nation has got its money's worth in buying the coal from the coal owners. One important point is the approaching depletion of reserves in certain areas, for example, West Durham and the Forest of Dean. Durham as a whole, however, is promised a long productive life, since "long after the medium-volatile coals (of West Durham) have been exhausted, the field will produce coals similar in type to the best

coals now used in coke ovens in the Midland areas." Moreover, not only in South Wales, but also in Lancashire, the Midlands, Northumberland, and Scotland, the great virtue of our coals lies in their adaptability to almost any purpose. Though the coals are here grouped according to volatile content and caking properties, it is emphasised that this is not an exhaustive classification of British coals; there are yet more data to be collected, and this work is already in hand.

Minerals in Istria

BECAUSE the future of the Julian March and the port of Trieste has, for over a year, occupied the attention of the Foreign Secretaries of the four major Allies, it is of interest to note that the president of the Italian Mining Federation has recently stated that only a trickle of news has been reaching Italy about mining operations in the mineral-bearing regions of the Istrian Peninsula and its neighbourhood. Thanks to the initiative of Italian companies, and the efforts of technicians and workers alike, the region has attained a high level of production, and consequently it assumed an important rôle in the national economy of the country. Annual pre-war production figures for the main minerals are as follows: coal 1,000,000 tons, bauxite 400,000 tons, mercury (from Idria) 480 tons, sandstone 70,000 tons, limestone 400,000 tons. In particular, the loss of the Arsa coal and anthracite deposits would have a severe impact on the Italian fuel supply position, because one-quarter of the country's normal consumption came from this source before the war. The bauxite mines in Istria were also of importance in the country's economy: they have been the basis for the aluminium industry which played an important part in overcoming many difficulties caused by the general paucity of raw materials and minerals.

Chemurgy Again

THE better utilisation of farm products and waste material by American chemical industry was the principal aim of the chemurgical movement which originated in that country in 1934 or thereabouts, at a time when agriculture was at its lowest ebb in many parts of the world. *Farm Chemurgic*, the book by Dr. W. J. Hale, of the Dow Chemical Co., published in 1934, seems to have inspired a considerable amount of active support to the movement

which gathered increasing momentum before the war. The pursuit of chemurgy was more than ever a primary need under war conditions; and to-day, with half the world at starvation level, it merits the concentrated attention of both industrialists and agriculturists. For although the original intention was the better utilisation of farm products and waste as industrial raw material, it has become increasingly clear that the matter is of the utmost importance from the food point of view also. The Farm Chemurgical Council of the U.S.A. recently held its annual congress in St. Louis, when several interesting papers were read. A brief account of the proceedings was published in *Chem. and Eng. News*. But chemurgy and all that it stands for is of considerable importance also in this country, even more in the Dominions and Colonies. The second report of the Colonial Products Research Council describes research on many colonial products (much of which would doubtless have been done if chemurgy had never been heard of); but the essence of the chemurgical idea is to reduce waste to a minimum by application of more scientific and improved technological methods. In Canada the Prairie Regional Laboratory of the N.R.C. is being organised for chemurgical work, as a result of a conference held under the auspices of the Council a few weeks ago. It is mainly intended to serve the needs of the west, but these must be considered and co-ordinated with those of the eastern provinces, and joint action taken.

Export or Die !

HERE is a remarkable case, the accuracy of which is vouched for by the *Liverpool Daily Post*. A scientific man of the highest standing required 25,000 glass bottles. He went to the head of a manufacturing firm, but after several weeks learnt that by governmental orders all their output had to be exported. He received a hint that he might obtain a supply from Holland. Eventually he did get the required number from Antwerp, at an additional cost of 30 per cent. He then discovered that these had been made and compulsorily sent over the Channel by the English firm in question. Is this the way in which our export output is augmented—to be brought back at large additional expense to ourselves? Can it also be that the report of increased beer exports from Holland is similarly due to our increased exports of barley to that country?

Phosphating Metallic Surfaces

II. Baths and Compositions : Accelerating Methods

by W. G. CASS

(Continued from THE CHEMICAL AGE, July 6, 1946, p. 8)

AMONG the modes of phosphating the most common is the use of a bath or solution in which the finished article or unfabricated metal is immersed. But spraying, too, is largely used in the latest methods, also resilient rollers; and occasionally a phosphating preparation can be applied by brush, when structures or objects are too large for the bath. The fused salt bath method has been tried from time to time, as in B.P. 464,982, 466,661-2, of Rust-proofing Co. of Canada, Ltd. A fairly detailed review of the patent literature up to 1934 was given by E. Rackwitz, of Berlin, in *Korr. u. Met.*, 1934, 10, 58, supplemented by H. Högel, *loc. cit.*, 1941, 17, 180. The history and development of phosphate coatings by R. C. Davies and S. J. Scouse mainly relates to the various processes of the Parker Rust-proofing Co. of U.S.A.: Parkerising, Bonderising, Spra-Bonderising, and the "D" process. (*J. Electrodep. Tech. Soc.*, 1943, 19.) As this American firm strides like a colossus over the phosphating world some account of its rise and progress, as disclosed in the recent report of the case brought against it by the U.S. Government under the Anti-Trust laws, will be given in Part IV of this article, together with some of the main points in the company's infringement suit against the Norge Division of the Borg Warner Corporation.

Two Types of Bath

Broadly, the two principal types of phosphating bath are the iron-zinc and the iron-manganese, of both of which there are many varieties; and occasionally zinc and manganese are used together. While comparatively minor changes have taken place in bath composition from time to time—apart from accelerators—the major problem in recent years has been to shorten the time of processing by means of accelerating agents, by pressure spraying, and by the use of resilient rollers. These various methods are dealt with later in this article.

As we have seen (Pt. I, p. 6), Coslett in 1909 introduced zinc oxide or phosphate into the bath; and it was also used in the important German patents (Nos. 310,756, 313,578) of W. Schmidding, the special feature of which was the addition of other metals, especially calcium (as phosphide), and some manganese, cobalt, nickel, or lead, together with chlorates or other oxidising agents (accelerators). See also patents by Gen. Motors Corpn. (U.S.P.

1,856,261), Pacz (Fr.P. 728,411), Patents Corp. (U.S.P. 2,067,077; zinc pyrophosphate), and Castiglioni & Battaro (Ital.P. 347,354-5; for special steels; they include also some copper oxide, the use of copper in some form or other being a well-known feature of some phosphating baths).

It is clear also that the type of phosphating bath must be adapted to the kind of metal or alloy treated; different steels, for example, may require special solutions, as in Castiglioni's patent. The effect of various constituents in steels on the kind of phosphate, or indeed any other coating, has been emphasised by various well-known authorities, e.g., Hedges & Jordan in their recent book on Tinplate, Adams & Dickinson in their paper read before the Iron & Steel Institute, etc.

Factors for Efficiency

Before going further it may be well to indicate some of the chief factors governing optimum conditions for producing an efficient phosphate coating on metallic surfaces. They are all essential, so there is no special significance in the order of setting forth.

(a) *Pointage*, or ratio of total to free phosphoric acid. If free acid is too low there may be increased sludge formation through hydrolysis, and if too high the iron surface is too vigorously attacked so that phosphating is retarded and coarser grained (Macchie, *Korr. u. Met.*, 1936, 12, 211, and Domnitsch, *loc. cit.*, 223). But it is not correct to say, as Högel does (*Korr. u. Met.*, 1941, 17, 180) that best results are obtained with one particular grade of acidity: it must, of course, vary according to circumstances. More or less standardised practice has now been determined for a large variety of materials, but the most skilled and experienced would hesitate to state beforehand what are the best conditions for a new alloy or other material: he could probably make a shrewd guess, but would wish to confirm by preliminary tests.

(b) Maintenance of proper metal ion content of bath, i.e., by suitable and regular replacements or regenerators.

(c) *Temperature*.

(d) *Time of operating*: this usually varies according to the thickness of coating required. For example, the Parker Co.'s Bonderising and Spra-Bonderising yield a comparatively thin coating to be afterwards painted or enamelled, and require only

3-5 min., whereas the full Parkerising, giving a thicker coating, which may only require sealing with oil, may take up to 30 min. These two different treatments, formerly needing separate plants, can now be carried out in the same plant (the "D" process) by merely increasing time of operation for complete Parkerising (Davies & Scouse, *J. Electrodep. Tech. Soc.*, 1943, 19, or *Tech. Bull.*, No. 55, of the Pyrene Co., Ltd.). Another factor is the purity of the water used, and yet others are connected with accelerating, spraying, etc.

An important step forward was achieved by R. G. Richards and M. A. Adams, of Coventry, in introducing the use of manganese phosphate (B.P. 17,563/1911). This was further developed by subsequent workers, especially the Parker research staff, W. H. Allen and others. See Parker's first British patents (Nos. 270,679-80, 270,820, 273,168, 346,401, 350,559). In these the importance of pointage is emphasised, also the ratio of manganese to iron in the bath, and the much more resistant coatings obtained with manganese. One of them (270,820) appears to be first for preparing the well-known Parker salts in solid and stable form for subsequent use, using ferromanganese as raw material, as also in 270,680. Battini, in Fr.P. 770,617, prepared his manganese bath by dissolving $MnCO_3$ in phosphoric acid, using a reducing agent to deal with the MnO formed; Tschurakov dissolved iron in phosphoric acid, with addition of manganese dioxide and permanganate (Russ.P. 36,126); and Garre & Kaspras used alkali persulphate and manganese phosphate solutions (G.P. 683,087).

Sulphate Addition

Sulphates are sometimes included in manganese and other baths: thus Waterfall, in B.P. 440,215, uses calcium, strontium, or barium phosphates, plus sulphates of zinc, manganese, or other, with or without complete precipitation of the calcium, etc., together with an oxidising agent such as nitrate (accelerator). The Curtin-Howe Corp. also uses sulphates (U.S.P. 2,132,000); and in U.S.P. 2,045,499 of the Met. Fin. Research Corp. (Parker associate) for the preparation of baths of manganese nitrate and phosphate they use a mixture of manganese phosphate, manganese sulphate, and barium nitrate. A further note on the Parker claims about the iron/manganese ratio may be added. They state that with increasing manganese content in the bath the phosphate layer is so much the richer in manganese and therefore the more rust-resistant; also the manganese is deposited in the coating more quickly than iron, and therefore regular and adequate replenishment of the Mn is important.

In the Atramental process of I.G. Farben (B.P. 365,569; Fr.P. 698,878), acid solu-

tions of manganese phosphate prepared by a special method are used. A temperature at boiling point is stipulated and the time required is 60-90 min.

Low-Temperature Phosphating

Copper compounds have been introduced in various patents and technical articles, partly for working at a lower temperature and also for other reasons. In B.P. 302,746 (or U.S.P. 1,791,715) Parkers use boiling solutions containing copper; and acid copper phosphate in Fr.P. 680,946, and some of their other patents. In B.P. 346,401 they claim copper phosphate as accelerator. In B.P. 390,834 the Met. Fin. Res. Corp. includes copper nitrate, presumably as accelerator, and if any metallic copper appears in the coating it must be oxidised by heating, which would seem to detract from the value of the copper additions. In B.P. 427,921 the same firm uses copper carbonate; and in B.P. 438,816 H. T. Davies claims phosphating after pre-treatment with a copper salt and zinc salt, with acceleration by means of electric current—an old device already anticipated by Coslett, but usually not very effective. In U.S.P. 1,949,060, Met. Fin. Res. Corp., with a high pointage of 31 and the presence of a copper compound (one-fifth the amount of phosphate), plus also copper nitrate as oxidiser, claims that phosphating can be done in a few minutes at room temperature.

In more recent work on low-temperature operation various methods have been adopted. Some of the solutions used by the I.G., though not precisely recent, claim the addition of organic nitro-compounds, sulphites, etc., for low-temperature working (Fr.P. 773,554, 776,042, 836,140, with addition 50,154, and 801,033). In one of their early pressure-spraying patents (B.P. 473,285), the Pyrene Co., Ltd.—associates of Parker—claim a lower working temperature of 65°-75°C. using an accelerator; and in B.P. 550,751 of Am. Chem. Paint Co. lower working temperature, with accelerators and pressure-spraying, is claimed.

Pre-cleaning in fairly hot solutions and also pressure-spraying both have a warming effect on the metal surface and facilitate, it is said, low-temperature working. See B.P. 554,654 (Am. Chem. Paint) and 551,261 (Parker). Low-temperature operation of phosphating baths has been dealt with in some detail by Schuster & Krause, of the Metallges. A.G., Frankfurt (*Korr. u. Met.*, 1944, 20, 153), and in their cold Bonderising patent, G.P. 741,937, for coating iron, steel, and zinc. They indicate the main essential factors: pH value of solution, metal phosphate and other constituent concentration, choice of suitable accelerator, and auxiliary accelerator and concentration thereof.

It was an obvious advantage to speed up

the phosphating process, especially in the old days when it took nearly three hours; and attempts to do so have been continuous almost from the start. Coslett himself hoped that the auxiliary use of the electric current might help in this direction, and later on introduced boric acid into his solution with the purpose. Progress since has certainly been impressive, for, as already stated, by the most up-to-date methods and plant, phosphating of a much better quality than hitherto can be accomplished in a few seconds. Generally it may be said that the principal factor in accelerating has been thought to be the removal of the hydrogen formed, or possibly also other products, by oxidising them as fast as they are formed; so that the accelerators added to the bath have usually been oxidising agents: nitrates, nitrites, hydrogen peroxide, copper compounds, etc. But there are also other conditions to take into account, and the matter is not quite as simple as is sometimes pretended. As we have seen, for example, in the Westinghouse Electric patents, some form of intermediate bonding or activating film, or Parker's electrolytic iron, appears to have a marked accelerating action. Catalysis too has been invoked, as well as the action of colloids, wetting agents, etc. All the mysteries and complications of surface chemistry and physics, in fact, may be involved, and there is still much to learn.

Inorganic Accelerators

In one of the numerous early patents of W. H. Allen, *e.g.*, U.S.P. 1,287,605, oxygen-yielding salts such as sodium or potassium bichromate, permanganate, or other are added. W. Schmidding uses compounds yielding hydrogen peroxide; W. H. Cole employs chromates or bichromates, and sodium borate. Of the many users of nitrates probably the Met. Fin. Res. Corp. in B.P. 386,739 is among the first. But there is little need to go into detail over these earlier attempts. They have for the most part become obsolete in their original form, though nitrates are still popular. In the improved Bonder method of the Metallgesellschaft, a zinc nitrate is added and the time required is 2-5 min. In the Pyrene Co.'s B.P. 473,974 nitrates are used together with phosphates of zinc, manganese, calcium, cadmium, or barium. Nitric acid is added to the bath and reacts with the precipitated insoluble phosphates, forming soluble nitrates and free phosphoric acid; and in their B.P. 514,443 the same firm proposes the addition of nitrite to oxidise ferrous ions. In some of their patents the I.G. has proposed the addition of zinc dust, also organic nitro-compounds, such as toluidine, pyridine, etc., and sulphite-yielding compounds to oxidise ferrous iron to ferric, as proposed also by the Curtin-Howe

Corp. in U.S.P. 2,121,520. The addition of various organic compounds is frequently proposed: Prod. Chim. T.B.I. (Fr.P. 836,140, and addition 50,154); Soc. Continentale Parker (Fr.P. 849,856); Kahn (Fr.P. 851,541-B.P. 507,355); and Du Pont (B.P. 478,338).

Some Organic Types

An interesting suggestion in this class is the Pyrene Co.'s nitroguanidine patent (B.P. 510,684) with or without addition of copper or zinc nitrate: picric acid, hydroxylamine, and trichloroacetic acid are also claimed as good accelerators. The same firm in B.P. 514,443 (communicated by Parker) as addition patent to 386,739, proposes addition of extra nitrite to oxidise ferrous iron or control nitrite formation from nitrate, or both, *i.e.*, adding nitrate from which nitrite is generated. And in B.P. 517,049 they suggest addition of a copper, nickel, iron, or other metal accelerator as particularly advantageous in conjunction with a nitrate. Time of operating is said to be one minute; but in this case spraying assists acceleration. In B.P. 519,823 (Parker through Pyrene) two kinds of accelerator are distinguished: (a) the oxidising type, such as nitrate, nitrite, or sodium sulphide, and (b) the nitro type represented by nitroguanidine, etc.

The Parker B.P. 551,261 is of interest in giving a general review of the progress of accelerating technique, first with copper compounds, then with oxidising agents, and thirdly by spraying—down to one minute for motor-car parts. This particular invention claims special merit in the combined use of chlorates with a nitrate, which is said to give unexpectedly good results, including operation at a lower temperature as well as acceleration. The specification is of further interest in discussing various theories, as well as the effect of pre-cleaning on the subsequent coating. Coatings formed, for example, are claimed to be very fine-grained and thin, but may be coarser-grained if the surface has been pre-cleaned with strong alkali. An alkali cleaner of the emulsion type is recommended. Incidentally, this type appears to be gaining ground.

Mechanical means to increase acceleration are spraying and the use of resilient rollers. Spraying has for long been suggested as an alternative to brushing or dipping; and while in some cases any kind of known spraying method may be used (Am. Chem. Paint Co.'s B.P. 501,739) in others a special form of spraying, using a fairly definite pressure, is recommended, as in the A.C.P. Co.'s B.P. 495,098, wherein a speed of 17 ft. per sec. and pressure up to 20 lb. is proposed.

The use of spraying and resilient rollers combined has been often claimed of late in connection with the phosphating of metal

sheet or strip which is to be afterwards fabricated into cans or containers or the like, e.g., as substitute for tinplate, as in the Parker B.P. 554,734, 557,846, 561,504, 561,670. In the first two of these another novel feature is the inclusion of a bonding film, for example by preliminary galvanising before phosphating. This first coating of zinc is said to require only 30 sec. and the subsequent phosphating no more than 15 sec. Quicker working and also improved quality of coating (finer-grained) is said to be aided by means of rollers; and in 557,846, where chlorate plus nitrate plus copper accelerators are used, with or without preliminary galvanising, a further "tremendous accelerating effect" (total time 5-10 sec.) is achieved with resilient rollers. Here again, too, a pre-cleaner of the emulsion kind (kerosene) is recommended.

It has long been agreed that the underlying theory of acceleration is by no means completely summed up in the one word "oxidation" or the addition of oxidising agents only. As already pointed out, surface chemistry and physics are much more subtle and complicated than that. Although not strictly a phosphating process, nor indeed mainly dealing with acceleration, the Ford Motor Co.'s B.P. 563,025 is directly of interest in again suggesting the possibility of some form of activating or catalytic action in coating processes. In that specification is claimed a method for treating zinc or cadmium surfaces by (a) formation of bright lustrous durable surfaces which will take a protective coating, and (b) applying a transparent coating which adheres to the polished surface. Various ways of brightening were already known, e.g., dipping the zinc plate in chrome and sodium sulphate solution; but the present invention covers immersion in a chromic acid bath containing minute amounts of sulphuric and nitric acids, and includes a theoretical discussion of surface phenomena involved with the suggestion that the action of the combined acids in minute amounts may be catalytic.

Use of Catalysts

The introduction of catalysis is by no means new in this connection. About the time of Coslett's boric acid patent, or a little earlier, O. Bauer, in B.P. 226,776, had used an alkaline bichromate solution in the presence of a catalyst, and in B.P. 471,070 of the Hanson Van Winkle Munning Co. (U.S.) a special activating agent, e.g., alkali cyanide, tartrate, or tannate, is claimed in a phosphate coating bath for iron and steel. In one or more of the numerous Sutton & de Brocq patents for coating magnesium and its alloys (not phosphating), e.g., B.P. 510,253, an activator, such as alum, is included in the claims. And as we have already seen, the Westinghouse Electric also claim an activating effect in con-

nection with their bonding or preliminary films, using a titanium compound (B.P. 560,847-8).

Into the theory of the subject, catalytic or otherwise, it is not possible to go further at this time. Reference may be made to the standard works of U. R. Evans and others on corrosion and surface chemistry; and possibly also to the rather lengthy discussions of the Austrian writer, M. Machu, in *Korr. u. Met.* and elsewhere.

Quality of Coatings

Machu has specialised in the study of the porosity and general quality of phosphate coatings, and in conjunction with Müller has evolved his well-known formula for determining porosity which, of course, is one of the principal factors in quality. A distinction has been drawn, for example, between zinc baths and manganese baths in regard to the fineness and compactness of the crystalline structure of the coating formed; and was particularly emphasised in the report of the Automobile Research Committee of the Institution of Automobile Engineers on the beneficial effects of chemical surface treatment, such as phosphating, in reducing scuffing or seizing of piston rings and gears (see also D. Manson, *Engineering*, August 10, 24, and 31, 1945). In this work several different kinds of phosphating bath were tried, and it was found that the manganese type yielded for the most part comparatively thick and coarse-grained coatings, while those from the zinc baths were thin and fine-grained. Dürer and Schmidt, in Germany, in their work on the effect of phosphating on metal-working (deep-drawing and shaping), also distinguished between the finer-grained zinc and the coarser-grained manganese phosphate coatings (*Z. Ver. deut. Ing.*, 1942, 86, 15; *Korr. u. Met.*, 1944, 20, 161), especially from the point of view of paint, etc., adhesion.

Further details of phosphating in metal-working, etc., will be given in a subsequent section, and the above note on quality has been introduced here, because quality is undoubtedly dependent on acceleration—or duration of treatment—and on other factors; and because the quality of the coating and especially the nature of its crystalline structure plays a pre-eminent part in the adhesion, covering power, and durability of the subsequent finishing coats of paint or enamel. See Dürer and Schmidt (*loc. cit.*).

Phosphating solutions have now been developed which result in the production of uniform and complete coatings of a more satisfactory crystalline structure. Some of these developments used during the war have not yet been fully disclosed, but there is reason to believe that some interesting results will be available in the near future.

(To be continued)

Organic Compounds of Silicon

A Few Notes on their Uses

by A. E. L. JERVIS, Assoc.I.E.E.

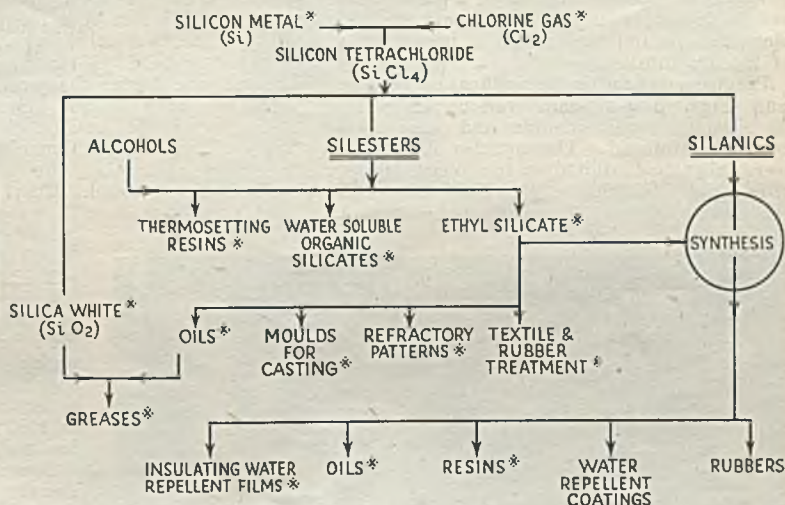
THE industrial applications of the silicon ester, ethyl silicate, are of increasing interest. The literature on this subject has been fairly extensive, and as recently as March, 1945, Shaw and Hackford¹ summarised *Developments in the Application of Silicic Esters*. At the outset it is worth while to record the following uses of ethyl silicate, viz.: as a preservative for stone,

black. Silica white is also offered as a general thickening agent, for liquids and in particular for aggressive liquids. Experiments have been conducted with strong hydrochloric and sulphuric acids. It is also suggested as an inert base for high temperature greases.

Silesters

Silesters 1 and 2 are liquids comprising par-

Fig. 1. Organic compounds of silicon. Products available in this country are marked with an asterisk.



brick, concrete, or plaster, in weatherproof and acidproof mortars and cements, refractory bricks, heat-resisting paints, chemical-resistant paints, protective coatings for industrial buildings and in lacquers and bonding agents.

The "tree" shown in Fig. 1 is intended to give a quick impression of various products (marked with an asterisk) already available in this country, some of which are considered very briefly below. Fig. 2 shows a portion of the plant of Silicon (Organic) Developments, Ltd., used for the production of ethyl silicate.

Silica White

Silica white is of considerable interest. It is a very finely divided form of silica, having a particle size of 1×10^{-5} mm. It has been suggested as a reinforcing agent for those rubbers and plastics where its pure whiteness is an advantage. Other characteristics, such as high electrical insulation properties and high impact strength, follow. In the case of rubber, experiments suggest that silica white produces characteristics comparable to those obtained with carbon

tially hydrolysed stable ethyl silicate and a condensing agent. Their fluidity enables them to penetrate well into porous substances and the method of application is by brush or spray. Two Silesters are already available: "Silester 1" will "cold set" in 60 to 75 minutes, and "Silester 2" will "cold set" in 20 to 25 minutes. Depending on the absorbent nature of the material under treatment, one pint of Silester will treat one to two sq. yds., and it is interesting to note that the price is sufficiently low to make preservative treatment of stonework and damp proofing, etc., a commercial proposition. Surface treatment based on mixtures containing ethyl silicate have a wide appeal. One of the latest inquiries comes from Barbados and deals with a novel subject, namely, the protection of coral walls. It is hoped at a later date to give details of the results of the experiments undertaken.

Silester fluids are being developed over a wide range of viscosity for use as heat-transfer media, shock-absorber fluids, and pressure-transmitting fluids. Film-forming, thermo-setting resins are also being developed. Some of the potential uses are

for high-temperature lacquers, electrical varnishes, mouldings, and laminates.

Silanic fluids and resins are characterised by temperature stability and excellent electrical properties. They are suggested for electrical insulation, especially at high frequency, and as lubricants at high or low temperatures. The Silanic resins are thermo-setting and are appropriate for use as high temperature lacquers, electrical varnishes, and in cable insulation, plastic mouldings, and laminates.

The applications of silicon ester cements are numerous and in a short article of this nature it is possible to deal with only one of them, though it is hoped in a subsequent article to deal with other applications. The electrical insulation field, for instance, is of intense interest.

Precision casting is the application chosen, and Figs. 3 A-G show various examples of silicon cement moulds and the metal castings produced. The articles illustrated were recently exhibited at the Welsh Industries Fair, Cardiff, by Mr. Noel Shaw, of the Samuel Osborn Research Laboratories,

Newcastle-on-Tyne. The limitations of plaster of Paris are well known, and the reader will therefore be interested in the refractory moulds shown in the photographs, some of which have stood up to temperatures as high as 1600° C.

Precision Casting

There are various methods of precision casting. Reference will be made to one only, namely, the lost wax (*cire perdue*) process. Apparently, this process was used by the Chinese and the Greeks many years before the Christian era. Centuries later it was rediscovered. Some suggest that the inclusion of the word "lost" in the title refers to the fact that the process was lost for a time, but others suggest (with much greater probability) that it refers to actual loss of wax during the process.²

It has been known for some time that refractory bodies can be obtained by binding a filler, *e.g.*, sillimanite, by means of a silicon ester, *i.e.*, the product of silicic acid and an alcohol. Ethyl silicate, for example, will react with water under certain conditions to form a strong gel of silica and will bind the sillimanite together. The mould or form produced can then be baked into a strong, hard article capable of standing up to temperatures as high as 1600° C., when molten metal is poured.

There is little dimensional change during the mixing and firing, and so it is possible to take a master metal pattern and surround it with a mixture of ethyl silicate and sillimanite which, when set and subsequently fired, can be used to produce metal castings of astounding accuracy and smoothness of finish. It is claimed that this method has, in certain instances, made possible the production of components, unmachined and yet accurate within a tolerance of ± 0.002 in. per

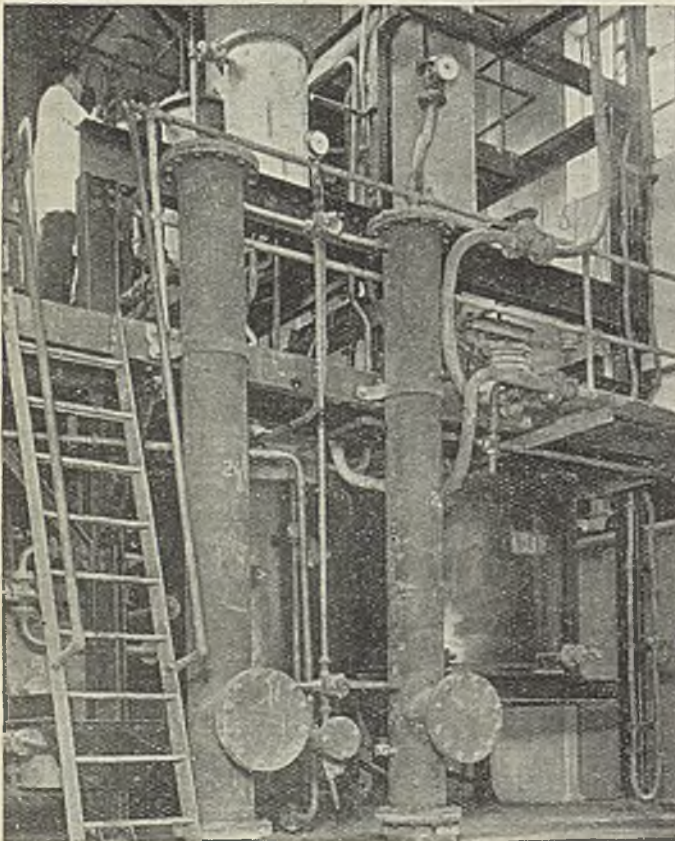


Fig. 2. Part of the ethyl silicate plant at Bridgend.

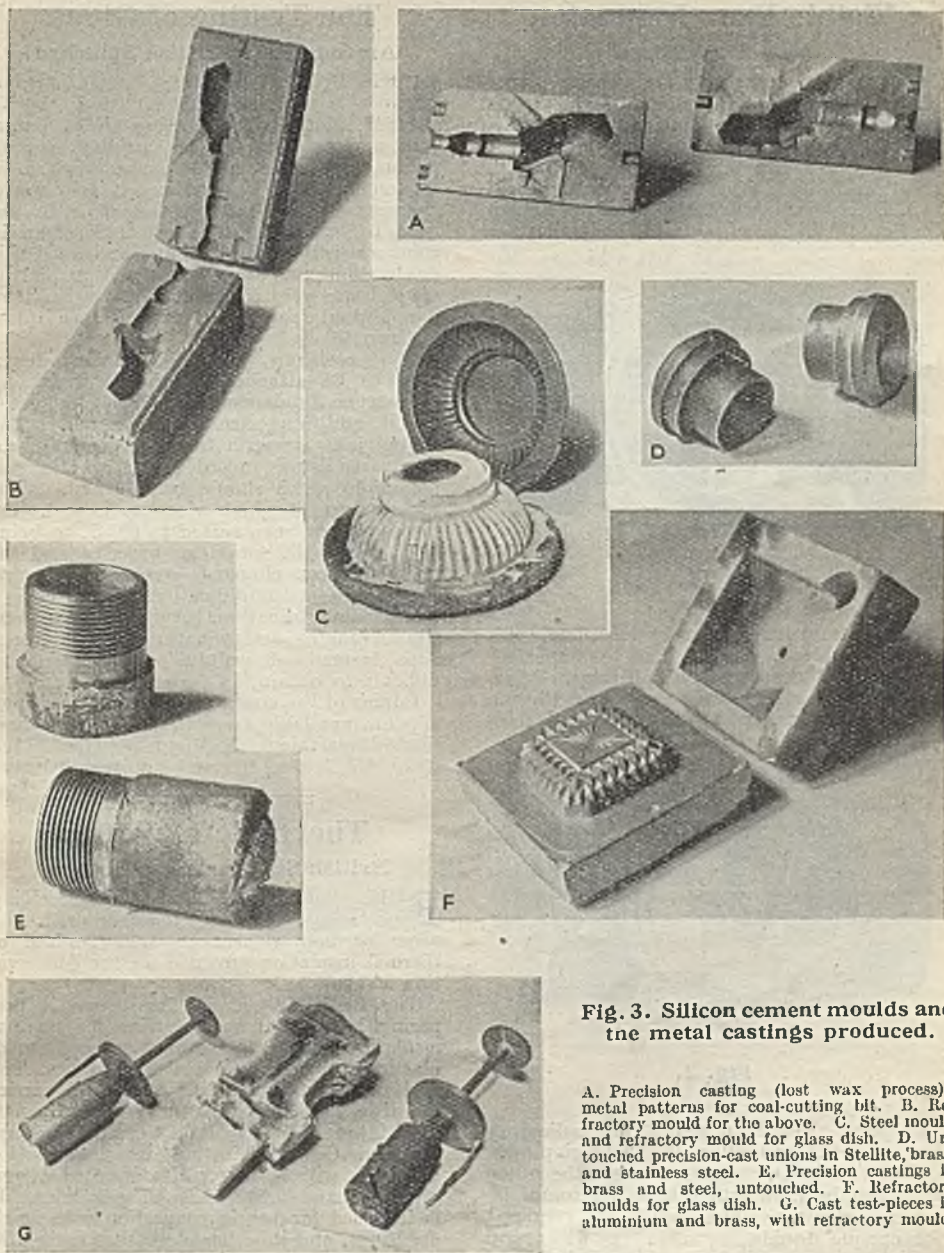


Fig. 3. Silicon cement moulds and the metal castings produced.

A. Precision casting (lost wax process): metal patterns for coal-cutting bit. B. Refractory mould for the above. C. Steel mould and refractory mould for glass dish. D. Untouched precision-cast unions in Stellite, brass, and stainless steel. E. Precision castings in brass and steel, untouched. F. Refractory moulds for glass dish. G. Cast test-pieces in aluminium and brass, with refractory mould.

linear inch, an accuracy which would have been extremely difficult, if not impossible, to produce by other methods.

Castings have been produced from various metals including carbon and low-alloy steels, cast iron, aluminium, and bronze, and other non-ferrous alloys. Certain alloys (machine-tool metals, Stellite,

and Nimonic, for example) are very obdurate and would have been difficult to forge or machine.

Precision casting is now definitely out of the experimental stage and has reached the development stage.³ Where the job does not warrant tooled automatic machine

(Continued on p. 47)

Visible Flow Indication

New Sight Glass

IN all steam generating and process plants it is extremely valuable to have visible indication of flow in pipe lines, and this need has been met by the Drico sight glass made by the Drayton Regulator & Instrument Co., Ltd., West Drayton, Middlesex.

A Drico single-sided sight glass is shown in Fig. 1; this is suitable for observing the



Fig. 1.

flow of steam traps, thereby completely eliminating steam losses due to imperfect action of these important fittings. The double-sided sight glass shown in Fig. 2, fitted with an eccentrically mounted flap,



Fig. 2.

has been specially designed for indicating the flow of clear liquids; it can be employed only in horizontal pipes, whereas the other type can be used either in a horizontal or vertical position. The flap is not required for opaque liquids.

Sight glasses with flaps are normally made in cast iron only, screwed up to 2 in. and flanged from 1½ to 3 in. The other models have 1½-in. dia. windows in the ½-in., ¾-in., and 1-in. sizes, and 3½-in. dia. windows in the larger sizes, the bodies being made either in cast iron or gunmetal, with screwed sizes ranging from ½ in. to 2 in., and flanged sizes from 1½ in. to 3 in.

The Testing of Glues

Amendment to British Standard

THE British Standards Institution has just issued amendment No. 2 to B.S.647, Methods for Testing Glues (bone, skin and fish glues). The original specification, published in 1935 and revised in September, 1938, was well received by works chemists. The adhesives dealt with are used in many industries, though often in comparatively small amounts, and until this publication was issued, information on the subject was very scattered and neither here nor abroad was there any uniformity in testing.

The revisions, issued as amendment slips to be attached to the 1938 edition, present no fundamental changes, but some useful additions are to be noted. The Bloom jelly strength test has been set out in greater detail, in order to make clear the technique which should be followed. The temperature at which viscosity is to be determined has been raised to 60°C. to bring it in line with American practice and the unit has been changed from centipoises to centistokes—a simplification which cuts a density determination. An alternative tensile strength determination, using beech slips instead of walnut test pieces, now difficult to obtain, is set out in detail.

Copies of the specification and amendment slip are available from the B.S.I., Publications Department, 28 Victoria Street, London, S.W.1 (3s. 6d. and 6d. respectively).

Thermal Insulation

British Standard Specification

FUEL shortage and fuel cost are receiving increasing attention, together with the need for improvement in the standard of thermal insulation provided for the conservation of heat.

The British Standards Institution is preparing a series of specifications for thermal insulating materials, embracing pre-formed, plastic, granular, and loose-filled types. The first of this series is B.S.1304, and carries the title "Ready-to-Fit" Thermal Insulating Materials for Hot and Cold Water Supply and Central Heating Installations for dwellings with a Water Heater rated at not greater than 40,000 B.Th.U. per hour. It is intended for use in connection with small dwellings, and it is hoped that its issue will assist manufacturers in the mass production of materials suitable for this purpose.

The fuel saving to be achieved by the installation of thermal insulation in such dwellings is emphasised in an appendix. A list of suitable materials with information concerning thermal conductivity is also given. Copies may be obtained from the B.S.I., as above (2s.).

Polymerisation of Styrene*

Experiments with High-Frequency Currents

NONE of the substituted styrenes so far investigated has given a polymer of significantly improved properties. Substitution in the side chain sometimes prevents polymerisation, while substitution in the benzene nucleus, although tending to raise the coefficient of polymerisation and the thermal

Table 2, indicated that this result was probably due to the presence of the oxygen in the atmosphere, since styrene in carbon-dioxide-filled ampoules gave products of higher molecular weight in the H.F. field than in the control. Atmospheric oxygen is activated in a H.F. field and oxygen ions and

TABLE 1.
Polymerisation of styrene in a H.F. field in air.

Time of treatment (hr.)	Time of polymerisation (days)	Molecular weight of alcohol-insoluble
0 (auto-polymn.)	60	206,232
2		204,562
4		171,860
6		173,495
8		173,495

stability of the product, does not have sufficient effect to justify the use of such difficultly obtainable monomers. It appeared possible, however, that an entirely different method of polymerisation, based on the use of high-frequency currents, as used on an industrial scale for the sterilisation of milk, etc., might reduce the influence of the factors which tend to break the reaction chain.

As is well known, thermal treatment accelerates the process but at the same time lowers the average molecular weight. The

ozone may be formed which would tend to oxidise the end-groups and form ozonides at the double bonds, thus exerting an adverse influence on the creation of active centres for polymerisation.

It appears, therefore, that waves of less than 1 m. can effect a substantial increase (50,000) of the molecular weight of the polymer, in spite of the increase of temperature occurring during the treatment. The last experiment in Table 2 was carried out under

TABLE 2.
Polymerisation of styrene in a H.F. field in CO₂.

Time of treatment (hr.)	Time of polymerisation (days)	Molecular wt. of alc.-insol.	Position of ampoule
0 (auto-polymn.)	80	254,222	In the dark, at room temp.
8		298,769	In the field
8		300,046	do.
8		327,322	In the generator

chain reaction is broken earlier, according to Staudinger, the higher the temperature of polymerisation. In the case of H.F. currents there is a thermal effect, but heating occurs from inside as well as outside, so the conditions might be more favourable for the preparation of high polymers.

The first experiments, with decimetre waves, were not encouraging, since the molecular weight was reduced, as shown in Table 1.

The molecular weight was less, by about 30,000, than that of the auto-polymerised sample. Further experiments, as shown in

conditions which maintained a lower temperature, and the molecular weight of the product was still higher. It was further noticed that the yield of the high polymer fraction in the H.F. field was three or four times as great as that of the control; the rate of polymerisation is thus increased.

Experiments have been carried out also with metre waves. In this case, however, whether the process was operated in air or in carbon dioxide, the molecular weight of the fraction separated by means of alcohol was equivalent to that obtained in thermal polymerisation at 100°. It is considered, therefore, that metre waves serve merely as a source of thermal energy.

* From a paper by N. V. Shorygina and E. I. Petrova in Russian. (*J. Gen. Chem. Russ.*, 1945, 15, 173).

Tetrafluoroethylene Polymer

Du Pont's New Plastic

PRODUCTION details concerning "Teflon," the tetrafluoroethylene polymer developed for war purposes by Du Pont's, are included in a recent note in *Chemical Industries* (1946, 58, 781), special stress being laid on the unequalled chemical inertness of this plastic, and its excellent electrical and heat-resisting properties.

The discovery of "Teflon" is said to have taken place in the course of refrigerant research by Kinetic Chemicals, Inc., a partially owned subsidiary of the Du Pont company. The gaseous monomer, which boils at -78°C ., was prepared as an intermediate and stored temporarily in a steel cylinder. Later, when the gas was used, it was noticed that only one-third or so of the material was released before the pressure fell to zero, and the tare weight of the cylinder was high. Suspecting what might have happened, the research men cut the cylinder open and found the insoluble, infusible white powder which was the first "Teflon."

From the chemical composition and physical nature of the polymer, it was clear that the substance might find useful applications in the field of plastics; and, consequently, a patent was applied for and obtained (U.S.P. No. 2,230,654), and development of the plastic was taken over by the Plastics Department at Arlington, N.J. Pilot-plant production was undertaken in 1943 for war uses under strictest secrecy. It is still only in the pilot-plant stage, but it is available for evaluation.

In thin sections this plastic is transparent, but in thicker pieces it is waxy in appearance and white or grey in colour. It is remarkable for its toughness over a wide range of temperatures, its excellent electrical properties over a wide range of frequencies, its extreme chemical inertness, and its high heat-resistance.

Physical and Chemical Properties

With no true melting point, it undergoes a solid-phase transition to a gel at 325°C . with a sharp drop in strength. In the neighbourhood of 400°C . it decomposes slowly to yield the gaseous monomer plus a few other gaseous fluorine derivatives. Small amounts of fluorine-containing gases are given off at temperatures above 215°C .

The chemical resistance of "Teflon" is outstanding, in that it withstands the attack of all materials except molten alkali metals. It can be boiled in *aqua regia*, hydrofluoric acid, or fuming nitric acid, with no change in weight or in properties. It also resists the attack of organic materials and strong alkalis. Since it can be used over the tem-

perature range -75°C . to 250°C ., its employment as a gasket and packing material and as tubing for chemical process work is suggested.

So far no plasticiser has been found for the material since at the high temperatures at which "Teflon" finds its special niche, plasticising materials would volatilise out.

The excellent electrical properties of "Teflon," coupled with its heat-stability, give it many potential applications in the power field, where one of the limiting features in design of electrical equipment has been the lack of a suitable insulating material that will withstand high temperatures.

"Teflon" can be extruded in the form of rods and tubes or as a wire-coating, and compression mouldings of simple articles can be made by using special techniques. Sheets and thin films are made by shaving baked blocks and cylinders. Extrusion rates vary, but all of them are measured in terms of feet per hour, which is slow when compared to those of other thermoplastics.

Technique of Machinery

Until moulding techniques become fully developed, it is necessary to form articles of complicated shape by machining standard shapes. The material can be machined easily with standard wood-working or metal-working tools as long as they are kept sharp. Sheet stock can also be worked on a punch press. Thin-walled tubing can be flared by standard flaring tools as used for copper tubing, and heavy tubing can be threaded by standard pipe-threaders.

The field for tetrafluoroethylene as a plastic will always be limited. For applications which can take advantage of its unique properties, however, it is bound to find a ready, but special, market. Its only near competitor, for example, in the manufacture of electronic parts subject to high frequency current and high temperature, is the silicone group of resins.

Present production approximates to 10,000 lb. per month, and the price is from \$12-\$15 per lb., but large-scale production may bring the price down to \$2.50 per lb., though even then it probably will compete exclusively for the aforementioned special purposes.

Meanwhile, development is in progress to extend the usefulness of "Teflon." Organic fillers have been added successfully; dip-coating methods may prove feasible; and modifications are being studied in order to provide a material which can be more readily moulded on injection and compression machines.

German Assets in Spain

Strong Chemical Interests

(from a Special Correspondent)

THE extent to which Germany has succeeded in penetrating the whole economic structure of Spain, and in particular the Spanish chemical industry, has been strikingly revealed in a memorandum prepared by the U.S. Government for submission to the United Nations Security Council Sub-committee on Spain.* In addition to a thorough survey of the magnitude of German assets in Spain, the memorandum contains details about the obnoxious anti-Allied activities of Nazi agents, as well as a chapter on the Spanish war potential. Even a cursory reading of this document leaves no doubt that Nazi authorities, commercial interests, and individuals, have received and continue to receive a strong measure of support from the Franco régime which, even a full year after Germany's unconditional surrender, hesitates to extradite known Nazi agents.

Intensive Penetration

The fact that Spain had been penetrated by Germany before and during the war has, of course, been known to H.M. Government. In the spring of 1944, Mr. Dingle Foot, Parliamentary Secretary to the Ministry of Economic Warfare, stated in reply to a question by Mr. Alfred Edwards that "he had received considerable evidence of German infiltration into Spanish industry in the form of making available patent rights and supplying technical plant, advisers and engineers."

To summarise the general observations on German assets in Spain given in the American memorandum, German property in Spain known to the U.S. totalled \$95,000,000. However, it is quite likely that there is a large amount of still hidden property. Out of this total, about \$80,000,000 are invested in Spanish industry and, according to the Spanish financial directory, the *Anuario Financiero y de Sociedades Anónimas de España*, German investments amount to about $3\frac{1}{2}$ per cent. of the total. However, this percentage figure may easily give an entirely wrong impression because it stands in no relation to the influence of German interests in several important industries. The breakdown of the \$80,000,000 invested in industry is as follows: \$45,000,000 are held by private German companies, while the remaining \$35,000,000 are in the hands of the German State-owned "Sofindus" organisation, which embraces

about 25 participating companies, under the direction of the Ministry of Economics.

Chemical Industry Controlled

Referring to German assets invested in the Spanish chemical and pharmaceutical industry, the American memorandum states that they amount to about \$8,000,000. The I.G. Farben, through a number of Spanish subsidiaries, and by control of patents and manufacturing processes, had, until the collapse of this German chemical empire, a genuine grip on the Spanish chemical industry. Other companies with important investments are Schering, Merck, and Boehringer.

To describe briefly the activities of the leading German-controlled chemical companies in Spain, the Unicolor S.A. distributes the chemical, pharmaceutical, and dye products of the I.G. and its subsidiaries. At the end of 1944, it had assets totalling \$4,400,000. The import of aniline colours by this company represented approximately 60 per cent. of the total Spanish imports during most of the war. The fertiliser business of Unicolor was based almost exclusively on imports from Germany and former German-occupied countries. Although the company no longer receives supplies, its organisation is still intact. The sale of chemical products has been extremely profitable to the firm, but with the loss of foreign supplies, its volume of business has naturally dwindled. Another company, the Fabricación Nacional de Colorantes y Explosivos, S.A., is engaged in the manufacture of dyestuffs, chemical fertilisers, and coal-tar products for textiles, and is closely connected with Unicolor, through which it is controlled by I.G., the latter holding 50 per cent. of the capital stock of \$2,750,000. At the end of 1944 assets totalled \$5,700,000, and the company still uses technical processes of the I.G. The main offices are in Barcelona and there are factories in four other Spanish towns. Although most of the directors are Spanish, technical matters are in the hands of German experts who received their training in most instances in I.G. plants. The company is the only large-scale producer of dyes in Spain, the entire output being supplied to the home market. In spite of its title, the company does not engage in the manufacture of explosives, because this field of activity has been ceded, by agreement, to another I.G.-controlled unit, the Unión Química del Norte de España. This company (with a capital of \$5,540,000) is one

* Published and distributed in the U.K. by the U.S. Information Service, Room 311, Davies Street, London, W.1.

of the largest chemical producers in Spain. Its wide range of products includes ammonia, phenol, methanol, and other alcohols, plastics, and inorganic compounds.

The Electroquímica de Flix, S.A., is one of the largest Spanish manufacturers of caustic soda, sodium sulphate, liquid chlorine, and ammonia. It owns land and a factory at Flix, Tarragona, where it employs some 700 people. Another German-controlled unit, the Clorotida, S.A., which formerly manufactured and sold explosives and related products, is now engaged in coal mining.

Pharmaceutical Interests

To make brief reference to German pharmaceutical interests, La Bayer Química Comercial y Farmacéutica, S.A., distributed I.G. products under the trade mark "Bayer." It has enough semi-finished products on hand to last about four years at the present rate of sale. The annual volume of business aggregated about \$13,600,000, and it is believed that the company has made exorbitant profits, which are not revealed in the books. These secret profits, a prominent official of the Spanish chemical industry stated, have been used by the German Embassy for its nefarious activities. The subsidiary of Merck, Productos Químicos Farmacéuticos, S.A., also disposes of large pharmaceutical stocks. The Boehringer S.A., owned by Boehringer Brothers, of Mannheim, supplied quinine and other special products to the Spanish market, while the Schering group owned four subsidiaries in Spain, the chief of which is Productos Químicos Schering, S.A. Before the war, this was essentially a sales organisation, but later it established an important laboratory in Madrid for the finishing of imported chemicals. Another small concern is the S.A.L.I.A. Productos Químicos Farmacéuticos, S.A., owned by the Diwag Chemische Fabriken A.G., of Berlin.

Mining Interests

The high strategic importance of tin and wolfram led to a keen scramble for supplies between the Allies and Germany, euphemistically termed "pre-emptive purchases." Spanish ores, of course, played a vital part in German armament production, and the U.S. memorandum states that during the war, the "Sofindus" group purchased a number of tin, wolfram, and iron mines at highly inflated prices. It is estimated that these mines cost the Germans about \$10,000,000, whereas their present value is about one-fifth of that sum. At present, of six companies, holding 42 mines, only seven are operating—one lead mine, and six tin mines. Another important metallurgical concern, Lipperheide y Guzman S.A., owned by two of the leading German families in Spain, is a large-scale producer of

non-ferrous metals. In 1942 its foundry produced metals of the value of \$4,000,000. German members of the firm participate in the management of about ten other mining and smelting companies. Rheinmetall-Borsig and Röchling Stahlwerke also had subsidiaries in Spain.

Allied Control

Even before Germany's defeat, the British and U.S. missions in Spain pressed the Franco Government to turn all German property over to the Allies. In May, 1945, their efforts met with partial success, when all German assets were blocked and a census prepared. However, this census proved to be entirely inadequate for it failed to reveal German interests of which the Allies had definite knowledge. But as a result of determined insistence on the part of the American and British missions, later on supported by the French, known official German assets in Spain came into the physical possession of the Allied Joint Trusteeship, established early in the summer of 1945. By early February, 1946, the Trusteeship had taken possession of official funds valued at \$3,000,000. It also took over control of 22 companies of the "Sofindus" combine, as well as buildings and valuable equipment. Large numbers of German and Spanish personnel were dismissed from these companies. Plans have been made to sell the remaining enterprises to non-German interests.

Yet the United States memorandum makes it abundantly clear that the Franco régime has offered hardly any assistance to the Allied missions, because constant pressure had to be exerted over each individual German asset. Furthermore, the Spanish authorities have consistently refused to co-operate in a programme of "unmasking German dummies." In April last, the Franco Government openly refused to agree to the sale of German State-controlled properties and requested that matters with regard to German property in Spain should be left in abeyance until over-all negotiations had been completed. These negotiations are to take place in Washington in the near future, it is stated. On the boards of private German companies, the Allies have secured the appointment of their nominees, a measure against which the Spanish also officially protested. While not openly prohibiting the Trusteeship's activities, the Spanish authorities advised their citizens not to co-operate with the Allies. The Spanish Government, while recognising the Allied Control Council as the *de facto* German Government, refuses to recognise its *de jure* status, and therefore also the so-called "vesting decree" of October, 1945. However, there is little doubt that the Allies will not allow the continuation, in any form whatever, of Germany's powerful position in Spain's economic system.

Personal Notes

LORD HYNDLEY, chairman-designate of the National Coal Board, has resigned from the board of Powell Duffryn, Ltd.

SIR RICHARD PEASE has been elected president of the National Benzole Association in succession to the late Sir David Milne-Watson.

DR. H. K. WORNER, of the Australian College of Dentistry, has been appointed Professor of Metallurgy in the University of Melbourne.

DR. PETER KAPITZA is among the Russian scientists who are visiting Great Britain this month, and it is understood he will be at his old university, Cambridge, on July 22, when he will deliver a discourse on his recent work.

MR. H. WARREN, M.Sc., M.I.E.E., managing director of the B.T.-H. Company, and formerly director of the company's research and engineering, has received the honorary degree of D.Sc. at Birmingham University, principally in recognition of his work in industrial research and technical education.

MR. R. A. HACKING has resigned his position as a special director of Dorman, Long & Co., and has been appointed by Richard Thomas & Baldwins, Ltd., to deal with, and advise on, all that company's iron and steel production, including new construction and development.

DR. D. W. KENT-JONES, the well-known cereals chemist, recently returned from a visit to the U.S.A., where he delivered a paper at the annual convention of the American Association of Cereal Chemists, held at Niagara Falls. He also addressed several other meetings and was guest of honour at a large number of dinners and luncheons.

SIR OLIVER FRANKS, who was formerly Professor of Moral Philosophy at Glasgow University, has been mentioned as the possible first chairman of the Steel Board. He was educated at Bristol and Oxford and on leaving Glasgow University in 1939 and going to the Ministry of Supply quickly rose to be Permanent Under Secretary. He was awarded the C.B.E. in 1942 and recently a knighthood in the Birthday Honours.

DR. CECIL L. WILSON, M.Sc., Ph.D., F.R.I.C., lecturer in chemistry at the Sir John Cass Technical Institute, London, has been appointed to a lectureship in chemistry (with special reference to microchemistry) at the Queen's University of Belfast, with effect from October 1, 1946. This is a new appointment, made possible by a grant to the University by I.C.I. for a period of seven years, to aid research and teaching in microchemistry and glassblowing.

MR. JAMES GERSTLEY, who has been associated with Borax Consolidated, Ltd., since its inception in January, 1899, has resigned from the position of joint managing director. He retains his seat on the board, however, and will continue to act as consultant. MR. A. H. REID, C.B.E., who has been a director for the past ten years, has been appointed to succeed him as joint managing director in conjunction with Mr. F. A. Lesser.

Organic Compounds of Silicon

(Continued from p. 41)

methods, it compares very favourably with older methods of casting. Some of the advantages claimed are: (1) direct labour charges reduced; (2) with tooling-up eliminated, the capital costs are reduced; (3) the equipment is remarkably versatile for work of new design.

The "lost wax" technique has been used to a large extent in the U.S.A. as well as in Great Britain. The procedure is briefly as follows:

- (1) A master replica of the article to be produced is prepared.
- (2) A bismuth alloy mould is formed round it in two or more sections in the conventional manner, leaving "gates" for pouring.
- (3) The master replica is then removed and the cavity in the mould is evacuated under vacuum.
- (4) The wax pattern is then produced by forcing wax into the cavity under pressure.
- (5) The wax pattern is removed from the cavity and is sprayed with a fine fluid mixture of the refractory material, which is then allowed to dry off.
- (6) A mould is then made around the wax pattern, using ethyl silicate, sillimanite, and controlling agents in slurry form.
- (7) The slurry is vibrated for some time in order to remove air bubbles and is then allowed to set. The setting time depends upon the mass of the mould.
- (8) The mould is then baked in order to melt the wax, which comes out through the pouring gates, and also to harden the mould.

(9) Molten metal can now be poured into the refractory mould.

(10) After the casting has cooled, the refractory mould is broken away and the casting trimmed.

REFERENCES

- ¹ SHAW and HACKFORD, *Ind. Chem.*, 1945, 21, 130.
- ² A. DUNLOP, *Foundry T. J.*, 1945, 75, 107.
- ³ D. GREENSMITH, *Pract. Eng.*, 1946, 13, 597.

Parliamentary Topics

Oil Seed Production

IN the House of Commons last week, Sir R. Glyn asked the Colonial Secretary whether, in view of the importance of niger oil as an alternative to linseed, any immediate steps could be taken to increase the supply to the U.K.

Mr. George Hall: Niger oil is produced from a seed which grows chiefly in India and Abyssinia though it also occurs in East Africa. It is very inferior to linseed oil and offers no commercial attraction as a substitute. I am actively encouraging the production in Nyasaland of tung oil which is an excellent alternative to linseed. Answering a further question by Sir R. Glyn, Mr. Hall stated: Linseed, rape seed and perilla are not produced within the Colonial Empire, with the exception of a small amount of linseed in Cyprus. Attempts to grow perilla, which normally comes from Manchuria, Japan, and India, have proved abortive. As regards soya and castor seed, I have asked the Governors of certain territories to encourage their production so long as this does not interfere with the production of even more valuable edible oilseeds such as groundnuts.

Glycerine in Paint Manufacture

Mr. Belcher, replying to a question by Mr. Bosson, stated: It is estimated that 295 tons of glycerine were used in paint manufacture in the first quarter of 1938, but it is not known how much of this glycerine was produced in the U.K. In the first quarters of 1945 and 1946, 215 tons and 538 tons respectively of glycerine, all produced in the U.K., were used in paint manufacture.

Linseed for Linoleum

Mr. Belcher, in answer to a question by Mr. Prescott, said the total allocation of linseed oil to the linoleum industry for the month of July was 195 tons a week, as compared with 250 tons in June and earlier months this year.

Basic Slag

Mr. Belcher, replying on behalf of the Minister of Agriculture to a question by Lieut.-Col. Thorp, stated that the quantity of basic slag which steel works could produce as high grade material was limited by technical considerations; and distribution had been affected by transport difficulties.

Molasses

In reply to a question by Brigadier Mackeson, Mr. Belcher said a farmer could obtain 10 cwt. of molasses in a season by giving a formal undertaking to his supplier that the molasses was to be used for silage. For larger quantities a permit must be obtained from the county agricultural execu-

tive committee. That requirement was necessary in view of the world shortage of molasses, and of the fact that molasses supplied for silage was in addition to the farmer's feed ration.

Use of Pig Lead

Mr. Leonard, in reply to a question addressed to the Minister of Supply by Major Lloyd, stated that the quantity of lead used for the manufacture of sheets and pipes in the first quarter of this year was 23,000 tons. The quantity used for this purpose in 1936, 1937, and 1938 was 180,000, 180,000, and 170,000 tons per annum respectively. In each case the figures included sheets and pipes manufactured for industrial installations (chemical plants, etc.), but the greater bulk would be for housing.

Ground Nuts

Mr. George Hall, answering a question as to whether investigations into the practicability of large-scale production of ground nuts would extend to other colonies than those in East Africa, said he was hoping for the team of experts now in East Africa to visit parts of West Africa for the same purpose.

Soap Substitutes

The Minister of Food, replying to questions as to the provision of substitutes for soap to the public, said he had already taken steps to encourage production and distribution of such products. More than 1000 firms had already been licensed to produce or market soap substitutes. He would see that reasonable prices were charged to the consumer, and he agreed that hard water districts should have preference in supplies.

Asked by Mr. Ward what steps he was taking to make greater use of coconut oil in the manufacture of cooking fat and soaps, the Minister replied that the highest percentage of coconut oil that was technically possible was already being so used.

Export of Tinplate

Mr. Marquand, replying to a question by Mr. Walker-Smith, stated that exports of tinplate last year amounted to 27,169 tons, as compared with 319,308 tons in 1938. All the tinplate being exported to-day was for food packing requirements related to the food import programme, except for small quantities used in the distribution of oil.

Iron Foundry Industry

Mr. Wilmot, replying to a question by Mr. W. Shepherd, stated that the present potential capacity of the iron foundry industry is 3,500,000 tons a year, compared with 3,400,000 in 1939 and 3,200,000 tons in 1943. Owing to shortage of labour, actual present production was at the rate of 2,300,000 tons a year. Everything was being done to increase the labour force.

German Technical Reports

Particulars of Latest Publications

SOME of the latest technical reports from the Intelligence Committee in Germany are detailed below. Copies are obtainable from H.M. Stationery Office at the prices stated.

BIOS 243. *I.G. Hoechst, Inorganic Division: Manufacture of sulphuric acid, sulphite products and chlorosulphuric acid* (3s. 6d.)

BIOS 256. *Phosphoric acid and sodium phosphates in Germany* (4s.).

BIOS 260. *I.G. Farben, Ludwigshafen: Manufacture of sulphuric acid, sulphite products, liquid sulphur dioxide, and cyanides* (4s.).

BIOS 296. *German non-ferrous copper base foundry industry* (11s.).

BIOS 375. *The wrought light alloy industry in the Ruhr* (6s. 6d.).

BIOS 392. *Welding of aluminium and aluminium alloys with particular reference to the manufacture of pressure vessels* (3s.).

BIOS 395. *German fluorescent lamp industry and phosphor chemical manufacture* (8s. 6d.).

BIOS 402. *Rolled non-ferrous metal industries in Germany* (9s. 6d.).

BIOS 419. *I.G. Wares: Manufacture at Gersthofen and Oppau* (1s. 6d.).

BIOS 422. *I.G., Ludwigshafen: Sodium hydrosulphite and related compounds* (3s.).

BIOS 423. *Deutsche Gold und Silber Scheide Anstalt (Degussa), Frankfurt: Report on organisation, research activities, and production of sodium cyanide, sodamide, and potassium ethyl xanthate* (4s. 6d.).

BIOS 425. *A.G. für Chemische Industrie, Gelsenkirchenschulke (a controlled subsidiary of the I.G.): Manufacture of carbon bisulphide* (1s. 6d.).

BIOS 438. *German collapsible tube and extrusion industries* (2s. 6d.).

BIOS 445. *Investigation of German plastic plants. Part III. Processing of polyvinyl chloride* (12s. 6d.).

BIOS 468. *I.G. Farben, Oppau-Ludwigshafen: The manufacture of synthetic crystals* (1s.).

FIAT 170. *Animalisation and water proofing of cellulose fibres at Dormagen* (6d.).

FIAT 406. *Non-ferrous metal rolling mill practice in Germany* (3s.).

FIAT 437. *Stickstoff-Syndikat G.m.b.H., Ramholz über Vollmerz, near Schlüchtern: Production and use of nitrogen fertiliser in Germany* (1s.).

FIAT 480. *German wood preservatives other than coal-tar creosote for the war period* (3s. 6d.).

New Control Orders

Glue, Gelatine and Size

THE Glue, Gelatine and Size (No. 3) Order, 1946 (S. R. & O. 1946, No. 973), revokes and re-enacts with amendments the No. 2 Order of 1945. The amendments are:

1. Control is re-imposed on the supply and acquisition of animal glue, gelatin and size, and of adhesives in the preparation of which any such material has been used.

2. The quantity of animal glue, gelatine (other than edible) and size which may be used without a licence is reduced.

3. The treatment, use and consumption of fish glue is freed from control.

Under the new order, licences will be necessary to supply, or to acquire or to treat, use and consume, in any quarter, quantities in excess of (a) 5 cwt. for edible gelatine, or (b) 1 ton in the aggregate for gelatine other than edible, animal glue and size. The first quarter will run from August 1, 1946, to September 30, 1946; subsequent quarters from October 1, January 1, etc. Applications for licences should be made to the Board of Trade, Raw Materials Department (R.M.2C), I.C. House, Millbank, London, S.W.1.

Fertiliser Prices

The Control of Fertilisers (No. 31) Order, 1946 (S. R. & O. 1946, No. 975), which came into force on July 5, revokes and re-enacts earlier Orders governing fertiliser prices. The new Order provides higher prices for superphosphates and compounds containing ammonium phosphate but prescribes lower prices for all other compounds. All prices reflect the increased cost of transport. Rebates on deliveries of compounds payable during July/August/September are increased by 10s., 7s. 6d., and 5s. respectively. Northern Ireland prices of compounds, superphosphates and ground phosphate are now brought into line with those ruling in the rest of the U.K. The Order also provides for certain other minor changes.

SAMPLING OF LEATHERS

A new British Standard Specification "Sampling and Analysis of Vegetable Tanned and Chrome Tanned Leathers," (B.S. 1309:1946) gives exact instruction as to methods of sampling, as well as diagrams showing from which part of the hide samples are to be taken. A full range of chemical tests is described. Both the methods of sampling and the chemical tests are those approved by the International Society of Leather Trades' Chemists. Copies of this Standard can be obtained from the B.S.I., 28 Victoria Street, London, S.W.1 (2s.).

Empire Scientific Conference

Report on Chemical Industries

SUMMING up the observations made at the Royal Society's Conference on the natural products of the Empire and the chemical industries that are, or might be, based on them, the "Steering Group," under the chairmanship of Dr. J. L. Sijmonsen, has made the recommendations which follow.

In view of the varied nature of the natural products of the Commonwealth, their wide geographical dispersal, and the diverse and often inadequate facilities in staff and equipment which may be available locally for their investigation, it is suggested:

(1) That a standing central committee, including representatives of the United Kingdom, the Dominions, India, and the Colonies, should be set up to advise on policy for the co-ordination of research, both scientific and economic, into the natural products of the Commonwealth. Such advice on their own particular problems would be made available to all Commonwealth countries with the minimum of delay.

(2) The Conference, while recognising the desirability of centralising research on problems common to many parts of the Commonwealth, supports very strongly the view that research into problems of more local interest should be co-ordinated within regions. This should lead to increased efficiency and

economy in man-power. The Conference regards advice on the concentration or regionalisation of the research in question as an important function of the central committee.

Essay Competition

Newton, Chambers' Awards for 1945

AN award of up to £100 is made annually by Newton, Chambers & Co., Ltd., to members of the Royal Institute of Chemistry, for the best essay, or essays, on a subject related to the application of chemistry to industrial welfare.

For papers presented in 1945 to the adjudication committee of the South Yorkshire Section of the R.I.C., awards have been made to the following:

- (1) C. A. P. Fagan, A.R.I.C. (of the Research Department, Marconi's Wireless Telegraph Co., Ltd., Chelmsford).
- (2) D. A. B. Llewelyn (registered student, Leicester).

The first award when the competition was started was made to Dr. Stocken, of the team working at Oxford Bio-Chemical Laboratory, for his contribution to research on synthetics of therapeutic value, mainly in arsenical poisoning. For security reasons neither the title, nor the work, could be published during the war, but it is hoped that in a few months' time this paper will be read in Sheffield.

General News

From Week to Week

One man was killed, and another injured, when an explosion occurred while they were drilling in the anhydrite mine of I.C.I., Ltd., at Billingham, on July 5.

Following the dismissal of some men owing, it is stated, to redundancy, employees of I.C.I. Metals, Swansea, decided to give seven days' strike notice.

Ministry of Labour statistics issued this week show that in the chemical industry the number of insured workers employed totalled 170,000 in April, 1946, as compared with 157,500 in mid-1945 and 124,800 in mid-1939.

The oil cake and cake feed industry in Scotland has been already affected by the shortage of linseed oil, one unit, the British Oil & Cake Co., Ltd., having been forced to dispense with certain of its employees.

New D.T.D. Specifications, obtainable from H.M. Stationery Office at the prices stated, have been issued as follow: No. 423b, Aluminium Alloy Bars, Extruded Sections and Forgings (superseding D.T.D. 423a), 1s.; No. 685, Lead-Silver-Tin Solder (suitable for aircraft radiators and oil coolers), 6d.

Reports on recent investigations of pyrethrum flowers from St. Helena and patchouli oil from Nyasaland are included in the latest issue of the *Bulletin of the Imperial Institute*.

Paines & Byrne, Ltd., have taken additional factory space at Bridgend, Glamorganshire, for the manufacture of catgut. All inquiries should be addressed to the head office at Greenford, Middlesex.

Addressing the Royal Society of Edinburgh last week, Professor James Ritchie stated that the use of sodium nitrate and superphosphate on an enclosed area of the sea in the West of Scotland resulted in increased growth of the marine plant and animal communities, with resultant improvement in the quality of fish.

In an attempt to alleviate the difficulties of the Scottish linoleum industry induced by the 20 per cent. cut in linseed oil, Councillor Peter Smith, a Kirkcaldy broker, purchased 1200 tons of sardine oil from Portugal last week, but, although he made application to the Board of Trade a month ago for an import licence, he has not yet had a reply.

All existing lists of persons specified as enemy by the Board of Trade have been revoked with effect from July 9 by S.R. and O. 1946, No. 1041. The U.S. and French Governments are taking parallel action in regard to their respective lists.

The silver jubilee of the discovery of insulin was celebrated on July 5 by a special gathering of the Diabetic Association at the Royal Institution. A tribute was paid to the late Sir Frederick Banting and to the work of his collaborator, Dr. Charles Best, who delivered an oration at the meeting.

World tin production (export) in the first quarter of 1946 is estimated at 20,000 long tons, according to the International Tin Research and Development Council. Bolivia provided 9500 tons, Nigeria 3200 tons, while about 2000 tons are stated to have been exported from Malaya. The world total is 50 per cent. of the average three-monthly production in the years 1934-38 and 32 per cent. of the similar average in 1941, when output reached its peak.

In consequence of the increase in railway rates, the prices of gas coke have been raised as follows: Northern Counties, 7d. a ton; rest of England and Wales, 10d.; Scotland, nil. In the area of the London and Counties Coke Association there will be a further increase of 10d. a ton to balance the coke levy fund. Foundry coke prices are to be increased by 1s. 3d. a ton, and other hard coke by 6d. to 1s. 3d., according to area.

An ingenious adaptation of Holmstrom's system of documentation and filing of information (see THE CHEMICAL AGE, 1940, 42, 186) is described in Bulletin No. 7 of the Scottish Reconstruction Committee, by A. G. Clement and R. H. S. Robertson. A particular advantage of their system is the arrangement whereby it can be used in loose-leaf binders, instead of as a card-index. Copies of the Bulletin are obtainable (3d.) from the S.R.C., 213 West Campbell Street, Glasgow, C.2.

Foreign News

The spraying of DDT in North-Central Ceylon has resulted in a remarkable reduction of the incidence of malaria.

In Shanghai, an exporters' guild has been set up by dealers in tung oil and other Chinese export commodities.

Pig-iron production at the Volta Redonda plant, the large new Brazilian steel plant, was expected to start last month with an initial rate of output of 600 tons per day.

The United States occupation authorities in Germany have purchased Belgian super-phosphate fertiliser to the amount of 15,000,000 Belgian francs for the use of German farmers.

A kaolin deposit has been discovered recently in Tanganyika, some 17 miles from Dar-es-Salaam, and production is being developed.

A new ceramics factory manufacturing glazed coloured ware has recently gone into production near Rybinsk on the Volga. Its annual capacity is 330,000 slabs.

The first section of a new Russian manganese concentration plant has been completed in the manganese district of Nikopol in the Ukraine.

The Italian department of public health has recently received plans for the layout of a penicillin plant, which is to be erected in the neighbourhood of Rome as a gift from U.N.R.R.A.

Northern Rhodesia's war output of minerals reached a value of over £76,400,000, of which copper (1,400,000 tons) accounted for £67,000,000. Current copper output runs at about 18,000 tons a month.

From India it is reported that a Government committee has recommended a seven-year plan under which production of steel in India would be raised from 1,200,000 tons a year to 2,500,000 or 3,000,000 tons.

In Tanganyika, the Uruwira area has recently been toured by the colony's new mining consultant, since prospects for the mining of lead-containing minerals are considered as promising.

To avoid a slump in the production of copper sulphate, the U.S. Office of Price Administration increased the price about 65 cents per 100 lb. to cover the 2½ c. per lb. increase recently made in the price of copper.

In Sierra Leone, prospecting work on the lignite deposits north of Newton is being continued, and a total of 1,000,000 tons has been proved or can be classified as probable. It is suitable for making briquettes and for gas production.

Legislation is to be introduced in Ceylon for the purpose of regulating the mining of radioactive minerals found in the island. There are scanty deposits of thorianite which are now being investigated by the Government mineralogist's department. Larger occurrences of monazite and smaller deposits of another radioactive mineral, zirkelite, are also known to exist in Ceylon.

Forthcoming Events

July 16. British Standards Institution. Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, 3.30 p.m. Annual general meeting.

July 20. British Association for the Advancement of Science. British Medical Association, Tavistock Square, London,

W.C.I., 10.15 a.m., statutory meeting of council; 10.45 a.m., statutory meeting of general committee; 12.45 for 1 p.m. (at Claridge's Hotel, Brook Street, W.1), luncheon; 3.30 p.m., general meeting—Sir Richard Gregory, Bt., F.R.S.: "Civilisation and the Pursuit of Knowledge."

Company News

Accounts for 1944 have now been published by **British Emulsifiers, Ltd.**, showing that trading profits totalled £29,418, as compared with £31,660 for the previous 15 months. The dividend of 10 per cent. compares with 12½ per cent. previously.

British Glues and Chemicals, Ltd., are raising the ordinary dividend by 5 per cent. to 15 per cent. for the year ended April 30 last. Net profit for the year is given as £109,384, as compared with £101,725 for the previous year.

The full report of **Boots Pure Drug Co., Ltd.**, for the year ended March 31 last, shows that the trading profit for the group totalled £2,122,954, as compared with £2,012,881 for the previous year. The company's net profit was £619,459, as against £554,139, and the final dividend of 15 per cent. makes a total of 35 per cent. for the year, an increase of 2½ per cent.

Reckitt & Colman, Ltd., have issued accounts for 1945, which are in revised and consolidated form. Excluding profits of companies on the Continent, group trading profit and investment income declined from £2,898,153 for 1944 to £2,737,044 last year, owing to smaller sales in the U.K. and higher costs. Provision for net profit is reduced and net profit shows an increase from £870,488 to £967,495. The final dividend of 5 per cent. again makes 20 per cent. for the year.

At the annual meeting of the **Bleachers' Association, Ltd.**, on July 5, the chairman, Sir Alan Sykes, stated that a capital reconstruction scheme would be in the hands of stockholders within a few weeks. The proposals would deal with the six years' arrears of preference dividend and a reduction in capital which, without injustice to any class of shareholder, would put the company in a position to resume payment of ordinary dividends, provided no further deterioration of trading conditions took place. Existing capital amounts to £6,306,237 in ordinary and 5½ per cent. preference stock and £2,250,000 in 4½ per cent. debentures. No ordinary dividend has been paid since 1930. On March 31 last the company had a credit balance of £143,667.

Borax Consolidated, Ltd., announce that the £1,000,000 4½ per cent. first, and £1,500,000 4½ per cent. second debenture stocks will be repaid on Jan. 1, 1947, and

May 15, 1947, at 110 per cent. and 103 per cent. respectively. The amount required will be provided by the issue of £1,500,000 out of an authorised amount of £2,000,000 new 3½ per cent. debenture stock at 101 per cent., and by issue of the unissued 200,000 deferred ordinary shares of £1, each at the price of 42s. 6d. per share. The 200,000 new deferred will be offered to the holders of the £1,300,000 deferred ordinary at 42s. 6d. per share in the proportion of two new for every £13 deferred ordinary stock held on June 28. The deferred shares will be converted into stock when fully paid up. New 3½ per cent. debenture stock to an amount of £1,500,000 is to be issued at 101 per cent. The directors have no immediate intention of issuing the balance of £500,000 new stock. The effect of the scheme will be that the company saves £60,000 gross per annum in interest charges, as against a provision for dividend on the additional deferred.

Commercial Intelligence

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

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, 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 and 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.)

FREERS CHEMICAL WORKS, LTD., Stroud, (M., 13/7/46.) June 4, £1000 debentures; general charge. *Nil. December 4, 1945.

ARROW PLASTICS, LTD., Thames Ditton, (M., 13/7/46.) June 11, debenture to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge.

G. & E. BABEY, LTD., Totton, creosote manufacturers. (M., 13/7/46.) June 11, debenture to Lloyds Bank, Ltd., securing all moneys due or to become due to the bank; general charge.

BRITISH PLASTOIDS CO., LTD., Nottingham, manufacturers of plastics, etc. (M., 13/7/46.) June 3, £3150 charge to C. R. B. Eddowes, Derby; charged on Manor House (otherwise Manor Farm), Stapleford (Notts). *£1404. August 31, 1944.

J. CASARTELLI & SON (LIVERPOOL), LTD., dealers in scientific instruments. (M., 13/7/46.) June 6, debenture to Martins Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *£1500. August 5, 1943.

LIBERTY INDUSTRIAL TRUST, LTD. (formerly BEACON CHEMICAL CO., LTD.), Sittingbourne. (M., 13/7/46.) June 12, debenture to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *Nil. January 26, 1945.

BRITISH ALUMINIUM CO., LTD., London, E.C. (M., 13/7/46.) June 4, disposition by Union Bank of Scotland, with consents, granted in implement of a trust deed dated September 12, 1934; charged on certain land and buildings at Falkirk. *£3,182,330. April 12, 1946.

NORTH BRITISH ALUMINIUM CO., LTD., London, E.C. (M., 13/7/46.) June 4, dispositions by Lochaber Building Co., Ltd., and by Mrs. A. L. Whitmore or Colquhoun, with consents granted in implement of a trust deed dated September 12, 1934; respectively charged on certain properties in Inverlochy and in Lochaber. *—. March 26, 1946.

STEWART PLASTICS, LTD., Teddington. (M., 13/7/46.) May 15, charge securing £28000 and any further sums, etc., to Cheltenham and Gloucester Building Society, £500 second mortgage to Capt. T. D. Searle, Cheltenham, and £1000 third mortgage to Mrs. M. E. Czajka, Addiscombe; all charged on 87 Gloucester Road, Croydon.

Satisfaction

ARPLEX (ENGINEERS), LTD., London, W.C., manufacturers of liquid products for the protection of glass. (M.S., 13/7/46.) Satisfactions June 17 of charge securing all moneys, etc., registered October 19, and £3000 registered December 10, 1943.

Chemical and Allied Stocks and Shares

STOCK markets have been cheerful on hopefulness regarding the American loan and the renewed strength of British Funds, although business in most sections continued moderate. Home rails were easier despite the forthcoming interim dividend decisions, and movements in the other nationalisation groups remained small and indefinite apart from a sharp rise in Cable & Wireless ordinary stock.

Imperial Chemical strengthened to 43s. 3d., it being pointed out that there is a not unattractive yield on the basis of the 8 per cent. dividend ruling in recent years. B. Laporte maintained their recent rise to 100s., Fisons were 62s. 6d., and British Drug Houses rallied to 70s. awaiting the final decision regarding the proposed capital increase. Associated Cement have been steady at 70s. on the full report, while

Turner & Newall firmed up to 93s., United Molasses to 56s. 9d., and the units of the Distillers Co. to 134s. Borax Consolidated eased to 48s. 6d., and British Oxygen (102s. 6d.) failed to hold all an earlier advance, but Dunlop Rubber at 74s. were good on the success of the company's big debenture issue. Elsewhere, Boots Drug firmed up to 63s. 3d. on the increased profits and strong financial position; as previously announced, the payment for the year is raised from 32½ to 35 per cent. Goodlass Wall & Lead Industries 10s. ordinary remained steady at 31s. 6d. on further consideration of the past year's results, the latter showing that the higher dividend of 10 per cent. was earned with a margin which would have provided a further 12½ per cent.

Greiff-Chemicals Holdings 5s. shares continued to attract more attention on the recent meeting, changing hands up to 13s. 3d. Monsanto Chemicals 5½ per cent. preference have marked 24s. 6d., and Leeds Fireclay preference 18s. 1½d. Among plastics and allied shares, De La Rue were £12½, British Xylonite £7½, and British Industrial Plastics 2s. ordinary 8s. 9d., while O. & M. Kleeman rose further to 37s. 3d. Iron and steels showed only small movements, Guest Keen easing further to 40s. on the capital proposals, but Consett Iron 6s. 8d. shares firmed up to 8s. 7½d. as a result of the meeting. Elsewhere, Staveley were better at 45s. 9d. Textiles became firmer and were featured by a rise of 1s. 3d. to 25s. 3d. in Bleachers preference, following the official news that a capital scheme is pending; the ordinary shares were slightly higher at 14s. 3d. Calico Printers were 23s. 4½d., and Bradford Dyers 24s. 9d. Activity around 57s. 6d. continued in Courtauld's, and British Celanese were 37s., but Lansil receded to 32s. 6d. on the results.

Lever & Unilever moved back to 56s. 3d., and Lever N.V. to 56s. 10½d., but Amalgamated Metal rose to 21s. 6d., and Imperial Smelting to 19s. 3d., while General Refractories at 23s. 1½d. were firmer. British Glues & Chemicals 4s. ordinary rose to 15s. 3d. on the higher dividend, the preference shares also moving higher at 45s. in view of their participating payment. There was again activity in Beechams deferred around 27s., reflecting recognition of the extent the company stands to benefit when E.P.T. is abolished. Timothy Whites were 46s. 6d. Triplex Glass at 44s. eased slightly, following their recent rise. There was buying of United Glass Bottle shares at over 90s. on the possibility of a further increase in dividend now that the debentures have been redeemed. Oil shares, after receding at the end of last week, rallied on the more hopeful view of international affairs, Anglo-Iranian being £52, Shell 93s. 9d. and Burmah Oil 71s. 3d. Canadian Eagle Oil were better at 34s.

Prices of British Chemical Products

STEADY trading activity is reported in the London industrial chemicals market, there being little change in the demand either for home or export account. Apart from the price adjustments of chemicals derived from non-ferrous metals, quotations are unchanged at recent levels, but the undertone is distinctly strong. Among the potash and soda compounds, chlorate of soda and the bichromates are in good call against a relatively short supply, and there has been a steady flow of specifications for solid and liquid caustic soda, with values well maintained. Rather more inquiry is reported for acetic acid, boric acid, borax and formaldehyde. There has been plenty of buying interest in the coal-tar products market, with spot offers difficult to negotiate. Prices are firm in all departments.

MANCHESTER.—The demand for textile and other industrial chemicals on the Manchester market during the past week has again been affected to some extent by the prevalence of holiday conditions in a number of districts, but otherwise trading conditions are steady and prices are firm in virtually all sections. Delivery specifications for the alkalis and other heavy chemicals are circulating freely and a fair amount of replace-

ment business on home trade account has been reported. Shippers continue to enter the market with inquiries for a fairly wide range of products. Trade in the general run of fertilisers is seasonally quiet, but a steady business is being done in the leading tar products, both light and heavy.

GLASGOW.—Little change can be recorded for conditions in the Scottish heavy chemical market during the past week. A large number of price alterations has taken place owing to the increase in rail rates which took effect at the beginning of July, and all classes of chemicals have been affected. Inquiries and orders are still far in advance of supplies, and there is no sign that supplies will meet the demand for a considerable time. Export inquiries for zinc oxide, formaldehyde, sulphur, and sodium hydro-sulphite have been very brisk, and a considerable volume of business has been done.

Price Changes

Rises: Coconut oil; copper sulphate; lead, red; lead, white; palm kernel oil; sodium nitrate; zinc oxide.

Falls: Ammonium phosphate; ammonium sulphate; pitch (Manchester).

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £47 10s.; 80% pure, 1 ton, £49 10s.; commercial glacial, 1 ton, £59; delivered buyers' premises in returnable barrels, £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 50 tons and over, £65; 10/50 tons, £65 10s.; 5/10 tons, £66; 1/5 tons, £66 10s.; single drums, £67 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £16 per ton, f.o.r. **MANCHESTER:** £16 to £16 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. **MANCHESTER:** £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—**MANCHESTER:** £39 10s. per ton d/d.

Ammonium Carbonate.—£37 10s. to £38 per ton d/d in 5 cwt. casks. **MANCHESTER:** Powder, £43 d/d.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £19 10s. per ton. See also Salammoniac.

Ammonium Persulphate.—**MANCHESTER:** £5 per cwt. d/d.

Antimony Oxide.—£110 to £117 per ton.

Arsenic.—Per ton, 99/100%, £26 10s. for 20-ton lots, £31 for 2 to 10-ton lots; 98/99%, £25 for 20-ton lots, £29 10s. for 2 to 10-ton lots; 96/99% white, £21 15s. for 20-ton lots, £25 15s. for 2 to 10-ton lots.

Barium Carbonate.—Precip., 4-ton lots, £19 per ton d/d; 2-ton lots, £19 5s. per ton. bag packing, ex works.

Barium Chloride.—98/100% prime white crystals, 4-ton lots, £19 10s. per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £18 15s. per ton d/d; 2-ton lots, £19 10s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s.

- B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.
- Boric Acid.**—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.
- Calcium Bisulphide.**—£6 10s. to £7 10s. per ton f.o.r. London.
- Calcium Chloride.**—70/72% solid, £5 15s. per ton, ex store.
- Charcoal, Lump.**—£22 to £24 per ton, ex wharf. Granulated, supplies scarce.
- Chlorine, Liquid.**—£23 per ton, d/d in 16/17 cwt. drums (3-drum lots).
- Chrometan.**—Crystals, 5½d. per lb.
- Chromic Acid.**—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.
- Citric Acid.**—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6½d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.
- Copper Carbonate.**—MANCHESTER: £8 5s. per cwt. d/d.
- Copper Oxide.**—Black, powdered, about 1s. 4½d. per lb.
- Copper Sulphate.**—£33 10s. per ton, f.o.b., less 2%, in 2 cwt. bags.
- Cream of Tartar.**—100 per cent., per cwt., from £13 17s. 6d. for 10-cwt. lots to £14 1s. per cwt. lots, d/d. Less than 1 cwt., 2s. 5½d. to 2s. 7½d. per lb. d/d.
- Formaldehyde.**—£27 to £28 10s. per ton in casks, according to quantity, d/d. MANCHESTER: £28.
- Formic Acid.**—85%, £54 per ton for ton lots, carriage paid.
- Glycerine.**—Chemically pure, double distilled 1260 s.g., in tins, £4 to £5 per cwt., according to quantity; in drums, £3 19s. 6d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.
- Hexamine.**—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.
- Hydrochloric Acid.**—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.
- Hydrofluoric Acid.**—59/60%, about 1s. to 1s. 2d. per lb.
- Hydrogen Peroxide.**—11d. per lb. d/d, carboys extra and returnable.
- Iodine.**—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.
- Lactic Acid.**—Pale tech., £60 per ton; dark tech., £53 per ton ex works; barrels returnable.
- Lead Acetate.**—White, 57s. to 60s. per cwt., according to quantity.
- Lead Nitrate.**—About £53 per ton d/d in casks. MANCHESTER: £53 10s.
- Lead, Red.**—Basic prices per ton: Genuine dry red lead, £71; orange lead, £83. Ground in oil: Red, £84; orange, £95. Ready-mixed lead paint: Red, £86; orange, £98.
- Lead, White.**—Dry English, in 8-cwt. casks, £83 per ton. Ground in oil, English, in 5-cwt. casks, £94 10s. per ton.
- Litharge.**—£57 10s. to £60 per ton, according to quantity.
- Lithium Carbonate.**—7s. 9d. per lb. net.
- Magnesite.**—Calcined, in bags, ex works, £36 per ton.
- Magnesium Chloride.**—Solid (ex wharf), £22 per ton.
- Magnesium Sulphate.**—£12 to £14 per ton.
- Mercuric Chloride.**—Per lb., for 2-cwt lots, 9s. 1d.; smaller quantities dearer.
- Mercurous Chloride.**—10s. 1d. to 10s. 7d. per lb., according to quantity.
- Mercury Sulphide, Red.**—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.
- Methylated Spirit.**—Industrial 66° O.P. 100 gals., 3s. per gal.; pyridinised 64° O.P. 100 gal., 3s. 1d. per gal.
- Nitric Acid.**—£24 to £26 per ton, ex works.
- Oxalic Acid.**—62s. 6d. to 65s. per cwt. £85 5s. per ton in ton lots, packed in free 5-cwt. casks. MANCHESTER: £4 to £4 2s. 6d. per cwt.
- Paraffin Wax.**—Nominal.
- Phosphorus.**—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.
- Potash, Caustic.**—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.
- Potassium Bichromate.**—Crystals and granular, 7½d. per lb.; ground, 8½d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.
- Potassium Carbonate.**—Calcined, 98/100%, £57 per ton for 5-ton lots, £57 10s. per ton for 1 to 5-ton lots, all ex store; hydrated, £51 per ton for 5-ton lots, £51 10s. for 1 to 5-ton lots.
- Potassium Chlorate.**—Imported powder and crystals, nominal.
- Potassium Iodide.**—B.P., 8s. 8d. to 12s. per lb., according to quantity.

- Potassium Nitrate.**—Small granular crystals, 76s. per cwt. ex store, according to quantity.
- Potassium Permanganate.**—B.P., 1s. 8½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £9 6s. 3d. per cwt., according to quantity d/d.
- Potassium Prussiate.**—Yellow, nominal.
- Salammoniac.**—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £19 10s. per ton, in casks, ex store.
- Salicylic Acid.**—MANCHESTER: 1s. 8d. to 2s. 1d. per lb. d/d.
- Soda, Caustic.**—Solid 76/77%; spot, £16 7s. 6d. per ton d/d.
- Sodium Acetate.**—£42 per ton, ex wharf.
- Sodium Bicarbonate.**—Refined, spot, £11 per ton, in bags.
- Sodium Bichromate.**—Crystals, cake and powder, 6½d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.
- Sodium Bisulphite.**—Powder, 60/62%, £19 10s. per ton d/d in 2-ton lots for home trade.
- Sodium Carbonate Monohydrate.**—£25 per ton d/d in minimum ton lots in 2 cwt. free bags.
- Sodium Chlorate.**—£36 to £45 per ton, nominal.
- Sodium Hyposulphite.**—Pea crystals 19s. per cwt. (ton lots); commercial, 1-ton lots, £17 per ton carriage paid. Packing free.
- Sodium Iodide.**—B.P., for not less than 28 lb., 9s. 11d. per lb., for not less than 7 lb., 13s. 1d. per lb.
- Sodium Metaphosphate (Calgon).**—11d. per lb. d/d.
- Sodium Metasilicate.**—£16 10s. per ton, d/d U.K. in ton lots.
- Sodium Nitrite.**—£22 10s. per ton.
- Sodium Percarbonate.**—12½% available oxygen, £7 per cwt.
- Sodium Phosphate.**—Di-sodium, £25 per ton d/d for ton lots. Tri-sodium, £27 10s. per ton d/d for ton lots (crystalline).
- Sodium Prussiate.**—9d. to 9½d. per lb. ex store.
- Sodium Silicate.**—£6 to £11 per ton.
- Sodium Sulphate (Glauber Salt).**—£4 10s. per ton d/d.
- Sodium Sulphate (Salt Cake).**—Unground. Spot £4 11s. per ton d/d station in bulk. MANCHESTER: £4 12s. 6d. to £4 15s. per ton d/d station.
- Sodium Sulphide.**—Solid, 60/62%, spot, £19 2s. 6d. per ton, d/d, in drums; crystals, 30/32%, £12 7s. 6d. per ton, d/d, in casks.
- Sodium Sulphite.**—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.
- Sulphur.**—Per ton for 4 tons or more, ground, £14 to £16 5s., according to fineness.
- Sulphuric Acid.**—168° Tw., £6 2s. 8d. to £7 2s. 8d. per ton; 140° Tw., arsenic-free, £4 11s. per ton; 140° Tw., arsenious, £4 3s. 6d. per ton. Quotations naked at sellers' works.
- Tartaric Acid.**—Per cwt., for 10 cwt. or more, £15 8s.; 5 to 10 cwt., £15 9s. 6d.; 2 to 5 cwt., £15 11s.; 1 to 2 cwt., £15 13s. Less than 1 cwt., 9s. 1d. to 3s. 3d. per lb. d/d, according to quantity.
- Tin Oxide.**—Nominal.
- Zinc Oxide.**—Maximum prices per ton for 2-ton lots, d/d; white seal, £54 5s.; green seal, £53 5s.; red seal, £51 15s.
- Zinc Sulphate.**—Tech., £25 per ton, carriage paid.

Rubber Chemicals

- Antimony Sulphide.**—Golden, 1s. 5d. to 2s. 6d. per lb. Crimson, 2s. 2d. to 2s. 6d. per lb.
- Arsenic Sulphide.**—Yellow, 1s. 9d. per lb.
- Barytes.**—Best white bleached, £8 3s. 6d. per ton.
- Cadmium Sulphide.**—6s. to 6s. 6d. per lb.
- Carbon Bisulphide.**—£37 to £41 per ton, according to quality, in free returnable drums.
- Carbon Black.**—6d. to 8d. per lb., according to packing.
- Carbon Tetrachloride.**—£44 to £49 per ton, according to quantity.
- Chromium Oxide.**—Green, 2s per lb.
- India-rubber Substitutes.**—White, 6 3/16d to 10½d. per lb.; dark, 6 3/16d. to 6 15/16d. per lb.
- Lithopone.**—30%, £26 5s. per ton.
- Mineral Black.**—£7 10s. to £10 per ton.
- Mineral Rubber, "Rupron."**—£20 per ton.
- Sulphur Chloride.**—7d. per lb.
- Vegetable Lamp Black.**—£49 per ton.
- Vermilion.**—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.
Plus 5% War Charge.

Nitrogen Fertilisers

Ammonium Phosphate.—Imported material, 11% nitrogen, 48% phosphoric acid, per ton in 6-ton lots, d/d farmer's nearest station, in July, £19 7s., rising by 6s. per ton per month to September, then by 2s. 6d. per ton per month to March, 1947.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in July, £9 11s., rising by 1s. 6d. per ton per month to March, 1947.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £14 18s. 6d.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £17 5s. per ton; granulated, over 98%, £16 per ton.

Coal Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 11½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 9½d. to 11½d. per lb., d/d; crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 5½d. to 8d. per gal., according to quality, f.o.r. maker's works. MANCHESTER, 6½d. to 9½d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £7 2s. 6d. to £10 per ton, according to m.p.; hot-pressed, £11 10s. to £12 10s. per ton, in bulk ex works; purified crystals, £25 15s. to £28 15s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 75s. per ton f.o.r. suppliers' works; export trade, 120s. per ton f.o.b. suppliers' port. MANCHESTER: 75s. to 77s. 6d. f.o.r.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. MANCHESTER: 14s. 6d. to 18s. 6d. per gal.

Toluol.—Pure, 3s. 1d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 1d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £21 per ton; grey, £24. MANCHESTER: Grey, £24 to £25 per ton.

Methyl Acetone.—40/50%, £56 per ton.

Wood Creosote.—Unrefined, about 2s. per gal., according to boiling range.

Wood Naphtha, Miscible.—4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. per gal.

Wood Tar.—£5 per ton.

Intermediates and Dyes (Prices Nominal)

m-Cresol 98/100%.—Nominal.

o-Cresol 30/31° C.—Nominal.

p-Cresol 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-Nitraniline.—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

o-Toluidine.—1s. per lb., in 8/10 cwt. drums, drums extra.

p-Toluidine.—2s. 2d. per lb., in casks.

m-Xylydine Acetate.—4s. 5d. per lb., 100%

Latest Oil Prices

LONDON.—July 10.—For the period ending August 3 (August 17 for refined oils), per ton, naked, ex mill, works or refinery, and subject to additional charges according to package: LINSEED OIL, crude, £65. RAPESEED OIL, crude, £91. COTTONSEED OIL, crude, £52 2s. 6d.; washed, £55 5s.; refined edible, £57; refined deodorised, £58. COCONUT OIL, crude, £49; refined deodorised £56; refined hardened deodorised, £60. PALM KERNEL OIL, crude, £48 10s.; refined deodorised, £56; refined hardened deodorised, £60. PALM OIL (per ton c.i.f.), in returnable casks, £42 5s.; in drums on loan, £41 15s.; in bulk £40 15s. GROUNDNUT OIL, crude, £56 10s.; refined deodorised, £58; refined hardened deodorised, £62. WHALE OIL, crude hardened, 42 deg., £84; refined hardened, 46/48 deg., £85. ACID OILS: Groundnut, £40; soya, £38; coconut and palm-kernel, £43 10s. ROSIN: Wood, 32s. to 45s.; gum, 44s. to 54s. per cwt., ex store, according to grade. TURPENTINE, American, 87s. per cwt. in drums or barrels, as imported (controlled price).

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each. Numbers given under "Applications for Patents" are for reference in all correspondence up to acceptance of the complete specification.

Applications for Patents

- Esters.—E. Lilly & Co. 17221-2.
 Cutting of plastic material.—N. S. McNab. 17300.
 Metal powder melting.—O. J. Metzger. 16993.
 Cathode-ray tubes.—R. Milne, and D. McMullen. 17137.
 Zinc.—National Smelting Co., Ltd., and L. J. Derham. 17052.
 Zinc.—National Smelting Co., Ltd., and S. Robson. 17053.
 Alloys.—Paramount Alloys, Ltd., and H. J. Henbrey. 17239.
 Cathode-ray tubes.—F. N. Scaife, E. Parker, H. Jackson, and C. S. Wright. 17279.
 Organic compounds.—P. F. C. Sowter, and W. A. Rogerson. 17075.
 Granulation of molten chemicals.—Spolek Pro Chemickou a Hutni Vyrobu, Narodni Podnik. 17026.
 Fibrous materials.—A. H. Stevens. (Monsanto Chemical Co.) 16902.
 Acid pickling baths.—N. Swindin. 17212.
 Dehydrochloric acid.—A. Abbey. (Armour & Co.) 17987.
 Hydrocarbons.—Anglo-Iranian Oil Co., Ltd., S. F. Birch, and J. Habeshaw. 17643.
 Acetal decomposition.—C. Arnold. (Standard Oil Development Co.) 17571.
 Hydrocarbons.—J. C. Arnold. (Standard Oil Development Co.) 17506.
 Carbon monoxide.—J. C. Arnold. (Standard Oil Development Co.) 17507.
 Baking ceramic products.—L. Bernardaud et Cie. 17497.
 Aromatic amines.—S. F. Birch, F. A. Fidler, D. V. N. Hardy, and E. L. Molloy. 17719.
 Insect detergents.—R. G. Boniface. 17544.
 Amidines.—Boots Pure Drug Co., Ltd., P. Oxley, and W. F. Short. 17636.
 Heating liquid baths.—M. Boss. 18125.
 Aluminium base alloy.—T. F. Bradbury. 17720.
 Organic acids.—J. G. M. Bremner, D. G. Jones, and I.C.I., Ltd. 17413.
 Organic compounds.—J. G. M. Bremner, F. Starkey, D. A. Dowden, and I.C.I. Ltd. 17414.
 Elastomers.—British Thomson-Houston Co., Ltd. 17374, 17375.
 Chlorosilanes.—British Thomson-Houston Co., Ltd. 17376.
 Hydrocarbon compositions.—British Thomson-Houston Co. 18139.
 Measuring instruments.—R. O. Browning. 17406.
 Liquid filtration.—R. S. Brownlow. 17638.
 Mixing apparatus.—B. Brunton, H. Rose, and T. E. Carron. 17516.
 Glutamic acid.—A. F. Burgess. (International Minerals & Chemical Corporation.) 17624.
 Fungicide dispersing.—R. D. Campbell, J. D. Campbell, and H. Campbell. 17886.
 Dyestuffs.—Ciba, Ltd. 17605.
 Solder analysers.—Continental Can Co., Inc. 17655.
 Treatment of textile fibres.—A. K. Croad. (Alrose Chemical Co.) 17802.
 Heat treatment of alloy steels.—E. T. Digby. 18073.
 Oxygen jet cutting nozzles.—C. Dod. 18106.
 Liquid atomisers.—Drugs, Ltd. (S. Gimelli.) 17631.
 Pipe connections.—E. Duffield, and Yorkshire Copper Works, Ltd. 17937.
 Thermoplastics.—Dunlop Rubber Co., Ltd., R. A. Canter, and T. E. H. Gray. 18057.
 Centrifugal sprayer.—D. Dunnet. 17858.
 Thermosetting compositions.—E. I. Du Pont de Nemours & Co. 17919.
 7-Dehydro-cholesterol.—E. I. Du Pont de Nemours & Co., and J. A. Callan. 17920.
 Tube connectors.—H. Eisner. 17656.
 Iron base alloys.—Electro Metallurgical Co. 17851.
 Iron base alloys.—Electro Metallurgical Co. (Cognate with 17851.) 17852.
 Ferrous alloys.—Electro Metallurgical Co. 17853-4.
 Drying of flowable solids.—J. L. Erisman. 17801.
 Complete Specifications Open to Public Inspection
 3,4-Di-(*p*-hydroxy-phenyl)-hexadiene-2,4.—F. Hoffman-La Roche & Co. A.G. Dec. 5, 1944. 23317/45.
 Vinyl esters and polymers and interpolymers derived therefrom.—I.C.I., Ltd. Dec. 9, 1944. 33334/45.
 Insolubilisation of polyamides.—I.C.I., Ltd. Dec. 8, 1944. 33336/45.
 Production of fluorinated hydrocarbons.—I.C.I., Ltd. Dec. 8, 1944. 33337/45.
 Handling liquids.—Josam Manufacturing Co. Dec. 6, 1944. 31685/45.
 Basic calcium chloride.—Solvay & Cie. Dec. 5, 1944. 30668/45.
 Preparation of diarylamines.—Timbrol, Ltd. Dec. 11, 1944. 31040/45.
 Liquid sprayers.—E. W. Vose. Dec. 7, 1944. 9055/44.
 Alkali aluminium fluoride.—A/S Norsk Aluminium Co. Feb. 11, 1941. (Cognate applications 13186-7-8/46.) 13185/46.

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Cryolite.—A/S Norsk Aluminium Co. May 6, 1941. (Cognate applications 13190-13191/46.) 13189/46.

Heat-resisting alloys.—Allegheny Ludlum Steel Corporation. Jan. 23, 1943. 6046/44.

Halogeno-hydrocarbon polymers.—American Viscose Corporation. July 14, 1943. 9246/44.

Thermostatically adjustable fluid circulator means.—G. Annesley. Dec. 14, 1944. 33812/45.

Modification of fatty oils or derivatives thereof.—Bakelite, Ltd. Dec. 14, 1944. 31965/45.

Abrasives.—Cie. de Produits Chimiques et Electrometallurgiques Alais, Froges & Camargue. Dec. 12, 1944. 33479/45.

Fluid pressure energy translating devices.—Denison Engineering Co. Dec. 14, 1944. 26631/45.

Preparation of filtered infusions.—J. Derek. Dec. 14, 1944. 33787/45.

Chemical products.—E.I. Du Pont de Nemours & Co. Sept. 18, 1943. 23160/44.

Production of aminoacetonitrile.—E.I. Du Pont de Nemours & Co. Aug. 22, 1944. 21439/45.

Compositions comprising acrylonitrile polymers and copolymers and shaped articles produced therefrom.—E.I. Du Pont de Nemours & Co. Dec. 14, 1944. 33894/45.

Organic chemicals.—E.I. Du Pont de Nemours & Co. Dec. 14, 1944. 33895/45.

Saturated alpha, omega-dinitriles.—E.I. Du Pont de Nemours & Co. Dec. 14, 1944. 32896/45.

Condensation products from 1:8-naphthosulphone, and the resulting products.—J. R. Geigy A.G. Dec. 12, 1944. 34222/45.

Mixing Apparatus.—Girdler Corporation. Sept. 14, 1943. 18618/44.

Press moulded articles made of ceramic masses.—S. F. Glauberg. April 6, 1944. 10641/46.

Hollow electrodes for salt bath furnaces.—A. de F. Holden. Dec. 13, 1944. 27501/45.

Elastomeric materials.—Imperial Chemical Industries, Ltd. Nov. 16, 1944. 30441/45.

Apparatus for the determination of the flash-point of a substance.—E. Jenson. Nov. 9, 1944. 13280/46.

Azeotropic distillation.—Lummus Co. Feb. 9, 1942. (Cognate applications 2183-2184/43.) 2182/43.

Electrolytically separating zinc from a bath containing zinc cyanide.—N.V. Philips Gloeilampenfabrieken. Dec. 24, 1941. 12972/46.

Fire extinguishing foam.—National Foam System, Inc. March 12, 1943. 4227/44.

Checking butyric acid fermentation in cheese and other preservatives.—T. Nielsen. Sept. 18, 1941. 24409/45.

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Manufacture of coating compositions.—H. Sohm. Dec. 19, 1941. 577,954.

Process for the alkylation of iso-paraffins with olefins.—Standard Oil Development Co. Feb. 12, 1942. 577,869.

Lubricating oil compositions by the addition of compounds having oxidation-inhibiting and like qualities.—Standard Oil Development Co. Jan. 1, 1942. 577,955.

Process and apparatus for the cracking of carbonaceous material.—M. Steinschlaeger. March 21, 1944. 577,906.

Manufacture of composite metal articles.—W. O. Alexander, and I.C.I., Ltd. April 28, 1943. 577,986.

Heat exchange devices.—W. O. Alexander, C. S. Steadman, and I.C.I., Ltd. July 5, 1944. 578,003.

Production of nitroparaffins.—M. P. Appleby, and I.C.I., Ltd. April 23, 1943. 578,044.

Curing or vulcanisation of chloroprene-type synthetic rubber-like materials.—W. Baird, B. J. Habgood, D. A. Harper, J. A. Hendry, and I.C.I., Ltd. March 11, 1943. 578,012.

Production of alpha-chloracrolein.—J. G. M. Bremner, D. G. Jones, and I.C.I., Ltd. July 19, 1944. 578,071.

Manufacture of metalliferous materials for use as catalysts.—H. E. Charlton. Sept. 22, 1941. 577,974.

Heat exchange devices.—J. L. Coltman, and I.C.I., Ltd. Jan. 19, 1943. 577,979.

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Surgical and dental alloys.—Deloro Smelting & Refining Co. June 1, 1943. 578,097.

Manufacture of organic compounds containing sulphur.—E.I. Du Pont de Nemours & Co., and A. M. Alvarado. May 26, 1943. 578,124.

Electrodeposition of tin.—E.I. Du Pont de Nemours & Co., and N. F. Blackburn. July 13, 1944. 578,069.

Cellulose derivatives.—E.I. Du Pont de Nemours & Co., H. F. Mark, and S. Siggia. June 23, 1944. 578,067.

Hot cathode mercury vapour rectifying apparatus.—Electric Furnace Co., Ltd., and S. G. King. May 22, 1944. 578,137.

Crystal contacts of which one element is silicon.—General Electric Co., Ltd., and C. E. Ransley. March 22, 1943. 578,013.

Manufacture of silicon material for crystal contacts.—General Electric Co., Ltd., C. E. Ransley, J. W. Ryde, and S. V. Williams. July 19, 1941. (Cognate applications 16431/41 and 12969/42.) 577,976.

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Manufacture of butadiene.—G. M. Henderson, and I.C.I., Ltd. April 30, 1943. 578,086.

Manufacture of sulphathiazole derivatives.—Herts Pharmaceuticals, Ltd., C. W. Picard, D. E. Seymour, and F. E. Smith. Aug. 4, 1944. 578,004.

Manufacture of polymerisable products from hydrogenated naphthalene and of resins made therefrom.—W. I. Jones, Powell Duffryn, Ltd., and R. Hutt. April 16, 1943. (Cognate applications 6143/43 and 9162/44.) 578,083.

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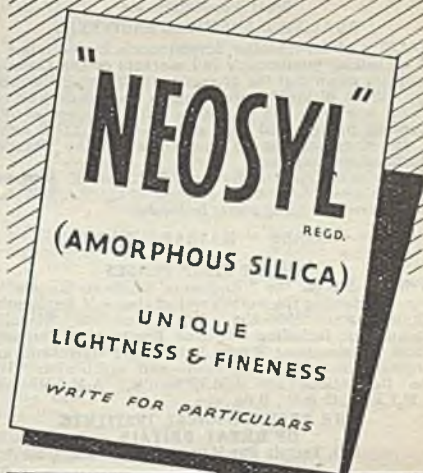
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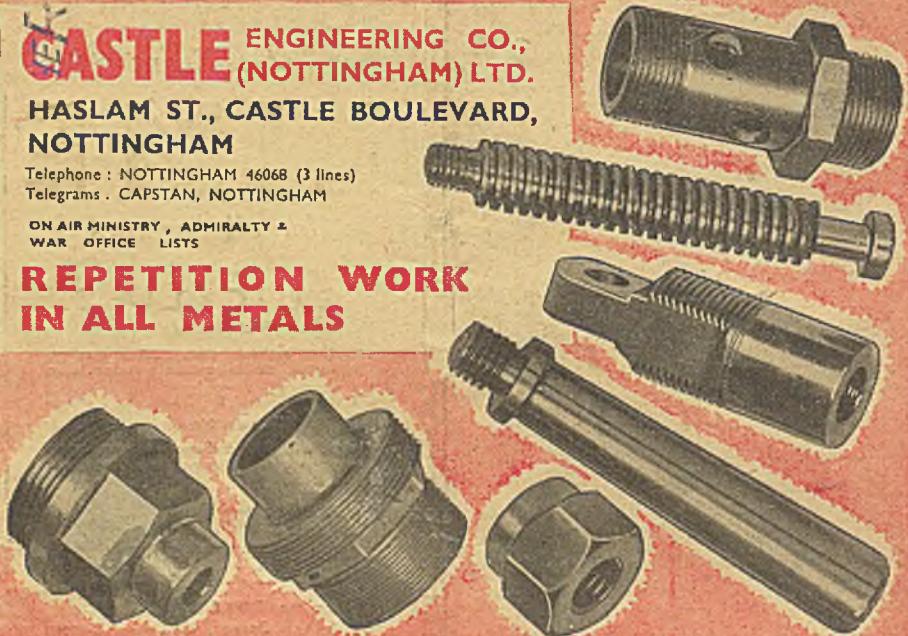
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