The Chemical Age, September 7th, 1946.

WITH METALLURGICAL SECTION

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LV
No. 1419

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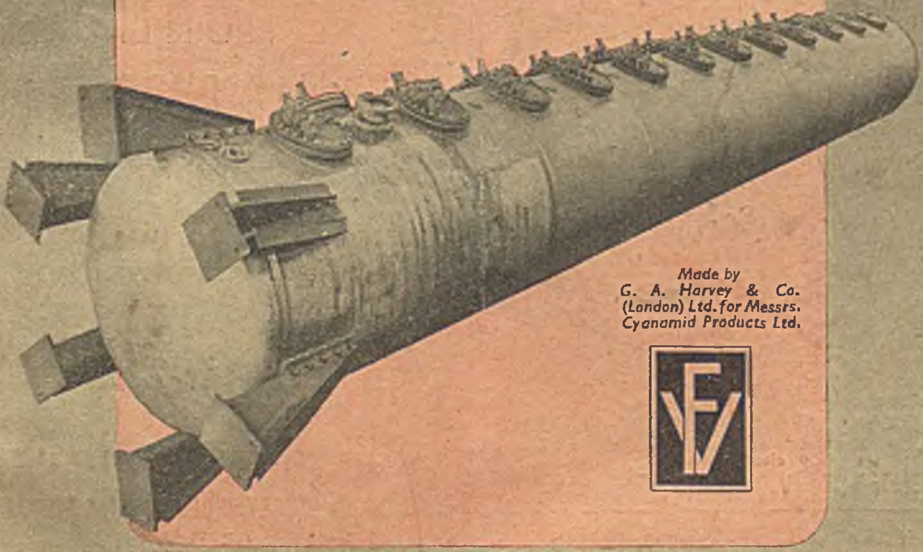

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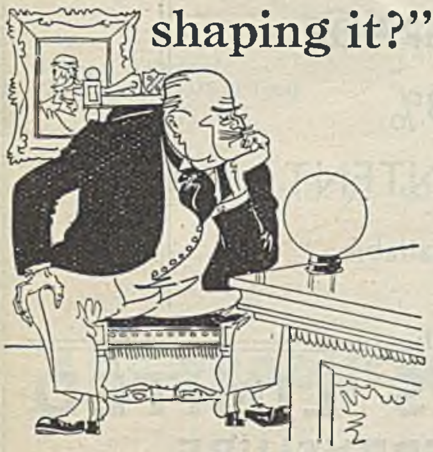

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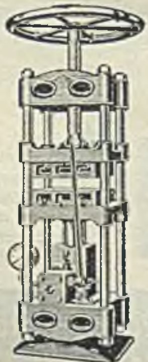

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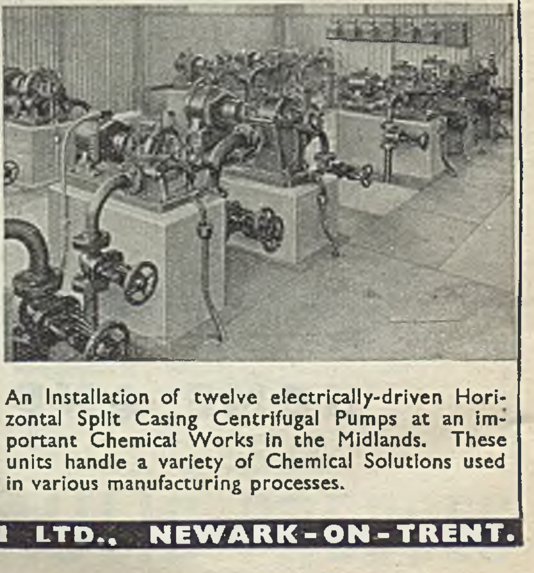

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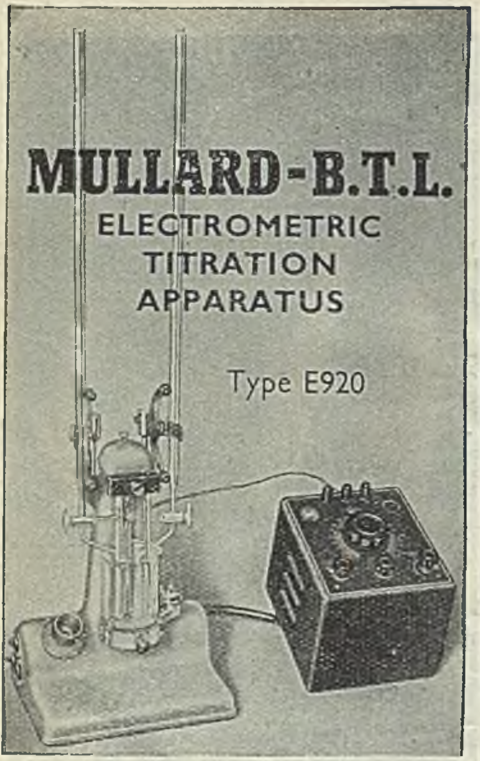

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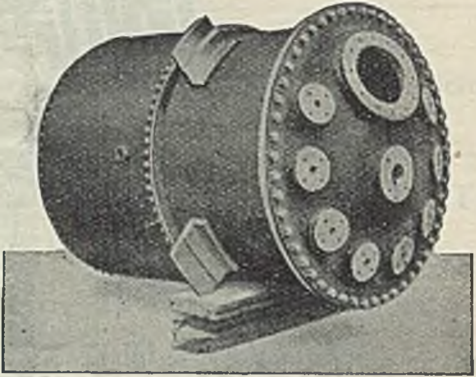
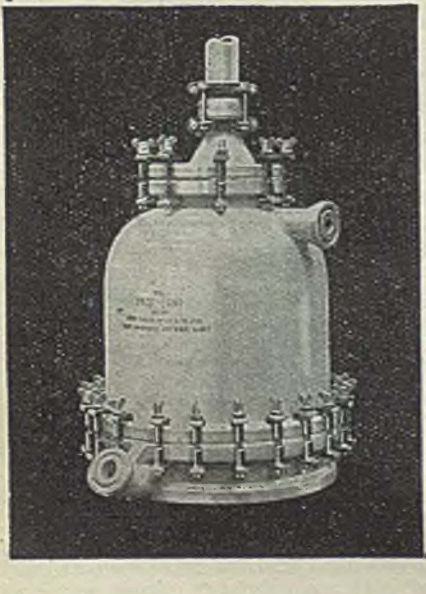


A new chemical pump



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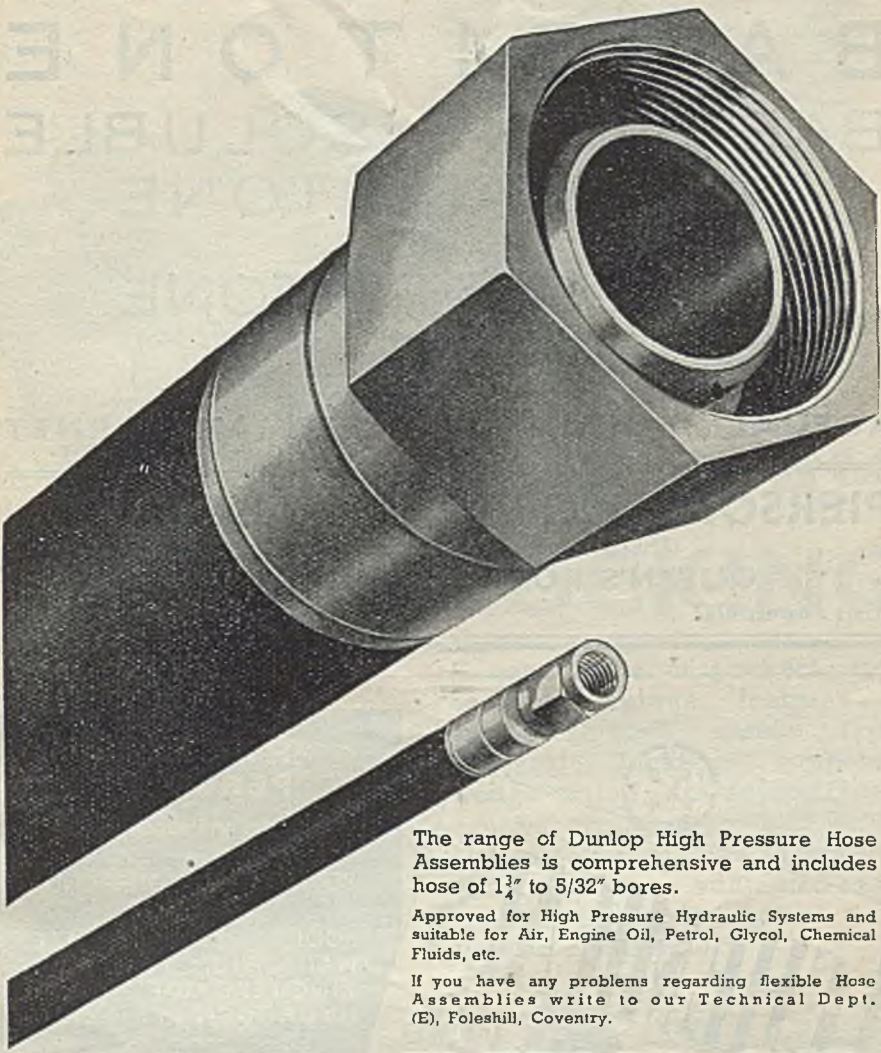

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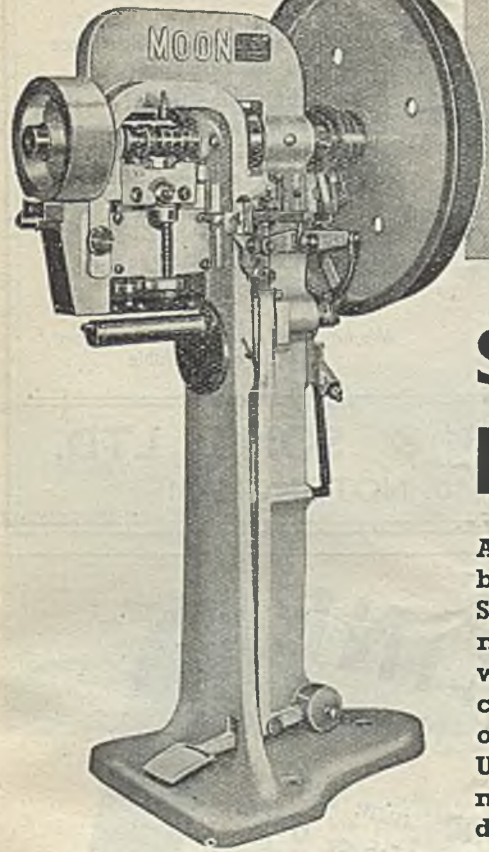

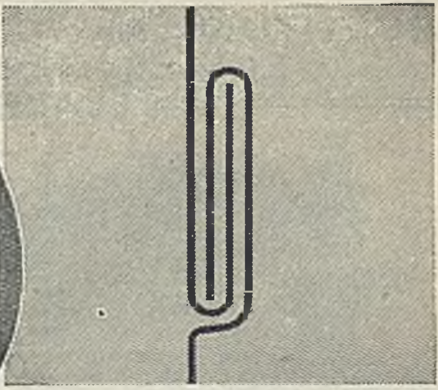

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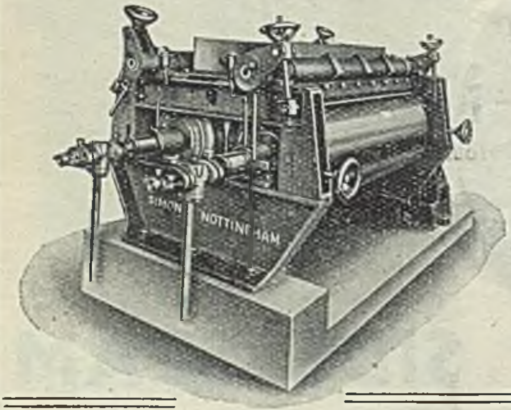

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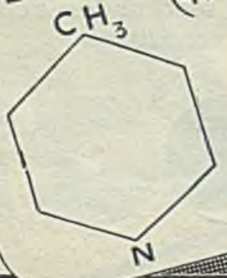

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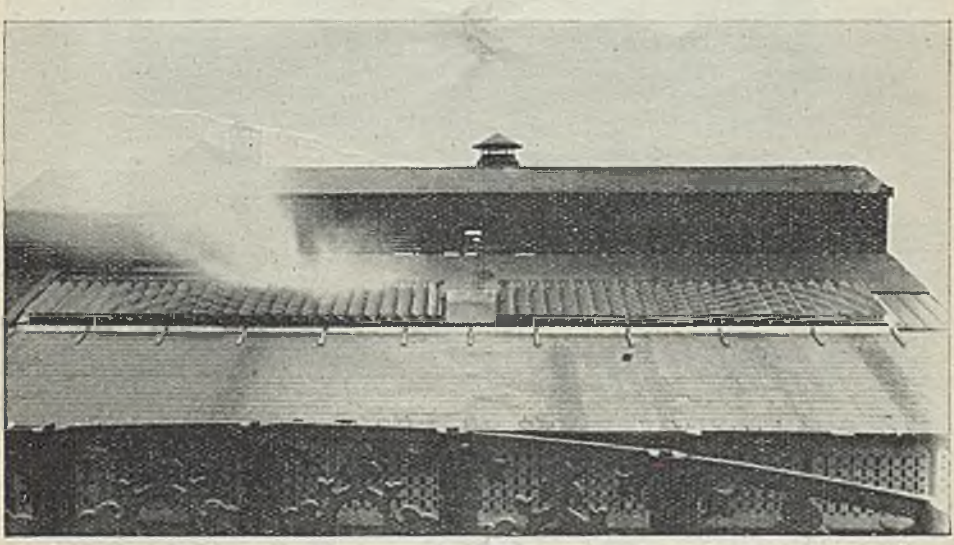

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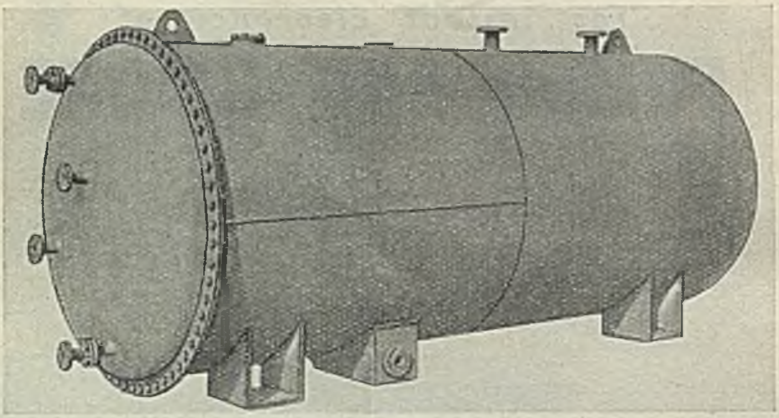

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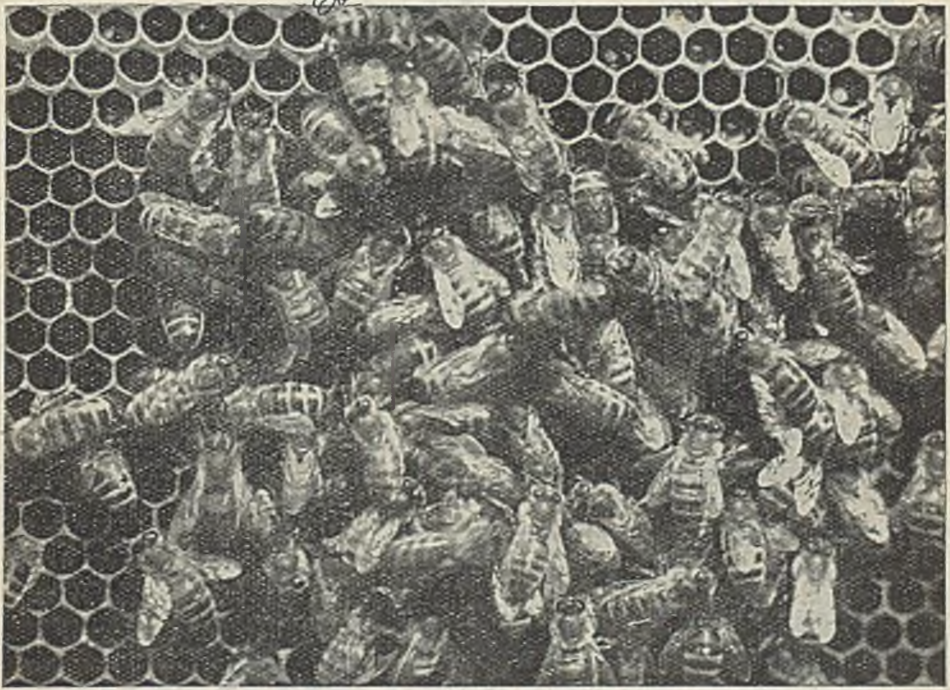

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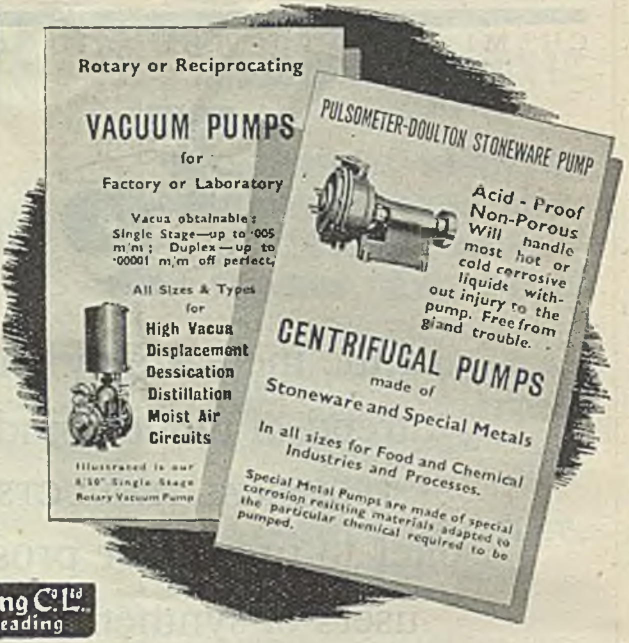

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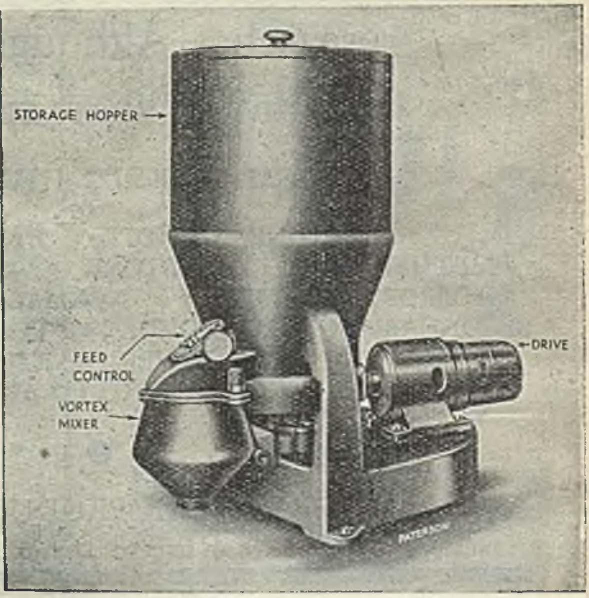

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No. 1419.

September 7, 1946

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POLITECHNIKI ŚLĄSKIEJ

Iron and Steel Research

ANTIQUARIANS have divided the progress of mankind into " ages " according to the predominant material used for weapons and utensils. The stone age, the iron age and the bronze age have all passed away and it may be that historians of the future will regard this as the steel age. It is certain that steel is one of the great basic materials of our time. The word " steel " is all-embracing. Used originally of what we now term mild steel, it now embraces a vast number of alloys of iron with other elements besides carbon. We have perhaps merged insensibly from the mild steel age to the alloy steel age. Progress in ferrous metallurgy now is less concerned with alloys of carbon and iron than with alloys of many elements, formerly regarded as " rare " with iron or with one another in a matrix of iron. Obviously, the field for experimentation has increased enormously as we have the possibility of adding to iron one or more of the 93 other elements known, any of which may profoundly modify the properties of the metal, either in a satisfactory direction or in the reverse.

The country depends basically upon a supply of steel of good quality and reasonable price. So far as this concerns mild steel and other of the simpler established alloys, it is a matter of business organisation. This country has always been pre-eminent in steel, although in the early years of the present century the American steel industry advanced in a quite remarkable manner to take the first place. This leeway was largely made up in the years before the war when the iron and steel industry was modernised. However, the cessation of building of new works during the war, together with the impossibility of doing more than the most essential running repairs, created a very difficult situation which can only be met now by heroic measures. These measures have been announced by the British Iron and Steel Federation, and although there may be directions in which some will consider they should be modified in the interests of efficiency, it cannot be denied that they are bold, far-reaching and likely to achieve their objective. The appointment of a Steel Board to direct the modernisation programme and to exercise general supervision over the industry sets the seal upon the Federation's plan, and it is extremely unlikely that a policy of nationalisation will find supporters in the future except from those who regard it as a purely political move. The iron and steel industry is quite efficient now

On Other Pages

METALLURGICAL SECTION

and will be as efficient as any steel industry in the world when the present plans have been put into effect.

There remains, however, the important matter of advancement in the future. This country must produce better qualities of steel at equal or less cost than anywhere else in the world, and it must be the first to introduce new steels and processes, just as it has generally been the first to discover them. Research must be intensified and this research must be carefully balanced and organised so that it will enable the due proportions of fundamental research, of background research and of applied research to be undertaken together with large-scale development of the results of research.

The formation of the British Iron and Steel Research Association has lately set the seal upon the organisation of the industry in that direction. Recent speeches by the director of the Association, Sir Charles Goodeve, have described the organisation of research in the steel industry. Before the Association was formed there was already a great deal of research. Most of the major steel makers of this country have well-equipped and well-staffed research and design laboratories, and some of these are outstanding. Sir Charles Goodeve has stated that these laboratories will soon be double their pre-1939 size.

The individual research laboratory is the peculiar creation of private enterprise. It is the spearhead of the competitive battle which every firm must wage if it is to maintain its position. There has been a considerable change within recent years in the attitude towards these laboratories. Too often they were started by those who believed that if a chemist were put into a room and left there for a few weeks he would produce new ideas and new products in a continuous stream. Fortunately, this frame of mind is now a long way behind us. It is recognised that the industrial research laboratory must conduct a certain amount of fundamental research, not perhaps pure research in the sense in which research is conceived in universities, but at least what may be termed background research on principles. From this there will grow up a better understanding of industrial processes which ultimately lead to advances in various practical ways translatable into terms of new industrial products.

The co-operative organisation of research in the iron and steel industry may be said to have started during the last war, when committees were set up under the Iron and Steel Institute to investigate certain problems which affected the industry as a whole. Although these committees disbanded at the end of the war, the seed had been sown and the body which is now the British Iron and Steel Federation set up a Fuel Economy Committee and a research group, which, in time, became the Iron and Steel Industrial Research Council. While maintaining their competitive effort in their own laboratories, the great firms which comprised the iron and steel industry continued to collaborate in regard to common technical problems and quite recently set up the British Iron and Steel Industrial Research Association. There are now in the industry three closely-linked yet autonomous bodies : the British Iron and Steel Federation, controlling the business and major administrative side of the industry; the Iron and Steel Institute, which is the technical and professional body of the industry; and now the Research Association.

It is important to notice that the formation of the Research Association is not intended to, and will not, disturb in any way the operations of the laboratories operated by the individual firms. Whether this valuable competitive spur will be lost if the industry is nationalised we do not know; the fact that it may be lost is one of the greatest objections to nationalisation. The problem of collaborating in a research association and yet keeping the competitive spirit alive in private laboratories is one of some difficulty, but it appears to have been solved in the iron and steel industry. Sir Charles Goodeve has divided research into three categories : (a) pure research, (b) background research, these two together forming fundamental research, and (c) applied research. Universities are principally concerned with pure research, to a somewhat less extent with background research, and only to a small extent with applied research. A research association is concerned mainly with background research, to a very much less extent with pure research, and to a moderate extent with applied research, the objective here being obviously to see that background research is carried to the stage when it can be taken up industrially. The industrial laboratory hardly touches pure research. it must do quite a fair amount of background research, but its main effort is devoted to applied research. The function of the Research Association is therefore to see that whatever pure research is needed is done, to undertake the background research, and to leave applied research mainly to the individual firms who will thus apply, each in its own way, the background knowledge discovered by the Research Association. The setting up of a research association should eliminate bottlenecks in respect of background knowledge, but in Sir Charles Goodeve's view, "unless works laboratories are also increased we shall run into a further serious bottleneck at the end when the application of research begins to produce commercial results." The meaning of all this is thus explained by Sir Charles: "The development of steels for high temperature is an important field in which Britain leads the world. She has made her technical advances largely by competitive research in works' laboratories. However, these laboratories are outreaching the background knowledge and have not the time nor facilities to gain it. This background will be obtained first by pooling some of the existing knowledge through the Research Association and then undertaking the missing experiments necessary to complete the picture. With this broadened base of knowledge, competitive research in works' laboratories will carry British high temperature steel to greater heights of technical achievement."

The Iron and Steel Research Association does not propose to set up a central laboratory but to continue the practice of using the existing research facilities in the country, supplementing these where efficiency demands it by special groups of research stations dealing with certain fields. Pure research and certain background research will be farmed out to universities. Individual firms will be asked to undertake operational investigations and development work of new processes of general interest to the industry as a whole. Firms are expected to throw into the pool of the Research Association the results of work carried out on their own initiative, as they have done in the past. Full use will be made of such bodies as the British Refractories Research Association, the British Coking Industry Research Association, B.C.U.R.A., and similar specialist bodies, the principal task here being to ensure that the iron and steel industry's proposals are specifically dealt with in the research work of allied associations and that the results are applied. The picture here presented is highly satisfactory. It is evident that the iron and steel industry has tackled the problem of research in a comprehensive manner which gives every confidence that the industry will be as successful in the future as it has been in the past. We can only hope that the Government will do nothing to disturb by ill-considered proposals for nationalisation the very excellent organisation which is now being built up.

NOTES AND COMMENTS

Nationalisation Opposed

AS the Government proceeds with its plans for nationalising the steel industry, so the leaders of the industry become more outspoken in their criticism of the proposal. The latest contribution in this direction comes from Mr. E. H. Lever, whose opinions, as chairman and joint managing director of Richard Thomas and Baldwins, Ltd., demand a large measure of respect. Speaking at the annual meeting of the company the other day, he voiced the considered opinion of himself and his colleagues on the board when he said the nationalisation of the steel industry *at any time* (the italics are our's) would be against the true interests of the community, since, in their view, it would lead to a decrease in efficiency and to an increase in costs. This is in direct opposition to the Government view, and since Mr. Lever and his colleagues are experts they should be in position to know what they are talking about.

A Serious Blow

DEALING more specifically with the present position, Mr. Lever went a step further in his outspokenness by declaring that to press forward a scheme of nationalisation at this moment, when the industry's plans for development are well advanced, as we point out in our leading article this week, is likely to strike a serious blow at the country's economic recovery, especially as the speedy execution of those plans is essential. At the best, Mr. Lever continued, the uncertainty will lead to delay, and to an increase in capital cost which the country can ill afford: at the worst, the results may well be disastrous. As an instance of the delaying effect of the Governments proposals, Mr. Lever mentioned the holding up of his own company's plans for the erection of new strip mills in Wales, where, as is well known, unemployment is again making itself felt in a most unpleasant manner. The Government cannot say it has not been warned.

Universities and Science

THERE has been some interesting correspondence in *The Times* lately regarding the attitude of the universities towards the admitted need for increased science teaching in this country. It has been pointed out by Sir Lawrence Bragg that although the Universities of Oxford and Cambridge may not be prepared to expand to the degree required so far as total numbers are concerned, that does not mean to say that their science schools are not growing—indeed, figures have been given to show that they are. Now Lord Cherwell has come along with some comments on another aspect of the problem. While agreeing with the view that a great increase in the number of pure scientists is needed, he claims that the country's greatest need is for a vastly increased supply of thoroughly trained engineers. To teach engineering, it is not enough, in his view, to add just one extra to the many different science departments in an ordinary university; rather, there should be at least four to six professors, each specialising in one of the principal branches of engineering, with a corresponding number of well-equipped departments, as well as numerous courses of lectures and exercises arranged to suit an engineer's needs by professors in the ancillary schools of mathematics, physics, chemistry, etc.

A Better System ?

LORD CHERWELL points out that a full-blown school of engineering on the lines he suggests could not be grafted on to a university in the ordinary sense without throwing the whole place out of balance; to try to make shift with less would, on the other hand, render it almost impossible to give a thorough, generalised training to the engineering pupils. It is for this reason that in the U.S.A. and Germany great independent institutions of university status have been created. There, engineering and all its related subjects are taught by men of the highest standing in departments equipped with all the necessarily elaborate and modern machinery required to instruct the budding engineer. Degrees are given by these institutions just like the older universities. Lord Cherwell will not be alone in his contention that if the universities of this country are given a free hand and adequate funds, they can be trusted not only to maintain the high standard of the humanities, but to continue to develop the pure fundamental sciences which properly belong there as successfully as in the past.

Oil Replacing Coal

LAST week we commented on the wisdom of those industrialists who are considering the use of oil as an alternative source of energy to coal. So far, there has been an encouraging response from industry to the official appeal to turn over to oil consumption, but now doubt is being expressed as to whether sufficient equipment and fuel oil can be obtained at short notice to make effective the desired saving of 20,000 tons of coal before the period when the coal shortage will make itself felt most acutely. The Government expects industry and the railways to use 2,000,000 tons of fuel oil in substitution for 3,000,000 tons of coal in time to avert interruptions in the fuel supply. It would have been easy to ensure the supply of all this additional oil had the decision been taken in the spring, when the tanker programme for the year could have been adjusted accordingly, but now a great effort will be required to get the oil.

TUNG OIL

The Board of Trade announce that as a preliminary step to the restoration of normal trading in tung oil (China wood oil) consumers may in future nominate their own suppliers of this commodity. For the present the Board of Trade will continue to be the sole buyers in the U.K. of this oil from whatever source it may be imported, but licences to acquire from the Board of Trade will be issued by the Directorate of Paint Materials as before and must show the name of the consumer and his nominated supplier. The supplier will then present the licence to the Director of Sundry Materials who will authorise the release of the appropriate quantity of oil. The selling price of tung oil to the consumer is fixed by the Board of Trade at £275 per ton ex-store and includes merchant's commission.

Laminated Plastics

The Utilisation of Resins in their Manufacture

by CHANDRA KANT

THE development of new synthetic resins such as silicones, polyamides (of which nylons are the most famous), polythenes, acrylates (Perspex), glyptals, alkyds, etc., has opened a new chapter in the world's plastic industry.

In India, entirely because of the absence of a flourishing chemical industry, and consequent dearth of basic raw materials, the field of synthetic resins has hardly been touched. The conditions obtaining during the war, especially in the matter of metals, which were in short supply, have led, however, to a highly fruitful field of investigations, *viz.*, the utilisation of natural resins in the manufacture of plastics.

Of the several resins investigated, lac has been found to be versatile in that it has opened up a wide range of industrial applications. Shellac laminated plastics, towards the development of which the laboratories of the Council of Scientific and Industrial Research, the Indian Jute Mills Association, and the Indian Lac Research Institute have made significant contributions, have in particular become useful in the manufacture of various laminated products, containers and drawn laminated mouldings.

Laminated Products

Investigations on shellac fabric laminates were first carried out in 1926, in the University Chemical Laboratories, Lahore. The commercial possibilities of the products attracted wide interest and at least two Indian industrialists, one from Calcutta and the other from Cawnpore, came forward to finance the development work. When the Board of Scientific and Industrial Research was inaugurated in 1940, the problem of resinated fabrics was taken up for investigation once again. Metal containers were in short supply, and there was urgency for finding substitute materials. Resinated laminates of shellac, textile materials, and paper suggested themselves as suitable substitutes, providing scope for the development of a wide range of utility articles and containers.

A considerable amount of basic work both on resin-impregnation of fabrics and paper, and on processing them, has been carried out in the laboratories of the Council of Scientific and Industrial Research. Aqueous alkaline dispersions and solutions of shellac in easily available solvents, *viz.*, methylated spirit, together with hardening agents, have been successfully employed for impregnating jute cloth, cotton cloth, paper, etc., for the production of laminated sheets and boards, including corrugated boards. Sandwiched boards have also been produced in which a filling of cheaper materials, such as impregnated jute waste, is used with outside laminates consisting of more decorative fabric. The products have found extensive fields of application in industry, such as, for example, light building material for the construction of partitions; material for electrical accessories, and switchboards; identity discs; piston ring jigs; tea-chests; silver cans; and other utility ware. The processes of manufacture have been covered by Indian Patents Nos. 28,277 and 28,281 and are being industrially utilised by several industrial groups in the country.

"Jutlac" is the name given to jute fabric-shellac laminates, which have found commercial uses in the manufacture of tea-chests, grease-drums, and containers for dry goods, etc. It has also been used by the British and American Military and Air Force Services. The process of manufacture was first investigated by the laboratories of the Council of Scientific and Industrial research, and was later developed by the Indian Jute Mills Association. It consists of impregnating the laminate surface in a continuous manner between hot rollers with molten shellac.

In another process of resin impregnation developed by the Council of Scientific and Industrial Research and by the Indian Lac Research Institute, use has been made of alcoholic solution of resin obtained by the modification of shellac with urea or melamine. The laminate boards obtained have been claimed to possess remarkable mechanical shock-resistant properties, in addition to low water absorption.

Plastic Containers

Under the duress of wartime shortage of sheet metal of different sizes required in the manufacture of containers, suitable techniques and processes have been developed by the laboratories of the Council of Scientific and Industrial Research for the production of containers from metal substitutes, particularly from shellac fabric laminates. A wide range of plastic containers has been produced, including petrol containers of different capacities up to four gallons, for transport purposes. An outstanding development in this field has been the so-called unburstable containers (Indian Patent No. 28,247) designed for dropping petrol, oil, and other liquid supplies, without the use of parachutes, from low-flying aircraft to troops stranded in inaccessible war zones. Solutions of shellac in alcohol or ammonia have been employed in the manufacture of these containers. For jettison tanks re-

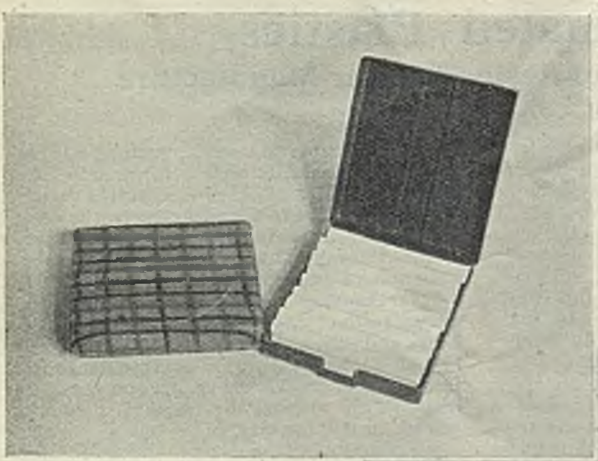


Fig. 1. (left). Cigarette case in multi-coloured checkered cotton cloth-jute core combination in phenolic resin.

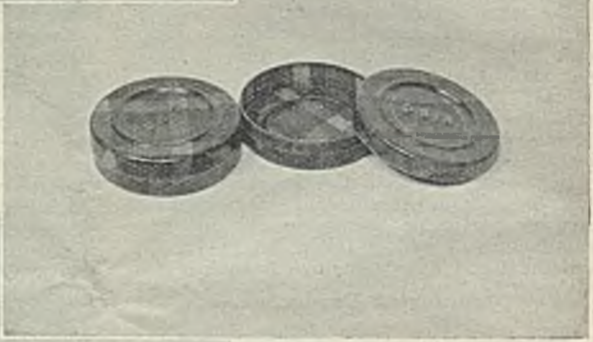


Fig. 2 (right). Shoe polish container moulded in checkered cotton cloth on the outside and jute cloth in the core.

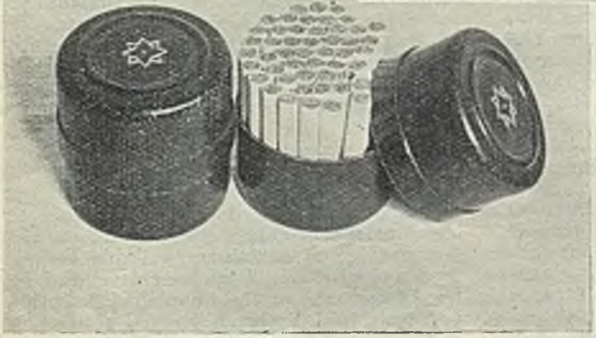
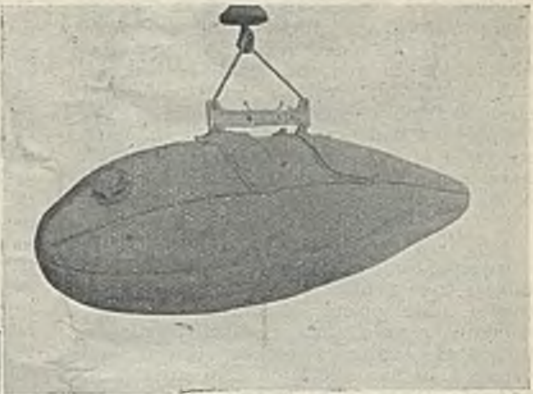


Fig. 3 (left). Cigarette container in two laminations of jute cloth, impregnated with unfilled but dyed thermo-plastic resin.

quired by the U.S.A. Air Forces, either dispersions of shellac in water or molten lac with extenders or wetting agents have been preferred.

Early developments in the field of laminated container manufacture entailed the use of heavy hydraulic presses and mould equipment, which became more expensive and unwieldy as the size of the containers increased. Difficulties of procuring this equipment have now led to the development and improvement of simpler processes, better adapted to cottage industry processing, which have found a noteworthy application in the production of 4-gallon petrol containers of satisfactory design. In one of the methods adopted a well plasticised resin solution of 50 : 50 mixture of de-waxed shellac and de-polymerised shellac, with urea as hardening agent, has been employed to treat the fabric. The solution penetrates into the fabric structure when applied with a paint brush. Several layers of treated fabric which form the main walls of the container are pressed with hand under a hot flat iron, or wooden formers, to make a suitably shaped body of the container, consisting of material resembling hydraulically-

Fig. 4 (right). A 75-gall. jettison tank in single layer of canvas, with inside stiffening walls impregnated and stiffened with plastic composition under 2 lbs./sq. in. pneumatic pressure.



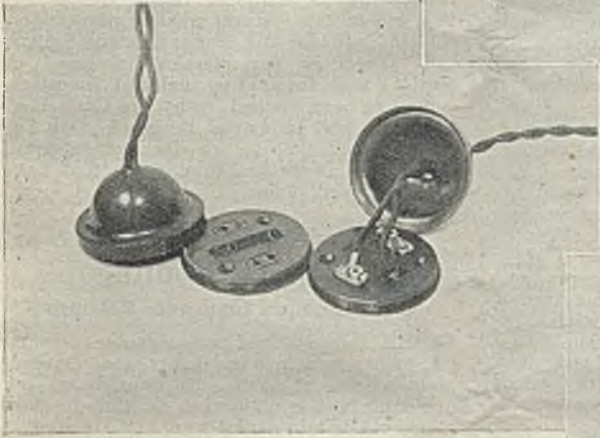


Fig. 5 (left). Electric ceiling rose, in two laminations of jute cloth, impregnated with pigment-filled phenolic resin.

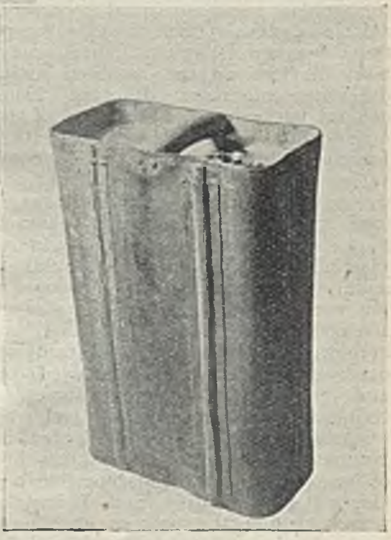


Fig. 6 (right). A 4-gall. petrol tank made of two laminations of impregnated canvas, hand-pressed and stiffened with bamboo strips. There is a screwed metal stopper.

pressed laminated board. End pieces of the container are similarly shaped to form suitable flanges, which can be sealed internally to the main body of the containers. The container body and ends are joined afterwards by resin cement. The mechanical strength of these containers admittedly does not correspond to those made by hydraulic pressure, but it has been found to be sufficient for a great many applications, particularly as 4-gallon petrol containers.

For jettison tanks, another shellac composition containing shellac, casein portland cement, borax, sodium carbonate, and urea has been developed. Envelopes of jettison tanks are machine-sewn in single-ply canvas and transported to the front in rolls, along with the resin composition in a powder form. In the field, the composition is dispersed in water and the solution introduced into the outstretched canvas tanks or bags. The tank is then blown up by means of an ordinary bicycle or tyre inflator to an air pressure of about 2 lb./sq. in. When, under pneumatic pressure, the tank is rolled about, the resin solution spreads and tends to ooze out through the pores of the canvas, thus impregnating the latter thoroughly. The solution that oozes out is spread on the outside surface of the container and is allowed to set dry. In a few hours an impervious film is formed and the container becomes stiff enough for service. The mechanical strength requirements of these tanks are not rigid as the tanks are used only once. Jettison tanks of large capacities up to 70 gallons have been prepared by this simple and inexpensive process.

Drawn Laminated Mouldings

Investigations on the manufacture of containers from laminates have led to the successful development of drawn laminated mouldings, which has enabled plastic-impregnated laminates to be drawn and moulded in one operation into articles of intricate design. The technique is a combination of metal sheet drawing and pressing, plastic powder compression moulding, and laminated sheet production, and adopts a highly specialised procedure for the design and production of mould equipment. In certain deep drawing operations, a pilot plunger, together with a locking device, for suitably guiding the laminated stock into the moulds, has been found necessary. One associated development involves the production of raised letterings, labels, and trademark devices on the moulded articles in different colourings differing from the general background, by the use of dry pigments and colours introduced in the same pressing operation.

The foregoing process has great possibilities as it has very many advantages, including: simplicity of operation, characterised by a single pressing operation as in ordinary plastic powder compression mouldings; the articles produced are much stronger weight for weight and much lighter, strength for strength, as compared with metal products or powder mouldings; possibility of utilising decorative materials such as dyed, printed, and multi-coloured cotton fabrics for exterior laminations and relatively cheaper materials such as jute cloth for interior laminations; and the consequent low cost of production. In the laboratories of the Council of Scientific and Industrial Research, where the process was developed, both simple and intricate shaped articles have been produced, such as containers for shoe polishes, dentifrices, ointments, jellies, cigarettes, etc., ashtrays, electrical mouldings, ceiling roses, etc. Further possibilities of the process, particularly in the production of luxury goods and electrical equipment, are under investigation. One of the most promising fields, however, appears to be the manufacture of automobile body panels, in which lightness, strength, finish and attractive appearance are important considerations; all of these are the special features of this process.

All the foregoing developments in the field of laminated plastics have taken place to meet the exigencies of the war, under acute shortage of metals. Now that the war is over and the general conditions are returning to normal, it might be thought that the processes would lose much of their industrial significance. On the other hand, the importance of these processes will, if anything at all, increase as further investigations on the lines indicated are encouraged, for a new plastics world is born in which laminated plastics will play a great part. Even if India were to have a flourishing chemical industry, as she must in the near future, to supply the basic raw materials for all the latest types of synthetic resins, the utilisation of her vast natural wealth, particularly shellac, will form a fundamentally important aspect of her plastics industry. A fruitful and fascinating field of investigations has been opened up by the Council of Scientific and Industrial Research, and it is to be hoped that future developments will be no less important than those that have already taken place.

Export Credits

Government's Insurance Scheme

THE Export Credits Guarantee Department, which administers the Government scheme of credit insurance, is making an important contribution to the development of Britain's post-war exports, but it is doubtful whether U.K. exporters are sufficiently aware of the facilities now offered by the department for their protection, states the *Board of Trade Journal*.

The guarantees available cover most of the risks met with in selling goods overseas, including insolvency, protracted default in payment and the inability of the foreign buyer to obtain sterling when his debt is due. A high percentage of the invoice amount is guaranteed—normally up to 85 per cent. for insolvency or default and up to 90 per cent. for other risks. Exporters holding the department's policies will also find that they are of value should advance and discounting facilities be required from bankers.

This scheme of credit insurance is entirely voluntary and is run on business lines. The department does not, however, seek to make profits, but on the other hand aims merely at being self-supporting and has, in fact, so far not involved the taxpayer in loss. Premiums are kept at moderate levels attractive to exporters, and the number of policy-holders is constantly on the increase.

Chemical exporters who would like further particulars are invited to communicate with the head office of the department at 9 Clements Lane, Lombard Street, London, E.C.4. (Tel.: Mansion House 8771.)

Alkylation Spent Acid*

American Method of Recovery

ALKYLATION spent acid is a waste product from the alkylation process of producing high octane gasoline when using sulphuric acid as the catalyst. This spent acid varies in character with the products treated and with the procedure used by the refineries. On the average, the spent acid contains by weight: acid, 85 to 90 per cent.; water, 2 to 4 per cent, and hydrocarbons 6 to 10 per cent. It is black in colour and fluid at atmospheric temperatures.

Reclaiming of 98 per cent. strength sulphuric acid from this alkylation spent acid is being done by three organisations on the Gulf Coast, one of which is the Consolidated Chemical Industries at its Houston, Tex., plant. Alkylation spent acid, when decomposed at high temperature, will break down into its components, SO_2, H_2O, and O_2. In the Chemical Construction Corporation's process, in use in this plant, the alkylation spent acid is sprayed into a specially designed furnace maintained at high temperature by means of auxiliary gas. The acid is decomposed and the hydrocarbon content supplies part of the fuel required to maintain the high temperature. The hot gases pass through a heat recuperator that serves to pre-heat the air used for combustion while the combustion gases are partially cooled, cleared of acid mist by means of a Cottrell precipitator, and then dried and processed in the contact sulphuric acid plant to full strength 98 to 99 per cent. sulphuric acid. Inasmuch as the acid is completely decomposed into its components and all hydrocarbons burned, the acid from this process is as clean as acid made directly from sulphur and therefore suitable for all purposes.

High Efficiency

This Houston plant was designed for a capacity of 87.5 tons (100 per cent. acid basis) per day, but over a long period has averaged 104 tons of water white acid. One or two men per shift operate the plant. The over-all efficiency of the plant from spent acid to new acid is approximately 93 per cent. The efficiency of the converters from SO_2 to SO_3 is about 96 per cent. In addition, the recovery of H_2SO_4 in the alkylation plant averages 95 to 97 per cent. of the new acid charged.

At the time the plant was visited the spent alkylation acid being processed contained about 85 per cent. H_2SO_4, 12 per cent. carbonaceous matter, and 3 per cent. water. With this type of feed a small amount of fuel gas was required. By blending small quantities of acid sludges of somewhat higher hydrocarbon content, as, for example, naphtha sludges, combustion can be made self supporting and the cost of fuel gas eliminated.

Briefly, the "Chemico" process consists of spraying the spent acid into a furnace where it is decomposed to form sulphur dioxide at a temperature of approximately 2200°F. Hydrocarbons in the sludge, with the addition of gaseous fuel (if needed), furnish the heat required in the process. Gases leaving the furnace pass through a recuperator where heat is recovered by preheating the air entering the furnace. The hot gases are then scrubbed with acid and cooled by direct contact with water. Sulphur dioxide in the water leaving the tower is recovered by stripping with air. Sulphuric acid mist is removed in an electric mist precipitator operating at 80,000 volts. Water vapour is removed by scrubbing with sulphuric acid in a drying tower. The circulating acid is cooled in a suitable cooling system. A centrifugal blower is situated behind the drying tower to propel the gases through the system. The SO_2 gases are then pre-heated and converted to SO_3 by passing through layers of vanadium catalyst. The hot gases leaving the catalyst layers are used to pre-heat the incoming SO_2. The SO_3 leaving the converters is absorbed in strong sulphuric acid where it combines with water to form 98 to 99 per cent. H_2SO_4. The acid is cooled in a suitable cooling system. Acid lost in the alkylation and regeneration cycles can be made up by burning sulphur or hydrogen sulphide in the combustion furnace.

Decomposing Furnace

The Houston plant is advantageously situated near several large petroleum refineries. On arriving at the plant the spent alkylation acid is stored in a covered steel tank. It is pumped directly into the decomposing furnace, consisting of a brick-lined steel shell and sprayer, by using a "spinning cup" burner. This burner produces a thin film of acid by means of centrifugal force. The film is broken into a fine spray by means of compressed air. Fuel gas, when used, is admitted concentrically around the acid burner to provide additional heat required for the process. Three Maxon Pre-mix burners are also installed radially around the furnace. Most of the gas requirements should be introduced in the concentric burner.

It is sometimes advisable to produce more acid than can be recovered from spent acid in order to overcome losses in the alkylation and regeneration cycles. In such a case, molten sulphur from the melting pit is also

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*Chem. and Met. Eng., 1946, 53, 102

sprayed into the furnace and burned. This sulphur supplies the necessary additional SO_2, and at the same time provides part of the heat required for decomposition of the spent acid. It is not necessary, however, to burn sulphur unless it is desired to increase the acid production.

Admission of Air

Air is admitted at the front of the furnace, around the acid burner. A silicon carbide tubular heat exchanger of the Fitch recuperator type is used to pre-heat this air to about 1700° F. by means of the heat in the exit gases from the decomposing furnace previously mentioned.

An air fan is provided for use in starting up the furnace, at which time the furnace is under a slight pressure with discharge gases going to the atmosphere through the scrubber tower. Acid must be circulated over this tower. During normal operation the furnace is under a slight vacuum and the fan is used to overcome some of the pressure loss in the recuperator.

The furnace was designed to operate at a temperature of 1900 to 2300° F. with preheated air of 1600 to 1700° F., but was operating at 2000° when visited. The oxygen content of the gas leaving the furnace should not fall appreciably below 6 per cent. of oxygen by volume (dry basis). Under these conditions, all of the H_2SO_4 is reduced to SO_2 with a negligible amount of SO_3. Operation at lower temperatures would be advantageous since it would reduce fuel costs, furnace maintenance costs, etc., and would allow operation with a higher percentage of SO_2 in the exit gases. However, if the temperature is reduced below 1900 to 2000° F., the decomposition will be incomplete. Hydrogen sulphide, mercaptans, waste SO_2 gases, etc., can be burned in the furnace, if available, and their sulphur content converted into sulphuric acid.

The recuperator is not gas-tight and there is a tendency for some air (20 per cent.) to leak into the SO_2 gas stream. For this reason it is important to balance the pressure on the system properly so as to attain a minimum pressure drop through the recuperator. This is easily kept at a minimum by careful treatment. In a more recent design excessive leakage has been prevented.

Molten sulphur is kept at the temperature for best atomisation (275° F.) and is pumped into the furnace through a sulphur burner, by means of steam-driven centrifugal sulphur pumps. Care is taken to see that there is sufficient air for the amount of sulphur (and other fuels) being burned, as lack of air would tend to cause sublimation of the sulphur.

Gases leaving the recuperator enter a scrubbing tower, a steel shell lined with sheet lead and acid-proof masonry and packed with spiral rings, at about 1120° F. and are cooled by direct contact with re-circulated liquor to approximately 200 to 250° F. Sulphuric acid of 46 to 60° Bé. is used as the re-circulating liquor. This liquor is cooled by means of cooling water flowing through lead coils immersed in lead cooling tanks.

Sulphuric acid mist which might be formed in the process is partially removed in the scrubbing tower. Mist recovered by the mist precipitator is also returned to the weak acid cooling tanks for re-circulation. The concentration of the acid on the scrubber towers can be controlled by applying more or less cooling on the circulation system. The higher the temperature the higher the concentration of the circulating acid.

When the quantity of acid in the cooling tanks increases, it is removed from time to time by adding to the 93 per cent. drying tower as drip acid. If the gases from the decomposing furnace contain too much SO_3, or if the circulating liquor is too weak, or both, there may be an excess of water to take care of which may lead to waste of acid.

Acid is circulated over the tower at all times in order to cool the gases and prevent damage to the lead work, and simultaneously to clean it of any dust or other foreign matter which might be carried over from the furnace or recuperator.

Gases are further cooled to 100° F. in a cooling tower, similar in construction to the scrubbing tower except that this tower is not packed. Fresh water is sprayed directly into this tower to cool and condense water vapour from the gases. This water is fresh, clean, and reasonably free from chlorine, H_2S and salts.

Treatment of Hot Water

Hot water leaving the tower is saturated with SO_2 and contains traces of H_2SO_4. This water goes to a distributing box from which it is pumped over the stripping tower, a lead-lined steel shell packed with spiral rings. Air is drawn through the stripping tower by means of the suction on the system. This air strips the SO_2 from the hot water and returns the SO_2-air mixture to the cooling tower. Water containing a trace of SO_2 discharges from the stripping tower directly to the sewer.

Gases from the cooling tower contain a small amount of sulphuric acid as a fine mist which must be removed before the SO_2 gases can be converted to SO_3. This mist results from the presence of small amounts of SO_3 in the gas stream leaving the combustion chamber. The physical nature of this mist is such that it cannot be removed by scrubbing.

A Cottrell electric mist precipitator is provided to remove this mist before it enters the drying tower. The electrostatic charge on the mist particles causes them to travel toward the positive electrode and collect on the side walls of the tubes. The resulting weak acid solution runs down the tube walls and out of the precipitator through a sealed boot. It flows by gravity into the scrubbing tower cooler tanks.

Clean gases leaving the precipitator are saturated with water vapour and next pass into a drying tower, a steel shell lined with acid-proof masonry and packed with spiral rings. Here the moisture is removed from the gases by absorption in 93 per cent. sulphuric acid, which is circulated over the tower from a pump tank consisting of an acid-proof masonry-lined steel shell and submerged pump. The acid discharges by gravity from the drying tower and passes through cast-iron cooling coils connected by cast-iron lines to the pump tanks. Water sprayed over the surface of these coolers removes the heat generated by the absorption of the water vapour in the strong acid. Part of the acid circulated over the drying tower is withdrawn continuously and simultaneously replaced by stronger 98 per cent. acid sufficient to maintain the strength of the circulating acid constant at 93 per cent.

Air sufficient to dilute the SO_2 content of the gases to about 8 per cent. is also admitted at the drying tower, and the entire volume of gas passes through a centrifugal blower-exhauster located in the system after the drying tower. This blower maintains the entire purification system previously described under a slight vacuum and delivers the gases under pressure to the primary and secondary heat exchangers.

Important Points

In order to obtain a gas of the highest possible dryness, the following points are of importance:

1. The temperature of acid circulated over the drying tower is kept as low as possible, preferably 75 to 85°F. However, in summer the temperature may go as high as 105°F., all depending upon the cooling water available.
2. The strength of the circulation acid should be kept as uniform as possible; 93 per cent. strength has been found to be desirable for drying purposes. It is also possible to utilise a stronger acid In this case mist formation is likely to occur if the strength is accidentally allowed to exceed 98 per cent.
3. The acid distribution over the tower must be even and a proper amount of acid must be pumped over the tower at all times.

In the heat exchangers the gases are heated to 800°F. before entering the primary converter. In general, the lowest converter entrance temperature possible, but still maintaining the entrance to contact mass above 800°F. will give the highest conversion efficiency.

Two tray converters are arranged in series with a heat exchanger in between for control of temperature. In the primary converter SO_2 oxidises to SO_3 producing heat which raises the temperature of the gas mixture rapidly to about 1100°F. After leaving the contact masses in the first converter, the gases are cooled to 800°F. by passing through the hot side of the secondary heat exchanger where heat is given up to the SO_2-air mixture before it enters the primary converter. This cooling is of importance in order to finish up the reaction and obtain the highest possible yield.

The gases then enter the secondary converter where any residual unoxidised SO_2 is converted to SO_3. This secondary conversion produces additional heat, raising the gas mixture to 860°F. The gases are then passed through the hot side of the primary heat exchanger where heat is transferred to the incoming cold SO_2-air mixture, and are thereby cooled to 475°F. before entering the absorption tower. A small quantity of sulphuric acid is condensed and drained off from time to time.

The asborption tower consists of a steel shell lined with acid-proof masonry and packed with spiral rings. The SO_3 in the gas stream is completely absorbed in 98 per cent. sulphuric acid which is circulated over the tower from the strong acid pump tank and 98 per cent. acid cooler. Part of the 98 per cent. acid produced in the absorption tower is delivered continuously to the drying tower to maintain the strength of drying acid at 93 per cent., and the 93 per cent. acid withdrawn from the drying tower is mixed with the absorbing acid, which provides part of the water required for the formation of H_2SO_4 from SO_3. The remainder of this required water is introduced directly into the absorbing acid.

Copper Consumption

U.K. Increase Reported

COPPER consumption in the U.K. rose during July to 42,784 long tons—22,099 tons virgin and 16,685 tons scrap, according to a statement issued by the British Non-Ferrous Metal Federation. This compares with the total for June of 39,580 tons (including 15,890 tons scrap) and a monthly average of 38,286 tons for the first half of the year.

Unalloyed copper products accounted in July for 23,798 tons of metal, of which 14,980 tons went into high conductivity rods and strip, and 5249 tons into strip and sheet. In addition, some 17,758 tons of copper were used for alloyed products, including 6320 tons for extruded rods and sections, 4277 tons for brass strip and sheet, and 4278 tons for castings and miscellaneous products. The balance of 1228 tons of metal was used for copper sulphate.

Digest of Statistics

Chemical and Allied Production and Consumption Figures

DECREASES in the production and consumption of chemicals and fertilisers in the U.K. during June are recorded in the recently-published August issue of the *Digest of Statistics* (H.M.S.O., 2s. 6d. net). It is pointed out, however, that there were fewer working days in June than in May. The figures given represent thousand tons.

Sulphuric acid production, i.e., as 70 per cent. acid and including acid made at Government factories, was 161.3, which is 3.0 less than the May figure, but 1.0 better than the figure for April. The consumption of sulphur for the manufacture of sulphuric acid was 17.0, which is .9 less than the May figure, but the same as that for April. Sulphuric acid consumption is given as 152.0, this being 24.0 less than the figure for May and 6.0 less than the April figure. Stocks of sulphur for the manufacture of sulphuric acid dropped to 58.1, after being 69.3 in May and 59.0 in April, while sulphuric acid stocks are returned at 92.7, which is an increase of 11.3 compared with May and 3.0 better than the April figure.

Less Superphosphate

After reaching the record figure of 95.4 in May, the production of superphosphate dropped in June to 75.1, which is less than it has been since last September. The consumption of superphosphate, which includes deliveries to consumers and the amounts used in compounds, went down to 64.8, as compared with the May figure of 111.9. This also is the lowest figure for several months. There were similary reduced figures in respect of compound fertilisers, production of which is returned at 80.9, as against 116.0 in May and 146.0 in April. The consumption of compound fertilisers dropped sharply to 18.9, a record low figure, comparing with 101.3 in May and the record high figure of 231.1 for April.

Consumption of pyrites in June was 17.6, which is .9 below the May figure and .6 less than that for April. Stocks of pyrites showed an increase, however, the June figure of 88.0 being 4.0 better than the May figure and 6.0 above the April figure. Spent oxide consumption is given as 15.6, compared with 16.5 for May and 16.4 for April. Stocks of spent oxide went up to 139.0, after being 138.5 in May and 134.6 in April.

The consumption of phosphate rock for fertilisers showed a big decline, the June figure of 64.8 being 57.1 below that for May and 52.0 less than the April figure.

Ammonia consumption, including exports and deliveries to consumers in the U.K., but excluding ammonia produced in by-product factories and converted directly into ammonium sulphate, was 25.51, which is 6.45 less than the May figure, but 1.43 better than that for April. Stocks dropped to 3.11, as against 3.28 in May and 3.26 in April.

July production of iron ore was 211.0, which is 15.0 less than the June figure and 34.0 below the figure for May. There was likewise a drop in pig-iron production, the July figure of 148 being 4.0 below the June figure and 3.0 under that for May. The July production of steel ingots and castings was 228.0 (including 10.0 alloy), which is 22.0 less than the June figure and 34.0 below the figure for May.

Among non-ferrous metals, the production of virgin aluminium was 2.25 in June (the latest month for which figures are given), this comparing with 2.53 in May and 3.29 in April. Consumption dropped to 7.9, after being 9.0 in May and 10.5 in April, this last figure including 2,292 tons lent to France.

Total disposals of virgin copper in June were given as 23.7, which is 6.5 less than the May figure, but only .3 less than the figure for April. Stocks of virgin copper in June were 80.9 (excluding 30.0 held abroad), this being an increase of 7.8 compared with the May figure and .5 better than the figure for April. Virgin zinc disposals totalled 17.1 in June, this being 1.2 less than the May figure, but .8 better than the figure for April. June stocks of virgin zinc were 78.2 (excluding 2.7 held abroad), this being 5.7 under the May figure and 15.9 less than that for April.

Other Metals

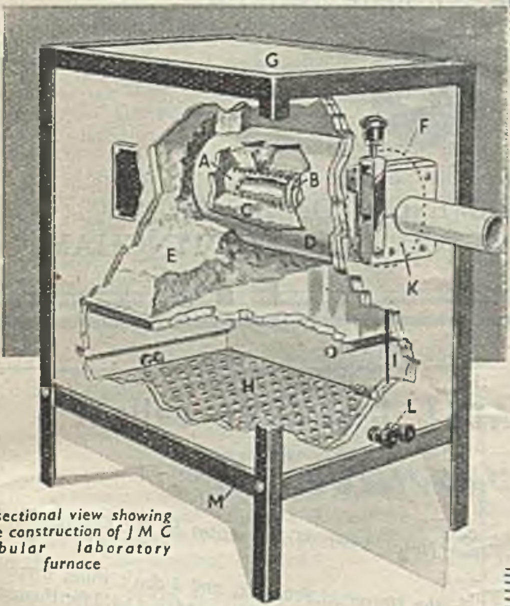
Consumption of zinc concentrates in June was 16.9, which is an improvement of 4.7 compared with the May figure and 5.2 better than the figure for April. The June stocks of 125.0 (excluding 22.6 held abroad) were only 1.0 below the May figure and 3.0 under the April figure. Total disposals of refined lead in June were given as 16.4, which is 3.6 less than the May figure and the lowest for eighteen months. Stocks were slightly better at 33.7 (excluding 14.7 held abroad), the May figure being 30.4 although in April it was 37.8. Tin metal total disposals in June were 2.63, after reaching the record high figure of 7.16 in May; the April figure was 6.24. Stocks were 22.4, this being only 1.0 less than the May figure, but 4.8 under the figure for April.

For the first time in seven months, an increase is recorded in the number of people employed in chemical and allied works, the figure (in thousands) for June being 227.8 (including 80.0 females), as compared with 226.9 in May and 225.3 in April.

Metallurgical Section

Published the first Saturday in the month

TEMPERATURES UP TO 1,500° C



A sectional view showing the construction of J M C tubular laboratory furnace

A	High temperature refractory
B	Rhodium-platinum alloy element
C	High temperature insulation
D	Medium temperature refractory tube
E	Medium temperature insulation
F	Asbestos sealing washer
G	Sindanyo heat-resisting case with removable end plates
H	Perforated iron plate
J	Reinforced connecting leads
K	Combustion tube clamp
L	Thermocouple terminals
M	Vitreous enamelled frame

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Metallurgical Section

September 7, 1946

Polarography

The Electrochemical Analysis of Metals

by L. SANDERSON

In considering the application of polarography to metals, there is no need to dwell unduly on the basic principle of electrolysis, which will be familiar enough to readers of this journal. The point to be borne in mind is that, as Arrhenius's Theory of Electrolytic Dissociation indicates, when a salt is dissolved in water, it breaks up into two distinct components with electrical charges of different sign. These ions obey electrostatic laws whereby the cation or metal ion is attracted to, and deposits at, the cathode and is positive in sign, whereas the ion deposited at the anode is negative in sign. The solid in which these ions originate represents a balance of negative and positive ions, so that it is electrically neutral in itself. The aqueous medium of the electrolytic action has the effect of modifying the interionic field of its high dielectric constant.

When, therefore, anode and cathode in an electrolyte each attract ions of opposing sign, these ions surrender their electric charges, and the cations are deposited at the cathode in the form of neutral atoms. It is the carrying of the electrical charges by the ions that makes up the electric current.

Polarisation of Electrode

In this simple account, however, there is nothing to explain what happens when an electrode is polarised. The fact is that until the potential applied to an electric cell attains a specific and typical value, termed the decomposition potential, virtually no current at all flows. If in the electric field between electrodes immersed in an electrolyte there is a heightening of the applied potential without any corresponding increase of current, both electrode and cell are said to be polarised. However, as soon as the decomposition potential has been attained, there is a sharp increase in current with higher voltages, and eventually a circumscribing value is attained termed the saturation current. This remains unchanged, although, and when the applied potential is increased. Fig. 1 should be examined in this connection. The saturation current is directly proportional to the concentration of ions in process of discharge. What is the explanation? As far as can be seen, there is a potential barrier at the surface of a metallic conductor, and this has to be forced if the ion is to achieve discharge at the electrode.

It was not until the development of modern quantum mechanical theory that these potential barriers began to be understood, but it has been fully demonstrated that they actually exist, and we now know a good deal of the way in which they work. It is clear that it is impossible for an ion to achieve discharge at the electrode until it has been sufficiently charged with kinetic energy to ensure that it will force the potential barrier. Moreover, while in theory it would be feasible for an undischarged ion, not well enough charged with kinetic energy to force or leap over the barrier, to burrow through it and so achieve discharge, in actual practice this so rarely happens that there is no need to take it into account.

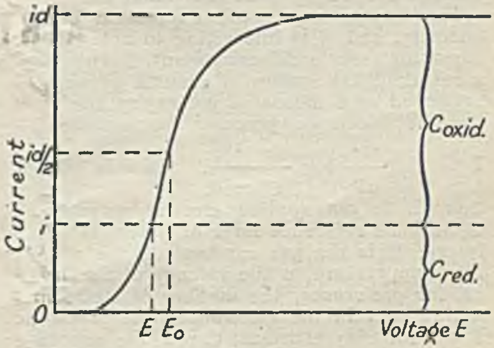

Fig. 1.

Any particle in an electric field possesses a kinetic energy directly proportional to the field, and for any specific arrangement of the electrode, proportional to the applied potential. This means that the decomposition potential can be correlated to the height of the potential barrier or to the minimum energy the ions must carry to enable them just to leap over the barrier. The point must be stressed that the total kinetic energy of the ion has to equal, if not exceed, the height of the potential barrier at the electrode.

We must define this phrase " total kinetic energy " more closely by pointing out that it includes the heat energy of the ion as well as the kinetic energy arising from electrical causes. It is therefore probable that the total number of ions reaching the electrode and achieving discharge, thereby constituting the electric current, will be governed by the electric potential, the temperature, the concentration of ions in the electrolyte, and the number of electric charges carried by each individual ion.

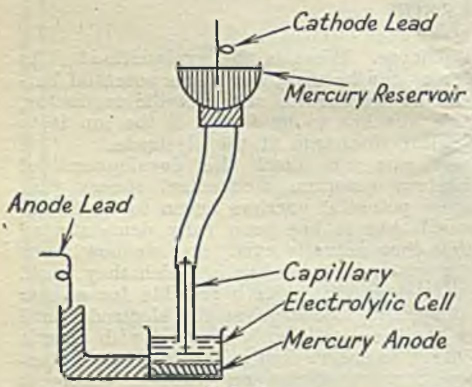

Fig. 2.

This brings us to the expression of a quantity, and it is interesting to note that, departing from a different point, Nernst, as a result of his studies of osmotic pressure, suggested as a means of portraying the reversible electrode process, the equation:

$$E = E_1 \frac{RT}{nF} \log \frac{C\ \text{red.}}{C\ \text{oxid.}}$$

In this equation, E is the applied electric potential; E_1 is some reference level of potential (*see* later); R is the gas constant, T the absolute temperature, n the valency of the ions or, for preference, the number of electrons taking part in the electrochemical process, F the Faraday constant, C red. the concentration of ions in the reduced condition, C oxid. that of ions in the oxidised condition, facing the electrode.

This equation can be expressed in terms of currents, as follows:

$$E = E_1 - \frac{RT}{nF} \log \frac{i}{id\text{-}i}.$$

Here, id is the saturation current attained after each ion reaching the electrode has achieved discharge; i is the current passing at the applied potential E. Because id depends primarily on the diffusion of ions from the greater part of the electrolyte, it may be referred to as the diffusion current. It will be clear that it is in direct proportion to the concentration of electro-reducible (or electro-oxidisable) substance in the electrolyte. Whether the substance is electro-reducible or electro-oxidisable depends on whether we are taking the cathode or the anode as our starting point.

Because the ions carry the current it is obvious that i is in proportion to the number of ions per second discharged, or to C red., while C oxid. will be proportional to the number of ions queuing up, so to speak, for discharge, or to id $-$i. Examination of Fig. 1 will show this also. It follows that the two equations given above both apply to every electrolytic oxidation-reduction process whether ions take part in it or not, *i.e.*, as long as a reversibly electro-reducible material is present.

If C red. equals C oxid. in the first equation, the logarithmic term disappears, and E equals E_1. This potential is termed the standard potential of the ion species, and is generally indicated by E_0. From the second equation it follows that for $E = E_0$ it becomes equal to $id/2.E_0$, and for this reason is often termed the half-step potential.

The problem is to work out a system of electrochemical analysis using these Nernst equations as the basis. The first aspect of the problem is that we must employ an arrangement whereby study of the processes at a single electrode only is possible.

The Heyrovsky Electrode

Fig. 2 should now be examined. This shows the dropping mercury electrode developed by Heyrovsky as a solution of this part of the problem. It will be seen that it consists of a container, holding a quantity of mercury, which is connected to a capillary tube through which the mercury falls a drop at a time with a few seconds between each drop, the time interval being constant in each case. The other electrode may be merely a pool of mercury at the bottom of the vessel contacting with a platinum wire sealed through a piece of glass tubing. It will be appreciated that there is here a considerable difference between the surfaces of the two electrodes, which is the type of arrangement complying with what is required.

The energy of an ion is primarily governed by the potential gradient (volt per cm.) and not by the absolute potential applied. In consequence, the very small surface of the drop of mercury, which involves the squeezing up of the lines of force, and the broader surface of the anode, which allows of their opening out, cause virtually the whole of the applied potential to appear across an extremely minute space in the region of the cathode. Moreover, the uninterrupted generation of new and clean electrode surfaces exposed to the electrolyte prevents the electrode from being contaminated by electrolytic products. There is also a continual agitation of the solution by the falling of each drop, so that it becomes easier to achieve even diffusion. As each drop grows into the solution and in this way continually encounters new layers of liquid, the results are reproducible and more uniform than they would otherwise be. It must also be remembered that a primary advantage of a mercury electrode is the high value of H_2 over-voltage at a mercury surface.

It is possible to employ a platinised Pt electrode instead of mercury, in which case hydrogen ions will be liberated in advance of a considerable number of metals. Because $H+$ ions are contained in water, satisfactory investigations in aqueous solutions would be impracticable. At every other electrode hydrogen would be discharged at more negative potentials, the difference being the hydrogen over-voltage. Its size is governed mainly by the smoothness of the surface of the electrode, so that, as will be imagined, it attains its maximum at a mercury electrode.

This is the system of electro-chemical analysis originally termed polarography, and the reader should now study Fig. 3 in which the complete equipment is shown. A continually and gradually increasing direct potential is applied to the cell from the potentiometer P. The current corresponding to every voltage co-ordinate is recorded on sensitised paper by the galvanometer G. The paper is wound on a revolving cylinder direct-coupled to the arm of the potentiometer. By this means it becomes possible to trace curves of the form shown in Fig. 1. The potential E_0 are obtained from ½ the saturation current id.

As the standard potentials for almost every practically important type of ion have been measured with precision and tabulated, the ion species being discharged can be obtained. Evaluation of the ion concentration can be had from the id value on the curve (*i.e.*, the step height), because, as previously indicated, id is in direct proportion to the concentration. Polarography provides, therefore, at one and the same time a qualitative and quantitative analysis of electro-reducible or electro-oxidisable materials.

Other Aspects

We have still to consider two other aspects of the subject. In the first place, the solutions must be completely free from air by passing through them H_2 or other agent. Furthermore, the dropping electrode causes the galvanometer to oscillate, and these oscillations increase in size as the instrument becomes more sensitive. It is therefore impracticable to assess the ions if there is a considerable surplus of nobler ones. The reason for the existence of these severe oscillations is the superior concentration of the nobler ions discharged at lower potentials, since these swamp the small steps resulting from the less noble ions. If this ordinary method is adopted, it is feasible to achieve a complete analysis in about 45 minutes.

Research into electrode reactions in alternating fields has, however, led to the development of a novel means of carrying out polarographic analysis. The originators of this method are Breyer and Gutman of the Department of Organic and Applied Chemistry at the University of Sydney, to whom the author is indebted for the details given in this article. In their method, they use a superposition of direct and alternating voltages, so that the time required for carrying out an analysis is reduced to two minutes, but the process is considerably simplified. The principles on which the new method is based are summarised below.

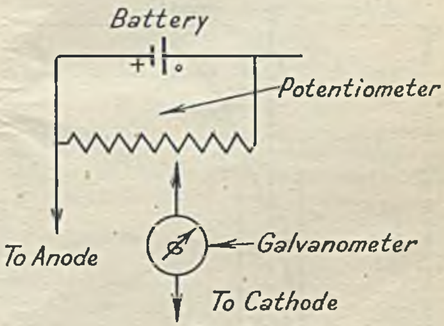

Fig. 3.

Assuming the cell to be merely a short length of wire, *i.e.*, a so-called ohmic conductor, it would constitute a resistance R to the passage of current i, resulting from the voltage e. $R = e/i$ or $e = i.R$. If this equation is differentiated, it is apparent that for a conductor of this type $de/di = \text{Constant} = e/i$. If such an ohmic resistance is plotted on a current-voltage graph, it forms a straight line.

In the electrolytic cell, achievement of the decomposition potential means that the relation of current to voltage completely ceases to be represented by a straight line, because voltage and current are then in no way connected by an expression of the above type, the cell following the Nernst equation. If, however, direct currents alone are employed, it is possible to represent the cell *at any one point on the curve* by an equivalent resistance $r = e/i$. If, however, an alternating potential is superimposed upon the unvarying voltage, a different treatment is necessary.

Reference should now be made to Fig. 4,

from which it will be seen that restriction to one solitary point of the curve ceases to be feasible, as the instantaneous potential of the cell moves along the curve about the working point E. This point corresponds to the simultaneously applied direct potential, which controls the equilibrium point of the electrode reaction. Note must also be made that the alternating potential is small in relation to point E so as to obviate any marked shift in the equilibrium point.

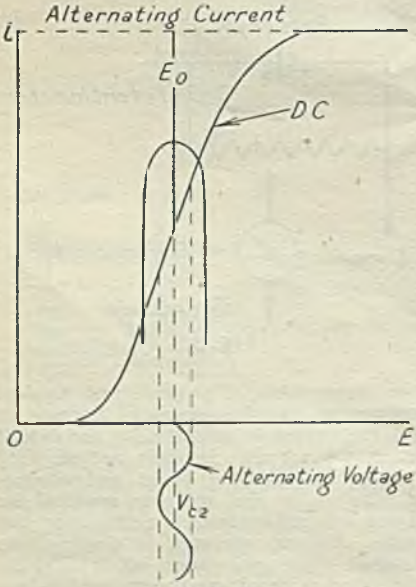

Fig. 4.

The resistance of the cell to the alternating current passing through it becomes, for this reason, the dynamic resistance de/di evaluated at the working point E, instead of the static resistance e/i. By differentiation, we obtain the equation:

$$R = de/di = (-RT/nF) \frac{id}{i(id-i)}.$$

This equation constitutes a function of i, as before, so that it is possible for a value of i to exist that makes the resistance R a minimum. If this equation is itself differentiated and equated to O, as follows:

$$dR/di = (-RT/nF) \frac{id(-id + 2i)}{i^2(id-i)^2} = O,$$

it will be seen that the existence of such a minimum is a fact 2i = id or i = id/2. This, in terms of voltages, forecasts resistance minima or current maxima for $E = E_0$. In other words, the a.c. rises from the beginning of discharge, reaches a peak at the standard potential, and goes back to its original value immediately the saturation current region has been attained. By inserting the values in terms of voltage given (2i = id, etc.) in the first equation above before differentiation, the magnitude of the dynamic resistance at Ee is obtained, and it is also demonstrated that the a.c. there is proportional to id and in consequence, to the concentration of the ions being discharged.

The reader must carefully bear in mind, however, that over and above the a.c. that goes through the cell as result of its dynamic resistance, as already explained, further current will go through by reason of the capacity of the electric double layer at the electrode. This is a consequence of the aggregation of ions at the electrode-solution interface, which ions do not possess energy adequate for the overleaping of the potential barrier at the surface of the electrode. Moreover, until the saturation current is attained, there will be an aggregation of ions about the electrode, creating a space-charge. Because these ions are charged particles, they act in the same way as conducting particles, and the space-charge cloud in the region of the electrode will consequently show extra capacity. This capacity fails to become evident with d.c., but in connection with a.c. voltages it is of some consequence.

It is demonstrable that the existence of this alternating field lowers this capacity by a factor of $1/(\omega V - 1)$, where ω is the circular frequency, and V is the amplitude of the alternating voltage applied. The space charge and consequently this dynamic capacity also are in proportion to the concentration of ions, to the surface of the electrode, and to that distance from the electrode in which there reigns a notable charge-density. The latter has been found to be in the region of 10^{-4} cm.

The reader may inquire as to the basic difference between the d.c. method and the new a.c. method. It lies in the fact that the d.c. is actually carried by the ions. The a.c. component, on the other hand, constitutes the outcome of the variations in resistance and the capacity of the ion space-charge.

Electrochemical Analysis

By means of this new instrument, it becomes possible to make an electrochemical analysis by rotation of the potentiometer dial until the current, indicated by means of a meter, attains its highest point. This point in turn shows the concentration of the ion species present, and the character of the irons being discharged are obtained as a result of the potentiometer reading. In this way a very rapid and simple quantitative and qualitative analysis is achieved. Often it is possible to analyse in air, or, where essential, after merely a couple of minutes bubbling through of H_2.

World Tungsten Position

Australian Industrialist's Conclusions

SOME conclusions arrived at regarding the world position of tungsten and scheelite, after investigations made abroad earlier this year, were given by Mr. A. R. Bruhn, managing director of King Island Scheelite N.L., on his return to Australia a short while ago.

They appeared in *Industrial Australian and Mining Standard* and are reproduced, in part, below:

1. In both England and America, tungsten consumers insist upon a tungsten ore with very little molybdenum content, as the makers of high-speed tool steels have, since the war ended, gone back to a pre-war specification of a high tungsten content and very little molybdenum content.

2. English tungsten consumers are wolfram-minded, as their plants have, for years past, been used to clean wolfram ore, and they will purchase scheelite up to some 10 per cent. to 15 per cent. only of their total requirements. On the other hand, American consumers are scheelite-minded because their own mines produce scheelite and not wolfram, and, in addition, chemical treatment was developed in America during the war for the purpose of removing molybdenum from scheelite. The resultant product is a very clean high-grade scheelite in better demand than wolfram.

3. Scheelite mines in America produced a big quantity of scheelite during the war, and many of those mines, as a result, have closed down due to running out of ore. The remaining mines have very high costs due to various reasons, and they cannot produce scheelite as cheaply as Australia can to-day. Australian producers have, however, to pay a very high import duty on scheelite into America.

The Largest Consumer

4. America is likely to be a much larger consumer of tungsten than any other country in the world.

5. The American corporation which developed chemical treatment of scheelite to remove molybdenum is, with its associated corporation, one of the two largest tungsten consumers in America. It is now engaged in expanding its chemical works.

6. Tungsten mining in China will not be nearly the same powerful influence on world market price as it was before this war, and tungsten mining in other countries is relatively unimportant from a competitive point of view.

7. Both in England and America, industry generally was very slow in changing from war-time to peace-time production, due to many causes, which are probably by now well known, and it was explained that forecasts as to when peace-time production would be in full swing were so difficult that nobody would entertain entering into fixing contracts for purchase of Australian scheelite.

8. Whereas Australian mining practice is considerably cheaper than mining practice in the American mines, Australian milling practices are, by their standards, both expensive and not in accordance with modern principles. American tungsten mills, for instance, secure a recovery of 93 per cent. of the head value of their ore, whereas our mill cannot do better, with only gravity concentration, than 60 per cent.

Government Metal Notes

Non-Ferrous Scrap

THE Ministry of Supply announce that the stock of non-ferrous scrap on Government charge at June 30 was 199,238 tons, made up as follows:

	Tons
Q.F. Cases and muffled S.A.A. ...	88,209
Ingots	27,810
Lead and lead alloy	1,537
Copper and copper alloy	18,834
Zinc and zinc alloy	11,199
Other grades	51,649

Sales for June-July amounted to 18,889 tons (approximate value of £850,000), divided up as follows:

	Tons
Q.F. and muffled	4,466
Copper and copper alloy	12,204
Lead and lead alloy	1,601
Other grades (including zinc and zinc alloy)	618

U.K. Tin Position

Summarising the tin position, the Ministry notes that stocks in its possession at January 1, 1946, were 23,780 long tons, to which must be added 13,870 tons produced, making 37,650 in all. Of this, 26,661 tons were delivered by way of export, leaving a stock of 10,989 tons at July 1.

Consumers' stocks at the beginning of 1946 were 2186 long tons. Adding deliveries, 13,114 tons, and subtracting consumption, 11,870 tons, the stock at July 1 (calculated) was 3430 tons. Actually 3623 tons were reported held in stock by consumers at that date.

Tin ore (tin content) in stock in the U.K. on January 1 was 7322 tons; on July 1, 7753 tons.

Monazite, an important source of thorium, is not to be exported from Travancore, where it occurs in large quantities, except by arrangement with the British Government. According to the president of the Travancore Legislative Assembly, confidential negotiations are proceeding with this country.

Aluminium Foil

New South African Plant

The new aluminium factory to be erected shortly at Pietermaritzburg by the Aluminium Company of South Africa (Pty.) Ltd., ("OCOSA"), is to produce initially aluminium foil, made largely from ingot produced at the Arvida smelters of the Aluminium Company of Canada, Ltd. Rolling mills for the production are already on order. It is expected that the foil will find a ready market among manufacturers of both sweets and cigarettes.

The plant is also to produce aluminium sheets and circles used for the manufacture of bottle caps, cooking utensils, etc. The company, which took over, as from July 1, control of the Johannesburg office of the Aluminium Union, Ltd., is a subsidiary of Aluminium, Ltd., Montreal. It has a capital of £200,000, which is being put up by the parent company in Canada, and an additional £200,000, required for the construction of the factory and the installation of plant, will, in all probability, also be found in Canada. Equipment will mostly be obtained in the United Kingdom, but the technical processes to be employed and the lay-out will be of Canadian origin.

Steel Production

Notes from France

WHAT is described as a revolution in metallurgical progress is stated to have been worked out by the Société des Forges et Aciéries du Nord et de l'Est, a very fine steel being produced from common steel by adapting the Perrin process to commercial steel.

The method may briefly be described by saying that while the steel is being treated in the ordinary Bessamer-Thomas converter, a charge of special composition is prepared separately in an electric furnace and then poured into a casting pocket. After the converter has run for about 20 to 25 minutes, it is tilted to permit a fine jet of steel to fall from a great height. This produces a close association of the steel and the charge, resulting in a very complete purification of the steel. The advantage claimed for this process is that it provides a high-grade product from ordinary raw materials without the installation of expensive plant.

The French Planning Office has drawn up a preliminary plan for the country's siderurgical industry, aiming at an output of about six million tons of steel in 1947, about equal to the production of 1938, to be increased to 12 million tons by 1950, which would be 20 per cent. above the maximum output reached in 1929. It is estimated that in order to produce economically about 56,000 million francs will have to be spent on modernising plant. The shortage of coke is a serious obstacle to further expansion, although the raw material supply position is good. Iron ore mining is being reduced because of the lack of storage space, stocks amounting at present to 615 million tons, compared with 4 million tons in 1938.

Czech Iron and Steel Output

Slow Recovery

ACCORDING to statistics published in the Czech weekly *Hospodar* (The Economist), output of pig-iron amounted to 424,848 tons in the first half of the current year, as compared with 806,663 in the same period of 1937, the last normal pre-war year. Steel production for the first six months totalled 795,620 tons, or 72.1 per cent. of the pre-war output of 1,103,151 tons.

The comparatively large gap in the output figures of pig-iron and steel is explained by the shortage of iron-ore, which is strongly felt. Moreover, the metal content of those ores that are available is too low to make a speedier recovery possible. Another bottleneck is the irregular supply of coke, and as a result only seven out of 13 blast furnaces are at present operating.

The position of the steel industry is somewhat brighter on account of the fairly ample supply of raw material in the form of iron scrap. According to the Government's new Two-Year Plan, pig-iron production is to reach 1.4 million tons by 1948, which would still be about 15 per cent. below the pre-war level, while the target figure for steel is 2.2 million tons, which would mean a small increase over the 1937 output.

The Scientific Society of Zürich, Switzerland, is celebrating its bicentenary this week-end in the Federal Technical Institute. Nearly 300 papers will be presented, including 38 by foreign guests. Two anniversary medals will be issued, bearing the portraits of the great Zürich scientists of the 16th and 17th century, Gessner and Scheuchzer.

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LETTER TO THE EDITOR

B.A.C. and T.U.C.

SIR,—The letter written by "Non-Socialist Chemist" in THE CHEMICAL AGE last week confirms my fears that chemists reading your comments will think the B.A.C. has a political bias. The official report, which has been quoted, contained a summary of the proceedings at the general meeting. A summary was necessary as a full report would have been too lengthy, but I would like to quote from the official reporter's typed notes of the proceedings. He reports that I said: "So far as the present discussion was concerned, it had been arranged that Mr. David Jackson would open the debate. Although he had been asked by the Executive to do so, Mr. Jackson would not speak on behalf of the Executive, but would express his own opinions. The Executive asked Mr. Jackson to open the discussion because they wanted someone who knew a good deal about this subject."

Mr. Jackson performed a difficult task in a very able manner and without political bias. He supported affiliation because he believed it would enable certain members to play a more active part in industrial life.

It is unfortunate that the very suggestion of affiliation to the T.U.C. immediately brands an individual or an association as definitely a supporter of the Socialist Party. It cannot be true because there are B.A.C. members who have told me that they consider affiliation would be useful and have also told me that they voted Conservative or Liberal.

The report adopted by Council to which your correspondent refers was prepared by an official who was asked to state the case for and against affiliation, and it was adopted and circulated because it was considered to be a fair statement which was amplified by extracts from speeches made at the meeting.

It is important to notice that the motion proposed by Mr. Jackson only *authorised* the Council to apply for affiliation. It did not *instruct* them to do so. The Council are still free to act as they think fit. The present disputes over "closed shops" may influence a final decision if they are called upon to make one.

I am an active member of the B.A.C. because I am convinced that all professional men should organise themselves into associations which will look after their economic interests. I joined the B.A.C. in 1918 and I have derived very great benefit from membership, in ways which I cannot very well explain here. Such benefits have far outweighed the meagre subscription, and I am anxious that the Association shall become strong enough to carry through to completion plans which will be of the greatest benefit to all our members. We are being hindered by those who say we are becoming supporters of one political party. I hope your readers will not believe that and that some will become members and help us.—Yours faithfully,

NORMAN SHELDON,
Vice-president and vice-chairman of Council of the British Association of Chemists.

London, W.1.
September 2, 1946.

Patents Agreement

An Anglo-French Extension

THE Anglo-French Agreement relating to certain Rights in Respect of Industrial, Literary and Artistic Property affected by the War,* which was to expire on August 29, 1946, is to be extended for a period of one year.

Article 1. Priority rights for the deposit of applications for patents, or for the registration of trade marks or industrial designs or models, which had not expired on September 3, 1939, and priority rights which have arisen during the war, or might have risen if the war had not taken place, can still be claimed for applications filed on or before August 29, 1947.

Restoration of pending applications for or of granted rights of industrial property is also possible, conditional to the payment of fees or accomplishing an act as may be prescribed by the laws and regulations of each country. *Bona fide* third-party rights acquired in the meantime are safeguarded, subject to conditions of licence settled by the respective Government departments.

Article 2. Conditions of compulsory licences may be varied and the term of patents may be extended on application of a party who has suffered hardship because of the war.

Article 3. The period between September 3, 1939, and the coming into force of the Agreement (August 29, 1945) was excluded from the prescribed periods for the exploitation of a patent or industrial design or model, and for the use of a trade mark, and no revocation of such an industrial property that was in force on September 3, 1939, should take place solely because of non-exploitation or non-use before August 29, 1947.

Article 4. This relates to the period of renewal of trade marks.

Article 5. The agreement applies to metropolitan France and the U.K. and to such colonies, protectorates and mandated territories as well be simply notified by one contracting party to the other.

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* *Treaty Series* No. 5 (1945) of August 29, 1945, Cmd. 6674, H.M. Stationery Office.

Personal Notes

Sir W. Griffiths, chairman and managing director of Mond Nickel Co., has been appointed to the management committee of the Copper Development Association.

Mr. Norman C. Fraser, A.M.I.Chem.E., and **Mr. C. N. Hillier**, A.M.I.Chem.E., of W. J. Fraser & Co., Ltd., are leaving for a business visit to India at the end of this month.

Sir Archibald Fleming left London airport on Sunday to fly by stages to Rio de Janiero, where he will be the guest of the Brazilian Government at the first Inter-American Medical Congress.

Mr. N. Isaacs has joined the board of Derby & Co., Ltd., on relinquishing his appointment as director for ferro-alloys and adviser on wolfram in the Iron and Steel Control of the Ministry of Supply.

Excess Profits Tax Panel

I.C.I. Director as Chairman

A TREASURY announcement issued last week-end stated that Dr. W. H. Coates, who is a director and deputy-chairman of Imperial Chemical Industries, Ltd., will be chairman of the Excess Profits Advisory Panel, which will deal with points arising from the use of E.P.T. refunds. In addition to Dr. Coates, there will be five other members of the panel.

The functions of the panel, broadly, are as follows: (1) Approving the arrangements for the use of the refund in cases where it will not be used in the original trade or business by the person who carried on that trade or business or where there has been a change of ownership; and (2) inquiring, after the event, in such cases as they think fit, how the refunds have been dealt with so as to ensure that the statutory undertakings have been observed.

All communications for the panel should be addressed to: The Secretary, Excess Profits Tax Advisory Panel, Treasury Chambers, Great George Street, S.W.1.

It is thought that few cases are likely to be referred to all members of the panel, but each case to a small number only. This method of procedure will enable the panel as a whole to deal with a number of cases simultaneously and result in settlements at a reasonably quick speed.

German Technical Reports

Latest Publications

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

CIOS XXIX—12. *The production of tetrahydrofuran intermediates*: Detailed description in German of a "polyurethane" nylon substitute (4s.).

BIOS 534. *The organisation of the German chemical industry and its development for war purposes* (4s.).

BIOS 589. *German light alloy die casting industry—machine tools for die sinking* (1s. 6d.).

BIOS 596. *Gesellschaft Fuer Teerverwertung Varziner-Strasse, Duisburg-Meiderich, Ruhr*: Distillation of tar (1s. 6d.).

BIOS 598. *Oelwerke Julius Schindler G.m.b.H.*: General and specialised lubricants, etc. (1s. 6d.).

BIOS 604. *The shellac industry in Germany* (2s.).

BIOS 639. *Deurag-Nerag. Gewerkschaft Deutsche Erdoel Raffinerie Und Neue Erdoel Raffinerie*: Fuels and lubricants (3s.).

FIAT 297. *Fats, oils and oilseeds* (2s.).

FIAT 362. *Synthetic fatty acids, I.G. Farben. A.G., Ludwigshafen* (6d.).

FIAT 423. *Rhenania-Ossag Mineraloelwerke A.G. Harburg Refinery*: Synthetic lubricating oil manufacture (2s.).

FIAT 429. *Development work for manufacture of caustic soda and sulphuric acid from sodium sulphate* (1s.).

FIAT 645. *The dyeing of spun rayon and rayon filament yarn in mechanical apparatus* (2s.).

FIAT 676. *German scientific literature published during the war* (10s. 6d.).

LEAD DEVELOPMENT

The Lead Industries Development Association has been registered as a company limited by guarantee, without share capital, to continue the activities of the Lead Industries Development Council, which was an unincorporated body. The objects are to promote co-operation between persons, firms and companies, etc., with a view to increasing the consumption of white lead, lead oxides, sheet lead, and lead products. The original number of members is 150, each being liable for £1 in the event of winding up. The council comprises Mr. J. H. Stewart, chairman of Allied Lead Manufacturers; Mr. G. A. Farmiloe, director of T. & W. Farmiloe; Mr. W. E. Grey; Mr. J. L McConnell, managing director of Goodlass Wall & Lead Industries; Mr. W. H. Boyce; Mr. B. T. Millross; and Mr. G. W. Buck. The solicitors are White & Leonard, 4 St. Bride Street, London, E.C.4.

A CHEMIST'S BOOKSHELF

A LABORATORY MANUAL OF QUALITATIVE ORGANIC ANALYSIS. By H. T. Openshaw. London: Cambridge University Press. Pp. 95. 6s.

This book, which was originally compiled for the teaching of University students, has been tested by several years' use, first as duplicated, then as privately printed matter. It can be divided broadly into two sections, the first giving instruction on the procedure to be adopted when subjecting organic substances to analysis, in order to characterise them; and the second giving data necessary for the preparation of derivatives, and tables by which these derivatives may be used to identify approximately six hundred of the more common organic compounds.

The procedure outlined for analysis follows the principles which form the foundation of the well-known Mulliken scheme. The directions are clear, and it is emphasised that in organic analysis no hard and fast scheme suffices, and the analyst must bring into play all his knowledge of the behaviour of the various classes of organic compounds.

The derivatives recommended are orthodox, and an attempt has been made to employ those which do not require great variation in conditions of preparation from member to member of a group. Where necessary, alternative directions are given for preparations, and the tables indicate clearly which is to be preferred for any given compound.

Using this book, the beginner in organic analysis should soon obtain a good grasp of the methods, while the ordinary worker may well find it of use for investigation of the commoner compounds. From it he will naturally turn, in more difficult cases, to the more advanced texts which the author recommends.

Applied Chemical Science

Forthcoming Australian Exhibition

"CHEMEX 1938"—the first chemical exhibition in Melbourne—was acclaimed an outstanding success. It rendered fine service to the public, to educational bodies and to the exhibitors. Now, with the cessation of war, the Australian Chemical Institute (Victorian branch) and the Australian Society of Instrument Technology have agreed, in response to many requests, to co-operate in the organisation of an exhibition relating in the main to recent developments in applied chemical science and the important field of industrial instruments. This exhibition, to be known as "Chemex 1947," will be held from March 5-25, 1947, at the Exhibition Building, Melbourne.

In the near future an official prospectus will be prepared for circulation by the Chemical Exhibition Council. The New South Wales branch of the Australian Chemical Institute is organising a similar exhibition in Sydney in September, 1946, and it is thought that the interval of six months between the Sydney and Melbourne exhibitions will enable many exhibitors to arrange their displays more effectively if they are taking part in both exhibitions.

The floor area of the Exhibition Building is 60,000 sq. ft. and it seems likely on present indications, especially in view of possible participation by overseas manufacturers, that this will not prove at all excessive. The building will be engaged for ample time to permit of erection and subsequent dismantling of stands. The show itself will be open each afternoon and evening, including Saturdays. It is not yet possible to state the rental for stand space, but it is thought that this will be from 2s. 6d. to 3s. 6d. per sq. ft. Exhibitors will erect their own stands to the approval of the Chemical Exhibition Council.

It is particularly desired that as far as possible there should be working exhibits, and every assistance will be given to make this possible. Electricity (230 volts, 50 cycle A.C.), water and gas will be provided. If other services, *e.g.*, compressed air, vacuum, special power supply, etc., are required, exhibitors should state this. Every stand should be in the charge of trained staff, able to explain and demonstrate the exhibits. Direct sales of goods during the exhibition will not be permitted. The intention is that the public should become interested in and be shown goods.

The war just ended emphasised the tremendous importance in modern life of the chemical and allied industries and of scientific instruments for all industries. With her rapid industrial growth during the war period, Australia can now provide a remarkable range of products which should lead to greater home and overseas trade.

The educational possibilities of "Chemex 1947" will not be neglected. To this end the co-operation of Commonwealth and State scientific organisations will be sought and arrangements will be made to display samples of latest goods and equipment developed overseas. Overseas manufacturers are also warmly invited to co-operate in this exhibition.

The Indian Copper Corporation announces that it has ordered a four-high cold rolling mill at an estimated cost of £70,000 for delivery and erection in India. Shipment of plant from the U.K. will begin early next year.

General News—From Week to Week

The Control of Natural Resins (No. 2) Order, 1946 (S.R. and O., 1946, No. 1415), removes damar and gum damar from the provisions of the Control of Natural Resins (No. 1) Order, 1942.

An unofficial strike of about 400 bricklayers started at eight West of Scotland steelworks on Saturday. If it continues, Scottish steelmaking will be crippled and many thousands of workers will become idle.

A very promising response is reported from the West of Scotland to the Ministry of Fuel and Power's campaign to encourage industrial undertakings to convert from coal to oil fuel. An official stated that the Ministry is receiving more inquiries than it can hope to deal with.

Telephone service with Yugoslavia was reopened on September 1, and the minimum charge for a call of three minutes from all places in England and Wales is 20s., and 2s. 6d. extra on calls from all places in Scotland, Northern Ireland, and the Isle of Man.

D.T.D. Specification No. 346, " Soft Aluminium Alloy Sheets and Strips," has been reprinted to incorporate Amendment Lists Nos. 1 and 2; it is obtainable from H.M. Stationery Office (1s.). Amendment List No. 1 to Specification No. 683, " Aluminium Alloy Bars, Extruded Sections and Forgings," is also obtainable (1d.).

Firemen worked ankle-deep in tar, naphthalene, and water last week to suppress a fire at the Manchester works of the Lancashire Tar Distillers, Ltd. Six perpendicular stills in the works yard were ablaze, and the pipe feed broke, flooding the yard and part of the approach road with burning tar. In all, 120 tons of tar was involved.

The " Industrial Ten " supplement of clothing coupons for the 1946/47 ration period will be issued before the end of this year, states the Board of Trade. The opening date will be given wide publicity, and in the meantime employers and workers are asked not to send inquiries to the Board of Trade or to local offices of the Ministry of Labour.

Imperial Chemical Industries, Ltd., announce that of the departments of the southern region sales office which were left at Mill Hill, the engineering trades and metals departments have returned to Gloucester House, 149 Park Lane, W.1. (Tel.: GROsvenor 4020) and the agricultural, dyestuffs, household products and distribution (including packages and accounts) departments are scheduled to return to London on September 13 and 14.

Crude linseed oil has risen in price from £65 to £135 per ton, naked, ex-works, states the Ministry of Food in announcing changes in the prices of unrefined oils and technical animal fats allocated to primary wholesalers and large trade users during the four weeks ending September 28 next. The price has risen, it is stated, because of increased purchase costs.

London Section of the Society of Chemical Industry announces that the first meeting of the new session will be held in the rooms of the Chemical Society, Burlington House, Piccadilly, on October 7, at 6.30 p.m., when Dr. W. H. J. Vernon, D.I.C., F.R.I.C., will deliver the chairman's address, entitled " Chemical Research and Corrosion Control: Some Recent Contributions of a Corrosion Research Group."

The Councils of the Institution of Factory Managers and of the Works Management Association have mutually agreed to form a new body to be known as the Institution of Works and Factory Managers. To this new body the members of the older bodies will be transferred, thus uniting forces and creating an organisation worthy of the personnel of works and factory management throughout the country. All formal matters are well in hand. It is hoped to effect complete transference by November 30.

Trade Expeditions (England) are sending a travelling trade exhibition of British goods to South America at the end of the year. A road convoy of specially designed vehicles will tour Brazil, Argentina, Chile and Uruguay, stopping for periods of up to a week or more in each of the principal towns, depending on its size. This is the first post-war travelling trade exposition of such scope and enterprise, and is being well supported by British manufacturers in many trades. Further particulars are available from Commander A. S. Ward, R.N.R., 1-2, Great Winchester Street, E.C.2.

With the coming into force of the Anglo-Hungarian Payments Agreement on August 27, and with the removal of certain Trading with the Enemy restrictions, commercial relations between Hungary and the U.K., so far as current trade is concerned, can now be resumed, and private traders in the U.K. are free to enter into contracts with private traders in Hungary or with such agencies as may be designated by the Hungarian Government. Inquiries about export possibilities should be addressed to the Hungarian Commercial Representative at 46 Eaton Place, London, S.W.1. (Tel.: SLOane 4048).

The official cost-of-living index figure at August 1 was 105 points above the level of July, 1914, showing no change as compared with a month earlier.

Foreign News

A new "Analytical Chemistry" Division has been added to the Subject Divisions of the Chemical Institute of Canada.

Cost of producing copper at the large Rhodesian mines has almost doubled in the last few years. The annual report of Mufulira Copper Mines, Ltd., states that in 1945 production was 58,275 tons of copper and the cost £38 10s. per ton, compared with 72,459 tons at £21 12s. per ton in 1940.

Manufacture in Tasmania of bronze and brass fabrications has been decided on by Austral Bronze Co. Pty., Ltd., which will extend its manufacturing activities to the island State. The directors are negotiating for the use of a former munitions factory at Derwent Park, near Hobart, and when the company is established, between 200 and 300 hands may be employed.

Menthol production is now a considerable industry in Brazil, 20 factories in the State of S. Paulo being engaged in it. Using Japanese mint as raw material (the original plants are said to have been introduced by Japanese immigrants in 1923), the industry claims a yield of 85 per cent. menthol and two crops a year, instead of the usual single crop and 55 per cent. yield.

The only Canadian plant where RDX was manufactured during the war is being offered for sale by War Assets Corporation, it is announced. Known as St. Maurice Chemicals, Ltd., the plant is located near Shawinigan Falls, Quebec. Built at an approximate cost of $2,500,000, the plant was designed for expansion, and a modern 800-h.p. boiler plant was installed, with pumping station to distribute adequate steam and water.

A modern die-casting plant is to be established at Finsbury, near Adelaide, by Pope Products, Ltd. It will be one of the largest in Australia, according to the company's managing director, Mr. S. Barton Pope. He said capacity at peak production would be between 20,000 and 30,000 castings a day. A wide range of alloys, predominantly of aluminium and zinc bases, would be cast for the trade.

From India comes the information that the Board of Scientific and Industrial Research has tentatively formulated schemes for investigating the possibility of (1) manufacturing dyes from dust, (2) manufacture of graphite, and (3) the manufacture of artificial abrasives. The first two are to be undertaken at the laboratories of the Mysore Iron and Steel Works and experiments in regard to the latter are to be conducted at the Indian Institute of Science, Bangalore.

A contract has been signed for the delivery of 1,000,000 tons of iron ore from Lapland mines to the Bethlehem Steel Corporation's plant in the U.S.A. during the next 12 months. Before the war, Sweden's exports of iron ore to the United States was upwards of 500,000 tons annually.

Forthcoming Events

September 10-11. Institute of Metals (Autumn Meeting). Institution of Civil Engineers, Great George Street, London, S.W.1. September 10, 2.30 p.m.: Official business, followed by three papers. September 11, 10 a.m.: Simultaneous groups of papers (in Lecture Hall and South Reading Room); 1.15 p.m., Annual luncheon at Connaught Rooms, Great Queen Street, W.C.2. Applications to the Secretary not later than September 1.

September 11. British Association of Chemists. Gas Industry House, 1 Grosvenor Place, London, S.W.1, 7 p.m. Mr. J. S. Evans, B.A., B.Sc. (H.M. Inspector of Factories, Engineering and Chemical Branch): "The Factory Acts as They Affect Chemists."

September 11. Institute of Welding (North London Branch). The Fyvie Hall of The Polytechnic, Regent Street, London, W.1, 7.30 p.m. T. J. Palmer: "The Weldability of Malleable Cast Iron."

September 16. Institution of Works and Factory Managers (S.E. London Branch). Bonnington Hotel, London, W.C.2, 6.30 p.m. Mr. A. H. Buckle, M.I.Ec.E.: "Psychological Instability—Government and Working Classes."

September 16-19. Association of Tar Distillers. Programme of meetings at Queen's Hotel, Leeds, 1: September 16, 6 p.m., National Pitch Committee; September 17, 10 a.m., National Creosote Executive Committee, 2.15 p.m., A.T.D. Executive Committee; September 18, 9.30 a.m., A.T.D. Naphthalene Refiners, 10.30 a.m., A.T.D. general meeting, 2.15 p.m. National Creosote Committee, 4 p.m., B.R.T.A. Managing Council; September 19, 9.30 a.m., Pitch Marketing Company and Pitch Supply Association.

September 19. Oil and Colour Chemists' Association (Manchester Section). Visit to works of Monsanto Chemicals, Ltd., Ruabon. Motor coach leaves Lower Moseley Street bus station, Manchester, 9.30 a.m.

September 23-28. Welsh Industries Fair. Drill Hall, Cardiff, 11 a.m.-6 p.m.

September 26-27. Council of Industrial Design and Federation of British Industries. Central Hall, Westminster, London, 10 a.m.

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An unofficial strike of about 400 bricklayers started at eight West of Scotland steelworks on Saturday. If it continues, Scottish steelmaking will be crippled and many thousands of workers will become idle.

A very promising response is reported from the West of Scotland to the Ministry of Fuel and Power's campaign to encourage industrial undertakings to convert from coal to oil fuel. An official stated that the Ministry is receiving more inquiries than it can hope to deal with.

Telephone service with Yugoslavia was reopened on September 1, and the minimum charge for a call of three minutes from all places in England and Wales is 20s., and 2s. 6d. extra on calls from all places in Scotland, Northern Ireland, and the Isle of Man.

D.T.D. Specification No. 346, " Soft Aluminium Alloy Sheets and Strips," has been reprinted to incorporate Amendment Lists Nos. 1 and 2; it is obtainable from H.M. Stationery Office (1s.). Amendment List No. 1 to Specification No. 683, " Aluminium Alloy Bars, Extruded Sections and Forgings," is also obtainable (1d.).

Firemen worked ankle-deep in tar, naphthalene, and water last week to suppress a fire at the Manchester works of the Lancashire Tar Distillers, Ltd. Six perpendicular stills in the works yard were ablaze, and the pipe feed broke, flooding the yard and part of the approach road with burning tar. In all, 120 tons of tar was involved.

The " Industrial Ten " supplement of clothing coupons for the 1946/47 ration period will be issued before the end of this year, states the Board of Trade. The opening date will be given wide publicity, and in the meantime employers and workers are asked not to send inquiries to the Board of Trade or to local offices of the Ministry of Labour.

Imperial Chemical Industries, Ltd., announce that of the departments of the southern region sales office which were left at Mill Hill, the engineering trades and metals departments have returned to Gloucester House, 149 Park Lane, W.1. (Tel.: GROsvenor 4020) and the agricultural, dyestuffs, household products and distribution (including packages and accounts) departments are scheduled to return to London on September 13 and 14.

Crude linseed oil has risen in price from £65 to £135 per ton, naked, ex-works, states the Ministry of Food in announcing changes in the prices of unrefined oils and technical animal fats allocated to primary wholesalers and large trade users during the four weeks ending September 28 next. The price has risen, it is stated, because of increased purchase costs.

London Section of the Society of Chemical Industry announces that the first meeting of the new session will be held in the rooms of the Chemical Society, Burlington House, Piccadilly, on October 7, at 6.30 p.m., when Dr. W. H. J. Vernon, D.I.C., F.R.I.C., will deliver the chairman's address, entitled " Chemical Research and Corrosion Control: Some Recent Contributions of a Corrosion Research Group."

The Councils of the Institution of Factory Managers and of the Works Management Association have mutually agreed to form a new body to be known as the Institution of Works and Factory Managers. To this new body the members of the older bodies will be transferred, thus uniting forces and creating an organisation worthy of the personnel of works and factory management throughout the country. All formal matters are well in hand. It is hoped to effect complete transference by November 30.

Trade Expeditions (England) are sending a travelling trade exhibition of British goods to South America at the end of the year. A road convoy of specially designed vehicles will tour Brazil, Argentina, Chile and Uruguay, stopping for periods of up to a week or more in each of the principal towns, depending on its size. This is the first post-war travelling trade exposition of such scope and enterprise, and is being well supported by British manufacturers in many trades. Further particulars are available from Commander A. S. Ward, R.N.R., 1-2, Great Winchester Street, E.C.2.

With the coming into force of the Anglo-Hungarian Payments Agreement on August 27, and with the removal of certain Trading with the Enemy restrictions, commercial relations between Hungary and the U.K., so far as current trade is concerned, can now be resumed, and private traders in the U.K. are free to enter into contracts with private traders in Hungary or with such agencies as may be designated by the Hungarian Government. Inquiries about export possibilities should be addressed to the Hungarian Commercial Representative at 46 Eaton Place, London, S.W.1. (Tel.: SLOane 4048).

The official cost-of-living index figure at August 1 was 105 points above the level of July, 1914, showing no change as compared with a month earlier.

Foreign News

A new "Analytical Chemistry" Division has been added to the Subject Divisions of the Chemical Institute of Canada.

Cost of producing copper at the large Rhodesian mines has almost doubled in the last few years. The annual report of Mufulira Copper Mines, Ltd., states that in 1945 production was 58,275 tons of copper and the cost £38 10s. per ton, compared with 72,459 tons at £21 12s. per ton in 1940.

Manufacture in Tasmania of bronze and brass fabrications has been decided on by Austral Bronze Co. Pty., Ltd., which will extend its manufacturing activities to the island State. The directors are negotiating for the use of a former munitions factory at Derwent Park, near Hobart, and when the company is established, between 200 and 300 hands may be employed.

Menthol production is now a considerable industry in Brazil, 20 factories in the State of S. Paulo being engaged in it. Using Japanese mint as raw material (the original plants are said to have been introduced by Japanese immigrants in 1923), the industry claims a yield of 85 per cent. menthol and two crops a year, instead of the usual single crop and 55 per cent. yield.

The only Canadian plant where RDX was manufactured during the war is being offered for sale by War Assets Corporation, it is announced. Known as St. Maurice Chemicals, Ltd., the plant is located near Shawinigan Falls, Quebec. Built at an approximate cost of $2,500,000, the plant was designed for expansion, and a modern 800-h.p. boiler plant was installed, with pumping station to distribute adequate steam and water.

A modern die-casting plant is to be established at Finsbury, near Adelaide, by Pope Products, Ltd. It will be one of the largest in Australia, according to the company's managing director, Mr. S. Barton Pope. He said capacity at peak production would be between 20,000 and 30,000 castings a day. A wide range of alloys, predominantly of aluminium and zinc bases, would be cast for the trade.

From India comes the information that the Board of Scientific and Industrial Research has tentatively formulated schemes for investigating the possibility of (1) manufacturing dyes from dust, (2) manufacture of graphite, and (3) the manufacture of artificial abrasives. The first two are to be undertaken at the laboratories of the Mysore Iron and Steel Works and experiments in regard to the latter are to be conducted at the Indian Institute of Science, Bangalore.

A contract has been signed for the delivery of 1,000,000 tons of iron ore from Lapland mines to the Bethlehem Steel Corporation's plant in the U.S.A. during the next 12 months. Before the war, Sweden's exports of iron ore to the United States was upwards of 500,000 tons annually.

Forthcoming Events

September 10-11. Institute of Metals (Autumn Meeting). Institution of Civil Engineers, Great George Street, London, S.W.1. September 10, 2.30 p.m.: Official business, followed by three papers. September 11, 10 a.m.: Simultaneous groups of papers (in Lecture Hall and South Reading Room); 1.15 p.m., Annual luncheon at Connaught Rooms, Great Queen Street, W.C.2. Applications to the Secretary not later than September 1.

September 11. British Association of Chemists. Gas Industry House, 1 Grosvenor Place, London, S.W.1, 7 p.m. Mr. J. S. Evans, B.A., B.Sc. (H.M. Inspector of Factories, Engineering and Chemical Branch): "The Factory Acts as They Affect Chemists."

September 11. Institute of Welding (North London Branch). The Fyvie Hall of The Polytechnic, Regent Street, London, W.1, 7.30 p.m. T. J. Palmer: "The Weldability of Malleable Cast Iron."

September 16. Institution of Works and Factory Managers (S.E. London Branch). Bonnington Hotel, London, W.C.2, 6.30 p.m. Mr. A. H. Buckle, M.I.Ec.E.: "Psychological Instability—Government and Working Classes."

September 16-19. Association of Tar Distillers. Programme of meetings at Queen's Hotel, Leeds, 1: September 16, 6 p.m., National Pitch Committee; September 17, 10 a.m., National Creosote Executive Committee, 2.15 p.m., A.T.D. Executive Committee; September 18, 9.30 a.m., A.T.D. Naphthalene Refiners, 10.30 a.m., A.T.D. general meeting, 2.15 p.m. National Creosote Committee, 4 p.m., B.R.T.A. Managing Council; September 19, 9.30 a.m., Pitch Marketing Company and Pitch Supply Association.

September 19. Oil and Colour Chemists' Association (Manchester Section). Visit to works of Monsanto Chemicals, Ltd., Ruabon. Motor coach leaves Lower Moseley Street bus station, Manchester, 9.30 a.m.

September 23-28. Welsh Industries Fair. Drill Hall, Cardiff, 11 a.m.-6 p.m.

September 26-27. Council of Industrial Design and Federation of British Industries. Central Hall, Westminster, London, 10 a.m.

Conference on "Design," in association with the "Britain Can Make It" Exhibition.

October 9. Association of British Chemical Manufacturers. Grosvenor House, Park Lane, London, W.1, 7.30 p.m. Annual dinner.

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.)

KNIGHTS OIL & CHEMICAL CO., LTD., Birmingham. (M., 7/9/46.) August 8, £6000 (not ex.) charge to Lloyds Bank, Ltd.; charged on land, Church Road, Perry Barr. *—. May 15, 1946.

STABLE STEEL WORKS. LTD., Sheffield. (M., 7/9/46.) July 13, £900 mortgage or charge (section 81, 1929 Act), to Mrs. M. C. S. Wood, Sproatley; charged on Favorite Steel Works, Edward Street, Sheffield, and adjoining land. *£900. November 20, 1945.

ANTI-CORROSIVE FINISHES, LTD. (formerly GENERAL ELECTRO-PLATING CO., LTD.), Stockport. (M., 7/9/46.) August 9, mortgage, to Midlands Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 14, 16, 18 and 20 Waterloo Road, and 1 and 3 Canal Street, and warehouse at Joules Court (adjoining last-mentioned premises), all Stockport, together with fixtures. *—. July 18, 1946.

Company News

J. and E. Atkinson, Ltd., is paying an ordinary dividend of 10 per cent. in respect of 1945. This compares with 6 per cent. for 1944.

An increased interim ordinary dividend is being paid by the British Xylonite Co., Ltd., the figure of 5 per cent. comparing with 2½ per cent. (followed by 7½ per cent. final dividend) for each of the last seven years.

Net profit of £14,491 for the year ended June 30 is reported by **United Indigo and Chemical Co., Ltd.** This compared with £10,472 for the previous year. Ordinary dividend is increased from 7½ per cent. to 10 per cent.

Application for leave to deal in the £152,856 ordinary stock of the **Wolverhampton Metal Co.** is being made to the London and Birmingham Stock Exchanges. The capital has recently been increased from £138,960 by the issued of 55,584 ordinary 5s. shares at 17s. 6d., half of which were subscribed by British Metal Corporation.

The Bleachers' Association announces a proposed scheme of capital reorganisation involving a cut of nearly two million pounds in the nominal value of the £3,818,737 ordinary capital. The proposals include the reduction of the nominal value of the ordinary capital by one-half (£1,909,368), this amount being applied in writing down the book values of the fixed assets. This will be achieved by writing down the £1 ordinary stock units by 10s. each.

New Companies Registered

Ada Feld, Ltd. (417,608).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in chemicals, gases, etc. Subscribers: R. J. Fabian; R. Moss. Registered office: 62/4, Brook Street, W.1.

C. & G. Chemicals, Ltd. (418,272).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in chemicals, disinfectants, fertilisers, oils, soaps, etc. Directors: N. S. Campbell; S. Glicher. Registered office: 30, Hassop Road, N.W.2.

P. J. Moran, Ltd. (418,120).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in ferrous, non-ferrous, alloy and stainless metals, metal ores, powder metals, metal products, laboratory equipment, etc. Director: P. J. Moran. Registered office: 115 Heywood Road, Prestwich, Manchester.

Chemical and Allied Stocks and Shares

A BRIGHTER tone in stock markets was attributed to more hopefulness regarding international affairs and the renewed strength of British Funds. Industrial shares were firm, with movements mostly small apart from a number of outstanding features, while iron and steels held their recent all-round rally. Oil shares were again rather more active on the big future expansion in oil consumption, necessitated by the coal shortage.

Imperial Chemical have been steady around 44s. 6d., with Dunlop Rubber 74s. 6d., while Turner & Newall strengthened to 89s. 6d. De La Rue advanced strongly on the raising of the dividend from 40 per cent. to 45 per cent. and the expansion in profits, and at £13 xd held most of the earlier rise. British Xylonite remained at £7¼ following the higher interim dividend, British Industrial Plastics 2s. ordinary were 8s., and Erinoid 16s. 6d. The units of the Distillers Co. showed firmness at 138s., and there was activity around 55s. 3d. in United Molasses, partly on scope for future expansion in the tanker side of the business. British Plaster Board eased to 34s. Associated Cement were 69s. 3d., while in other directions Borax Consolidated at 47s. 9d. regained part of an earlier decline. British Match were easier at 48s., as were Goodlass Wall at 29s. 7½d., although paint shares generally recorded few movements, and Pinchin Johnson improved to 44s. 6d. United Glass Bottle ordinary showed firmness at 93s. 9d. on the big demand reported for glass bottles; in view of the recent increase in the interim dividend the market is expecting a total dividend of at least 15 per cent. for the year. Forster's Glass 10s. ordinary were higher at 46s. 3d., and Canning Town Glass 5s. ordinary 12s. 9d. Triplex Glass 10s. ordinary have been steadier at 42s. 6d., but in other directions General Refractories moved lower at 20s. 9d. Imperial Smelting at 20s. 1½d. rallied, and following beginning of business around 30s. 6d. Wolverhampton Metal 5s. ordinary rose in active dealings up to 33s. 6d. Amalgamated Metal were 20s. 7½d.

Among iron and steels, Guest Keen moved higher to 41s., while Ruston & Hornsby were good at 64s. 3d. and Staveley rose to 52s. 6d. xd on the dividend increase. Tube Investments were favoured at £6 3/16 on current dividend estimates. Stewarts & Lloyds were 53s. 10½d. and Indian Iron advanced 5s. to 92s. 6d. The market approved the terms of Bleachers' capital scheme; the ordinary receded 13s. 9d., but the preference gained 1s. at 27s., a good impression being created by the decision to pay half the dividend arrears in cash. Calico Printers, after easing, rallied to 24s. 6d. on further consideration of the financial results. Courtaulds were 56s. and British Celanese 36s. Metal Industries "B" shares have been good at 62s., and there was better demand for Lever & Unilever, which strengthened to 53s. 6d. Low Temperature Carbonisation 2s. shares, which remained under the influence of the financial results, were firm at 3s. 3d.

B. Laporte were again 100s., Burt Boulton 26s., while Fisons changed hands up to 62s. 6d. and Blythe Colour 4s. ordinary up to 47s. William Blythe 3s. ordinary changed hands at 13s. 4½d. British Lead Mills were dealt in at 12s. British Tar Products were 11s. 9d., while International Bitumen Emulsions shares have been active around 7s.

Boots Drug showed firmness at 64s. 3d. Sangers were higher at 35s. 6d., Griffiths Hughes 64s. and, in anticipation of the results, Aspro shares showed activity up to 41s. 6d. Leading oil shares lost part of recent gains. London & Thames Haven 4s. ordinary transferred up to 18s. 3d. partly on talk of a possible deal in connection with the company's French interests.

British Chemical Prices

Market Reports

STEADY trading activity has been reported in the London chemicals market and a renewed interest in fresh business has been in evidence. The supply position occupies the chief attention of the market, with export inquiries fully maintained. Quotations are firm in almost all directions. Owing to the controlled price of linseed oil having advanced, the prices for lead oxides ground in oil have been increased by £8 per ton, ready-mixed lead oxides by £13 per ton, ground white lead by £7 10s. per ton and ready-mixed white lead paint by £12 per ton. There is no change in the prices for dry lead oxides and dry white lead. There has been nothing of outstanding importance to record in the general run of industrial chemicals, and in the coal tar products market supply conditions are unaltered, with pitch quoted higher for shipment.

MANCHESTER.—Traders on the Manchester chemical market during the past week have reported a fair flow of new inquiries. These have included additional offers of business for export covering the alkalis and other heavy chemicals. Replacement buying on home trade account is on steady lines and there has been less interruption through holidays of deliveries to industrial users under contracts. Caustic and other soda compounds, as well as the magnesia and ammonia products and the mineral acids, are being taken up in good quantities. A moderate trade is reported in some of the fertiliser materials, while steady trading conditions continue in respect of the leading tar products, both light and heavy.

GLASGOW.—There has been a considerable advance in prices in the Scottish heavy chemical market, principally due to increased railway costs, and, in general, there is a large volume of business. Export business and inquiries are very numerous.

Price Changes

Lead, Red.—Ground in oil: red, £92 per ton; orange, £104. Ready-mixed lead paint: red, £99; orange, £111.

Lead, White.—Ground in oil: English, £102 per ton.

Linseed oil, crude.—£135 per ton, naked, ex works.

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

Centrifugal pumps.—A. Abbey. (Jönköpings Mekaniska Verkstads Aktiebolag.) 23582.

Heat-resisting alloys.—Allegheny Ludlum Steel Corporation. 23403.

Ammonium fluoride.—Aluminum Co. of America. 23516, 23517.

Fluoboric acid.—Aluminum Co. of America. 23515.

Sulphurised oils, etc.—Anchor Chemical Co., Ltd., and K. C. Roberts. 23811.

Hydrocarbon oil blends.—C. Arnold. (Standard Oil Development Co.) 23323.

Heat generation.—C. Arnold. (Standard Oil Development Co.) 23325.

Hydrocarbons.—C. Arnold. (Standard Oil Development Co. 23898.

Hydrocarbons.—J. C. Arnold. (Standard Oil Development Co.) 23324, 23326, 23901.

Gaseous, etc., fuel production.—J. C. Arnold. (Standard Oil Development Co.) 23327.

Centrifugal pumps.—J. F. Belaieff, C. T. Delaney, and Gallay, Ltd. 23545.

Hard metal alloys.—British Thomson-Houston Co., Ltd. 23301.

High density alloys.—Callite Tungsten Corporation.—23701.

Acid ethers.—G. P. Crowley, A. Macarthur, S. H. Oakeshott, E. G. Parry, and I.C.I., Ltd. 23400.

Polymers.—J. Downing. 23855.

Chemical process.—E.I. Du Pont de Nemours & Co. 23396.

Benzenes.—E.I. Du Pont de Nemours & Co. 23668.

Thermoplastic tubing.—Extruded Plastics, Inc. 23406.

Recovery of water soluble substances.—A. Heilmann. 23903.

Synthetic resins.—E. Hene. 23353.

Dispersion of carbon black.—J. M. Huber, Inc. 23510.

Furnaces.—International Alloys, Ltd., and F. G. Bacon. 23291.

Colouring matter.—W. O. Jones, and I.C.I., Ltd. 23399.

Thiophanes.—Ledeste Laboratories, Inc. 23513.

Fertilisers.—C. W. Levy. 23756.

Metallurgical processes.—R. M. McNutt. 23886.

Deep drawing metals.—Massilon Aluminum Co. 23658.

Organic compounds.—N.V. de Bataafsche Petroleum Maatschappij. 23463.

Synthetic resins.—G. Natta, and E. Beate. 23404, 23405.

Chemical, etc., process.—J. E. Nyrop. 23657.

Biological processes.—J. E. Nyrop. 23817.

Measurement of electrochemical potentials.—F. G. Paully. 23558.

Therapeutic compositions.—M. A. Phillips. 23387.

Chemical compounds.—M. A. Phillips. 23509.

Plastifiers.—Soc. Francaise de Raúnage. (France, June 11, 45.) 23713.

Bleaching materials. Soc. Rhodiaceta. 23424.

Surface treatment of aluminium, etc.—Sperry Gyroscope Co., Inc. 23865.

Vitamin preparations.—J. S. Spolecnost. 23679-81.

Separating alloys.—Spolok Pro Chemickou a Hutní Výrobu. 23210.

Hydrocarbon polymers.—Standard Oil Development Co., and C. Arnold. 2332.

Hydrated lime.—F. P. Stowell. 23397.

Atomisers.—E. Strauss 23753.

Phenol base powders.—G. Truffaut, and I. Pastac. 23625.

Arc welding electrodes.—Welding Supplies, Ltd. (Elektriska Svetsningsaktiebolaget. 23269.

Iodine compounds.—G. N. White. 23316.

Complete Specifications Open to Public Inspection

Refining of crude acrylonitrile.—American Cyanamid Co. Dec. 1, 1942. 21823/43.

Beneficiation of cobalt-nickel ores—American Cyanamid Co. Feb. 6, 1945. 3238/46.

Heat-hardenable phenolic resins.—Bakelite, Ltd. Feb. 7, 1945. 3726/46.

Electro-thermo-chemical processes such as combustion, distillation, synthetic tractions, molecular or atomic dissociations and the like, particularly applicable to organic bodies. Feb. 12, 1945. (Cognate applications 20269/70/46.) 20268/46.

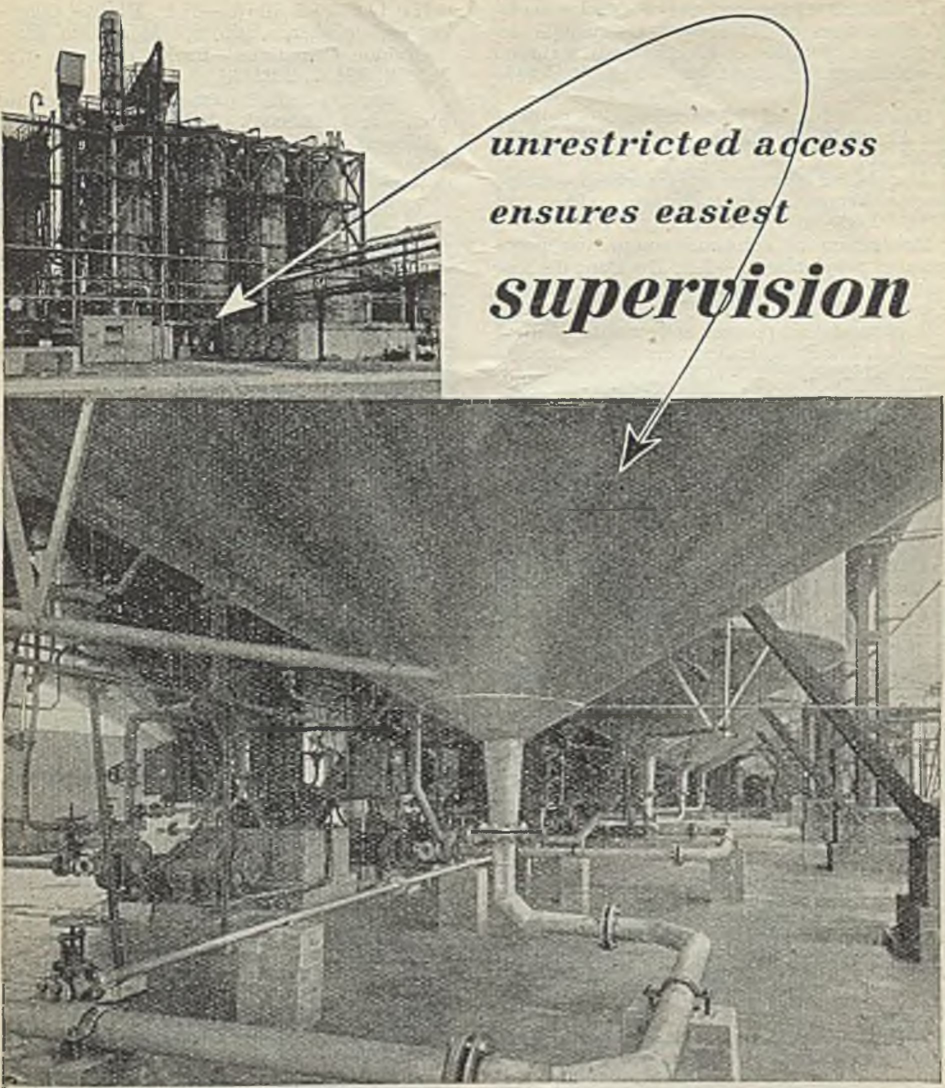
Alkylsilicon sols and gels.—British Thomson-Houston Co., Ltd. Feb. 10, 1945. 3438/46.

Organosilicon-silica sols and gels.—British Thomson-Houston Co., Ltd. Feb. 10, 1945. 3439/46.

Producing vinyl fluoride polymers.—British Thomson-Houston Co., Ltd. Feb. 13, 1945. 3746/46.

Treatment of ground wood pulp.—Buffalo Electro-Chemical Co., Inc. Feb. 5, 1945. 31479/45.

Esters and process for making same.—Carbide & Carbon Chemicals Corporation. Feb. 6, 1945. 1307/46.



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Treatment of the surfaces of articles made of aluminium or its alloys.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges & Camargue. Feb. 10, 1945. 1039-40/46.

Halogenation of hydrocarbons.—Compagnie Française de Raffinage. Nov. 23, 1943. 20668/46.

Alcoylating aromatic hydrocarbons.—Compagnie Française de Raffinage. Dec. 18, 1943. 20669/46.

Production of solutions comprising polymers of acrylonitrile.—E.I. Du Pont de Nemours & Co. June 23, 1943. (Cognate application 11948/44.) 11947/44.

Polymerisation process and products thereof.—E.I. Du Pont de Nemours & Co. Feb. 9, 1945. 4172/46.

Polymerisation of monoethylenic compounds.—E.I. Du Pont de Hemours & Co. Feb. 9, 1945. 4173/46.

Production of partially hydrolysed vinyl ester polymers and interpolymers.—E.I. Du Pont de Nemours & Co. Feb. 13, 1945. 4489/46.

Azine dyestuff images.—General Aniline & Film Corporation. Feb. 9, 1945. 4536/46.

Diacylamidobiphenylenedioxydialkyl-carboxylic acids and process of preparation.—General Aniline & Film Corporation. Feb. 7, 1945. 5872/46.

Hydrogen production.—Hercules Powder Co. Feb. 6, 1945. 2004/46.

Herbicidal compositions.—I.C.I., Ltd. Feb. 9, 1945. 4179/46.

Moulds for making lenses and like optical elements from polymerisable synthetic plastic materials, resins and the like.—International Polaroid Corporation. Oct. 16, 1942. 16910/42.

Light polarisers and manufacture of same.—International Polaroid Corporation. Feb. 8, 1945. 1005/46.

Solutions containing a high percentage of organically combined calcium.—Koninklijke Industrieele Maatschappij Voorheen Noury & Van Der Lande N.V. Feb. 13, 1945. 8388/46.

Effecting the precipitation and/or crystallisation of solids in solution, particularly in the softening of water.—L'Auxiliaire des Chemins de Fer et de L'industrie. Feb. 9, 1945. 20380/45.

Producing salts of antimalarial organic bases, and the products resulting therefrom.—E. Lilley & Co. Feb. 7, 1945. 12467/45.

Production of solutions and dispersions of surface active cleansing and dispersing agents. — J. Malecki. April 14, 1944. 20989/46.

Chemical compounds and process for preparing the same.—Merck & Co., Inc. Feb. 9, 1945. 2830/46.

Manufacture of objects by applying a molten metal mass to a metal surface.—N.V. Philips Gloeilampenfabrieken. Feb. 8, 1945. 3581/46.

Hardening of alloys.—N.V. Philips Gloeilampenfabrieken. Feb. 8, 1945. 3583/46.

Organic sulphides.—Park, Davis & Co. Feb. 9, 1945. 2302/46.

Production of para-oxy-phenyl-arsenic acid.—J. A. Pascual. Feb. 7, 1945. 3755/46.

Process for obtaining 4-4′-dioxi-3-3′-diamino-arseno-benzene-sodium-methane-sulphoxylate.—J. A. Pascual. Feb. 7, 1945. 3756/46.

Electron discharge tubes.—Raytheon Manufacturing Co. Feb. 10, 1945. 2161/46.

Preparation of acid anthraquinone dyestuffs.—Sandoz, Ltd. Feb. 12, 1945. 3624/46.

Manufacture of fibres from thermoplastic materials such as glass.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St. Gobain, Chauny & Cirey. Feb. 12, 1945. 4327/46.

Regulation of extruding presses.—Sulzer Freres Soc. Anon. Feb. 10, 1945. 994/46.

Production of aldehydes and ketones.—Usines de Melle. Feb. 8, 1945. (Cognate application 1351/46.) 1350/46.

Plating surfaces with tungsten, chromium or molybdenum.—Western Electric Co., Inc. Sept. 30, 1943. 18412/44.

Complete Specifications Accepted

Manufacture of bituminous materials.—Limmer & Trinidad Lake Asphalt Co., Ltd., D. C. Broome, J. Lewis, and S. C. Lewis. August 17, 1942. 579,368.

Treatment of polyvinylidene chloride.—D. McCreath, L. Wood and I.C.I., Ltd. May 13, 1944. 579,448.

Explosive primers.—G. Morris, and I.C.I., Ltd. June 16, 1943. 579,281.

Pressure responsive devices comprising diaphragms and the like.—H. N. Negretti, P. E. Negretti, and E. F. Greening. January 27, 1944. 579,289.

Production of hydrocarbons.—D. H. P. Peel, and I.C.I., Ltd. October 28, 1940. 579,363-4.

Manufacture of condensation products, having capillary activity.—Soc. of Chemical Industry in Basle. March 6, 1942. 579,370.

Lubricating oil compositions.—Standard Oil Development Co. December 31, 1941. 579,418.

Demolition blasting charges for military and other purposes.—J. Taylor, and I.C.I., Ltd May 3, 1943. 579,279.

Production of plastic detonating explosive compositions.—J. Taylor, D. S. Fensom, and I.C.I., Ltd. August 10, 1943. 579,376.

Process for the purification of 4-hydroxycoumarins.—Wisconsin Alumni Research Foundation. August 29, 1942. (Divided out of 578,589.) 579,459.

Explosive compositions comprising low freezing liquid mixtures of aromatic nitrocompounds.—H. R. Wright, J. Taylor, and I.C.I., Ltd December 18, 1942. 579,275.

Manufacture of high explosive compositions or charges.—H. R. Wright, J. Taylor, and I.C.I., Ltd. August 18, 1942. 579,283.

Non-detonating fuse compositions and fuses made therewith.—H. Zenftman, and I.C.I., Ltd. October 6, 1943. 579,388.

Sulphonyl guanidines and methods of preparing same.—American Cyanamid Co. April 11, 1942. 579,513.

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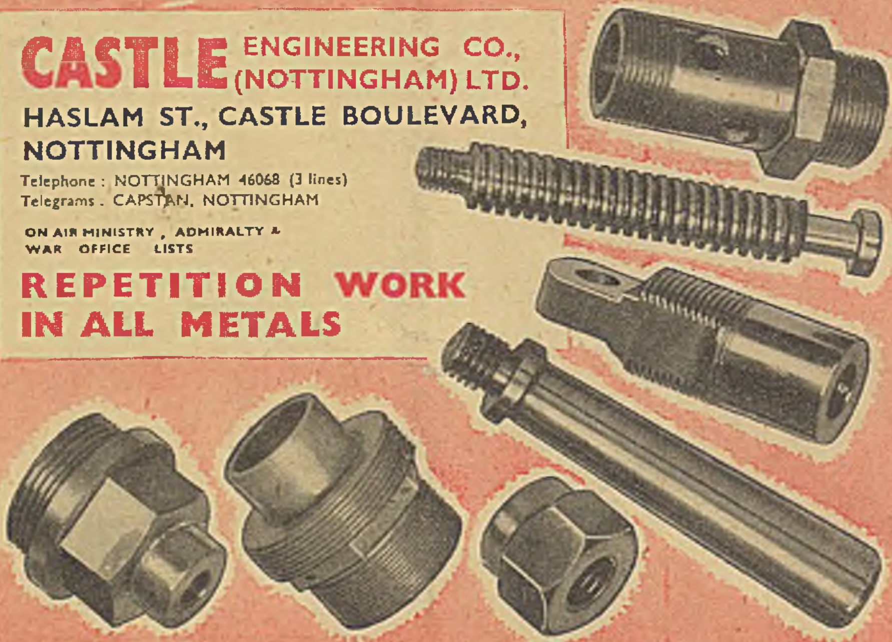

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