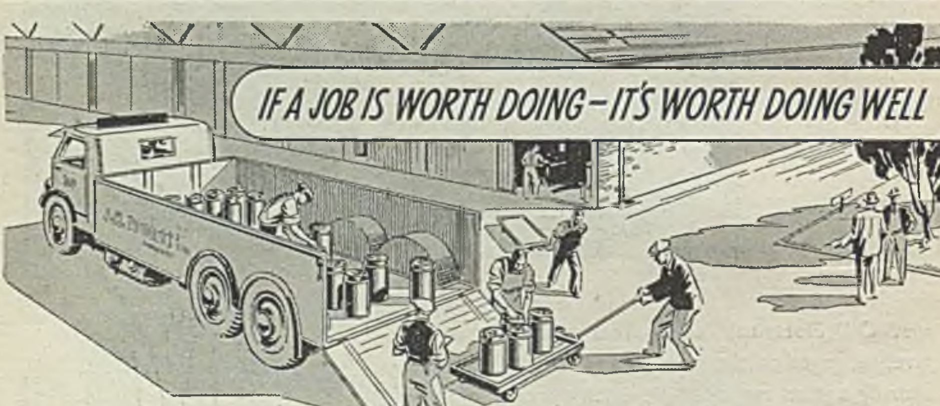
The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LII No. 1340 | SATURDAY, MARCH 3, 1945 | REGISTERED AS A NEWSPAPER | 6D. PER COPY POST FREE 8D.


MAKE VICTORY CERTAIN
How about your next job? Are your supplies near enough to the front line? If you have to wait for things to be made and assembled from many widely separated points, you are in a vulnerable position.


IF A JOB IS WORTH DOING—IT'S WORTH DOING WELL

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON — Telephone: CENTRAL 3212 (10 lines)

GLASGOW: 116 Hope Street (Central 3970) — BIRMINGHAM: Daimler House, Paradise Street (Midland 0784-5)

THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers Limited

VOL. LII No. 1340. — March 3, 1945 — Annual Subscription 21s. Overseas 26s.

Drawing the Viper's Fangs

THE plans drawn up at the Crimean Conference involve, among other things, that Germany and other aggressor nations shall be rendered impotent to disturb the peace of the world again at least for the next half century. The leaders of the Allied nations have declared: " It is our inflexible purpose to destroy German militarism and Nazism and to ensure that Germany will never again be able to disturb the peace of the world. We are determined to disarm and disband all German armed forces: break up for all time the German General Staff that has repeatedly contrived the resurgence of German militarism; remove or destroy all German military equipment; eliminate or control all German industry that could be used for military production; bring all war criminals to justice and swift punishment and exact reparation in kind for the destruction wrought by Germans; wipe out the Nazi Party, Nazi laws, organisations, and institutions, remove all Nazi and militarist influences from public offices and from the cultural and economic life of the German people; and take in harmony such other measures in Germany as may be necessary to the future peace and safety of the world."

On Other Pages

It cannot be doubted that the two principal industries which contribute to the power of any nation to make war are iron and steel and chemicals. We should regard petroleum as part of the chemical industry, since the production of aviation spirit has become essentially a chemical process. Thus, when the United Nations announce that they will " eliminate or control all German industry that could be used for military production," the iron and steel industry and the chemical industry must be the prime objectives of these measures.

Control of the chemical industry involves many considerations. We may with advantage quote from a recent letter to the Press by Mr. John Brown, the general secretary of the Iron and Steel Federation, who said: " There can be no question that Germany must be curtailed, not only in its direct armament production, but also its heavy industry must be limited to such an extent that it is only able to satisfy normal home consumption plus an adequate share in the export markets, which for a period of at least 15 to 20 years will have to be used for reparations. Furthermore, it must also be taken into account that Germany's heavy industry was at all times a State-subsidised industry and never stood on its own feet, and it is only justice if we ask that other European countries be protected in the future against such unfair competition." The German Government has for many years subsidised export trade for ends which cannot be defended. In that way Germany has built up an export trade and a reputation for chemicals and chemical engineering, which may or may not have been deserved, but which is purely fictitious in relation to what could be done by other nations with equal conditions of opportunity. How far is Germany to be allowed to retain her export trade in chemicals and chemical engineering products?

The German exploitation of patents has also been used for maintaining her war potential rather than in the interests of sound trade. It is widely suggested, particularly in America, that German-inspired cartels have prevented the United Nations from manufacturing many substances important for making war, while full production was maintained in Germany. We do not maintain that cartels are necessarily bad of themselves, but cartels operated in this way are certainly bad, and consequently there must in the future be some form of Government control of all cartels, whether purely domestic or international. The objects to which we have referred were achieved partly by business arrangements, but more completely by the operation of the special German system of taking out foreign patents irrespective of whether they were worked or not. One of the means of controlling German power to make war would be to confiscate all existing German patents and to keep a close watch on the extent to which German patents were taken out in other countries for the future. Some indication of the methods that might be pursued appeared in our issue of February 10, and further comments were provided by a correspondent in last week's issue.

The ramifications of the German chemical industry are widespread. It is believed that there was very close working between the German chemical plant industry and the German chemical industry. Whether it will ever be possible to control this working we do not know. We should rather suggest that it gives a model which could very well be followed in Britain. In Britain there has been almost complete divorcement of the chemical industry from the chemical plant industry, with the result that neither has been able to hold its own in foreign markets with the Germans. This war may have taught us a lesson which we only learnt partly as a result of the last war.

One of the difficulties of controlling a chemical industry is that plant put in for one purpose can be readily adapted to other uses. Whatever commission is set up will require to be staffed by chemical engineers of wide experience in the manufacture of chemicals of war value. Such engineers would be able to discover quickly whether apparently innocuous plant could be turned over easily to war production. It is not necessary that the control commission should have on it chemical engineers who fully understood every process. It is the manufacture of explosives and certain other war chemicals that must be forbidden and rendered impossible for generations to come.

It has often semed to us that control of technical education in Germany might be more effective than many other methods of regulating chemical production. If certain manufactures are forbidden to the Germans and if the permitted number of chemical engineering students at German universities and technical colleges could be severely restricted for a period, the world domination of German chemical plant might well receive a mortal blow.

The Allies must decide how far Germany is to continue to be an industrial nation. There can be no question that within the last century German industrialists have built up for themselves a high place in technical production. What we must try to discover is how to ensure (1) that for the future German industry competes with the rest of the world on equal terms; and (2) that plant installed in Germany is not used and cannot be used for the production of war potential. In our view the chemical and the chemical plant industries of this country are in the best position to say how that should be done; we hope that they will put their ideas before the Government and that the Government will pay due attention to them.

NOTES AND COMMENTS

Regimentation of Industry

WHILE one Minister last week was talking of post-war trade and declaring that Britain's salvation could be found only in expansion and freedom, another Minister was bringing forward a Bill to limit the freedom of the manufacturer to establish his works in the place which his knowledge, experience and judgment may tell him is best for his industry. The Distribution of Industry Bill is said to be intended to provide more varied employment in what were formerly known as "special areas"; but a general provision lays it down that the Board of Trade must be notified of all proposals to erect anywhere industrial buildings with an aggregate floor space exceeding 3000 sq. ft. The Board may by Order prohibit the erection or extension of industrial buildings exceeding 3000 sq. ft. in any area where further industrial premises would be "seriously detrimental to the proper distribution of industry"—the Departments in Whitehall presumably deciding what constitutes proper distribution. There will be vigorous criticism, in Parliament and outside, of a legislative proposal which would carry State regimentation of industry into the peace years. Control of industry has been accepted in war time under emergency powers regarded as necessary for the successful prosecution of the war, but every proposal to perpetuate controls without limit will be fought. Industrial expansion and the rehabilitation of our trade and commerce—the life blood of the nation—cannot be assured by continuing controls and restrictions, nor can the promises of the restoration of our liberties be fulfilled by measures of the kind now being introduced.

Scientific Publicity in America

WHATEVER preparations are being made by the British Government authorities to make known throughout the world the achievements of British scientists during the war—and past experience does not lead us to expect that these preparations will be either timely or well-chosen—there is evidence that the highest authority in the United States is taking steps to see that the work of his compatriots does not suffer from neglect. There has come into our hands, almost by accident, a copy of a letter addressed by President Roosevelt to Dr. Vannevar Bush, director of the Office of Scientific Research and Development. In this he asks, among other things, for recommendations on the following points: (1) What can be done, consistent with military security, to make known to the world as soon as possible the contributions which have been made, during the war effort, to scientific knowledge? (2) What can the Government do now and in the future to aid research activities by public organisations? (3) Can an effective programme be proposed for discovering and developing scientific talent in American youth? There are, it should be said, some signs that the two latter questions are not passing unheeded in British official quarters, but we see little indication that any real attention is being given to the first. Some carefully censored hand-outs, many of them admittedly of high interest, are being issued by private concerns; but only the faintest of whispers has so far interrupted the uniformity of official silence. We have heard, unofficially, that the Scientific Advisory Committee to the Cabinet Council has appointed an archivist; such a step, however, is, to say the least of it, ambiguous.

Works Chemists' Charter

SIX "freedoms" for the works chemist were demanded by Dr. C. H. Spiers at a recent symposium of the London group of the International Society of Leather Trades' Chemists. The subject under discussion was "What the Leather Industry Expects from the Scientist," but after three captains of the leather industry had expressed their views on the matter, they heard a few suggestions on what the scientist expects from the leather industry. Dr. Spiers, who made the suggestions, speaks with authority, as he is a lecturer on the science of leather manufacture at the Leathersellers' Technical College and a member of various technical committees, and has been engaged on various aspects of leather research for the Government during the war. Dr. Spiers was deliberately provocative; having first stigmatised the leather trades' chemists themselves for not attaining a requisite standard of knowledge, he then asked, on the chemists' behalf, for the six "freedoms" whereby they might carry out their work effectively. These were: Freedom from Obstruction, Freedom from Diversion, Freedom from Squalor, Freedom from Isolation, Freedom from Want, and Freedom from Discouragement. No doubt in other branches of the chemical and allied industries many or all of these freedoms are enjoyed; but it might be worth the while of certain employers of works chemists just to consider for a moment whether their chemists are getting a fair deal in all these respects. It may be remarked that "freedom from want" does not mean just a rise in wages, but rather the provision of equipment and facilities to do the work properly. Quite by the way, it is worth noting that Dr. Spiers uttered an urgent demand for more chemical engineers in the leather industry; if the industry is to come into line with modern practice, it will do well to accede to this request.

Chemistry at Cambridge

CONSIDERING how the science of chemistry has developed in recent years, it is not altogether surprising that there has been no holder of the comprehensive title "Professor of Chemistry" at Cambridge University since the death of Sir William Pope in 1939. Last year saw the appointment of Professor A. R. Todd to the chair of organic chemistry; Professor E. K. Rideal and Professor R. G. W. Norrish have held, respectively, the chairs of colloid science and of physical chemistry since before the war, and it is not many years since the chair of theoretical chemistry was occupied by Professor Lennard-Jones. An obvious gap remains, and we are prompted to ask: What about inorganic chemistry? The lopsidedness of the existing state of affairs has appeared more prominent since Professor Todd's appointment, and it is widely felt that some definitive step towards a balanced adjustment is imminent; an interesting rumour connects the name of Dr. H. J. Emeléus, now at the Imperial College in London, with the possible new chair of inorganic chemistry. Further signs of important movements in the chemical world at Cambridge are contained in a report presented to the Senate recommending increased accommodation for certain of the scientific departments now housed in conditions that have been described as "slumlike." It is recommended, *inter alia*, that the Lensfield site, where the Scott Polar Research Institute stands, should be used for the departments of organic and inorganic chemistry, physical chemistry, colloid science, and metallurgy. This grouping and rehousing of the chemical departments is a good and logical step, even though it implies a slightly longer journey from the academic centre of the University.

Aluminium Price Reduced

From £110 to £85

THE Ministry of Aircraft Production announces that the Control of Aluminium (No. 5) Order, 1940, constituted the Minister of Aircraft Production the sole seller of virgin aluminium in the U.K. In November, 1939, it was announced that virgin aluminium in ingot or notch bar form would be sold until further notice at £110 per ton, delivered to consumers' works, with extras for other forms and purities. Starting on March 1 the Minister will sell virgin aluminium in ingot or notch bar form at £85 per ton, delivered to consumers' works, with extras for purities. From the same date the Minister will cease to trade in the following forms of unwrought aluminium, which will in future be obtained under licence issued by the Light Metals Control from the normal commercial sources—rolling blocks, rolling slabs, billets, wire bars.

The price cut confirms recent forecasts, reported in THE CHEMICAL AGE of January 17, of a reduction designed to bring the British quotation into line with the U.S. level of 15 cents per lb., as well as to absorb the greatly expanded productive capacity of the British aluminium industry now largely used in aircraft manufacture.

U.K. output rose from less than 30,000 tons in 1939 to about 60,000 tons by 1944. Of the 1944 total output of some 2,000,000 tons, the United States contributed nearly 1,000,000, and Canada about 500,000 tons.

A glossary of German, French, Russian and Spanish welding terms has been published by the American Welding Society, 33 West 39th Street, New York 18, N.Y. (Price 50c.).

Science in Peace

Conference of Association of Scientific Workers

THE valuable criticisms made by Professor Harold Laski in a recent lecture before the British Association of Chemists (and reported on p. 181 of last week's issue), regarding the reluctance of most scientists to take part in civic affairs, evidently do not apply to The Association of Scientific Workers. In an open conference on "Science in Peace," held on February 17-18 at Caxton Hall, Westminster, the Association demonstrated the many constructive possibilities offered by science for human advancement. Its declared object was to make the fullest use of science in order to meet the manifold needs of the people. Political decisions alone cannot bring about social security, full employment, good health and housing; these involve the fullest use of science and the mobilisation of resources on a scale unknown hitherto.

The programme of the conference was arranged under three heads: Science and Production; The Future Development of Science; and Science in Everyday Life, presided over respectively by Professor P. M. S. Blackett, Sir Robert Watson-Watt and Professor N. Levy. The first session showed that for this country, as for the world as a whole, expansion, and not restriction, of production, was the problem. It discussed the relations between science and labour, and the needs of three vital industries—fuel and power, engineering, and chemicals. The second session was concerned with problems of fundamental research and of applied science as well as with questions of finance and organisation. The final session discussed the application of science to human needs; consumer research, food, and agriculture, health services, and housing being the main subjects.

Scientists not "Gadgeteers"

Professor Blackett stressed the point that scientists were not "gadgeteers." The rôle of the scientist in industry was not to assist in the production of expensive luxuries for the rich but in aiding the output of cheap and beautiful goods for the masses. It is generally admitted, he said, that applied science in this country needs to be greatly increased in amount and in many cases much improved in quality. In the applied physical sciences, by far the most important objective was the improvement of the processes of production, so as to lower the real costs of ordinary articles of consumption. There was a grave danger that far too much of our national resources in physics and light engineering would be devoted to cashing in on the post-war boom, rather than to the basic development work necessary to obtain an important rise in productivity. The main need was to improve materials and productive processes and to invent new ones. The possibility of far-reaching advances in materials and machines depended on our fundamental knowledge of nature. A large development of fundamental research was thus an essential part of any programme of increasing human welfare.

An Overhaul of Methods

Mr. G. D. N. Worswick, an Oxford economist at present working at the Oxford Institute of Statistics, said that the task after the war was not only to make good the damage wrought by the war, but to launch an assault on the poverty of mankind. Even in Britain, where the average standard of living was relatively high, the bulk of the population were under-nourished, unhealthy, and ill-housed. There are great unsatisfied needs in Britain, and these are to be met, not only by a more equitable distribution of purchasing power, but by a great increase in total output of goods and services. The existence of needs is no guarantee that they will be met. These needs have always existed, yet science has been frustrated in its efforts to meet them.

It is often said that the development of backward countries will harm home industries and destroy export markets. This is true in a restrictionist economy which is technically static. But in an expanding economy, with industry flexible and continually developing technically, certain countries can always produce things needed in other countries not yet advanced enough to produce them for themselves. The pattern of trade will alter, but its volume may well rise.

In Britain a drastic overhaul of production and distribution methods is necessary. In some industries, such as coal and transport, national ownership will set the stage for the technical advances required. Production and distribution costs must be ascertained, so that efficiency can be scientifically determined. New discoveries must at once become available to all manufacturers and production and quality controls should be extended and improved. "Planning" need not involve bureaucracy. Methods of control can be freely and democratically adapted to the object required.

On coal, Britain's only major source of fuel, will depend the prosperity of our people in peace, said Dr. M. Ruhemann. The fuel and power industry sets the scientist and engineer three major tasks. The first, a geological problem, has been all but solved. The second task is that of bringing the coal to the earth's surface. This engineering feat is the gravest bottleneck of British industry. Three British miners are needed to raise the amount of coal that one miner deals with in the U.S.A. There are profound reasons for this and, if the British scientist is at fault, he has failed, not as a scientist, but as a citizen. The third task of the scientist is to enable the coal to be suitably utilised. This involves the physicist, the chemist, and the engineer. It is receiving much more attention than the problem of coal-getting, but still not enough.

The scientist would like to see a concerted scientific attack on the fuel problem as a whole, setting himself the task of doubling the output of coal per man-shift, while at the same time lightening the toil and lessening the risk of the miner.

Chemical and Allied Industries

The chemical industry's full contribution to an expanding British economy requires, according to Dr. N. Levy, an industrial research chemist, cheaper production of coal, its increased use as a chemical raw material, and systematic recovery of valuable by-products when used as a fuel; the advancement of agriculture, which can be achieved in part through an extended fertiliser programme, for the production of food and of crops which can be the source of chemical raw materials; the systematic review of national resources, the utilisation of industrial and other waste materials, and the development of processes based on home-produced materials; the increased production of heavy organic chemicals, from all sources; the directed production of building materials of all types; and improvements in the present system of controls over the industry.

The price of coal is the main economic factor dominating chemical production. The present emphasis on the use of coal as a source of raw material for highly-priced products of the chemical industry is certainly technically stimulating to the coal-mining industry, but does not of itself have the effect of cheapening coal. The efficiency with which by-products are recovered from coal must be greatly increased to avoid the present tremendous waste of valuable material. For example, methane recovered from coke-oven gas could compete with calcium carbide as a raw material for certain types of plastics.

Applied Science and Technology

The standard of life of the people of England in the next few years will largely depend on how adequately and intelligently science is employed in industry, Professor J. D. Bernal, F.R.S., contended. The natural resources of Britain are limited: there is all the more reason to get the best advice and to take it. In the past industry has too often been regarded as a means of producing cheap goods in large quantities irrespective of the uses and quality of the goods and of the lives of the workers who produce them. The modern aim for industry is to satisfy the needs of the consumers, that is, of the whole people, and at the same time provide them in their working hours, no less than their leisure, with the possibilities of worth-while and interesting lives.

To achieve this end requires the deliberate thinking out of industrial techniques and applying science to them, and the finding out of consumer needs. The war has shown us that this can be done in the matter of weapons; the methods are known, the men are trained; there are not enough of them, but enough to make a good start. It is only by making the effort that we will effectively find out the best ways of applying science to industry. We could begin by seeing that *all* the industries in the country use science as intelligently and on as adequate a scale as the best firms in the country do to-day. But this must be done in a co-ordinated way: this is no question of bureaucratic regimentation, but of the co-operative efforts of scientists and technicians. We want to see that the scientific effort, which is now in very short supply, is fairly distributed between the industries of this country and inside each industry. The older traditional industries have never had a chance to see what science could do for them. Looking at the seven big industrial groupings in this country we get some idea of what is meant.

Basic Industries' Needs

Coal mining is admitted everywhere to be in a very bad state. On existing world standards it is technically backward and imposes entirely unnecessarily hard conditions on the miners. It will take a lot more than science to put the mines right, but there is no natural reason why our mines should not be as effectively worked as those in the United States or the Soviet Union. The metal industry is also an old and backward industry by modern standards; our steel prices cannot compete with those of the United States. We should be prepared, here again, to make fuller use of science in a radical way. Professor Bernal referred here to the full-scale use of cheap oxygen, produced along the lines of Professor Kapitza's work, in the Soviet Union.

The chemical industry, which uses research extensively, is dominated by private commercial and not by national interests, and the full integration of chemistry with other industries and with agriculture is hindered. The textile industry needs a rational rejuvenation from science. Even more so does the building industry, for without the full use of science in the building industry we shall not see enough houses in this country in our time.

We simply cannot afford, with our present shortage of trained men, to duplicate work by competitive and secret investigations. Nor can we allow work to be carried out in a grossly inefficient way simply because the firms concerned are too small or too backward to make use of science. Here the Government must step in and vastly increase the scope of the industrial research associations. It is only the Government that can provide the background of co-ordinated policy in the national interest. Any useful organisation of science will require a rapidly increasing number of scientific and technical workers of all grades. The war showed how terribly short we were in this respect. The scientific worker should be in a responsible position in industry, able to use initiative and taking part in all discussions on policy. Just as much as the manual and administrative worker, he should form part of the collective direction of industry.

At the moment, such a claim would not be opposed by any responsible body of industrial opinion, but at the end of the war we must beware of lip-service to science, and complacency. The very existence of this country depends on the proper utilisation of science. To secure this will need the utmost efforts of the scientists in every section of industry and the energetic backing of the organised workers.

Organisation and Finance

Britain's leading position in the world of fundamental science was being maintained before the war only by the work of a few individuals and laboratories. In applied science we had already lost the lead. As a consequence the industrial efficiency of this country had fallen behind America, Germany, and Russia, said Dr. S. Lilley. There was too much emphasis on the development of small improvements in industrial products and too little attention to fundamental advances. The interval between new discoveries and their application was excessive.

The scientific activity of a country can be measured roughly by the amount of money spent on it. The pre-war annual expenditure of Great Britain was about £7 million, or a little over 0.1 per cent. of the annual income, as against 0.6 per cent. for America and 0.8 per cent. for Russia. We must aim to increase our expenditure to some £24 million per annum, *i.e.*, 0.5 per cent. of our present income, within 10 to 15 years; made up as follows: Industrial research, £10 million; agricultural research, £600,000; agricultural advisory service, £6 million; medical research, £4 million; consumer research, £500,000; fundamental research, £2.5 million—a total of £23.6 million.

In order to co-ordinate the whole scientific efforts of the country a National Research and Development Board, responsible to the Lord President of the Council, was suggested, to survey our needs and resources and to plan the broad lines of scientific work accordingly. This Board would not, in general, interfere in the carrying out of the work, and the maximum freedom would be given to scientific workers.

Information Services

Information services provide the channels of communication between scientific workers; if they are clogged, the whole of scientific activity is hindered and its effectiveness as a social force crippled. They are clogged now, claimed Mr. E. Carter, librarian and editor of the R.I.B.A. They must be regarded as an integral part of scientific endeavour and not just as a technique applied on the surface.

There are five elements in the information process; *viz.*, the original production of the item of information, the laboratory work; its publication; its collection into libraries; its classification, indexing and abstracting; and its distribution. Hitherto, the first two stages, *i.e.*, the fundamental form in which the material is prepared for publication, and the publication process, have been neglected.

Science and the Humanities

Speaking on "The Place of Science in Culture," Professor B. Farrington, who occupies the Chair of Classics at Swansea, maintained that science was not only the key to the understanding of man's natural environment, but it was essential to the understanding of human history. The effect of applied science on human history had been overwhelming. The progress of material civilisation in the past had depended on science, and the extension of the benefits of material civilisation depended upon fresh application of scientific knowledge. There were two replies, he said, to the contention that education in general should be in the humanities, not in the mindless processes of inorganic nature or the soulless processes of organic nature. First, nobody seeks to substitute science for the humanities but to include it with them as one of the supreme achievements of the human mind. To the figures of the saint, the prophet, the lawgiver, and the artist, we must add that of the scientist as worthy of inclusion among the benefactors of mankind. Second, science is of importance not simply as an addition to the number of the humanities, but for its method and temper, which have a contribution to make to other activities of the human spirit. Our whole spiritual inheritance has become material for scientific analysis. In this process both the humanities and science will be transformed and enriched.

Reflective Silver Coatings

A Simple Method for the Industrial Laboratory

by ANTHONY CLEE

IT appears that the production of thin reflective films of silver, by chemical means, is a subject on which very little of an introductory nature has been written, probably because this work has always been regarded as more of an art than a science. It is the purpose of this article to outline briefly the processes in general use, and to explain a simple method of silvering, without previous experience, such pieces of apparatus as may be required in the laboratory.

In 1835 Liebig announced that when a suspension of silver oxide in water is warmed with an aldehyde, it is reduced to silver, forming a reflecting surface on the sides of the containing vessel. Modifications were made to this principle, and it was eventually used to replace the old mercury amalgam process of making mirrors. The original method was to have two separate solutions, one being an ammoniacal solution of silver oxide, and the other containing the aldehyde reducer. These were mixed and flowed over the surface to be silvered, the reduced silver being deposited as a continuous bright film. Individual manufacturers, attempting to improve the quality of their products, developed new formulæ, using different reagents and new techniques in preparation and use. Consequently, there exists to-day a huge accumulation of varying recipes, each one claiming to have its own special desirable properties. Although only two solutions are used in the basic process, some methods use three or four solutions, which have to be mixed in certain proportions before use. They are processes in which only one solution is necessary, this being stable at room temperature, but requiring to be heated in order to start the deposition. Most modern methods do not require the application of heat, although their action is quicker when warm.

Reducing Agents

The reducing agents most commonly used are formaldehyde, sodium potassium tartarate, and sucrose. One of these, usually together with some other substance calculated to assist in the reaction, is dissolved in distilled water to form the reducing solution. The silvering solution is generally made by dissolving silver nitrate in distilled water and adding either sodium hydroxide, potassium hydroxide, or ammonia solution to cause precipitation of silver oxide. The precipitate is redissolved by the addition of more ammonia solution. The resulting solution is somewhat unstable and is likely to detonate upon the slightest mechanical shock. It is believed that the solutions prepared with sodium or potassium hydroxide tend more to produce explosive compounds than those using ammonia alone. When the reducing and silvering solutions are mixed, the ammonia, in which the silver oxide is dissolved, becomes neutralised, and silver oxide precipitates out in a finely divided form. This is immediately deprived of its oxygen by the reducing agent present, and is deposited on the sides of the vessel containing it as a thin shiny film of silver.

A Useful Formula

A good formula for small-scale work is as follows:

Solution A: 50 gm. silver nitrate.

This salt is dissolved in about 300-400 ml. of distilled water, and sodium hydroxide solution (approximately 10 per cent. aqueous solution) added until precipitation ceases. The precipitated silver oxide could be dissolved directly in ammonia solution in the same water; however, it is a better plan to wash the precipitate in several quantities of distilled water, either by decantation or in a sintered glass funnel, in order to extract the sodium nitrate formed during the reaction, which tends to enhance the explosive nature of the solution. The washed precipitate is then placed in a fresh amount of water, about 300-500 mls., and dissolved by the gradual addition of ammonia solution, with constant stirring. The exact amount to be added will depend, of course, on the strength of the solution; but if the solution supplied as 0.880 S.G. is used, it will be between 70 and 80 mls. It is most important that no excess of ammonia is added. As the solution becomes clearer from oxide particles, the ammonia is added very slowly and carefully, until there still remains a little undissolved matter. This can be filtered out, ensuring that there is just sufficient ammonia present to dissolve the silver oxide, and no more. Excess of ammonia may make all the difference between success and failure. The solution is finally made up to 1 litre with distilled water, and is then ready for use. It is best kept in a dark glass bottle, inside a carton or case, to guard against the possibility of explosion. This solution should be made as it is required, as it deteriorates with age.

Solution B: 25 gm. sucrose; 1 ml. nitric acid (conc.).

The sucrose, in 200-400 mls. of distilled water, is boiled with the nitric acid for 5-10 minutes. When it is cool, it is made up to 1 litre with water and bottled. Although sucrose is mentioned, ordinary household sugar can be used with success, although its absolute purity is to be doubted in war-time. The negligible amount required for treating quite a large area should not be missed from the weekly ration. This reducing solution does not deteriorate quickly, so it can be made in larger quantities for storing; it will keep indefinitely if about 5 per cent. of alcohol is added. For use, the solutions A and B are mixed in equal proportions immediately before application to the job.

Strict Cleanliness

The most essential point to remember, when trying to obtain a good, adherent, reflective silver deposit, is that the surface to be treated must be absolutely clean. Traces of grease, dust or any other foreign matter will spoil the surface. If glass is the material to be treated, it can be cleaned by most of the common degreasing methods, followed by a thorough rinsing in water until water will cling and flow over the surface in a continuous sheet. If the water forms into globules, or shows patches that will not wet, grease is still present. If no degreasing agent is available, soap often serves the purpose quite well. After this cleaning treatment, the surface must not be touched by hand, but rinsed in distilled water, and the silvering proceeded with immediately. The importance of cleanliness cannot be over-emphasised. Even a film of air on the surface can prevent the silver coating from gaining intimate contact with the material, and so result in poor adhesion.

If the surface to be silvered is flat and of great area, the article can be laid face upwards on a level bench-top. Solutions A and B are mixed and poured evenly and rapidly over the entire surface. If this operation is carefully performed, the mixture will flow neatly to the edges, where it will be prevented from running over by the surface tension; thus a continuous layer of liquid about 1/10 in. deep is obtained. The drawback to this method is, that "pinholes" will form in the film of silver produced, owing to settling dust and the sludge of fine silver particles which separate out during the reaction. Smaller articles with a flat face are better if silvered in a shallow vessel. They can be placed face downwards in an evaporating basin, or even a saucer, so that the edges rest on the sides of the vessel, supporting the article ¼ in. or ½ in. above its bottom. The mixed solutions are poured in up to the under-surface of the article, the silver film being deposited upwards. Thus, no dust or other particles can settle on and mar the continuity of the film. Irregular objects can be totally immersed in the solution, and hollow articles, for inside silvering, can be filled with the solution.

Within ten minutes of contact with the solution, the article will be covered with the desired coating of silver. Longer periods of immersion will produce slightly thicker films, but the rate of deposition falls off greatly after 10 min. have elapsed, as the solution becomes deficient in silver salts. The reaction will proceed more rapidly if the article is previously warmed, and will result in a thicker coat. As soon as the desired thickness of deposit is attained, the article should be well rinsed with water and dried off as quickly as possible. Naturally, a slightly raised temperature will effect rapid drying, but a good idea is to dip the article in alcohol to remove the water, and the alcohol will evaporate quickly at room temperature. Water, if allowed to remain in contact with the film, will soon seep underneath, wrinkle and blemish it, and eventually detach it from the article altogether. If the article is transparent, and back reflection is required, the silvered portion should be coated, as soon as it is dry, with a protective paint or varnish. It is best to spray this coating on to avoid disrupting the silver film, or alternatively a soft smooth brush may be used. The silver film will then be proofed against attack by moisture or fumes, and can be handled without fear of scratching it. A paint containing active chemical pigments or oils should not be used, as it will blemish the mirror surface.

If this silvering process is carried out with care, the result should be a firm, adherent, opaque film of silver, free from blemishes and capable of reflecting well over 95 per cent. of any light projected on to it. The silver films produced by this method vary in thickness according to the length of time immersed, the temperature of the solution, and the depth of the solution; but they are usually about .00005 in. If front reflection is required, a good thick deposit will stand light polishing. Cheap corrosive metal polishes are of no use, but it is recommended that a smooth soft cloth in conjunction with a very fine rouge compound be used.

Risks of Explosion

The explosion risk is not great with these solutions if certain precautions are taken. Silvering vessels should not be left containing solution, but rinsed immediately after use. Silvering solution should not be left uncovered, to evaporate to dryness or become concentrated. The silvering and reducing solutions can be diluted proportionally for use, and the weaker the solutions the less the probability of explosion. An explosion of this nature is not very violent, but damage may be caused to the eyes by splashed ammonia liquor, and splashes on the skin and clothes will cause staining. The stains will not appear until exposure to strong light, because of the light sensitivity of silver compounds. Often they may be removed by treatment with an iodide solution, which converts the staining silver compound to silver iodide, a whitish salt that can be washed off.

If any large quantities of solutions are used, it becomes economical to reclaim any remaining silver. The residual liquor is poured from the silvering vessels into some receptacle, and any sludge that may have formed is filtered out. This will be precipitated silver powder. It may be dissolved in nitric acid and subsequently converted to one of the salts of silver, or fused at a temperature approaching 1000°C. into a solid mass. Hydrochloric acid added to the filtered liquor will precipitate any silver salts left in solution as silver chloride, which is removed by further filtering. A considerable quantity of deposited silver will accumulate in the silvering vessels, which can be removed by rinsing them with nitric acid.

Glass is not the only substance that can be silvered by the chemical method. Several of the synthetic resins silver quite well, but care must be taken in the choice of cleaning solvents. Trial and error will determine the procedure best suited to the operator's individual requirements and materials.

Personal Notes

Mr. Maurice Lefebvre, a leading Continental glass technologist, has recently joined British Indestructo Glass, Ltd.

Mr. A. H. N. Wells, who has been works manager for A. Boake, Roberts & Co., Ltd., for 16 years, has been appointed a director of the Company.

Dr. M. A. Phillips, F.R.I.C., has taken up an appointment at Derby Technical College and it is anticipated that there will be a considerable extension of chemical research.

The title of Professor Emeritus of Chemistry has been conferred by the Senate of the University of London on Dr. R. H. A. Plimmer, who held the Chair of Chemistry at St. Thomas's Hospital Medical School from 1922 to 1942.

Mr. L. J. Humphrey, who is secretary of the Association of Manufacturers of Bituminous Protective Products, and a prominent figure in many organisations of the paint trade, has been adopted as Liberal candidate for Bedford.

Dr. C. W. Shoppee has been appointed to the University Readership in Chemistry tenable at the Royal Cancer Hospital (Free). Since 1939, he has been working at the Pharmaceutical Institute of the University of Basle.

Mr. Thomas Macara, who has been for twenty-five years the Research Director of the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery and Jam Trades, retired recently from the directorship of the Association and from that of the associated body, the British Food Manufacturers' Research Association. He still remains a member of the Food Investigation board, Ministry of Food. Dr. L. E. Campbell, who had been Assistant Director for many years, has been appointed to the directorship of the two Research Associations.

The Cameron Prizes in Practical Therapeutics for 1945 have been awarded by the University of Edinburgh to Sir Alexander Fleming, in recognition of his discovery of penicillin, and to Sir Howard Florey, for his work in making possible the clinical application of the drug.

Dr. Robert E. Wilson, Regional Director of the American Chemical Society, Second District, which comprises New York and New Jersey, has resigned owing to his new duties as chairman and chief executive officer of Standard Oil Co., of Indiana, and the chairmanship of Pan-American Petroleum.

At the annual meeting of the Newcastle Chemical Industry Club, on February 22, the chairman of the committee, Mr. R. H. F. Houstoun, and the hon. secretary, Dr. G. E. Stephenson, retired from office. Mr. W. S. Coates and Mr. E. B. Davies were elected to fill the vacancies. In recognition of the retiring chairman's long period of office and invaluable work, he was elected a vice-president.

Professor F. Y. Henderson, D.Sc., D.I.C., has been appointed Director of Forest Products Research in the Department of Scientific and Industrial Research on the forthcoming retirement of Mr. W. A. Robertson, who had been Director since 1933. Professor Henderson, who will take up his new post on April 1, is at present Reader in Timber Technology in the University of London and Assistant Professor in Timber Technology in the Imperial College of Science and Technology.

The new board of Alexander Duckham & Co. (lubrication technologists) has been constituted as follows: Chairman and joint managing director, Major J. E. Duckham, M.Inst.Pet.; vice-chairman, Mr. A. N. Duckham; joint managing director, Mr. G. T. Joyce, M.Inst.Pet.; directors, Messrs. A. C. Pepper, B.Sc., F.C.S., and H. B. Taylor. The new chairman and vice-

(*Continued on p. 209*)

Metallurgical Section

Published the first Saturday in the month

Metallurgical Section

March 3, 1945

Zinc Plating from Cyanide Solutions

A Survey of Present-Day Technique

by L. G. WHYBROW PALETHORPE, F.R.I.C.

THE primary function of zinc deposits on iron and steel components is to provide resistance to corrosion rather than to reduce mechanical wear or to improve appearance. Their durability in this respect is determined by the conditions to which they are exposed and by their thickness and uniformity. Of these, the conditions of exposure are decided by their service application which in turn regulates their thickness. Uniformity of deposit, however, is dependent upon the type of plating bath adopted. In practice, thickness and uniformity are complementary. That is to say if a uniform deposit can be produced, its thickness may be limited to the minimum necessary to provide a corrosion-resistant coating; an objective which need hardly be emphasised at the present time when it is expedient to economise both in metal and, if possible, in plating time.

Uniformity of Coating

The main factor, therefore, in electrogalvanising is to produce a uniform deposit. Of the two principal types of bath available for doing this, namely, the acid and the cyanide, only the latter is really suitable. The former is useful for producing coatings on articles of simple design, for example, on simple steel castings, on wire, strip, gauze, etc. Generally speaking, acid baths have a low throwing power and tend to produce crystalline deposits, although improved results can be obtained by plating a "flash" of zinc from a cyanide bath followed by a deposit from the acid bath. For high throwing power and good covering properties, which permit of the plating of more complex articles and which give coatings of a much more uniform thickness, cyanide baths are recommended. Further, by modifying these baths semi-bright and bright deposits can be obtained. On the other hand, they are more expensive to make up and maintain than acid baths. In addition, the rate of deposition is slower and uniformity is obtained largely at the expense of speed.

During the present emergency the electrodeposition of zinc from cyanide solutions has increased, partly on account of the shortage of non-ferrous metals which has led to the application of protective electro-galvanised coatings to the steels used as substitutes, and partly due to the shortage of cadmium, hitherto used for high-class coatings. In point of fact, both in America and in this country, zinc deposits have replaced cadmium deposits unless for exceptional duties.* For general applications zinc is as protective against corrosion, but tends to produce a more bulky and unsightly corrosion product than does cadmium. However, the passivation process now applied to zinc deposits further enhances their resistance to corrosion, thereby enlarging their potential field of application.

Cyanide zinc solutions may be used in either steel or rubber-lined vats. Wood or lead-lined vats should be avoided. The solutions can be made up to suit still vat or barrel practice by slightly modifying their composition. The sequence of operations necessary for the production of deposits is: precleaning, plating, passivation.

Precleaning

Zinc cannot be deposited over small areas of scale and rust or under traces of grease as can some metals, *e.g.*, copper and cadmium. Therefore, special care must be taken to produce, on components, surfaces which are perfectly clean chemically, otherwise coatings will be patchy. The cleaning technique necessary will depend upon the condition of the work when received and upon the material from which it is made. The principal agents in use for cleaning are: (1) mechanical, (2) chemical, and (3) electrochemical.

(1) Mechanical cleaning may consist either of sand-blasting, scratch-brushing, or hand-scouring. The first two are resorted to only if the work is heavily scaled or very dirty. Any grease or oil present on the surface must first be removed by a degreasing solvent. Hand-scouring is useful for preparing fairly clean work, and may also be used as an aid to the chemical cleaning processes. The operation is carried out with a wet brush dipped in pumice for iron and steel, or in Calais sand for the softer metals such as brass.

(2) Chemical cleaning involves the removal of oxide, scale, dirt, oil and grease, etc..

* *Iron Age*, 1944, *154*, No. 1, 75.

from the surface of components by the use of chemical agents. As is well known, the cleaners are solutions of acids or alkalis and are referred to as pickling solutions. Their composition and working temperature depend upon the nature of the metal or alloy to be cleaned, and upon the original condition and desired final condition of its surface. For pickling iron and steel components before electro-galvanising, suitably inhibited solutions of either hydrochloric or sulphuric acid may be used. Because of its lower cost the latter is more frequently employed, especially when the volume of work is large. If it is necessary to remove sand from the surface of castings, a hydrofluoric acid pickle may be used. For pickling copper and brass, solutions containing sulphuric and nitric acids are in regular use. After general pickling, additional bright or matt dips may be applied for particular purposes. Table I contains a summary of some acid dips in use at the present time.

TABLE I

Acid dips for the treatment of alloys before plating

Solution	Purpose
5 to 20 per cent. by volume of hydrochloric acid in water	Removes oxide scale or rust from iron and steel components. To some extent loosens sand, too.
5 to 15 per cent. by volume of sulphuric acid in water.	May be operated at room temperature or at 50°—80°C.
5 to 15 per cent. hydrofluoric acid in water.	Helps to dissolve and remove sand from the surface of iron and steel compnents.
5 to 10 per cent. nitric acid with sulphuric acid.	Removes oxides and stains from the surface of brass, copper, etc.
45 per cent. nitric acid, 45 per cent. sulphuric acid, 10 per cent. water, trace hydrochloric acid.	"Bright" dip for brass components to be used after pickling.
50/50 sulphuric and nitric acids with 1 lb. zinc in solution per 5 gallons.	"Matt" dip for brass components to be used after pickling. Use warm.

Before sand-blasting and pickling it is necessary to remove oil and grease from the surface of components. This may be done either by treatment in alkaline solutions or in organic solvents. The standard alkaline cleaner is a hot aqueous solution of caustic potash containing from 4 to 12 oz. of potassium hydroxide per gallon. The stronger solutions are recommended for ferrous components and the weaker solutions for non ferrous. In addition to potash solutions, other alkaline agents are available, *e.g.*, trisodium phosphate, potassium silicate, etc., some of which are incorporated in proprietary cleaners.

(3) Electrochemical cleaning is effected by suspending the work from a cathode bar into an alkaline solution contained in an insulated steel vat fitted up as for plating. The anodes are made up from steel sheet. A strong current is passed at fairly low voltage, causing a rapid evolution of hydrogen which assists materially in the cleaning. Two typical solutions for this service contain the following constituents:—

	oz./gallon (1)	oz./gallon (2)
Sodium hydroxide	4	4
Sodium cyanide	2—4	—
Sodium carbonate	—	2
Trisodium phosphate	—	2

Working temperature, 80° C.

Current density, 20—80 amps./sq. ft.

Of the organic solvents available for degreasing, trichlorethylene is by far the most popular, largely on account of its non-inflammability. Its properties and the manner in which it is used for industrial degreasing are so well known as to preclude any discussion of them here. After degreasing with it, however, a short immersion in an alkaline cleaning bath is advisable.

After precleaning, all components must be thoroughly mixed in running alkaline water so as to remove all traces of the acids used in pickling. Failure to do this may lead to the generation of hydrocyanic acid gas which is extremely toxic. Further, it is good practice to immerse the work, which is now ready for plating, in an alkaline solution containing 5 per cent. sodium cyanide. This serves to make doubly certain that all traces of acid are removed and provides a good foundation for the plating operation. For articles which prove difficult to plate because of deep recesses and holes, the writer has found the following special pickling solution useful:

Hydrochloric acid	1 gallon
Water	9 gallons
Zinc chloride	8 ounces

On many occasions it proved successful when difficulty had been experienced in obtaining a uniform "strike." After the normal pickling has been applied the work is immersed in this solution for 15 minutes. It is then thoroughly rinsed and dipped in the 5 per cent. alkali cyanide solution prior to the plating operation.

Electrodeposition

The theory of the electrodeposition of zinc from cyanide solutions is straightforward and needs only to be briefly surveyed. The plating bath consists mainly of a solution of the complex salt, sodium zinco-cyanide, $Na_2(Zn(CN)_4)$, the principal ions of which are $2Na^{++}$ and $(Zn(CN)_4)''$. The anion dissociates further, but to a far less degree, giving Zn^{++} and $4(CN)''''$. Thus, unlike the acid bath, the cyanide zinc bath contains a comparatively small proportion of its metal content as the cation, a condition which accounts largely for the superior throwing power and uniformity of deposit obtained from it. For plating solutions generally, it is well established that a low ionic concentration of the principal metal promotes good throwing power and covering properties.

As already mentioned, cyanide zinc solutions may be adapted for use in either the still vat or barrel type of plating unit. In the former the work is suspended from the cathode bus-bars. The anodes must be made from pure zinc in order to prevent sludge formation and to promote brightness of deposit. Heavy metal impurities in the bath, whether they originate from the anodes or from any other source (*e.g.*, from the copper or brass of bus-bars), give rise to dull coatings and so should be scrupulously avoided if a bright finish is desired. The barrel type of unit is employed for the smaller class of work. The cathode is let in at the bottom of the barrel so that it comes into contact with the work during rotation. The anode, which again must be pure zinc, is suspended into the solution from above. The electric current for use with both the still vat and the barrel can be supplied from the same motor generator, which is usually designed to give a predetermined current at a potential of 6 to 12 volts.

Make-up Formulæ

Formulæ for making up cyanide zinc solutions are many and varied. They range from "straight" solutions to those containing different kinds of brightening agents, some of which are covered by patents and trade names. The straight solutions produce a rather dull deposit and are applied purely as a protection against rusting. Further, they do not plate readily on to cast iron. The following are two typical formulæ for making them up:

	oz./gallon	
Still Vat	(1)	(2)
Zinc cyanide	8	10
Sodium cyanide	3	6
Sodium hydroxide	7	12
Working temperature, 60—90° F.		
Current density, 10—30 amps./sq. ft.		
Barrel	(1)	(2)
Zinc cyanide	10	5
Sodium cyanide	6	12
Sodium hydroxide	12.5	11
Working temperature, 110—130° F.		

Brightening Baths

Bright deposits are called for almost universally to-day because they afford protection against corrosion and at the same time are more pleasing to the eye. One of the oldest methods for producing them embodies the addition of mercury to the extent of 0.005—0.05 oz./gallon of solution, the still vat requiring the smaller addition and the barrel the larger. This type of bath exhibits good throwing power, covering properties and uniformity of deposit, but the presence of mercury in the coating is liable to cause season cracking of the parent metal (particularly if it is brass). On this account many authorities do not permit its use. More satisfactory brightening can be achieved by the addition of inorganic sulphites and sulphides, urea, certain alcohols, ketones, etc., used independently or in conjunction with small amounts of molybdenum or aluminium. Their use is mostly covered by patents or trade-names, making it very difficult to control baths without resort to the suppliers.

A solution which the writer has used with success contains a molybdenum addition in conjunction with urea and sodium thiosulphate. By slightly modifying the composition it can be adapted for use in the barrel. It may be conveniently prepared by dissolving the requisite quantity of zinc oxide in sodium cyanide and balancing up as follows:

	oz./gallon	
	Still Vat	*Barrel*
Zinc oxide	7.5	12.5
Sodium cyanide	15	25
Sodium hydroxide	12	15
Molybdenum compound	0.25	0.5
Urea	1	2
Sodium thiosulphate	0.5	1
Working temperature	60—90° F.	100—120° F.
Current density	15—40 amps./sq. ft.	

This solution gives a bright deposit with good throwing power and covering properties, and at the lower current density it plates at approximately 0.001 in. per hour.

Although the strength of cyanide zinc baths may be allowed to vary considerably, it is necessary to maintain a definite ratio between the principal constituents in order to duplicate results. The following are recommended as the optimum ranges and ratios for each solution:

Still Vat	oz./gallon	Ratio
Zinc (as metal)	5—8	1.0
Sodium cyanide	13—21	2.6
Sodium hydroxide	10—16	2.0
Barrel		
Zinc (as metal)	7—14	1.0
Sodium cyanide	21—42	3.0
Sodium hydroxide	10½—21	1.5

Bright solutions should be analysed frequently and maintained between the recommended limits, otherwise difficulties and failures will be experienced.

Passivation

After work has been plated for a predetermined time it is removed from the bath and thoroughly rinsed in clean running cold water and "passivated." As already mentioned, passivation is the term applied to the treatment by which zinc deposits can be rendered more resistant to corrosion and more pleasing to the eye. The original procedure was to immerse plated components in a 5 per cent. solution of chromic acid for 15—30 seconds immediately after rinsing. The solution, which may be contained in an earthenware or glass vat, is suitable for use at room temperature or up to 180° F. In effect, the result of the immersion is to remove all traces of alkali from the work and to create on the surface of the zinc coating an oxide skin impervious to the atmosphere. More recent developments, both here and in America, have led to the use of acid-chromate solutions most of which are marketed under trade names. The most popular one is a solution of a chromate or chromic acid containing about 0.5 per cent. nitric acid. The result is much the same as with the straight solution, but it is claimed that the acid solutions produce a skin exhibiting superior protecting properties and colour. On the other hand, however, when using them in practice, immersion times must be reduced to the minimum because more of the plated coating is removed than with the straight chromate dip. When fixing plating times, due allowance for this removal of coating must be made.

Finishing-Off

All that remains after passivation is to dry the work ready for despatch. Drying may be effected by different methods according to the size of components. Most work can be immersed in a bath of hot water and left to dry by its own heat. Small pieces may be dried centrifugally; large pieces are best dried in a current of warm air. Sawdust and similar materials, used by many platers, should be avoided because they promote stain formation. Many specifications call for the heat-treatment of iron and steel components at 200° C. in order to remove any hydrogen absorbed during pickling and plating. As is well known, the presence of this gas in iron and steel causes embrittlement. If zinc has been deposited on part of the surface only, the stopping-off medium must be removed. When the protected area has been machined beforehand it must be oiled to prevent rusting in transit to the site of application.

Control Analysis of Solutions

For the day-to-day control of cyanide zinc baths only the three principal constituents need to be checked. The following are reasonably accurate rapid methods for that purpose.

(1) *Zinc.*—Measure a 5-ml. sample of the electrolyte into a suitable beaker and dilute to 150 ml. with distilled water. Precipitate the zinc as sulphide at 80° C. using a solution of sodium sulphide. Filter, wash well with water containing a little ammonium sulphide, ignite, and weigh as zinc oxide. Zinc content on 5-ml. sample = wt. of zinc oxide × 25.40 oz./gallon.

(2) *Sodium cyanide.*—The standard method for determination of cyanide may be used, provided that the sample of electrolyte can be rendered neutral. This can be done if a slight excess of nitric acid is incorporated in the standard silver nitrate solution and an excess of sodium bicarbonate is added to the sample. The net result is that the alkalinity of the electrolyte is neutralised by the acid in the titrant; excess of acid is destroyed by the sodium bicarbonate.

Standard solution required: *N*/10 silver nitrate containing 15 ml. nitric acid per litre. Indicator required: potassium bichromate solution treated with silver nitrate. Measure 2 ml. of electrolyte into a 500-ml. conical flask into which add 100 ml. of distilled water, 5 gm. of sodium bicarbonate and a few drops of indicator. The titration may then be completed in the usual way. Factor using 2-ml. sample: 1 ml. *N*/10 silver nitrate = 0.392 oz./gallon sodium cyanide.

(3) *Sodium hydroxide.*—To determine alkalinity due to sodium hydroxide, an indicator is required which changes at the *p*H range of dilute sodium cyanide solution. Such an indicator is tropaeolin O, *p*H range 11.1 to 12.7. Measure 10 ml. of electrolyte into a conical flask containing 100 ml. of distilled water and 5 drops of indicator. For guidance in judging the end point, a blank solution is prepared having the same bulk and containing approximately the same concentration of sodium cyanide and 5 drops of the indicator. Titrate the sample from orange to the same shade of yellow as the blank with normal hydrochloric acid solution. Factor using 10-ml. sample: 1 ml. *N* hydrochloric acid = 0.64 oz./gallon sodium hydroxide.

An aluminium ingot industry is to be established in Tasmania at a cost of £A3,000,000, to be contributed, in equal parts, by the Commonwealth Government and the Tasmanian Government. Tasmania has been chosen as the location for the first smelting works on account of its hydroelectric resources. Australia's post-war aluminium requirements are estimated at a minimum of 6000 tons per annum.

LETTERS TO THE EDITOR

Waste Paper and the Chemist

Sir,—I had hoped that a pen more competent than mine would have dealt with Dr. Frank's letter under the above heading in your issue of February 10. As a chemist who is also a paper-board manufacturer, I feel that it is dangerous to allow Dr. Frank's misconceptions to pass unchallenged, since they reflect unjustly on paper-mill chemists and the paper trade.

De-inking of newsprint is a simple process only in the minds of those readers of patent literature who lack practical experience. It is manifestly impossible to bleach carbon black, which is the basis of all newsprint inks. It must, therefore, first be freed from the cellulose fibre, and then removed by adsorption on to colloidal clay. The process is rarely satisfactory or economical, and is never simple, but it is absolutely untrue to say that no interest has been devoted to the question in this country.

It is difficult to appreciate precisely how de-inking of newsprint is bound up with the manufacture of strawboard, but the reason for the non-establishment of a strawboard manufacturing industry in this country is simply that the high cost of transporting the very bulky wheat straw available in this country, in the large tonnage required for economical operation of a mill, renders competition with the Dutch product impossible. Whether the price at which the Dutch product was sold in pre-war days was a truly economic one is perhaps another matter, but the Board of Trade was not particularly helpful in assisting English manufacturers to combat "dumping" of some Continental paper products.

There may be some method unknown to the majority of paper-mill chemists, whereby strawboard of quite outstanding mechanical strength may be produced, but such a product does not seem to have reached the market. Perhaps Dr. Frank could provide samples and process details. The alkali used for the treatment of straw for strawboard manufacture is lime, which rarely pays for concentration and recovery.

Contrary to Dr. Frank's statement, it is quite possible to make a good sheet of writing paper from straw pulp, prepared by the De Vains or similar process; paradoxically enough, it is probably along these lines that the use of straw as a paper-making material in this country will develop. Unfortunately, it is unlikely that its use will reach such dimensions as seriously to challenge the paramount position of wood-pulp, import of which, either as pulp or finished product, will continue to be necessary for the manufacture of newsprint, kraft and sulphite wrappings, and folding boxboard (as distinct from strawboard), to name but a few of the grades of which Dr. Frank fondly imagines imports should become superfluous.—Yours faithfully,

N. L. Mathews, B.Sc.,
General Manager,
Papyrus, Ltd.

Scientific Publicity—and More

Sir,—Your leader of January 27 and the views of Dr. F. Kind published in your columns in the issue of February 17 deserve the attention not only of the scientific institutes but perhaps still more so of "practical" men, who are after all those responsible for production in this country. To the latter it is vital to be kept informed of every recent development, in their particular sphere, in Britain and still more so in foreign countries. In normal times this is easily achieved by access to the technical journals and books published abroad and, what is just as important, to patent applications and patents throughout the world. In times of war this matter assumes a vital importance. It has been repeatedly mentioned that modern warfare concerns not only the military man but the technician, and the publications of enemy countries become of paramount interest.

Since the outbreak of war the technical world has been practically cut off from access to these valuable sources of information. It is true that various industrial journals publish abstracts which are indeed a most valuable and indispensable contribution to any comprehensive survey. But, apart from the fact that such abstracts very often refer to publications of months or even years ago, it is impossible even for the most efficient abstractor to give anything but a brief and often inadequate précis of the information which to him appears most important. It is obvious that other information may well remain unmentioned containing details of developments, etc., which may not be complete novelties, but may be of the greatest interest to certain individual readers.

Again, access to the original publications is of great value for the advertisements contained therein, informing prospective buyers of the newest developments. The writer has repeatedly had occasion to discuss the importance of studying advertisements both with industrialists and with academicians, and found them for the most part in agreement.

Already a number of years have passed since our specialists had access to foreign journals, and technical developments have proceeded rapidly in this period. In allied countries, industry has been more fortunate in this respect, although the fortuitous channels by which this literature reaches them will mean a relatively late application of the information which they contain. It is hoped that industries in this country will in the future be able to consult these foreign journals with minimum of delay.

Since we now have access to the libraries and institutes, etc., of the capitals of Italy, France, and Belgium (and very likely in many other countries before long), it would seem advantageous to send to these countries specialists with the necessary knowledge of the language and with personal trade connections, in order to study recent developments in their particular industry, so that they may report back to their associations.
—Yours faithfully,

G. Ullmann, Ph.D.

Isano Oil

An Alternative to Linseed

WITH the idea of replacing paint and varnish oils in short supply, investigation of less well-known oils has been carried on since the war. Among these is isano oil, the product of the tree *Ongokea klaineana*, a native of the French and Belgian Congo, occurring also in Nigeria and the Gold Coast. A résumé of the literature on the subject is contained in *Bull. Imp. Inst.*, *42*, 4, p. 250.

Investigators differ as to the composition of the oil, but it is generally agreed that a main component is an unsaturated fatty acid (isanic or erythrogenic acid, $C_{18}H_{28}O_2$). It has been suggested that the oil might be used in making certain soaps, as a lubricant, or as a substitute for linseed oil in the formulation of varnishes. The untreated oil takes several weeks to dry; the most satisfactory drying process appears to be to add litharge or manganese dioxide and heat the mixture at 120-150°C. Copal varnishes prepared from the oil, heated with 5 per cent. manganese dioxide, and exposed at 30-35°C., dried within 24 hours.

Mosinski, in Fr. Pat. 818,802/1937, heats isano oil with phthalic anhydride and glycerol, when the oil polymerises below 240°C. and acquires high drying properties; in Fr. Pat. 48,914/1938 he treats the oil with aniline or its derivatives, or with sulphur or its compounds, to give more suppleness to the film obtained on drying.

Fertiliser Offences

Company Fined for Illegal Supply

ELEVEN summonses were heard at Swansea last week, against the Landore Chemical Co., Ltd., Swansea, for supplying fertiliser other than by authorisation of a permit held by a purchaser, and five summonses for selling basic slag at a price in excess of the maximum. George Grant, manager of the company, was summoned for aiding and abetting.

Mr. O. C. Somerville Jones, solicitor to the Treasury, instructed by the Ministry of Supply, prosecuted, and said that some 180 tons of basic slag had been sold without permits. The company's lorry driver, he stated, had been sent out with a pocket-book full of invoices and told to find customers for the slag. He was usually successful and completed the invoices in pencil. When Mr. G. F. Reynolds, senior investigation officer, visited the company's offices, it was at once apparent that, with one exception, no record of the transactions had been kept. The one exception was when the Agricultural War Committee had made a query.

Mr. T. R. Harris, defending, pleaded that much of the company's business had been done with smallholders who did not need permits for the fertiliser, but after the formation of allotment societies these had made purchases of fertiliser direct, and the Landore Chemical Co., Ltd., found they had accumulating stocks. It was felt that the best way of decreasing these stocks and at the same time being of use to the nation was to sell the slag to farmers and this was done. Grant was under the impression that all the slag had a 9 per cent. phosphoric acid content and not 8 per cent.

The company was fined £5 for each offence, with 20 guineas costs. Grant was ordered to pay £55 on the first 11 summonses within 28 days or serve a month's imprisonment.

New Control Orders

Copper Wire : Iron and Steel

THE Control of Iron and Steel (No. 39) Order, 1945 (S. R. & O. 1945, No. 190), extends the list of iron and steel products of which limited quantities may be acquired by any person without licence and also increases the quantities. It also permits stockholding merchants to acquire, without licence, limited quantities of wire and certain wire products. The Order also permits any person to acquire, without licence, any quantity of cemented carbide hard metal.

The Control of Non-Ferrous Metals (No. 16) Order, 1945 (S. R. & O. 1945, No. 203), raises the maximum price of black hot-rolled copper wire rods not less than ¼ in. nor more than 5/16 in. in diameter from £65 15s. to £66 10s. per ton. Both Orders came into force on February 26.

With the agreement of the British university authorities, the Universities of Brussels, Louvain, Liége and Ghent are to send a delegation of experts to this country to meet scientific authorities at Oxford and Cambridge in order to study progress made during the last few years and to renew personal contacts.

German Patents

Reported Flight to Sweden

A LARGE number of German patents are being registered with the Swedish patent office, reports the Swedish paper *Expressen*. Out of some 10,000 applications last year, nearly 60 per cent. were on behalf of German patentees and it is reported that Germany is inundating the Swedish patent office with registrations this year. Several leading concerns, such as I. G. Farben, Zeiss, motor car groups and electrical equipment manufacturers are taking out patents in Sweden either directly or through subsidiary companies. The reason for this mass flight of patents is, of course, the conviction among German industrialists of an early doom of the present régime, and represents an attempt to secure a nest-egg abroad at a time when German industry will be under Allied control.

It is to be hoped that the Allied declaration regarding transfers of looted property and gold to neutral countries will be extended to cover patent rights.

News from France

Non-Ferrous Metals

THOUGH details of the industrial side of France's economy are still regrettably scarce, a trickle of news has recently begun to reach this country.

Two leading establishments in the French non-ferrous metal industries, the Cie. Française des Métaux and the Soc. des Tréfileries du Havre, are reported to be negotiating with regard to the conclusion of a close co-operation, to extend, it is understood, to the technical field, involving the utilisation of mutual experience.

The Union des Consommateurs de Produits Métallurgiques et Industriels, operating a steel plant in Lorraine, has issued 4 per cent. debentures to the amount of 100 million francs, repayable after 40 years.

Workers' Representation Increased

Among the major changes in France's industrial system since the liberation is the increasing importance of works committees. Following the example of the coal mining industry, two major sectors of the French chemical industry, *viz.*, the potash mines and the nitrogen industries, have arranged for workers' representatives to have a larger say in the management of affairs. This represents an important departure from the pre-war system.

The Board of Administrators of the State potash mines in Alsace (Mines Domaniales de Potasse d'Alsace), has been reduced from 23 to 18 members, in order to bring about an increase in efficiency. The number of staff representatives was raised from three to five, embracing three workers, one administrative employee and one member of the executive and technical personnel. These will be officially nominated from the ranks of the works committee. The new board of this important enterprise includes, in addition to the aforesaid, seven representatives of various Government departments and six representatives of agriculture, of the chambers of commerce, and of the shareholders. Another instance of the same policy is the inclusion, on the board, of six members of the staff of the State Nitrogen works at Toulouse (Office National de l'Azote). It is safe to assume that members of the staff of other French concerns will receive similar appointments.

Irish Bauxite

Fresh Deposits Located

FACTS about the bauxite deposits of Antrim, Northern Ireland, were recounted to the Edinburgh Geological Society by Mr. V. A. Eyles last week in an address on "Tertiary Bauxite and Iron Ore Deposits in Northern Ireland." For some years Irish bauxite has been used by the British Aluminium Co. for the manufacture of alumina, and minor amounts of the closely associated iron ore have been produced from the workings as a by-product. The Antrim deposits, Mr. Eyles said, owed their origin to chemical alteration of the lavas under special conditions of weathering such as operated nowadays only in tropical countries.

Mining of bauxite ceased in Northern Ireland before the outbreak of the present war, but as a result of prospecting work carried out by the Geological Survey of Scotland, fresh deposits had been located of a somewhat superior grade to those formerly mined in the district.

BRITISH NYLON

A new industry for Britain—the spinning and processing of nylon yarn—will be set up in Pontypool by British Nylon Spinners, a private company formed jointly by Courtaulds and I.C.I. in 1940 with a capital of £300,000. Mr. Hugh Dalton, President of the Board of Trade, announced at Newport, Mon., on February 14. The factory, of one million square feet and built on the most modern lines, would employ 1700, mainly men, but including some hundreds of women, with the possibility of further expansion later. The company has willingly co-operated in agreeing to establish the new plant in accordance with the Government''s policy for the location of industry.

General News—From Week to Week

A new coalfield, situated to the east and south-east of Lincoln, was discovered while drilling for oil.

A lecture entitled "Some Aspects of Research in the Plastics Industry" was given on March 2 by Dr. J. C. Swallow before the Plastics Group, S.C.I.

British Titan Products Co., Ltd., has purchased 53 acres of land from Grimsby Corporation as a site for a proposed new works which will employ 1000 men.

"The Chemical Structure of Starch" was the title of a lecture given on March 2 by Professor E. L. Hirst, F.R.S., at a Manchester meeting of the three chartered bodies.

The British Colour Council features fifteen colours for town and country on its millinery card for spring and summer. It has also issued a report on colours popular in Portugal.

The National Smoke Abatement Society's annual report for the year 1944 states, *inter alia*, that attention has been focused on the important question of smokeless heating in post-war housing.

The Institute of Export is holding 24 lunch-time lectures at the Merchants' Hall, 24 St. Mary Axe, E.C.3, on Tuesdays and Thursdays from February 27, 1945, to May 17, 1945, from 1.20 p.m. to 2 p.m. sharp.

Nine thousand employees of Boots Pure Drug Co., Ltd., are to have an extra week's holiday this year in consideration of war strain due to their occupation in Civil Defence, the Home Guard, and other voluntary services.

A legacy of £5000 has been bequeathed by Mr. Charles S. Crawford, Maxwell Park, Glasgow, to the Royal Technical College, Glasgow, for the purpose of establishing a scholarship or scholarships in chemistry, to be known as the "Charles S. Crawford" scholarship or scholarships.

At its meeting on Wednesday last week, the Council of the University of Leeds gratefully accepted a further generous gift, from Mr. Charles Brotherton, of £1000 for the purchase of equipment for research in the Department of Textile Industries, and the offer by Brotherton and Co., Ltd., of £1000 a year, for a period of not less than seven years, for the establishment of a Brotherton Research Lectureship in Physical Chemistry in the same department. Another welcome gift was the grant of £300 for one year from I.C.I., Ltd. (Dyestuffs Division), in support of Professor Evans's work on the thermodynamic properties of polymers.

Professor A. Danilov, of Leningrad University, addressed the recent conference on "Science in Peace," arranged by the Association of Scientific Workers. He expressed his desire for a close collaboration with British scientists in the future.

Britain's climate in densely-populated areas had been changed materially through air pollution, which reduced the hours of sunshine and added to the intensity and duration of fog, said Major Markham, M.P., at the joint conference of the Institute of Fuel and National Smoke Abatement Society.

The Society of Glass Technology held its 227th ordinary general meeting at Sheffield on February 28, when one application for collective membership and 22 for ordinary membership were considered. Five technical papers on the subject of "Glass-to-Metal Seals" were received and discussed.

The Royal Society's Mond Laboratory has received a gift of 2000 cu. ft. of helium gas from the National Research Council of Canada. This will enable research on very low temperature problems, where the use of liquid helium is essential, to start again as soon as war conditions permit.

A complete list of goods, the export of which from the United Kingdom is controlled under the Export of Goods (Control) Order, 1943, showing the position on January 15, 1945, has been issued by the Board of Trade (Export Licensing Department), and is published by H.M.S.O., price 6d.

The Ministry of Education has notified Sheffield Education Committee that as soon as materials and labour are available it will authorise the erection of a college of art and technology in the city. In the meantime the committee is given authority to purchase a site opposite the L.M.S. station.

The Board of Trade announces that all policies for fixed sums under the Commodity Insurance Scheme which are in force on March 2, 1945 (whether policies extended without payment from December 2, 1944, or new policies), will be extended until June 2, 1945, without further payment of premium or the necessity for further action.

Edinburgh business men had their eyes opened to the potentialities of coal as a raw material of industry when Professor W. H. MacMillan, of the Chair of Mining in Edinburgh University, lectured on that subject last week at the City Business Club. He reminded them that 2500 separate substances could be obtained directly or indirectly from coal or its by-products, and that 25 per cent. of the coal at present used in power production was wasted.

An audience of Cambridge scientists enthusiastically heard addresses, at a meeting of the University Physics Society on Wednesday last week, from Professor F. Joliot and Madame Irène Joliot-Curie, on "Chemical Researches on the Radioactive Elements." Madame Joliot-Curie spoke first in English, followed by her husband in French. Sir Lawrence Bragg, in the chair, expressed the appreciation and gratitude of the company at the opportunity of hearing such distinguished visitors.

Proposals to bring technical education into line with the likely demands of Scottish industry are made in an interim report by a committee of the Advisory Council on Education in Scotland, issued last week by H.M.S.O. "Much attention," it is stated, "has been paid to training in the higher reaches of education, but the artisan and craftsman have not been offered corresponding opportunities. . . . The literary and academic traditions of Scotland have tended to obscure the needs of a great section of the community."

Further research on the vulcanisation of butyl rubber (GR-I) carried out by I.C.I., Ltd. (Dyestuffs Division), is reported on in Memorandum No. M 15 of the Research Departments of the Ministry of Supply, Admiralty, and Ministry of Aircraft Production. This memorandum covers further development work on (a) sulphur vulcanisation with high-speed accelerators; and (b) *p*-quinone dioxime plus an oxidising agent. Inquiries should be addressed either to the M.O.S. (C.R.D.4b), Berkeley Court, Glentworth Street, London, N.W.1; or to Dr. W. J. S. Naunton, Hexagon House, Manchester, 9.

Foreign News

A large molybdenum deposit has been found in Montana, reports the U.S. Bureau of Mines.

The Brass Forging Association, 420 Lexington Avenue, New York, announces the publication of a periodical called *Non-Ferrous Digest*.

A new aluminium sulphate plant is being erected at Arvida, Que., by the Aluminium Company of Canada, Ltd. The plant will be completed early this year and will supply the Dominion's requirements of about 40,000 tons per year.

In accordance with an announcement by the War Production Board, Washington, magnesium production in plants owned by the U.S. Government virtually ceased on January 1. Dow Magnesium Co., Velasco, Tex., and Electro-Metallurgical Co., Spokane, Wash., will be closed, and partial curtailment is ordered at Diamond Magnesium Co., Painesville, Ohio. Production in the U.S. will thus be reduced to 8,000,000 lb. per month, or one-sixth of rated capacity.

In the Soviet Union no less than 250 types of high-grade steel and its alloys are now being manufactured, many of which were introduced during the war.

Personal Notes

(*Continued from p.* 200)

chairman are sons of the late chairman, Mr. Alexander Duckham. Mr. G. T. Joyce and Mr. H. B. Taylor have both over 30 years' service with the company. Mr. A. C. Pepper is well-known for his work in lubrication research.

Obituary

Dr. Axel Lindblad, former deputy managing director of the Boliden Mining Company, died in Sweden on November 6, 1944.

Dr. Frederick William Eurich, whose death was recently reported, was Specialist Medical Referee to the Home Office for Aniline and Lead Poisoning, as well as for Anthrax.

Mr. Oliver Quibell, who died at Shalem Lodge, Newark, Notts, aged 81, was a partner in the firm of Quibell Bros., Ltd., and later a director of British Glues and Chemicals, Ltd., and chairman of the Newark Gas Co., at the time it was purchased by the Newark Corporation. As our readers will recall, Mr. and Mrs. Quibell celebrated their golden wedding anniversary on January 24.

Mr. George Duncan McIntyre, who died suddenly on January 1 at Montreal, aged 63, was a director of James W. Pyke & Co., Ltd., and secretary of the Canadian Society of Chemical Industry. A native of Cardross, Scotland, he graduated in chemistry from Glasgow University. Mr. McIntyre was employed by Lever Bros. at Port Sunlight and went to Switzerland to supervise the erection of a soap manufacturing plant. He came to Canada in 1907 to found Canada's first refined-glycerine plant at Toronto for Lever Bros.

Mr. Sydney Emsley, B.Sc., F.R.I.C., whose death on December 20, 1944, at the age of 55, is reported, had served as Borough Analyst at Southampton since 1922. Soon after graduating at Manchester in 1911, he became a research chemist at Woolwich Arsenal, and later with the London, Brighton and South Coast Railway, before going to Southampton as assistant to the Borough Analyst. In 1916-18 he worked at the Soda Ash Laboratories of Brunner, Mond & Co., Northwich, but returned to Southampton in 1919. In 1930 he was appointed Analyst for the Isle of Wight and the City of Winchester. In 1940 he was injured in an air-raid on Southampton, a shock from which his health never fully recovered.

Forthcoming Events

March 3. Society of Glass Technology (North-West Section). Gas Showrooms, Sefton Place, St. Helens, 3 p.m. Mr. L. M. Angus-Butterworth: "The History of Glass Making in Lancashire."

March 5. Society of Chemical Industry (London Section). Rooms of the Chemical Society, Burlington House, Piccadilly, W.1, 2.30 p.m. Dr. G. L. Riddell: "The Printing Industry as a Field for Scientific Research."

March 6. The Royal Institution, 21 Albemarle Street, W.1, 5.15 p.m. Sir Henry Dale, P.R.S.: "Nerve Endings and Chemical Transmitters."

March 6. The Institute of Physics (Electronics Group). Small Physics Theatre, Imperial College of Science and Technology London, S.W.7, 5.30 p.m. Professor G. I. Finch, F.R.S.: "Electron Diffraction."

March 6. Electrodepositors' Technical Society (Birmingham Section). James Watt Memorial Institute, Great Charles Street, Birmingham, 3, 6 p.m. Mr. E. J. Dobbs: "Nickel Plating."

March 6. Chemical Society and **Leeds University Chemical Society.** Chemistry Lecture Theatre, Leeds University, 5.15 p.m. Film on "Sulphonamide Theory." 6.30 p.m. Discussion. Opener: Professor F. G. Tryhorn: "The Repercussions of Modern Theoretical Developments on the Methods of Teaching Chemistry in Schools."

March 6. Society of Glass Technology (London Section). British Council Cinema, 6 Hanover Street, W.1, 6.30 p.m. Film show: 1, "Looking Through Glass"—a general survey of the British glass industry (British Council Film); 2, "The Manufacture of Sheet Glass" (Pilkington Brothers, Ltd.); 3, "Making Electric Lamps, etc., by Hand and Machine Methods" (G.E.C., Ltd.).

March 7. The Institute of Petroleum (Stanlow Branch). Grosvenor Hotel, Ellesmere Port, Cheshire, 7.30 p.m. Dr. G. Sutherland and Dr. H. W. Thompson: "Spectrographic Analyses of Fuels.

March 8. Society of Chemical Industry (Liverpool Section). Chemical Lecture Theatre, University of Liverpool, 6 p.m. Dr. R. E. Slade: "Benzene Hexachloride—An Insecticide with Outstanding Properties" (Centenary Hurter Memorial Lecture).

March 8. Royal Institute of Chemistry (Bristol and S.W. Counties Section). Chemistry Department, Bristol University, Woodland Road, 6.15 p.m. Annual general meeting. Mr. Osman Jones: "Modern Methods of Food Preservation" (Streatfeild Memorial Lecture).

March 9. Society of Public Analysts and Other Analytical Chemists. Chemical Society's Rooms, Burlington House, Piccadilly, London, W.1, 3.15 p.m. Annual general meeting. Mr. S. Ernest Melling: "Water and Water Supplies" (presidential address).

March 10. Institute of Physics (South Wales branch inaugural meeting). Physics Department, University College, Swansea, 2.30 p.m. Dr. C. Sykes, F.R.S.: "Physics in Metallurgy." Visitors are welcome.

March 10. Society of Glass Technology (Yorkshire Section). Glass Works, B.T.H., Ltd., Chesterfield. 2.30 p.m., tour of works: 3.30, Messrs. A. E. Dale and J. E. Stanworth: "Sealing Glasses."

March 14. The British Association of Chemists. Chemical Society's Rooms, Burlington House, W.1, 6.30 p.m. Dr. H. F. Rance: "The Chemist in the Paper Industry."

March 15. The Chemical Society, Burlington House, Piccadilly, W.1, 2.30 p.m. Professor E. K. Rideal, D.Sc., F.R.S.: "Reactions in Monolayers" (Liversidge Lecture).

March 16. Royal Institute of Chemistry (South Wales Section). Royal Institution of South Wales, Swansea, 6.30 p.m. Dr. C. A. Edwards, F.R.S.: "The Straining of Metals" (postponed from March 9).

Company News

The **United Steel Companies, Ltd.,** maintains its interim dividend of 2½ per cent.

The **Texas Corporation** repeats its regular quarterly dividend of 50 cents.

Aspro, Ltd., have declared an interim dividend of 10 per cent. (same).

Boots Pure Drug Co., Ltd., declared an interim dividend of 10 per cent.

Gulf Oil Corporation is paying the regular quarterly dividend of 25 cents (same), and a bonus of 25 cents (nil).

Kern Oil Co., Ltd., reports a net profit for the year to May 31, 1944, of £21,717 (£41,632). The dividend remains at 6 per cent.

The Anchor Chemical Co., Ltd., reports a gross profit for the year to November 30, 1944, of £71,950 (£65,213). Net profit amounts to £19,289 (£13,599). A final of 20 per cent., making a total of 30 per cent. (27½ per cent.), has been declared.

Cleveland Petroleum Co., Ltd., reports a trading profit, for the year to October 31, 1944, of £93,598 (£88,326). Net profit amounts to £41,651 (£43,458). An unchanged dividend of 10 per cent. on ordinary, and of 13½ per cent. on deferred, were declared.

Milton Antiseptic Co., Ltd., report a net profit, for the year to September 30, of £29,423 (£15,015). Gross profit amounted to £77,323 (£39,893). Taxation absorbed £31,160 (£11,054). A final ordinary of 10 per cent., making 15 per cent. (12½ per cent.) was declared.

E. Adler, Ltd., chemical manufacturers, etc., Finsbury Pavement, E.C.2, have increased their nominal capital, beyond the registered capital of £500, by the addition of £4500, divided into 2250 6 per cent. cumulative preference and 2250 ordinary shares of £1 each.

New Companies Registered

B. B. Kent, Ltd. (392,947).—Private company. Capital, £10,000 in £1 shares. Vitreous enamellers, metal workers, metal surface processors, protectors and finishers, metallurgists, engineers, etc. Directors: Bernard B. Kent; Dora B. Kent. Registered office: 84 Chancery Lane, W.C.2.

Stone-Fry Magnesium, Ltd. (393,140).—Private company. Capital £10,000 in £1 shares. Manufacturers of and dealers in metals, metallic compounds, chemicals, etc. Subscribers: P. M. Parish, A. R. Prestige. Registered office: Prince George's Road, Merton Abbey, S.W.19.

Fox, Martin-Reed, Ltd. (393,369).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in pest destroyers, fertilisers, chemicals, etc. Directors: E. R. Reed; Ena G. Reed. Registered office: 135a Uxbridge Road, Rickmansworth, Herts.

Ronald Lunt & Co., Ltd. (393,211).—Private company. Capital £1000 in 2000 "A" shares of 1s. and 900 "B" shares of £1 each. Merchants, manufacturers' agents, dealers in disinfectants, drugs, etc. Subscribers: R. L. Lunt, T. J. Harrison (first director). Registered office: 11 Dale Street, Liverpool, 2.

Julius Hulsen & Co., Ltd. (393,269).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in and agents for chemicals, chemical products, medicated foodstuffs, etc. Directors: F. G. Marshall; Elsie Marshall. Registered office: 43-4 Collingwood Buildings, Newcastle-on-Tyne.

Pharplast Processing & Supply Co., Ltd. (393,206).—Private company. Capital £1000 in £1 shares. Manufacturers and processors of raw material for the paint, plastic and fine chemical industry, etc. Subscribers: H. F. Maddy (permanent governing director), Twizzletwig, The Ballands, Fetcham, Surrey; E. J. R. May. Solicitors: Sole, Sawbridge & Co., London, E.C.2.

Presov, Ltd. (393,121).—Private company. Capital, £500 in £1 shares. Manufacturers of and dealers in a composition for preserving eggs and other foodstuffs, manufacturers of and dealers in chemicals, cartons, bags, boxes and containers, etc. Directors: T. E. Marash, Jessie G. Marash. Registered office: 9 The Quadrant, Coventry.

Chemical and Allied Stocks and Shares

FURTHER gains in British Funds and Industrial shares have again given stock markets a cheerful appearance. Sentiment reflected general anticipation that the Government's cheap money policy will be continued after the war, while the various factory acquisition and other developments have indicated that many important companies are well ahead with plans for the eventual switch-over to peace-time working. The strengthening of Imperial Chemical to 39s. 3d. was attributed to the big factory planned by British Nylon Spinners, the private company formed jointly by I.C.I. and Courtaulds. Courtaulds at 56s. 1½d. were also slightly higher on balance (the results are due), while Dunlop Rubber kept firm at 49s. 6d., and shares of companies with plastics interests were inclined to improve, De La Rue rising further to £10¼. Lewis Berger moved up further to 111s. 6d., and paint shares generally showed an improving tendency, sentiment being aided by the higher International Paint profits. Shares of the last-named company were 115s. While awaiting the results, Pinchin Johnson rose further to 42s.

In other directions, Turner & Newall have been steady at 85s. 3d., with Distillers 112s. 3d., and United Molasses better at 37s. 10½d. A firmer tendency in cement shares was attributed to the emphasis given to permanent house building plans. Associated Cement were 63s., and Tunnel Cement 47s. 6d. Pressed steel were better at 32s., but British Steel Constructions shares reacted to 16s. 10½d. Borax Consolidated deferred were again higher at 40s. 6d., awaiting the results. British Oxygen rose further to 86s. 6d. Although at first lower on the cut in the price of the metal, British Aluminium rallied to 46s. 3d. only to fall later to 45s. 7½d.

Iron and steels were generally firm, Tube Investments strengthening to £5¼, with Stewarts & Lloyds 58s., and Staveley 54s. 3d., while Firth Brown moved up to 78s. 9d. Vickers at 19s. 3d. improved, pending the dividend announcement. Although "ex" the interim dividend, United Steel were well maintained at 26s. 9d. Allied Ironfounders have been firmer at 52s. 3d., and Babcock & Wilcox at 54s. 3d., while Ruston & Hornsby strengthened to 51s.

Post-war plans of motor manufacturers tended to draw attention to Triplex Glass 10s. units, which were higher at 42s. 6d. B. Laporte kept firm at 86s. 3d., Greeff-Chemicals 5s. ordinary were 9s., W. J. Bush 75s., Monsanto Chemicals 5½ per cent. preference 23s., and British Drug Houses 31s. Burt Boulton were higher at 26s., Blythe Colour 4s. ordinary 10s. 9d., and Cellon 5s. shares 23s. 6d.

Only small movements were shown in the textile section, Bradford Dyers easing to 26s. 9d., Bleachers to 13s. 9d., and Calico Printers to 18s. 6d. Lever & Unilever were active around 47s. 6d, with Lever N.V. 46s. 9d. British Industrial Plastics 2s. shares were 6s. 3d., and Erinoid 5s. ordinary 12s. 3d. Gas issues have been generally firmer, with Gas Light and Coke 23s. 6d., and South Met. Gas stock 92. German potash loans reflected the reaction in German bonds, but later showed a small rally, the 7 per cents. being 41 and the 6½ per cents. 39. Reflecting the increased profits and the raising of the dividend from 12½ to 15 per cent., Milton Antiseptic 10s. shares rose to 36s., yielding 4½ per cent. on the basis of the higher dividend. Mather & Platt rallied to 55s. on further consideration of the past year's results.

Boots Drug rose to 57s. 3d. in sympathy with stores shares which have been an active market. Timothy Whites were 41s., Sangers 30s. 9d., and Beechams deferred 18s. 10½d. General Refractories 10s. shares eased to 16s. 10½d., but Amalgamated Metal at 18s., and Imperial Smelting at 13s. 6d. were maintained. British Match showed firmness at 41s. 7½d., and Barry & Staines strengthened to 53s. Oil shares were only moderately active, and Anglo-Iranian, at 115s., lost part of an earlier rise.

British Chemical Prices

Market Reports

IN the London general chemicals market, a fair movement of supplies has been reported during the past week, chiefly against orders already held, although there has been a certain amount of replacement buying in textile and allied chemicals. Prices generally are maintained on a firm basis. Fresh inquiry has been on a fair scale, with moderate additions to order-books. In the soda products section, bichromate remains in short supply and offers are being promptly absorbed. The demand for industrial refined nitrate of soda has been fairly active, while moderate trading conditions are reported for acetate and nitrate of soda. Pressure for delivery of both Glauber salt and salt cake has been maintained, and the hyposulphites of soda are well held. In the potash section, solid caustic is finding a ready outlet, and a steady call for supplies of bichromate and yellow prussiate of potash is reported. Acid phosphate of potash keeps very firm and is attracting fair attention. Conditions in the market for coal-tar products remain steady, with creosote and anthracene oil in good request. There is a steady inquiry for cresylic and carbolic acids, and the toluols and benzols are in good demand. The naphthas and xylols are quiet.

MANCHESTER.—Fresh inquiry on the Manchester market for heavy chemical products during the past week has been on a moderate scale and has resulted in additions to order-books in a fairly wide range, while a satisfactory feature is the steady call for contract deliveries from most of the leading consuming trades, especially of the alkalis and other bread-and-butter lines. Sulphate of ammonia, superphosphates and certain other classes of fertilisers are in good demand and in most sections there are signs that business will approach its seasonal peak before long. The tar products, with a few exceptions, are being steadily absorbed against old orders, though not a great deal in the way of new business has been reported in this section of the trade during the past week.

GLASGOW.—In the Scottish heavy chemical trade, activity during the past week in home business has been moderate. There is no change in the export trade. Inquiries are more numerous. Prices remain steady at previous levels.

THE BRITISH ASSOCIATION OF CHEMISTS

is the Trade Union for all professional chemists. ONE of its many activities is the UNEMPLOYMENT BENEFIT FUND.

- For a contribution of 2s. 6d. monthly, you can draw £1 a week if unemployed. For 10/- monthly, you can draw £4 per week.
- Over £3,537 paid out in benefits 1935-40.
- Reserve Funds of £34,000.

For particulars of Membership, write to :—

C. B. WOODLEY, C.R.A., F.C.I.S., General Secretary, B.A.C.
175, Piccadilly, London, W.1

EDUCATIONAL

Great Possibilities for

QUALIFIED CHEMICAL ENGINEERS

Key Men in Wartime and Afterwards.

MANY of the finest posts in Britain in Wartime are reserved for Chemical Engineers. The same will be the case when the war is over. The vast technique and experience now being applied to Chemical Technology for war purposes will then be suitably utilised in reconstruction, and in trade and commerce.

Enrol with the T.I.G.B. for A.M.I.Chem.E. Examinations in which home-study Students of The T.I.G.B. have now gained :—

THREE "MACNAB" PRIZES.

including the "MacNab" Prize awarded at the last (1943) Examination.

Write to-day for "The Engineer's Guide to Success"—free, containing the world's widest choice of Engineering Courses—over 200—the Department of Chemical Technology, including Chemical Engineering Processes, Plant Construction, Works Design and Operation, and Organisation and Management—and which alone gives the Regulations for A.M.I.Chem.E., A.M.I.Mech.E., A.M.I.E.E., C. & G., B.Sc., etc.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN,
219 Temple Bar House, London, E.C.4.

FOR SALE

CHARCOAL, ANIMAL, and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—Thos. Hill-Jones, Ltd., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hill-Jones, Bochurch, London." Telephone: 3285 East.

"Phone 98 Staines"

U SHAPE Winget Tipping Mixer 200 lbs. capacity; Jacketted Enclosed Mixer 80 gals. (Vertical) 2 in. Drum Rotary Pump: Several small Tubular Condensers: Dry Vacuum Pump 8 in. Cyl. 9 in. stroke.
HARRY H. GARDAM & CO. LTD., STAINES

3 Six Gallon Jar Pebble Mills, mounted on Steel Frames in batteries of 6 Jars to each. Belt driven. Thompson & Son (Millwall) Ltd., Cuba Street, Millwall, E.14. East 1844.

100 HYDRO EXTRACTORS by leading makers from 18 in. upwards, with Safety Covers. Jacketted Steam Copper and Iron Pans. Calorifiers-Washing Machines—Gilled Pipes, etc. List sent on request. Randalls, Engineers, Barnes. Tel.: Riv. 2436.

1000 STRONG NEW WATERPROOF APRONS. To-day's value 5s. each. Clearing at 30s. dozen. Also large quantity Filter Cloths, cheap. Wilsons, Springfield Mills Preston, Lancs. Phone 2198.

Secondhand
MISCELLANEOUS CHEMICAL PLANT
for sale.

COPPER steam jacketed **STILL** by John Dore, 3 ft. 4 in. on straight by 3 ft. 6 in. dia.; domed cover with copper swan-neck leading to aluminium coil condenser.

Copper lined steam jacketed **PAN**, 4 ft. 0 in. deep by 3 ft. 9 in. dia.; mild steel bolted-on casing: 3 in. bottom run-off.

Vertical steam jacketed riveted mild steel **PAN**, 6 ft. 0 in. deep on straight by 7 ft. 6 in. dia.; 6 ft. 0 in. deep conical portion; 3 in. bottom outlet.

Horizontal cast iron **FILTER PRESS** by Johnson; recessed plates 30 in. square, forming cakes 2 in. thick; pyramid surface; centre feed; individual outlet; hydraulic tensioning gear.

Horizontal **SIFTER** by Gardner, 3 ft. 0 in. long by 1 ft. 4 in. wide; shaker feed; spiral worm fitted to bottom of collecting box; pulley drive.

SOLVENT RECOVERY PLANT by Fraser; mild steel recovery vessel 7 ft. 3 in. high by 3 ft. 3 in. dia., arranged for direct heating; spiral tube condenser in tank 7 ft. 3 in. high by 5 ft. 0 in. dia.; complete with steel supporting structure.

All electric **HYDRO EXTRACTOR** by Pott Cassels & Williams, 400 volts, 3 phase, 50 cycles; removable steel basket 1 ft. 3 in. deep by 3 ft. 6 in. dia.: interlocking cover.

CENTRIFUGE by Sharples, type 5A; electrically driven with tinned bowl, complete with tools, spares, etc.

Three-turn **SPIRAL COPPER COIL**, 1 in. bore piping: inner coil 2 ft. 0 in. dia., intermediate coil 2 ft. 6 in. dia., outer coil 3 ft. 0 in. dia.

Ten mild steel **HOTPLATES**, 5 ft. 0 in. by 5 ft. 9 in.; 1in. cavity, ¾ in. steam connections; recessed rivets giving smooth surface either side.

Vertical unit type **AIR COOLER** by J. & E. Hall; casing 7 ft. 6 in. deep by 3 ft. 0 in. dia.; case containing nest of solid drawn 1½ in. bore N.H.S. piping in four concentric coils.

GEORGE COHEN, SONS & CO., LTD., STANNINGLEY, near LEEDS and WOOD LANE, LONDON, W.12

PATENTS & TRADE MARKS

KING'S PATENT AGENCY, LTD. (B. T. King, A.I.Mech.E., Patent Agent), 146a, Queen Victoria Street, London, E.C.4. ADVICE Handbook, and Consultation free. Phone: City 6161.

SERVICING

GRINDING of every description of chemical and other materials for the trade with improved mills.—Thos. Hill-Jones, Ltd., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill-Jones, Bochurch, London." Telephone: 3285 East

GRINDING, Drying, Screening and Grading of materials undertaken for the trade. Also Suppliers of Ground Silica and Fillers, etc. James Kent, Ltd. Millers, Fenton, Staffordshire. Telegrams: Kenmil, Stoke-on-Trent. Telephone: 4253 and 4254, Stoke-on-Trent (2 lines).

SITUATIONS VACANT

CHEMICAL ENGINEER assistant required by well-known firm of Chemical Engineers in London. Duties include calculation of evaporation, distillation and heat transfer problems, preparation of tenders and general assistance to department manager. Applicants must have B.Sc. or equal in Mechanical or Chemical Engineering and special knowledge of heat transfer. Preferred age over 25 and deferred military service. First hand works experience, essential. Write fully stating age, experience, qualifications, availability for the post, salary required to Box No. 2198, The Chemical Age, 154, Fleet Street, E.C.4.

SITUATIONS VACANT

CHEMICAL ENGINEER (Sales Manager) required by small old-established firm of Chemical Plant manufacturers in London. Duties include creating enquiries, preparing tenders and specifications, working out chemical processes and unit plant designs and getting orders. Applicants must have had experience in operating chemical plant and an intimate knowledge of the more important plants and processes used in the chemical industry. Salary to start around £600, according to qualifications. Preferred age 30 to 40. Excellent opportunity for suitable man. Write fully stating age, experience, qualifications, availability for the post to Box No. 2109, THE CHEMICAL AGE, 154, Fleet Street, E.C.4.

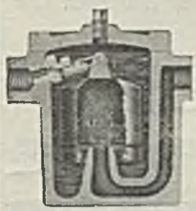
A LANCASHIRE ENGINEERING COMPANY of high repute, manufacturing a specialised line of Chemical Engineering Plant, require the services of a Technical Representative for the London district. Applicants must have initiative and have had a sound technical training in plant design and operation. Appointment offers excellent post-war prospects. Write fully, stating age, past experience and salary required to Box No. 2202, THE CHEMICAL AGE, 154, Fleet Street, E.C.4.

WANTED

WANTED regularly, Residues, Sludge, Slag, etc., containing Antimony, Cadmium, Copper, Lead, Nickel and Zinc. Oakland Metal Company Ltd., Willington, Derby.

WANTED.—Supplies of Nitre Cake in ten-ton lots. Box No. 2126, THE CHEMICAL AGE, 154, Fleet Street, E.C.4.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.



Printed in Great Britain by THE PRESS AT COOMBELANDS, London and Addlestone, and published by BENN BROTHERS, LTD., at Bouverie House, 154, Fleet Street, E.C.4, March 3rd, 1945. Entered as Second Class Matter at the New York, U.S.A., Post Office.