The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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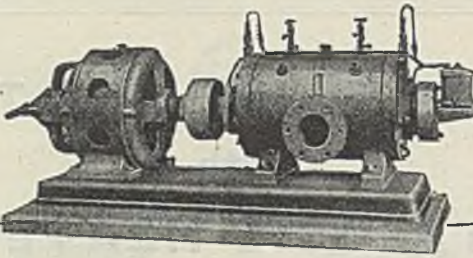

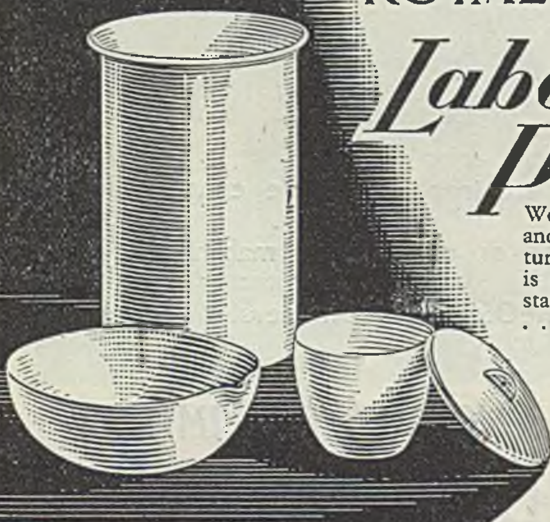

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Technology: Theory or Practice?

EMPHASIS has been given to the need for some better system of technical education in Britain—the theme of the Percy report, commented upon in our pages last week—by Dr. T. J. Drakeley, who recently expounded his views on the subject to the British Association of Chemists. Dr. Drakeley is among the many who believe that we certainly do *not* have at present an adequate standard of technical education in this country.

Would it be right to suggest that education is something a little foreign to the British mind? From the earliest days in industry until the industrial revolution had got well under way, there was virtually no technical education as such in this or any other country. The young man was apprenticed to his trade and he learnt it by watching the skilled master at work.

Even to-day, the apprenticeship system has not wholly disappeared. Thus Mr. J. R. W. Alexander, writing in the *Journal of Careers* shortly before the war, mentioned the recruitment to the gas industry of boys of 16-18 years of age who would be accepted as apprentices in gas engineering or gas chemistry; as such, "apprentices are given the widest possible experience commensurate with their abilities. They may pass from the chemical laboratory to a position on the chemical staff. And as carbonisation is as much a chemical as a mechanical process, they are equally well equipped to become works chemists or works engineers." This practical method of obtaining instruction seems peculiarly suited to the British character, though it is only fair to say that an adequate proportion of our young people are sufficiently well imbued with a desire for knowledge as such to attend classes in technical colleges and universities from which the theory as well as the practice may be taught.

Dr. Drakeley believes that we are securing a decreasing share in the world's trade, and that for a century we have been too prone to introduce foreign plant into this country instead of developing our own. He puts this down to lack of technical education. He points out that the decline of the chemical and colour industries in the middle of the 19th century was not due to inadequate patent laws, to the heavy duty on ethyl alcohol, or to the shortage of heavy chemicals. Neither was it due to anything fundamentally wrong

On Other Pages

with the personal characteristics of the British. There were many fields, such as that of coke and by-products manufacture, in which after being pioneers we became dependent on the foreigner for design and development. He maintains that although we conduct adequate research in this country, the one thing lacking is the fact that our industries "are suffering from rigidity of outlook." Not only is research essential, "but also the personnel capable of seizing the opportunities afforded by research."

"In 1922," said Dr. Drakeley, "95 per cent. of the moulded rubber goods produced in America contained accelerators, yet at that time the view was tenaciously held in this country that the use of accelerators was unsound and would disappear from works practice, and this in spite of the fact that they had stood the test of time in the chief rubber-consuming countries. The rubber industry then was in the same backward condition as our cotton industry is now. In fact, the decline has been widespread, and cannot be attributed to exchanges, tariffs, dumping, subsidies, etc., damaging though these may have been. The special reason which has been more disastrous to the U.K. than to other countries is our rigidity, our lack of nimbleness in surmounting obstacles. We must have courage to scrap obsolete plant and skill to adopt new inventions."

In Dr. Drakeley's opinion the solution to this problem must be found in the countries which have challenged our former supremacy in world markets. Our competitors possess not a personal superiority, but a recognised system of technical education extending up to university degrees in technical subjects. The functions of university and technical university are more clearly delineated on the Continent than in this country. Our universities provide technical courses, *e.g.*, engineering. The Continental university has only four faculties: theology, law, medicine, and philosophy. The technical universities or technical high schools are important institutions, sometimes overshadowing the local university, which provide courses in the major branches of technology. Both are State-maintained and self-governing. The technical university undertakes undergraduate and post-graduate work of industrial character and awards degrees. It is in no way inferior to the academic university.

This is a point of view which requires careful consideration and that consideration cannot be given solely by any one individual. Education is a highly individual business. Some react to one treatment, some to another. There are those, for example, who are adequately equipped for industrial life if they have a sound knowledge of scientific principles. Armed with this knowledge they can apply their minds to industrial problems and deduce from scientific principles the correct solution. Such a one will maintain that the study of pure science is the best possible preparation for industrial life. There are others again who find it difficult to apply the principles of pure science to the every-day work of industry. These people are the practical folk who will always learn better by application of the apprenticeship system than by any training in pure science. Dr. Drakeley evidently finds that the majority of his students belong to this latter category because he deplores the tendency to lay stress on scientific principles rather than facts, since unless the facts are provided the principles are left without sound foundation. He points out that the rubber industry depends on the reaction between sulphur and rubber, discovered by Hancock, who wrote that no chemical knowledge would have anticipated it. The basic problem of this reaction remains to be solved. Many other instances exist of processes dependent on chance discoveries. This shows the inadequacy of the auxiliary science without the technology. On many occasions, says Dr. Drakeley, we have had to call in foreign specialists because we had trained none of our own, and as a result we had to purchase foreign machinery.

It is a nice problem whether we should train our future technologists in scientific principles, leaving them to pick up their practical knowledge in the works; or whether we should give them the immediate and purely scientific training with the maximum of technical training. We leave that problem to our readers to think over.

NOTES AND COMMENTS

Export of Chemicals

THE fact that the American *Journal of Commerce* from time to time devotes a special supplement to the affairs of that country's chemical industry shows that the industry's importance to the economic life of the nation is fully understood across the Atlantic. In this country, quite apart from the shortage of newsprint, the chemical industry is unwarrantably handicapped by the fact that it is still considered a "new" industry. Yet it is precisely the sector of relatively new industries—with a high proportion of research and skilled labour—which will have to make an increasing contribution both to domestic reconstruction and to the revival and promotion of British exports. As regards the latter, the American chemical industry is determined, as an article in the above-mentioned supplement shows, to maintain its present position as the world's chief supplier of chemicals and related products. Although American observers readily admit that it is improbable that last year's level of exports, totalling $500,000,000, will be maintained, they nevertheless anticipate substantial exports, especially of dyes and organic chemicals, as well as of pharmaceuticals, with penicillin holding pride of place.

Home Market Demands

LET no British reader assume that America's chemical publicists were guided by wishful thinking when they arrived at the conclusion that the U.S. will remain the main supplier of a number of important markets. On the contrary, they have realised that the war has brought about an industrialisation of many countries that formerly relied entirely on imports, and that many Governments will wish to retain plants, even on an uneconomic basis, for strategic reasons. Furthermore, the fact is not being overlooked that many American manufacturers will again turn to the vast home market, the satisfaction of which may require less effort than the building up of foreign trade. In addition, the large domestic resources of the United States render her self-sufficient in many basic chemical raw materials, thus leaving little room for imports without which (as commentators on the American side of the Atlantic often like to overlook) exports cease, once the most urgent needs have been met. Despite all this, potential demand in many parts of the world is likely to necessitate a steady stream of imported chemicals, especially with Germany out of the running. In particular, demand for American dyes is certain to be large. Germany controlled 53 per cent. of international market in dyestuffs, while Japan dominated about 10 per cent. of the Asiatic market. As a result of the elimination of the Axis countries world production is likely to be inadequate for some years ahead, and an acceleration of U.S. shipments may therefore be expected.

Cut-Price Offers

AN example of the American policy of furthering exports at almost any cost has reached us from a Swiss source. Swiss chemicals and pharmaceuticals enjoyed practically a monopoly in the Turkish market, replacing German and Italian supplies, a development which was accentuated by the tension still existing between the Sterling area and Turkey. However, it is reported that American suppliers have submitted offers at pre-war prices, and sometimes substantially below that level, leading to the cancellation of contracts with Swiss firms. For instance, potassium bichromate has been offered at 26 cents per kg., compared with a pre-war price of 50 cents, owing to the large stocks of this chemical which is typical of many that are now available in the United States as a result of the sudden termination of both war and war contracts. A number of Turkish firms owe balances in the United States, which are to be liquidated by the purchase of chemicals and other commodities.

Science on View

CONSIDERING that the conversazione held on Wednesday last week by the Royal Society was the first since before the war, it is not to be wondered at that the majority of the demonstrations had to deal with war-like activities. Indeed, it was amazing to see how much scientific ingenuity had been put into the work of destruction and the defence of those engaged in destruction. Not only were there full-scale exhibits of the Comet tank, a human torpedo, and a decompression chamber (which overflowed into the courtyard of Burlington House), but there were also many demonstrations of the effects of fatigue, of light (or its absence), of heat, and of various toxic factors on the human body, together with the various measures taken to counteract deleterious effects. The result of all this was that the "constructive" exhibits were compressed into a rather small space. Nevertheless, the section on X-rays in science, art, and industry, arranged by Sir Lawrence Bragg, with its admirable series of molecular-structure models evolved from diffraction patterns, was most impressive. This section included the remarkable series of exhibits of fibres and fabrics, both natural, regenerated, and artificial, for which Professor Astbury was mainly responsible. Equally effective was the brilliant display of the development of fluorescent lighting, arranged by B.T.-H. Agreeable diversity from the prevailing warlike tone was provided by the series of exhibits illustrating the traditional connection of the Royal Society with men of science of other countries; and the presence of the mace presented by Charles II in 1663 testified to the not inconsiderable antiquity of the Society itself. We came away with the impression that the large and distinguished crowd of guests had had a thoroughly enjoyable evening.

Statesmen on Atomic Energy

THE mere fact that the spokesmen of three great nations such as Britain, the United States, and Canada should have united to suggest specific proposals relating to the control of atomic energy is in itself a great step forward. So far as we are aware, no combined effort was ever made to control the use of high explosive (the original purpose of the chief inventor of which was the improvement of the mining and quarrying industries); the League of Nations never approached so delicate a subject. Hitherto, also, the necessity for the international exchange of basic scientific information, if science is to advance as it should for the benefit of humanity, has not been more than tacitly recognised by the politicians. Thus, whatever the shortcomings of the Washington declaration, it does mark a turning-point in the attitude of the non-scientific world towards the application of science. It is significant that it required the explosion of an atomic bomb to bring about a change in this attitude.

Can Safeguards be Devised?

THE declaration, however, is not without its weak points. Although it has been maintained in authoritative quarters that it will be impossible to maintain secrecy for long concerning the applications of atomic energy, whether to peaceful or to warlike purposes, the signatories express their opinion that it is not yet expedient to spread "specialised information regarding the practical application" until enforceable safeguards are devised which shall be acceptable to all nations. Yet earlier in the declaration it is stated that "no system of safeguards that can be devised which will of itself provide an effective guarantee against production of atomic weapons by a nation bent on aggression." Further, even the worst pessimist has never suggested that the three nations concerned are ever likely to use atomic weapons against one another; and the interesting thing will be to watch the reaction of other nations to the statement. Meanwhile, the White House signatories are to be congratulated on emphasising the necessity for their suggested United Nations Commission on Atomic Energy to submit recommendations "with the utmost dispatch."

The Czechoslovak nationalisation decree, referred to on September 22, has been signed by President Benes. It affects the following industries: coalmining, gas and electricity, iron and steel production, the non-ferrous metal industries, all machinery works with over 500 employees, and plants for the manufacture of acids, fertilisers, motor fuels, rubber, and pharmaceuticals. The cement industry and the mining of kaolin have also been included. Enterprises in a large number of other industries are to be nationalised only if they employed over 400 men in 1938.

Separation of Lignin and Cellulose

Recovery of Methoxy Lignin Chloride

AMONG the papers presented to the tenth Unit Process Symposium last September at the "Meeting-in-Print" of the American Chemical Society (Division of Industrial and Engineering Chemistry) was a series on the separation of lignin and cellulose, by a team of workers at the Polytechnic Institute of Brooklyn (Katzen, Othmer, *et al.*). Abstracts of these are appended.

A process has been developed for the chlorination of wood in methanol at elevated temperatures, which separates up to two-thirds of the lignin from the cellulose in 3 to 5 hours of treatment. A new class of lignin derivatives has been obtained, showing a higher degree of methoxylation and chlorination combined than any similar derivatives previously obtained at lower temperatures. Methoxy lignin chlorides, as the new derivatives will be called, are recovered directly by precipitation from the methanol reaction solution into water. After filtering and drying the residue, ivory to light yellow powdered solids are obtained which are non-hygroscopic, insoluble in water, but soluble in a number of organic solvents in addition to methanol. Maple wood yields methoxy lignin chloride containing about 21 per cent. methoxyl and about 28 per cent. chlorine.

Preliminary Work

The process is carried out simply by suspending sawdust in methanol, raising the solvent to the boiling point at atmospheric pressure, and then bubbling in chlorine gas with provision for suitable agitation. Reaction is completed for all practical purposes after the wood has passed through a series of colour changes ranging from yellow to dark grey or purple and finally to light yellow. In the last stage, delignification is sufficient to permit visual observation of separation and swelling of cellulose fibres.

It is noteworthy that the presence or absence of small amounts of water does not appreciably affect the course of the reaction. Neither is there interference from the presence of extractives normally present in maple wood. In fact, it is indicated that the extractives yield a product very much like methoxy lignin chloride. The reaction is retarded somewhat when larger particles of wood are used.

Initial experiments on purification of the crude cellulose separated from the methanol solution of methoxy lignin chloride show that boiling with dilute alkali solutions will remove most of the remaining ligneous material. Following this, an alkaline bleach yields white hydrated pulp. Alpha-cellulose content of the purified pulp is low, however, indicating that there is considerable effect of the original methanol chlorination treatment on the crude pulp.

Process Variables

Extension of the methanol chlorination to a variety of hardwoods, softwoods, and bagasse proves that the process is applicable with few limitations to raw materials of quite differing characteristics.

Methoxy lignin clorides obtained, though similar in physical characteristics, varied from 16.2 to 24.6 per cent. in methoxyl content, and from 23.4 to 32.9 per cent. in chlorine content. Omitting results from three of the twelve wood species tested (namely, yellow pine, sugar pine, and redwood), the variations are reduced to only 19.6 to 22 per cent. for methoxy and 25.9 to 29.7 per cent. for chlorine in the other nine wood species and bagasse.

A study of the effect of the high extractives content in redwood on the methoxy lignin chloride obtained, showed that a considerable portion of the former material was methoxylated and chlorinated to yield a product recovered in the same manner as methoxy lignin chloride, and having physical and chemical properties of a like nature and magnitude. It was also noted that the extractives exerted some protective influence on the cellulose in the wood, reducing the amount of degradation caused by the acidic reaction system.

Effects of Moisture

A series of studies of the effect of moisture in the methanol chlorination system indicated that moisture, when present in appreciable quantities, can be a critical factor in this new delignification process. Although the presence of moisture is not essential to the reaction, increasing amounts in the system gradually convert the methoxy lignin chloride product from a highly methoxylated material to a demethoxylated derivative of inferior physical properties. It is likely that moisture creates conditions for an oxidative reaction when chlorine acts on the lignin. The methanol chlorination and oxidative chlorination reactions may occur simultaneously.

It was also noted that moisture in excessive amounts reduced the degree of delignification for a given reaction time, and increased the degradation of the crude cellulose. Reaction time in the methanol chlorination process is increased with length of wood particles, as is common in other delignification processes. This is probably a diffusion limitation.

Development of semi-pilot-plant operation was limited to glass equipment because of material restrictions and corrosion problems. Gradual evolution of the semi-pilot plant from batch operations to countercurrent continuous operation resulted in reduction of the time of reaction to about 1 hour at 55°-60°C. The time of reaction varies in inverse proportion to temperature, indicating that operation at elevated pressures and corresponding temperatures would be desirable in this process.

Methoxy lignin chlorides obtained by the new process have shown interesting physical and chemical properties. A further study of solubility characteristics has been made for redwood methoxy lignin chloride. In addition, observation of melting points and thermal decomposition indicated that the product as recovered is potentially unstable, although samples have been stored without change at room temperature for more than three years.

Methoxy Lignin Resins

The light colour and relative instability of the methoxy lignin chlorides indicated the desirability of converting them to resinous form. Preliminary work on a series of condensations, resulting in ester formations of resinous and oily types, led to further and more extensive experiment on the formation of methoxy lignin chloride phthalates. The resin fractions exhibiting methanol insolubility have been of greatest interest, and analytical data have been obtained for these materials.

Resinification is carried on in methanol, in an atmosphere of chlorine. It is indicated that in addition to condensation with the phthalate radical, more methoxy groups may be added. Increase in melting ranges with increased proportions of methoxy lignine chloride to phthalic anhydride used as reactants, indicates the propensity of the former component to form cross linkages, resulting in greater resin molecule complexity. Nevertheless, the resins obtained are more thermoplastic than thermosetting in nature.

Observations in a run in which methoxy lignin chloride alone was treated as a control led to experiments on catalytic polycondensation without addition of extraneous materials. Methanol-insoluble resins obtained in this manner were even more promising than the esters. Where the latter were subject to moisture absorption in film form, and to thermal decomposition at elevated temperatures of about 150°C., the polycondensation products were quite moisture-resistant, and heat-resistant at temperatures as high as 200°C. Resin films of both types were transparent, yellow in colour, and adhered well to glass and tinned surfaces. Sections of solid resins up to ¼ in. in thickness still exhibited the same colour and transparency.

Analyses of Hydrocarbons

Mass Spectrometric Method

ANALYSES of complex hydrocarbon mixtures can be made on the mass spectrometer with high precision, as is explained by A. Keith Brewer and V. H. Dibler in the August issue of *Journal of Research*. The basis for the analyses lies in two parenthetic facts: first, that molecules of all hydrocarbons, when bombarded by 50 to 100-volt electrons, are not only ionised, but are broken down; and second, that while the appearance ratios of these fragments is always the same for a given hydrocarbon, the ratios are never the same for different hydrocarbons.

A mass spectrometer record for any hydrocarbon consists of a series of peaks, the heaviest being for that of the normal molecule, while the rest of the peaks are for the various possible fragments resulting from a loss of hydrogen atoms or carbon atom groups. The mass spectrometer record for a mixture of hydrocarbons is the sum of the peaks for the various constituents, wherein each contributes in exact proportion to the amount present in the mixture. The analysis of such a composite record consists in subtracting the contributions of each possible constituent. Mixtures containing over twenty compounds have been precisely analysed at the National Bureau of Standards.

The reproducibility between individual analyses is high. Almost invariably independent analyses will agree to within a few tenths to a few thousandths of 1 per cent. for the concentration of each component. The absolute accuracy, however, may or may not be as great as the reproducibility. While it is dependent on the reproducibility, it is also dependent on the purity of the materials used for calibration, and on a number of other factors, which are not necessarily constant. In test analyses, where the composition of the sample is known, the precision has been found to agree to within the limits of uncertainty in the sample. The mass spectrometer uses about 0.01 ml. of gas during an analysis, and though the smallness of sample required is often of great help, it does introduce a complication in the taking of representative samples. Indeed, it is often evident that the reproducibility of the instrument is limited materially by non-uniformities in the sample.

A substance to prevent bread from getting mouldy has been discovered in the Berlin Laboratory for Grain Utilisation, reports the *Luebecker Nachrichtenblatt*. Bread inoculated with this substance can be eaten after three months.

India's Heavy Chemical Industry

Its Development and Future

by L. GUPTA*

THE development of a heavy chemical industry in India started with the erection of the first sulphuric acid plant of D. Waldie in Konnagar, near Calcutta, about 50 years ago. It was then considered a model plant, but judged from modern standards, it was child's play. With the manufacture of sulphuric acid, other acids, such as nitric acid and hydrochloric acid, were also produced. It was a good beginning, and the products of the then only chemical factory in India were distributed far and wide in spite of high transport charges. Nevertheless, imports met the demands of the country as a whole. The requirements of acids and chemicals in those days were very small, as there were no basic industries. The following decade saw the rise of the textile, steel and galvanising industries, followed by public services.

The late eminent scientist, Sir P. C. Rây, was the first Indian to realise how important a rôle the chemical industry played in industrial development and he, with a band of young scientific workers, started the B.C.P.W. These young men devoted themselves heart and soul to the growth of this industry. The hard struggle that followed has been narrated in an excellent manner in his autobiography.

The net result of this all-round development was the slow but steady demand for acids and chemicals in different parts of India. However, it is a matter of importance to note that the majority of those who controlled the industry did not possess much scientific knowledge. The business was conducted by rule-of-thumb methods. One by one, acid plants were established in other provinces, the result being that, with the manufacture of mineral acids, such other auxiliary products of sulphuric acid as alum, potash, aluminium sulphate, magnesium sulphate, sulphates of iron and copper, etc., came into production. These products could not, however, replace imports which continued to pay a large part in the country's chemical industry.

The Impetus of War

The 1914-18 war gave the first impetus to the growth of the heavy chemical industry in India. Great interests were created in its development and a better type of people, with greater finance at their command, were attracted by it. Investments began to flow in—both from India and European quarters.

The state of things just after the last war was characterised by the existence of about a dozen acid plants, producing about 20,000 tons of sulphuric acid and 200/300 tons of nitric acid and hydrochloric acid, and 4000/5000 tons of other salts, mainly sulphates, per annum. Of these plants, only four or five were properly equipped and based on scientific production methods, and they also introduced imported chemical plant, and engaged foreign experts as well as local personnel. These chemical factories were distributed in different parts of the country—the Cawnpore Chemical Works, Cawnpore, U.P., the Eastern Chemical & Dharannsi Morarji Chemical Company, Bombay, Shambhu Nath & Sons, Punjab, and others. The growth of the Tata Iron Works at Jamshedpur was stupendous. The coke-oven plants introduced the recovery of ammonia, and thus a well-equipped sulphuric acid and sulphate of ammonia plant came into existence. This can be regarded as a new era in the development of the heavy chemical industry in India.

A Sudden Setback

The inflation which followed the last war brought about a sudden setback; surplus imports were dumped on the Indian market and great chaos was created, the result being that the industry had to struggle for its existence against both foreign and domestic competition. Some of the small factories were closed and the larger ones appealed to the Government of India for protection. By this time, the question of the protection of the steel industry and of the magnesium chloride industry was favourably considered by the Tariff Board. The Board next considered the protection of the heavy chemical industry in 1928. The findings of the Board in this case were also favourable, and although the expected protection was not given, the enhancement of import duties gave the industry a partial relief. The chemicals protected were sulphate of copper and iron, aluminium, magnesium and alum, soda sulphide, zinc chloride and alum, The locally produced commercial mineral acids were supplying the requirements of the country and it was found that these acids required no individual enhancement by protective duties. Only at port towns, concentrated nitric acid was brought in from Germany, but these imports also stopped by 1930.

From then onwards, more acid plants were brought into existence and the export of gold from India gave the acid industry another occasion for a forward march. Some

* Member of the Delegation of the Indian Chemical Manufacturers' Association.

of the smaller units were modernised, while other plant was enlarged.

It has to be realised that there has never been a planning of the chemical industry in India and the Government of the country has not been sympathetic towards this development. The serious inefficiencies which have been prevailing right from the beginning continued, and are still being continued. There is no standard unit plant and no economic production. Consequently, production costs are naturally higher than in other countries.

From 1920 until the beginning of the late war, the industry progressed very slowly because it had no definite aim. In spite of the severe internal competition, most of the factories made profits. However, the people were fully conscious of the state of affairs. By 1938, India had about two dozen acid plants, big and small, including three contact-type sulphuric acid plants, one in Calcutta, one at Mysore, and one at Jamshedpur, exclusive of the Government acid plant at Aravankadu, and the Assam Oil Company's plant at Dighboi. Before the second world war, India produced the following heavy chemicals:

Sulphuric acid	40,000/50,000	tons
Hydrochloric acid	500/700	"
Nitric acid	400/500	"
Sulphate (other than ammonia sulphate)	12,000	"
Magnesium chloride	5000/6000	"
Ammonia sulphate	15,000/20,000	"
Superphosphates	3000/5000	"
Zinc chloride and soda sulphide	Small quantities.	
Bichromate	"	"
Barium sulphide	"	"
Miscellaneous salts	about 1000	tons

An important point to remember is that the full productive capacity of the industry was at least 50 per cent. higher.

The Alkali Industry

Tata Chemicals, Ltd., and the Mettur Industrial Corporation began to consider the prospects of the alkali industry from 1936. The latter came into production just about the beginning of the war with caustic soda, chlorine and bleaching powder. Tata's have not so far succeeded in coming into full production. However, attempts were made before to produce soda ash at Dharangadra, but with a chequered history. The Magadi Soda Plant near Calcutta was started in about 1924, but was closed down as there was a price-cutting competition between these soda plants and foreign interests. The only fixed nitrogen plant established in India before this war was at Mysore. The history of the establishment of alkali plant in India would not make pleasant reading. The difficulties put in its way by vested interests were enormous, and the Government of the country cannot be absolved from blame. It was surely no good judgment or sound policy on the part of the Governments of the Punjab and the Government of India to give away the rights to work the wastes of the Khewra Salt Mines to the I.C.I., without at least first giving the opportunity to others or calling for public tenders.

The healthy growth of the sulphuric acid industry in any country is linked up with the establishment of fertilisers, explosives, dyestuffs and rayon industries. India is far behind in fertiliser production, although she is predominantly an agricultural country. The manufacture of explosives is a Government monopoly, and no serious attention has yet been given to rayon or dyestuffs.

The requirements of the main heavy chemicals in India before the late war were, in round figures, as under:

Mineral acids	40,000/50,000	tons
Soda ash...	60,000/70,000	"
Caustic soda	22,000	"
Bleaching powder	10,000	"
Alums	2000/3000	"
Sulphate of alumina (iron free)	3000	"
" " (commercial)	10,000	"
Zinc chloride	2000	"
Bichromates	1500/2000	"
Iron sulphate	500	"
Copper sulphate	2000	"
Soda sulphate (glauber salt) ...	2000	"
Silicate of soda	3000	"
Salt cake	8000	"
Soda sulphide	15,000/20,000	"
Calcium carbide	2000/2500	"
Ammonia sulphate	120,000	"
Superphosphates	10,000/12,000	"
Hyposulphite of soda	500	"
Hydrosulphite	3000/4000	"
Bisulphates and sulphites ...	300	"
Magnesium sulphate	3000/4000	"
Magnesium chloride	2000/3000	"
Other salts, *e.g.*, Barium sulphide, Barium nitrate, White lead, Red lead, Lead acetate, Zinc oxide	3000/4000	"
Lithopone	2500	"

It will be seen from the above Table, that when this war broke out, India depended for the supply of many industrial chemicals on foreign imports. The demand for some of these increased owing to war requirements, especially acids, bichromates, soda sulphide, zinc chloride, alkalis, and bleaching powder. Those who are "in the know" will bear me out how helpless we were in many respects. Some of the immediate demands were met by local efforts, such as the increased production of acids, bichromates and chromates, chromic acid, soda sulphide, zinc chloride, hyposulphite and bisulphites, but quite a number had still to be imported from the U.K. and the U.S.A.

At this stage, the industry could not be left to its own resources, and the Government of India introduced special legislation to control production and distribution of a number of the above-mentioned products. These control orders were no doubt warranted, but they were ill-conceived and inefficiently managed. The manufacturers felt that, had they been taken into greater confidence, and planned assistance rendered to them, the industry, as a whole, would have risen to meet the abnormal situation and made far worthier contributions to the war and to civil requirements. It was naturally felt that all the measures adopted by the Government were for war exigencies only and not intended for the future development of the industry.

The situation was made worse by lack of proper transport and supply of essential raw materials. The position of both skilled and unskilled labour was also precarious, due to diversions to war services. The net result was that production costs of all acids and chemicals increased by 200-300 per cent., and black markets were created. E.P.T. and other control measures, particularly the check on the issue of capital—in the opinion of the delegation—worked as a great hindrance in the path of development of the heavy chemical industry of India.

The creation of the Bureau of Scientific and Industrial Research and other committees, which were set up by the Government of India and provincial Governments, might have been timely measures, but they could not contribute anything substantial to the industry. It is also considered by the delegation that the newly-formed Department of Planning and Development is not proceeding in the right direction.

The heavy chemical industry in India is still in its infancy. Careful handling is required, if development is to be carried out in the best interests of the country. Both the Government and the people have their parts to play. The chemical delegation believes that, for a successful achievement, help and co-operation from other advanced countries is a necessity. The delegation considers that much could be achieved by mutual trust and understanding.

National Chemical Laboratory for India

Details of the Final Scheme

AFTER careful consideration of the suggestions received from many scientific organisations in India and elsewhere, and bearing in mind the lines along which similar laboratories in other countries have been established, and the special needs of India, a final plan for India's National Chemical Laboratory has been formulated, based on the tentative scheme which was first circulated in 1943.

The laboratory will concern itself with developing the means for the application of scientific knowledge to practical problems of human welfare and its work will be largely on lines likely to promote research in industrial chemistry and the chemical utilisation of the raw material resources so as to help the development of the country and its industries.

The work of the National Chemical Laboratory will be divided into seven main divisions: (1) Inorganic Chemistry and Analytical Chemistry; (2) Physical Chemistry and Electro-Chemistry; (3) Chemistry of High Polymers; (4) Organic Chemistry; (5) Biochemistry including Biological Evaluation; (6) Chemical Engineering; (7) Survey and Intelligence.

Site of the Laboratory

Poona, which enjoys a moderate climate all the year round, and is within easy reach of Bombay and her industries, has been selected for the location of the laboratory. A site of 430 acres on a beautiful, breezy and healthy plateau, and in close proximity to educational institutions of the town, has been selected for the laboratory on the Pashan Road.

The staff requirement of the laboratory is summarised as:

1. Scientific staff.	
(a) Director, Heads of Divisions and Research Officers ...	51
(b) Research Assistants	64
2. Administration	42
3. Technical staff for workshops, etc.	35
4. Stores and Laboratory Assistants	86
5. Inferior staff	42
Total ...	320

The total floor space of the main building will be 150,000 sq. ft., with 20,000 sq. ft. for ten auxiliary buildings.

Non-recurring expenditure (cost of land, auxiliary buildings, equipment, etc.) is assessed at Rs. 33,50,000, while recurring expenditure during the first year (salaries, scholarships, maintenance), amounting to Rs. 9,52,520, will be subject to an annual increase of Rs. 50,676 for annual increments in salaries.

A total sum of Rs. 38,90,000 in the form of cash and equipment is expected to be available as detailed below:

Donation from the Tata Organisation	8,30,000
Allocation from Government grant	25,00,000
Value of equipment, etc., of the existing Chemical Laboratory of the C.S.I.R. ...	5,60,000
Total ... Rs.	38,90,000

Copies of the detailed plan are available for scientists and can be obtained by writing to the Secretary, Planning Committee (N.C.L.), c/o Council of Scientific and Industrial Research, Imperial Secretariat, North Block, New Delhi.

Development of Orissa

Scope for a Chemical Industry

A REPORT on the industrial survey of Orissa, carried out by Dr. H. B. Mohanty, has recently been issued. The survey covers all existing industries, and the possibilities for starting new industries have been discussed.

Orissa has not developed industrially as much as the other provinces of India, although she possesses considerable scope for industrial development. For instance, high-grade iron-ore is available near Umarkot in the Koraput district, and somewhat lower grade ore in several small scattered deposits in the Sambalpur district. The Umarkot deposit is far away from coal, but it may be possible to smelt the ore by using charcoal or hydro-electric power, when it becomes available. Secondary production of steel using pig-iron or scrap, production of ferro-manganese and establishment of a re-rolling mill for making structural steels, tools and agricultural implements seem possible.

Heavy Chemicals

The heavy chemical industry, especially the manufacture of salt and salt-products, such as alkalis, soda ash, sodium hydroxide and bleaching powder, has great possibilities in Orissa. Fine chemicals based on coal or wood distillation products can be established in the province. The Rampur coal is rich in volatile matter and quite suitable for distillation purposes. Pharmaceuticals, such as strychnine from nux-vomica, agar-agar from Chilka weeds, and shark liver oil, can also be manufactured. A sulphuric acid plant should be set up for the manufacture of alums and bichromates. Rosin oil and scents can be produced on a cottage scale. There is an immediate need for putting up a bone mill, and calcium cyanamide may be prepared, when cheap electric power becomes available, by using the chemical grade limestone available at Kottameta in the Koraput district.

Non-Ferrous Metals

The brass and bell-metal industry which is an important cottage industry, is in urgent need of improvement by introducing labour-saving mechanical devices. Manganese is the only non-ferrous metal available, chiefly at Kutingi in the Koraput district. The deposit is easily accessible and can be exploited for export. But it would be desirable to utilise it in the Province itself in the chemical and glass industries and in the production of ferro-manganese.

Among natural plastics available are shellac and resin, which are exported. Shellac could be made into furniture polish and insulating varnish, and the use of resin in paper manufacture needs investigation. There seems to be vast scope for making glues from waste animal matter.

There is one glass factory at Barang, and another factory is under construction at Mancheswar. The production of soda ash, for which possibilities exist in the Province, will greatly help the glass industry. There are vast possibilities for making fireclay refractories, stoneware and porcelainware in Orissa; and tile-making could be introduced on a large scale. The manufacture of graphite refractories, lubricants and other products can be taken up in collaboration with the Patna and Kalahandi States, by putting up a flotation plant at a central place for purifying the graphite ores obtained from these areas. The possibility of developing a cement industry in the Sambalpur district, by utilising the huge limestone deposits at Dungri seems to be bright.

Since the above was written, a conference of representatives of the Government of India and provincial governments, meeting at Cuttack, has decided that a survey of the rivers of Orissa should be undertaken, with a view to their conservation and the ultimate provision of electric power. Dr. Ambedkar, who addressed the conference, stated that enough water flowed in a year through Orissa rivers to fill the Great Boulder Dam three times; the key to the prosperity of the province lay in the storage of this great wealth of water, which now ran to the sea as a destructive waste.

The future of the mica industry in Ceylon is reported to be not very promising as no steps have been taken to find new markets in view of the Government's export embargo, imposed to conserve supplies for Allied use.

The discovery of a new species of mica was recently announced. It will be known as "mahadevite," after its discoverer, Prof. Mahadeven; it has physical properties quite different from those of existing known species. It contains more magnesia than moscovite species, more alumina than phlogophite, and less iron than biotite.

The British Government has invited a representative from Ceylon to inspect the graphite industry in Bavaria. The Ceylon Plumbago Advisory Board discussed the matter and decided that a Ceylon Government representative and a representative from the plumbago industry should proceed on this mission and submit a report. It is stated that the industry in Bavaria is intact.

Reports on German Chemical Works

Second List Available

SUPPLEMENTARY to the article in our issue of October 27 (p. 392), a further list of reports on German chemical works has now become available. As before, appointments to examine these reports can be made with the Association of British Chemical Manufacturers (Mrs. Consitt) at 166 Piccadilly, London, W.1. The position regarding their reproduction by H.M.S.O. is still uncertain, and at present only one copy is available for inspection, though in most instances copies can be reproduced for supply to members. The caveat regarding patent protection still holds good. A list of titles, with abbreviated contents, of this second batch of reports follows

XXII—19. *I.G., Leuna.*—Luran, triethanolamine; glycerine substitute; phosgene; oxidation of hydrocarbons; soap substitute; aldehydes; fatty acids; synthesis of benzene; alanine; aliphatic amines; adipic acid; resin.

XXII—20. *I.G., Bunawerke, Schkopau.*—Formaldehyde; acetylene, ethylene; styrene; polystyrene; acetone and acetaldehyde; acetic acid; aldol; Nekal BX; butadiene; Buna; chlorine and caustic; glycol; hydrochloric acid; vinyl chloride and polyvinyl chloride; lubricating oil; tetrachloroethane; trichloroethylene; dichloroethylene. $CH_2 = CCl_2$; other chloro-compounds; aluminium chloride; butinediol and tetrahydrofurane; naphthalene derivatives. Appendix on plant capacity, stocks, etc.

XXII—21. *Chemische Werke, Hüls* (Synthetic Rubber Plant).—Production of carbon black; production and purification of acetylene, acetaldehyde; aldol; butylene; butadiene; ethylbenzene; styrene. Production and distillation of benzene. Production of Buna polymers. Summary of bomb damage, production (butadiene, styrene, Buna), costs, etc. Total German rubber production.

XXII—22. *Buna Werke, Schkopau A.G.* (Synthetic Rubber Plant).—German synthetic rubber plant capacities. Manufacture of monomers; ethylbenzene; styrene; butadiene. Production of Buna polymers. Proposed manufacture of Koresin.

XXIII—20. *I.G., Leverkusen and Elberfeld.*—Manufacture of insecticides, etc. Lauseto old; other DDT types; Gix; Me 1700; Lauseto new; D1210 Bladan; Lucex; mosquito repellent 50/181; rodenticides; Eulan (moth repellent).

XXIV—11. *Zellstoff-fabrik, Haldof.*—Manufacture of Torula food yeast. Location of affiliated plants.

XXV—48. *Henkel and Cie A.G., Düsseldorf.*—Washing powders and other products for laundry and similar uses; industrial detergents; glues from vegetable bases only; sodium silicate; glycerine; sodium perborate. Manufacture of sodium perborate and of synthetic glue.

XXVI—2. *I.G., Höchst.*—Igepons; Igepals. Detergents of the alkyl-aryl-sulphonate type. Emulsifying agents and detergents from Fischer-Tropsch oils. Emulsifiers from Mersol. Dismulgans.

XXVI—63. *Röhm and Haas, Darmstadt.*—Pharmaceuticals; leather assistants and tanning agents; textile assistants; washing compositions; plastics.

XXVII—4. *I.G., Höchst.*—Insecticides; Hö 2474 or Gix; use of Gix against the ox warble; Nirosan; Dizan; Caterpillar Glue (*Raupenleim*). Fungicides: "2317W"; Brassicol and Tritisan-5; Bulbosan; Brassisan.

XXVII—39. *I.G., Uerdigen.*—Lacquers and paints; glues.

XXVII—48. *Chemische Werke Albert, Pharma, G.m.b.H., Mainz; Kolle and Co., A.G., Biebrich; Dr. Philo and Co., Mainz.*—Pharmaceutical products; Recresal (mixture of sodium phosphates); Lubrokal (KBr luminal); Neo-Lubrokal (KBr luminal (tetrahydro-*p*-oxazino) methyl phenyl ketone); Xylidrin, and Hæmo-xylidrin preparations (mixture of synthetic β, β'-diphenyl-β-hydroxyethylamines); Turgasept (one of the synthetic β, β'-diphenyl-β-hydroxethylamines); Eukliman (mixture of herb extracts with nitro-glycerine); Carbarom (medical charcoal with aluminium hydrosilicates); Albertstine (an antiphlogistic agent); Cholagutt (mixture of herb extracts); Vutox (aqueous solution of xylidrin).

XXVII—55. *Ges. für Linde's Eismachinen, Hollriegelskreuth.*—The Linde-Frankl Process. Separation of gases other than air by low-temperature Linde processes; hydrogen-nitrogen for ammonia production; separation of hydrocarbon mixtures.

XXVII—80. *I.G., Uerdingen.*—Inorganic and organic products with details of manufacture.

XXVII—83. *A.G. für Stickstoffdünger, Knapsack.*—Manufactured products; raw materials, services, and operations.

XXVII—85. *I.G., Ludwigshafen and Oppau.*—Miscellaneous chemicals: Chlorine; aluminium chloride; sodium hydrosulphite; calcium carbide and acetylene generation; hydrochloric acid; iron and nickel carbonyl. Monomers and Polymers. Tanning agents (Tanigans). Ethylene, ethylene oxide and glycols. Miscellaneous organic chemicals.

XXVIII—19. *Food Chemistry Institute*

Frankfurt-am-Main.—Vitamin studies; antioxidants; studies on arsenic, on alkaloids, and on sulphur compounds in vegetables; researches on food.

XXVIII—40. *Union Rheinischen Braunkohle Kraftstoff A.G., Wesseling.*—High-pressure hydrogenation plant, especially for brown coals. DHD Plant as proposed for Wesseling; alkylate (AT-244) plant built but not operated. Schematic drawings of the Pintsch-Hillebrand water-gas generator. Early laboratory tests on Rhenish brown coals for determining their suitability for high-pressure hydrogenation. Photographs and list of documents seized at the Wesseling plant. Contents of a document of unknown origin found at Wesseling and relating to the technology of metal alcoholates.

[Note.—Copies of the two following reports will *not* be reproduced for supply to members.]

XXVII—81. *J. Riedel-E. de Haen A.G., Seelze.*—Chemical warfare; production of chloracetophenone; production of solid smoke munitions.

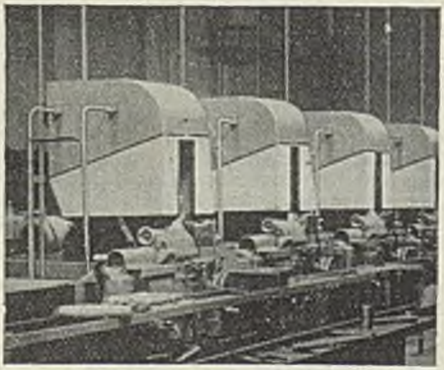
XXVIII—1. *Continuous and Staple Fibre Plants of Germany.*—Survey of the industry: acetone, cuprammonium, viscose, synthetic fibres, equipment. Description of individual plants and processes.

Oil Spray Collection

Treatment of Thread-Grinding Machines

ONE of the most important factories working on thread grinding during the war was seriously inconvenienced by oil spray and vapour given off during thread-grinding processes on eight machines. Bus-bars, plug-in boxes, etc., became a source of danger, the whole building (including works offices) being subjected to a penetrating mist of oil; and finally the Factory Inspector insisted on the adoption of suitable preventative measures as the employees were working under adverse health conditions.

The problem was put up to Dallow Lambert & Co., Ltd., of Leicester, as specialists on fan equipment; and their approach to the subject was that if the oil could be extracted from the atmosphere the remaining smoke still resultant from the cutting operation could be adequately dealt with by normal ventilation means. It should be mentioned that general mechanical ventilation had been attempted without alleviating conditions inside the building to any appreciable extent. Indeed, it caused further trouble by creating an oil deposit on the roof and on passers-by in the adjoining road.



Oil-spray collection units mounted over machines

A simple, yet highly efficient individual unit powered by a ¼ h.p. motor was designed for each machine. As the photograph shows, these units were supported above the machine, the operator still having complete access for working. Special impingement type filters were used in the unit, the resulting precipitant draining back into the oil tank of the machine. After taking careful and accurate tests, the engineer at the M.A.P. factory concerned was able to pass the following information on to the makers:

"After running the unit for one or two days satisfactorily clean new filters were weighed, inserted in the unit and left under working conditions for one hour, after which, with reasonable care to prevent spillage, they were removed and weighed again, showing a resultant increase in weight of 5 oz. It is not unreasonable to allow a further ounce to cover spillage or dripping back into the oil tank of the machine during the test, the total reclamation for one hour therefore being 6 oz. The machines are being used a minimum of 52 hours per week and the oil in question equals .055 pints per oz, therefore, oil extracted from atmosphere per week per machine amounted to 2.15 galls.

A check on the oil stores revealed that approximately 2.5 galls. of oil per week are used to top up one machine. When the oil still adhering to finished components, operators' hands, etc., is taken into consideration, the efficiency of the filters would appear to be nearly 100 per cent. It is also recorded that a piece of clean linen was suspended 18 in. above the cleaned air discharge pipe for 24 consecutive working hours and no trace of oil was discernible on the linen at the end of this period."

The above figures appear to prove clearly the economic value of the equipment if only for the actual amount of oil saved, quite apart from the healthier conditions and the resultant cleanliness generally.

LETTERS TO THE EDITOR

The Scientific Civil Service

Sir,—Reorganisation of the Scientific Civil Service as proposed in the recent White Paper (Cmd. 6679) is a matter of national interest and has aroused a lot of discussion in professional circles. The proposals are mainly concerned with the revision of salary scales, as it has been believed by competent observers that the salaries applicable in the Scientific Civil Service were not such as to retain the more outstanding scientists who were recruited. Frequently men of exceptional ability are drawn from the Civil Service by private firms. For example, Dr. H. J. Gough's appointment to a key position with Unilever proves that enlightened private enterprise does not accept the all-too-common conception of the scientist in the Civil Service as a man who, whatever his natural abilities, develops into an official hidebound by tradition and incapable of initiative and drive.

While temporary recruitment into the Civil Service of men and women from various industries, from the universities and colleges, and from other research institutions did occur to some extent during the war of 1914-18, the scale of recruitment was not in any way comparable with what has occurred during the past six years. In view of the many criticisms of the Civil Service which are voiced from time to time it is reasonable to inquire whether the Scientific Civil Service may be similarly attacked. Little account of the work of this branch appears in the national Press so that even the unprejudiced outsider finds it difficult to form a considered judgment. For a long time the scientists have regarded themselves as the Cinderellas of the Service, the professional Civil Service Association having campaigned unceasingly for increased remuneration and the award of a status parallel to that of the administrative side of the Service. While this exact equality has not been awarded by the White Paper, substantial increases in salary scales have been recommended. The legitimate question arising is whether this increased outlay of the taxpayers' money is warranted. From my experience as a temporary Scientific Civil Servant it has been possible to observe, even if in a very limited field, the work of this branch of the Service, to endorse the proposals for the award of well-earned salary scales, and to attempt to assess the merits of the proposed reorganisation.

Very rightly the Barlow report (included as an appendix to the White Paper) stresses the dangers to which a Government scientific branch is liable in its isolation from the rest of the scientific world. Some of these effects are unavoidable, owing to the nature of a percentage of the work, but the Barlow report emphasises the necessity to reduce this to the absolute minimum and makes some valuable suggestions for the correction of these tendencies. Among the most fruitful ideas propounded is the proposed introduction of a scheme on the lines of a "sabbatical year," under which selected scientific staff would be allowed a period or periods of leave to go to work at a university or other institution at home or abroad at the expense of the department by which they are employed. It is gratifying to note that the White Paper proposes that the new Interdepartmental Scientific Panel should be asked as one of its first tasks to consider how the Barlow proposals for the elimination of the "isolationist" tendencies may be implemented.

Probably the introduction into Government service of large numbers of scientific staff temporarily released from duties in other spheres will help towards breaking down the "isolationist tendencies" in the permanent service. While not accepting a somewhat common impression of rigidity, fear of overlapping, and strictly regimented conditions of work as obtaining in the Scientific Civil Service, it must be said that these dangers do exist. Sometimes those factors have been the cause of considerable irritation to the new and temporary recruits, many of them familiar only with the comparatively loose and easy arrangements of the universities.

A brief sentence in the Barlow report assumes great importance in any consideration of the future structure of the Scientific Civil Service. The report states "that there should be the closest contact between research and development." This is a lesson and admonition to which great attention should be paid. Government scientific staffs, in common with many others in industry, are liable to overlook the applied nature of much modern research, by far the greatest percentage of which is aimed at the application of scientific data to industrial processes. As close an acquaintance as possible, therefore, with the conditions and limitations imposed by industrial processes is essential. Yet precisely those facilities for the close study of the industrial development of scientific data are sometimes gravely lacking, not only in the Government research establishments but in research centres generally in this country. This provides a striking contrast with American practice where the idea of development and pilot-plant work is so carefully studied. Undoubtedly the pilot plant should be the meeting place of the scientific research worker and the technical man responsible for large-scale production. Frequently a decided gap exists between the two, effective bridging being provided only by adequate pilot-plant work. Too often during the war those of us who were concerned with large-scale production had to apply relatively new processes directly without the testing-out period of the pilot plant. Such happenings are probably inevitable in war, but much greater attention should be paid, in the future, to this vitally important work in Government establishments.

The White Paper does not include any discussion of this aspect of research, and detailed discussion was scarcely to be expected. One factor may, however, be significant. In the White Paper the future of experimental officers is dismissed rather perfunctorily, with very little indication of their functions. Now it may be expected that one of the main functions of the experimental officers would be the development of pilot-plant work. If this view is finally adopted then the salary scales applicable in the White Paper proposals will require revision because, as they stand, they are inadequate to attract men with the best qualifications. According to the new scales proposed the grades specified fall within £150 to £800 per annum. Surely no one will seriously argue that such salaries will attract the desired type of man. Is this new provision a continuation of the outmoded idea that pilot-plant work, should it prove necessary, may be carried out by groups of intelligent schoolboys, to whom working models are an unfailing attraction? While the other proposals of the White Paper may be accepted as reasonably satisfactory, there is an urgent need to face the provision of adequate pilot-plant and development work, together with salaries and conditions appropriate to the programme.

The claim in the White Paper that the Government is deeply conscious of the contribution which science may make during peace to the efficiency of production, to higher standards of living, to improved health and to the means of defence, will only prove valid if the necessary reorganisation of the Scientific Civil Service proceeds with rapidity and vision. Many of the younger scientists and technicians are men with an acute sense of the service which science should render to the community. That so much time and effort should have proved necessary for the job of providing the weapons of war is a matter for real regret. The urgent and inescapable challenge now is to apply the same powers and facilities for the development of the resources of the nation and for the promotion of the national well-being.

In many respects scientific research and development in this country have not kept pace with their progress in the other great industrial nations. If the peace is to be won and atomic forces harnessed for the benefit and not for the destruction of mankind, then all the potentialities and goodwill of the body of scientists recruited by the Government for the prosecution of the war must be retained and exploited. If such a challenge be put forward by the Government it will be quickly taken up by these men. In the White Paper the Government has shown an awareness that the scientists merit financial status commensurate with that of equally qualified men in other walks of life. Granted that these provisions are speedily made effective the response from a large proportion of the scientists is assured.—Yours faithfully,

A Temporary Scientific Civil Servant.

Barytes—White or Off-Colour

Sir,—In his recent address to the British Barytes Producers' Association on election to its chairmanship, Mr. Ian D. Orr made the plea for greater use of off-colour barytes by the architectural and decorative professions, on the grounds that, until the industry is given adequate labour and a fair chance to carry out development and prospecting work, white barytes, as distinct from the off-colour material, would be in short supply.

I should like to state quite definitely, however, that, given the application of modernised techniques, a very large proportion of such off-colour raw material can be cheaply and successfully converted into a pure white fine-ground barytes powder, of exceptional value for the paint and other industrial uses, and for export overseas. Why, therefore, should the paint and other industries at home and abroad, be penalised by having to make extended use of off-colour material? The unfortunate position appears to be that there is no one directly or indirectly associated with the barytes industry who understands the scientific use of modernised techniques. Until this warning is taken seriously, domestic barytes cannot hope for true prosperity, and a valuable national asset must continue to go more or less to waste.

I repeat the suggestion I have often made, that idle barytes mines and areas of promise should be investigated, to begin with, so that those chemical firms owning barytes mines which contain varying proportions of off-colour or white-looking barytes suitable for economical conversion into the more valuable prime white powder, might not thereby go short for their own needs. There are, however, a number of mines, either in actual production or in a state of extended development, which should receive early attention also.

The chief essentials must always be:

(1) The classification of the barytes lodes in accordance with the processing and marketing standpoints—a highly specialised job

(2) Works to be erected centrally to draw supplies of ore from approved groups of mines.

(3) The ore suitable for the economical production of a prime white powder to be

retained for that purpose; the remainder, with or without prior treatment, reserved for the chemical and other industrial uses, including some off-colour ground barytes.

(4) Provided my suggestions be adopted and the work conducted under my direction, powerful financial support will be accorded to the barytes industry in order to give full force to my recommendations.

Again, Mr. Orr foreshadows the coming of an ample supply of white barytes. Unfortunately, treatment methods practised to-day cannot produce, and never have produced, a really prime white powder at economic cost in bulk supply, much less of a quality comparable with the best pre-war German exports.

If the domestic barytes industry is to be saved plants must not be installed to operate upon old and discarded lines. Any companies so doing will expend their capital fruitlessly and thus deprive themselves of the ability to scrap and replace with the correct lay-out.—Yours faithfully,

Walter H. Reynolds.

Litmus Manufacture in Britain

Imports Replaced

An interesting booklet has just been issued by Johnson and Sons (Manufacturing Chemists), Ltd., Hendon Way, London, N.W.4, describing the manufacture, in this country, of litmus and indicator papers. Before the war, litmus had been imported almost exclusively from Holland. After Germany had invaded Holland in May, 1940, it became essential to take up the manufacture of litmus in this country. Investigations were at first delayed by the need to concentrate on the production of certain staple products, which were then in great demand for photographic purposes, but steps had to be taken when the position became more acute by the middle of 1941, and stocks of litmus were running out.

Much help and interesting data had been received by the British Museum, the Royal Botanic Gardens and others, regarding the possibility of litmus-bearing lichens from Cornwall or Scotland, but labour shortages, the high cost of collection, and the low litmus content of domestic lichens were serious obstacles. Inquiries were set afoot in a number of overseas countries, but the most promising tests were those made with a lichen sample provided by the Yorkshire Dyeware and Chemical Co., Ltd.

By February, 1942, when stocks of pre-war litmus had reached a perilously low level in spite of economies in the production of litmus paper, the Yorkshire Dyeware and Chemical Co., Ltd., supplied their stock of lichen and manufacture on a commercial scale began. Future supplies of the raw material were still a matter of concern but investigations by H.M. Consuls resulted in locating a parcel of the right lichen in a European port not closed by war. The first pounds of litmus were ready early in 1943, and the supply for the manufacture of the litmus papers required in this country was definitely assured.

As a result of the inquiries for the lichen which had been broadcast throughout the world, interesting reports of possible sources continued to come from many countries. Samples are still being tested and much information about lichen is being accumulated. This knowledge will not only help in the economic production of litmus, but may lead to the isolation of other dyes and fine chemicals of interest and value.

Before the war the commercial litmus was always supplied in cubes obtained by the admixture of the blue colouring matter with gypsum or calcium carbonate, compression and subsequent drying. Johnson's litmus, however, does not contain these adulterants and needs only extraction with water to produce an indicator solution, suitable for scientific and laboratory use, and is supplied in the form of granules.

The booklet also contains details of 24 varieties of test papers, the *p*H range and the colour changes, as well as particulars of other test books and papers.

Portland Cement

New French Method Reported

It is reported from official French sources that an engineer, M. Dicharry, working under the auspices of the National Federation of Building Trade Workers, has exhibited a "process of Portland cement manufacture," without using coal, invented by himself. Portland cement manufactured by normal methods requires at least one-third of its weight in coal, and it is estimated that French post-war reconstruction schemes will demand over ten million tons of cement per annum. If M. Dicharry's claims are substantiated, France will realise an economy of 3,000,000 tons of coal a year; and, moreover, the cost price of the cement is lowered by 50 per cent.

The new process involves the usage of all the calcareous or argillaceous waste thrown out at the mines, as well as the soot, dross, and clinker emanating from coal combustion. These waste products, it is stated, play the part of the clays employed in cement production, and any combustible that they may still contain is recovered during manufacture.

M. Dicharry has drafted a programme of "rational reorganisation of the French cement industry," with the support of the Government.

Parliamentary Topics

Surplus Metal

IN the House of Commons last week, Mr. King asked the Minister of Supply to what extent surplus quantities of brass, copper and other metal equipment had been sold as scrap; to what extent it was used in Government factories; and what was the general policy of the Government in this respect.

Mr. Leonard: Considerable tonnages of non-ferrous metals in various forms are becoming available for disposal, principally from the termination of war contracts and from the breaking down of munitions. In those cases where this material is saleable in manufactured or semi-maufactured form, it is disposed of in those forms; in other cases it is re-melted in Government depots or disposed of as scrap. During the first nine months of this year, some 51,000 tons of non-ferrous metals have been sold as scrap.

China-Clay Industry

Mr. King asked the President of the Board of Trade whether he was aware that the china-clay industry has over £250,000 worth of orders for export trade to America which they were unable to execute owing to the direction of labour away from the industry; that the livelihoods of many Cornish people depended on this industry; and how many officials of his Department have any knowledge of, or experience in, the china-clay trade.

Sir S. Cripps: The labour force has been increased by 750 workers during the last 16 months and exports to the U.S.A. are now at the rate of 98,000 tons per annum, against 62,000 last year. For over three years my Department has had advice of Professor W. R. Jones, of the Royal School of Mines, who is an expert on china-clay, and at one time managed china-clay works.

Sodium Chlorate

Colonel Crosthwaite-Eyre asked the Minister of Agriculture whether he would be able to make supplies of sodium chlorate available to farmers for the coming season.

Mr. T. Williams stated that the supply of sodium chlorate was steadily improving, and while it could not be guaranteed that full demands would be met, substantial quantities of this weedkiller should be available.

DDT

Lieut.-Commander Williams asked the Minister of Agriculture whether, before the next fruit-spraying season, he would make a categorical statement as to the extent to which DDT could usefully and safely be employed in this connection.

Mr. T. Williams replied that he was arranging for a notice to be published regarding the use of DDT by farmers and horticulturists; but until further research on its practical application had been carried out, any statement must be in general terms. The notice would be issued long before the next spraying season.

Carbon Rods

Colonel Clarke asked the Minister of Supply whether he would consider the continuance of the use of reclaimed carbon rods, which have proved satisfactory during the war, and thereby release newly manufactured carbon rods for export to the value of some £1200 per week.

Mr. Wilmot: Reclaimed carbon rods are unsuitable for use in automatic battery-making machines and are used only by the small number of manufacturers who still employ hand methods. Reclaiming used rods takes more labour than making new ones. It is expected that the production next year of new rods will be sufficient to meet home needs and leave a balance available for export.

Oil in Great Britain

In reply to a question from Mr. E. P. Smith on the development of oilfields in Great Britain, Mr. Shinwell circulated the relevant facts in the *Official Report*. The following is a résumé: Since the passing of the Petroleum (Production) Act in 1934, 191 prospecting licences have been issued, of which 80, covering 12,800 sq. miles, are still in force, and two mining licences are in preparation. Output from discoveries in Notts., Lancs., and Midlothian rose to more than 100,000 tons in 1943, and is now about 70,000 tons a year, with a tendency to decrease. Since 1939, when the first discoveries were made, about 400,000 tons of crude oil have been won. There is a reasonable prospect that further producing structures may be found, but the possibilities cannot be proved until tested by drilling.

NEW CANADIAN PLANTS

A new oxygen plant is to be built in Vancouver by Dominion Oxygen Co., a unit of the Union Carbide and Carbon. Also to be built in Vancouver is an acetylene generating plant for the Prest-O-Lite Co. This expansion is to serve the increasing number of industrial plants in the area. Included in the facilities will be a warehouse for the distribution of company's welding apparatus and supplies and an apparatus repair station. Besides its Vancouver expansion, Dominion Oxygen plans a new filling station. The former company owns oxygen plants in Sault Ste. Marie, Ont., Welland, Toronto, Montreal and Quebec, while Prest-O-Lite's acetylene generating or charging plants are at Winnipeg, Merritton, Ont., and Montreal.

Organic Treatment of Boiler Water*

The Internal Use of Reagents

ORGANIC materials are well known as coagulants to condition the precipitate formed when mineral reagents are employed for the internal treatment of boiler water; the present article deals with the use of organic materials alone for the prevention of underwater scale and corrosion.

An official description of such methods in respect of steam boilers is as follows:

(a) Certain colloidal organic extracts possess properties of adsorption and coagulation, and prevent, under suitable conditions, the formation of scale in boilers.

(b) Colloids can coagulate oil in the water and so prevent it from adhering to the metal and also aid in preventing priming.

(c) The action of colloids is physical and their use does not add to the dissolved salts in the boiler water.

(d) Suitable organic colloids absorb oxygen and form a corrosion-protective film on the surfaces of the boiler in contact with water or steam.

(e) Organic treatments must be carefully controlled, but they are not dangerous if used in excess.† Users of such treatments should refer to the suppliers for operating instructions.

The precise mechanism of the vegetable extracts used for organic water treatment is as yet not entirely known; we know their effects and similarly there are methods by which their presence in waters at the desired strength to prevent corrosion and scale can be checked, but there is research to be done even after their extensive use for over half a century. Since they are efficient oxygen-absorbing agents, their presence in boiler waters can be determined quantitatively by a simple method involving the use of a standard solution of potassium permanganate.

Sequence of Effects

In all boilers in which steam is raised we have to consider the following sequence:—

(1) Directly the water is heated, the free CO_2 is driven off with the bicarbonate CO_2 and oxygen, and it is the quantity of these two (the free and bicarbonate CO_2) that determines the degree of acidity as carbonic acid present in condensed or distilled water.

(2) By the time the water boils, the carbonate or temporary hardness is deposited as scale or sludge and the CO_2 which, in the cold, held the tempory hardness in solution, is driven off with the steam. Oxygen is also driven off.

(3) With the progressive evaporation and replenishment of the boiler water, the concentration of the solids is correspondingly increased.

Temporary hardness is easily dealt with by lime softening which consists of fixing the CO_2 by calcium hydrate in a softening plant, whereby calcium carbonate is precipitated. This is settled out and filtered and the water available for feed is then devoid of temporary hardness.

Use of Condensed Water

In a case where 100 per cent. condensed water is returned and the boilers are filled with distilled water, and no condenser leakage or priming occurs, there would be no hardness whatever and no treatment would be required for scale prevention. If it were possible, when producing the distilled water, to do so in a closed system and to remove by calcium hydrate all the free and bicarbonate CO_2 from the raw water distilled and to remove as much of the oxygen dissolved in the water as possible by mechanical deaerators, subsequently adding an organic solution sufficient to deal with the residual oxygen, then boilers on a properly closed feed system would require no treatment of any sort, nor would it be necessary to blow down at all.

In practice, however, this does not occur because, unless distillate has no access at any time to the atmosphere and there are no leaks, it readily takes up both CO_2 and oxygen again so that while, in theory, if the CO_2 and oxygen are fixed in the original water from which the distillate is obtained, the distillate should contain no carbonic acid and no oxygen, it invariably does, and therefore if the feed water is distillate there are still traces of oxygen and CO_2 entering the system, whatever precautions are taken.

If the correct organic treatment is used, it adds minute quantities to the figure for dissolved solids (or density), however, and, as against sodium sulphite for oxygen absorption (which is recommended not to be used where the oxygen in the feed exceeds 0.2 ml./litre, since it greatly increases the dissolved salts in the water and will produce sulphurous acid corrosion if used in excess), organic treatments are not subject to critical factors and cannot produce alkalinities, priming conditions, action on metals, etc., even if used in excess of the quantities specified. Furthermore, the right organic treatment will produce an interaction between the

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* From an article by Bernard G. Houseman, Technical Director, Houseman & Thompson, Ltd., in *Fuel Economy Review*, 1945, 24, 25.

† This sentence may appear paradoxical, but the intention is to show that enough of the treatment must always be used to combat fluctuating conditions and different waters. If insufficient is present, scale and corrosion will not be prevented.

oxide of iron film present on all ferrous metals, so that, instead of the metal being covered on all underwater surfaces with oxide of iron in the absence of scale, it is covered with a type of tannate of iron. This film is not always evident with organic treatments without wire brushing but, if established, it is of value since it resists the deposition of scale, apart from the action of colloidal treatment in preventing the crystallisation of particles as they are precipitated by heat or concentration.

All evidence seems to show that the action of an oxide of iron " scab " covering a " pit " mark is to produce the cathode against the anode of the good metal; then obviously the removal of oxide deposits by chemical descaling with inhibited acid first (whereby the " scabs " of iron oxide are removed and the " pits " cleaned out) and the subsequent conversion of the skin of the metal—in the " pits " as well as on the good metal—to a type of tannate, prevents the galvanic action, since the electrical potential of all surfaces must then be the same,* and this is the major advantage of the process.

CO_2 and Oxygen in Steam

The maintenance of an alkaline feed-water† is, however, essential in all conditions, because, even where the raw water is hard and any condensate is returned, the distillate from that water will contain all the CO_2 as carbonic acid (both free and bicarbonate) from the original water unless it is fixed by calcium hydrate, and if fixed by calcium hydrate it will be permanently fixed. If a water is " internally " treated by soda, it is true that an alkaline feed will result but, on concentration in the boiler, sodium carbonate may decompose, releasing CO_2 again. The activity of CO_2 on the steam side is aggravated by the presence of oxygen, as the following will show.

Carbon dioxide in the water forms carbonic acid which attacks the metal and produces ferrous carbonate; the oxygen in the air or in the water oxidises the ferrous carbonate and converts it to ferric hydroxide (iron rust), freeing the carbon dioxide to form carbonic acid which continues to attack the metal.

Nevertheless, even in the absence of oxygen, CO_2 corrosion in condensate return systems can still occur, unless the CO_2 is fixed permanently in the water before it is heated; but, to be active, liquid water must be present, since CO_2 in dry steam is harmless and carbonic acid is reformed only when the steam is condensed. If the steam is not being condensed, then the fixing of the CO_2 is really unnecessary, provided that the steam is not being used for any purpose where it may condense in contact with ferrous metals before being taken to atmosphere. Where, on the other hand, condensation of steam containing CO_2 occurs, carbonic acid is reformed and may have a corrosive effect as, for instance, in steam jacketed pans or in distributing pipes where the latter are of iron or steel. In certain cases this corrosion may have other adverse consequences; the staining of textiles brought into direct contact with such steam is a notable example.

Treatment of Hard Feed Waters

If there is no condensate return and all the feed is hard raw make-up, then consideration must obviously be given to the fact that, while under organic treatment there is no increase in the alkalinity and dissolved-solids density, the hardness that would form as scale on the metal in the absence of any treatment is held as finely divided non-crystalline suspended matter in the boiler water. In waters where 3 lb. or more of solid scale-forming matter is being added to the boiler per 1000 gallons of water evaporated, the concentration of suspended solids would increase rapidly unless excessive blowing down were done, and even then with shell boilers it is only during the first second or two that blowing down is of any value for the removal of suspended matter. After that it is merely a wastage of hot water and active treatment.

Continuous blow-down which consists merely of a constant bleed is successful, if wasteful, in keeping down densities of dissolved solids under chemical treatment but, without properly placed " internal draw-offs," the orifice areas of which are carefully calculated to deal with each case and the type of suspension to be removed, continuous blow-down is little use for the removal of deposited solids. Where boilers are " banked " at night and there is nothing but a very hard feed being used, some settlement of suspended matter may occur, with the result that the circulation, on raising steam, may not be sufficient to bring the settled matter into suspension again, and it bakes on the heating surfaces as scale. This occurs with both chemical and organic methods and it means a constant removal of scale while steaming. It accounts for the fact that the slurry on washing out a new boiler may sometimes contain what are obviously pieces of scale that at some period in the run have been adherent. This trouble can be eliminated if organic treatment is used by installing continuous blow-down

* In order to make a proper examination of the metal in any vessel, many authorities are now insisting on chemical descaling first, since it is obvious that the depth of pit marks can be properly gauged only after cleaning out, and because corrosion or cracking is frequently in existence under hardness scale.

† Obviously, if the make-up is 100 per cent. distilled then the *p*H value cannot be more alkaline than neutral even if the CO_2 has been fixed in the original water, nor does it need to be alkaline because, if the distilled water is neutral, there can be no CO_2 in and it must have been fixed in the original water.

with internal pipes which, if suitably placed and designed, remove the suspensions and, as the method of organic treatment does not increase the dissolved solids, the continuously blown-down water can be passed through filters and the hot filtered water returned like condensate to the feed tank. This effects a saving in treatment (because there are active tannates in the filtered water), a saving in water, and a saving in heat.

The suspended scale removed can be analysed and weighed and compared with the scale-forming potential of the feed water and a very accurate estimate of the internal boiler surfaces maintained. Special blow-down valves are required when dealing with such suspensions, as otherwise there may be a tendency to choke in idle periods, considering the very small orifices involved. In such circumstances boilers that previously had to be opened up every few weeks are now operating for six and twelve months.

There are obvious advantages in being able to deal with such conditions by a treatment that does not have the effect of increasing the density to any measurable extent. With a boiler working at 200 lb./sq. in. and using a coal of calorific value 12,000 B.Th.U. at 40s. per ton, every thousand gallons of water blown away means a waste of over 6s. above the value of the water itself.

One of the greatest advantages of organic treatment is its versatility. Provided there is the necessary excess of the correct active tannate in the boiler water (as determined by the potassium permanganate test), it is immaterial if the water used varies from day to day, because sufficient excess can always be carried in the boiler water to deal with any change.

Since the object of fixing CO_2 with organic treatment is to prevent it passing with the steam to the condensate, the use of calcium hydrate with an organic treatment is unnecessary, even in naturally acid waters, except when the steam raised is condensed or where CO_2 passing over with the steam in the process for which it is employed or in the steam lines is liable to condensation and where the carbonic acid formed has access to something which it can corrode.

General Conclusions

In the light of information accumulated during fifty years of boiler treatment, several points have become evident :

(1) That far too little attention has been paid to service to the steam user by the supplier of reagents for water treatment.

(2) That, while organic treatment, *proper*, may be used haphazard without injury, no chemical treatment should be used unless it is actually prescribed in accordance with an analysis of, and the requirements of, *each* water, and that, in any case, chemical treatment is best carried out in a softening plant.

(3) That the fundamental differences between pre-softening, internal chemical, and internal organic treatment have not generally been recognised.

(4) That, given the right organic treatment, complete freedom from carbonate and sulphate scale formation can be achieved together with underwater protection against corrosion and pitting by traces of acidity, oxygen and magnesium chloride dissociation without a soda alkalinity.

(5) That the standard of boiler cleanliness has left much to be desired and that there is still a belief in some quarters that a boiler cannot be steamed with clean metal underwater surfaces without risking pitting and corrosion.

Organic treatment may be applied in two different ways. Tannins (often derived from chestnut or oak) may be used in conjunction with inorganic treatment whereby the insoluble solids first formed are coagulated. On the other hand, the author recommends the use, in aqueous form, of special vegetable extracts which, without added sodium salts, are capable of preventing the deposition of insoluble matter in the form of scale. In applying the latter method, it is vitally important to make proper provision for the continuous removal of precipitated solids from the boiler, while in operation, and also to ensure, by the employment of a simple test, that the boiler water always contains an adequate concentration of the organic reagent.

Titanium Pigments

New British Standard

A STANDARD (B.S. 1269) has been issued by the British Standards Institution to cover certain titanium pigments (rutile type) which have been developed as having increased weathering properties. It is claimed that the use of this pigment provides for a paint which has very good chalk-resisting properties. The specification provides for two types of rutile pigment—antimony-modified and zinc-modified pigment.

The document also includes specifications for two further types of titanium white which are based on the use of the two types of rutile pigment. These have been given the numbers 6 and 7, and are intended as additions to the series of titanium whites covered by B.S. 636.

The requirements included in the specifications relate to composition, resistance to chalking, freedom from coarse particles, oil absorption and the other customary requirements for pigments.

Copies can be obtained from the Institution, 28 Victoria Street, London, S.W.1, at 2s. each.

Personal Notes

Mr. E. Barnard has been appointed deputy secretary of the Department of Scientific and Industrial Research.

Sir M. Visvesvaraya was re-elected president of the Court of the Indian Institute of Science, Bangalore, for 1945-46.

Mr. W. R. Jewell, director of the Victorian State Laboratories, has been elected president of the Australian Chemical Institute in succession to Mr. R. D. Williams.

Sir Robert Robinson has retired from the position of Censor to the Royal Institute of Chemistry, owing to pressure of other work, and Mr. Lewis Eynon has been appointed in his stead.

Dr. M. Guter has resigned from the position of treasurer, Tees-side Section, Royal Institute of Chemistry, owing to his transfer to Leeds, and has been succeeded by Mr. R. Parmella.

Dr. Herman Shaw, Keeper of the Physics Department, etc., at the Science Museum, has been appointed Director and Secretary of the Museum in succession to Col. E. E. B. Mackintosh, D.S.O., who will retire on November 30.

On the amalgamation of the Ministry of Production and the Board of Trade, Professor I. M. Heilbron has relinquished his appointment as one of the full-time scientific advisers to the Minister of Production and returned to his chair at the Imperial College of Science and Technology.

Dr. J. N. Mukherjee, Ghose Professor of Chemistry, University College of Science, Calcutta, has been appointed director of the Imperial Agricultural Research Institute, New Delhi. His research work is mainly in the field of colloids, especially the electrochemistry of colloids.

Certificates in Laboratory Arts have been awarded by the Institute of Physics to Messrs. M. K. Davis, D. E. Hart, G. R. Nicholls, A. J. Page, and G. R. Phebe. All the candidates are employed by the Essex County Council and studied for the examination at the Mid-Essex Technical College, Chelmsford.

Dr. F. S. Spring, D.Sc., Ph.D., F.R.I.C., of Manchester University, has been nominated Professor of Chemistry at the Royal Technical College, Glasgow, in succession to the late Professor F. J. Wilson. During the war Dr. Spring has been associated with Professor A. R. Todd, in the preparation of antimalarials and of drugs to combat tuberculosis.

Sir James Weir French, chairman of Barr & Stroud, Ltd., has been appointed chairman of the Board of Governors of the Royal Technical College, Glasgow, of which he was vice-chairman. He succeeds Dr. Robert Robertson, chairman since 1920, who has resigned on grounds of health but has intimated his willingness to remain a governor.

Mr. Gordon Long, who joined the staff of I.C.I. in 1936, has now returned to that company after six years' military service, and will take up the position of press officer. After the capture of Tripoli, he ran a daily all-Italian newspaper, the *Corriere di Tripoli*, and later carried out splendid work in rehabilitating the Press of Northern Greece.

News has been received of the safety of the following members of the Royal Institute of Chemistry in Malaya, who have been prisoners in Japanese hands since 1942: Mr. H. J. Page, M.B.E., F.R.I.C., Director of the Rubber Research Institute, and his colleague, Mr. V. H. Wentworth, A.R.I.C.; Dr. D. J. Frye, A.R.I.C., who expects to resume his appointment in the Department of Chemistry, Straits Settlements; Mr. J. F. Clarke, F.R.I.C., of the Municipal Analyst's Department, Singapore; and Dr. I. A. Simpson, F.R.I.C., of the Institute for Medical Research, Kuala Lumpur. Mr. W. E. Abbott, F.R.I.C., and Mr. W. G. Sewell, A.R.I.C., are also safe, after internment in China.

Professor Wolfgang Pauli, a Viennese scientist specialising in atomic research, who has been at Princeton University since 1940, has been awarded the Nobel Prize for Physics for 1945. The Nobel Chemistry Prize for 1944 goes to Professor Otto Hahn, for work on splitting the nuclei of heavy atoms. Professor Hahn has been director of the Kaiser Wilhelm Institute of Chemistry, Berlin, since 1928, and is now reported to be in the U.S.A. The 1945 Chemistry Prize has been awarded to Professor Artturi Wirtanen, occupier of the Chair of Chemistry at Helsinki University, for research in agricultural and food chemistry leading to the "alv" method of fodder preservation.

Obituary

Mr. Alexander Smith, who died at Widnes on November 9, aged 67, had for 40 years been employed as a chemist at the Pilkington-Sullivan works of I.C.I., having retired 14 years ago from the position of departmental manager.

Reports have been received by the Royal Institute of Chemistry of the death of Mr. G. E. Boizot, F.R.I.C., of the Department of Chemistry, Singapore, who died on October 27, 1943, while a prisoner in Siam; and of Mr. C. J. T. Owen, A.R.I.C., Raffles College, who died in an internment camp.

General News—From Week to Week

The parcel post to Norway has been restored.

Businessmen visiting Sweden will be well advised to obtain a copy of the new number of the "Hints to Business Men" series, published by the D.O.T.

Civilian staff of I.C.I., it is reported, successfully operated the "Starfish" decoy lights which drew off many bombs intended for the important city of Middlesborough during the war.

The Department of Overseas Trade has removed from Hawkins House, Dolphin Square, London, S.W.1, to 35 Old Queen Street, Westminster, S.W.1. (Telephone: VICtoria 9040.)

Following the Anglo-Norwegian monetary agreement, the Board of Trade has removed Trading with the Enemy controls to enable normal commercial relations to be resumed between Britain and Norway (*see* S. R. & O. 1945, No. 1411).

Temporary use of the laboratory of the Royal Institute of Chemistry at Russell Square has been granted to the British Leather Manufacturers' Research Association while their own premises are being reconstructed after bomb damage.

Exploitation of the gypsum deposits in County Monaghan, with a view to sending shipments to Sweden in exchange for woodpulp and timber, has been suggested by a leading Eire industrialist during the past week.

Now that all airmail correspondence for Australia, New Zealand, etc., is to be carried all the way by air from this country, the special arrangements for sending business correspondence to the D.O.T. for transmission by air by the "Anzair" service will be terminated.

The Brigade Education Officer, H.Q.R.A., 3 Brit. Inf. Div., M.E.F., is seeking assistance in keeping his Vocational Information Rooms (he has seven) up to date in technical information. He asks, therefore that readers of The Chemical Age, when they have finished with their copies of the paper, should send them to him at the address beginning this paragraph.

The three governments concerned in the Rubber Study Group—the U.K. the U.S.A. and the Netherlands—have invited the French Government to participate in their second meeting which started on November 20, and a French delegation has arrived in London. The meeting will review the situation in the light of the liberation of the natural rubber-producing areas of the Far East.

The postponed visit to Manchester of Sir John Anderson, chairman of the Advisory Committee on Atomic Energy, has now been fixed for December 6, to be held in the Whitworth Hall of the University. Sir John will speak on "Research in Relation to Reconstruction."

The John Innes Horticultural Institution, now at Merton, Surrey, is to be moved shortly to Bayfordbury, Hertford, the trustees having purchased that historic mansion, noted for its connection with the "Kit-Cat" portraits and for an important collection of trees in the grounds.

A committee has been formed in Aberdeen to consider the creation of a fitting memorial to the late Dr. J. F Tocher. A handsome medal has been struck in bronze to be known as the James Fowler Tocher Medal to be awarded at the School of Pharmacy, and a fund is being arranged to perpetuate its award.

A series of Henderson Memorial Lectures is to be given under the auspices of the Royal Institute of Chemistry. The Council of the Institute has gratefully accepted an offer from Dr. David Spence (made during Thanksgiving Week) of £2000 in National War Bonds, for the purpose of endowing the lectures in memory of the late Professor G. G. Henderson.

The Control of Iron and Steel (No. 44) Order, 1945, which came into force on November 16, amends the (No. 33) Order, 1944. Its effect is to remove entirely the prohibition on the manufacture in blackplate, tinplate, etc., of oil cabinets, shelf strips, and spools for electric cables; and of the other articles listed in the Schedule to the Order in so far as they are for export (S.R. & O., 1945, No. 1425).

Special war explosives, the existence of which was disclosed this week, include "Torpex," officially described as "the most effective under-water explosive used during the war" and tritonal. The former, developed at Woolwich Arsenal, is a mixture of TNT, RDX and aluminium powder; the latter, made up of TNT and aluminium powder only, was a constituent of many "block-busters."

Scottish Tar Distillers, Ltd., have acquired the whole of the business interests in Scotland of Richard Smith, Ltd., and of the Shettleston Oil & Chemical Co., Ltd. The tar distillation sections of these two companies will be conducted in future by Scottish Tar Distillers, Ltd., while the acid and chemical departments will continue to be carried on by Richard Smith, Ltd., at Glasgow.

The Board of Trade has made an Order (S.R. & O. 1945, No. 1414) modifying the arrangements for payment of money owed to residents and business people in territory formerly occupied by the enemy. Persons in the United Kingdom are relieved of the obligation to pay such money through the Custodian of Enemy Property if before the date of occupation they acquired a draft, telegraphic or mail transfer for the purpose of making payment in foreign (other than enemy) currency.

Foreign News

Tin smelters in Penang, scorched by the British, have not been operated by the Japanese. Only a fraction of the plant could, however, be operated within reasonable time.

The Bridgeport Brass Co., Bridgeport, Conn., has just published a 128-page technical handbook which deals concisely with the excellent properties of copper-base alloys.

More extensive use of Ceylon plumbago instead of plumbago imported from elsewhere was discussed by the leader of the Ceylon State Council, who recently visited this country.

The possibility of a future exploitation of the great oil reserve from the submerged lands of the continental shelf of the United States has been suggested by Mr. Harold L. Ickes.

The Institution of Indian Chemists has recently decided to award annually a medal called H. K. Sen Memorial Medal to an eminent industrial chemist who would be requested to deliver a memorial lecture.

The Dow Chemical Company, Houston, Tex., is planning a 15 million expansion programme at Freeport, about 60 miles from Houston. It is hoped to obtain the lease of part of the 90 million Government-owned plants it operated during the war for the production of magnesium and styrene.

Forthcoming Events

November 26. Society of Chemical Industry (Leeds Section). Chemistry Lecture Theatre, Leeds University, 6.30 p.m. Professor E. D. Hughes: "Substitution" (Tilden Lecture).

November 26. Institution of the Rubber Industry (London Section) and **Society of Chemical Industry** (Plastics Group). Great Hall, Caxton Hall, London, S.W.1, 6.30 p.m. Dr. S. J. Skinner: "Synthetic Polymers in the War Effort."

November 26. Electrodepositors' Technical Society. Northampton Polytechnic, St. John Street, Clerkenwell, London, E.C.1, 5.30 p.m. Annual General Meeting. Mr. R. M. Angles: "The Electrodeposition of Tin-Zinc Alloys."

November 27. Hull Chemical and Engineering Society. Regal Room, Royal Cinema, Ferensway, Hull. 7.30 p.m. Dr. G. W. Stevens: "Micro-photography."

November 27. Society of Chemical Industry (Agricultural Group). Physics Lecture Theatre, Royal College of Science, Imperial Institute Road, London, S.W.7, 2.30 p.m. Mr. D. H. F. Clayson: "The Chemistry of Composts."

November 27. Chemical Society (Edinburgh Section) and **University Chemical Society,** Local Sections of the **Royal Institute of Chemistry** and the **Society of Chemical Industry.** Biochemical Lecture Theatre, Edinburgh University, Teviot Place, 7 p.m. Professor E. D. Preston: "The Structure and Chemistry of Metallic Crystals."

November 28. Institution of Metallurgists, 4 Grosvenor Gardens, London, S.W.1, 3.30 p.m. Inaugural reception and meeting.

November 28. Institute of Welding. Institution of Civil Engineers, Great George Street, Westminster, S.W.1, 6 p.m. Dr. H. O'Neill: "Metallurgical Features of Welded Steel."

November 28. Royal Institute of Chemistry (Tees-side Section). William Newton School, Norton, Stockton-on-Tees, 7.15 p.m. Mr. A. L. Bacharach: "Recent Developments in Vitamin Biochemistry."

November 28. Royal Institute of Chemistry (Belfast & District Section). Physics Lecture Room, Royal Academical Institution, 7.30 p.m. Mr. J. W. Parkes: "Thirty Years of Chemical Engineering."

November 29. The Association for Scientific Photography. Alliance Hall, Westminster, London, S.W.1, 6.30 p.m. Mr. A. G. Sabin: "Some Notes on Illumination in Photomicrography."

November 29. Royal Institute of Chemistry (Manchester and District Sections). Engineers' Club, Albert Square, Manchester, 7 p.m. Ladies' Evening: Mr. J. M. Carroll: "Chemistry of Cosmetics."

November 29. Imperial Institute. Cinema Hall, Imperial Institute (East Entrance), London, S.W.7, 3 p.m. Dr. N. R. Junner, O.B.E., M.C., D.Sc., D.I.C., M.Inst.M.M.: "The Geology and Mineral Resources of the Gold Coast." No tickets required.

November 29. Chadwick Public Lecture. Sir Edward Meyerstein Lecture Theatre, Westminster Hospital Medical School, 17 Horseferry Road, Westminster, London, S.W.1, 2.30 p.m. Dr. M. H. Gray: "Some Social Aspects of Industrial Dermatitis."

November 29. Chemical Society (Nottingham Section), and **University College Physical and Chemical Society.** Chemistry Lecture Theatre, University College, Nottingham, 4 p.m. Professor W. Wardlaw: "Structural Inorganic Chemistry."

November 30. The Association for Scientific Photography. Restaurant Frascati, 32 Oxford Street, London, W.1, 6.30 p.m. for 7.15 p.m. until 10 p.m. Dinner and social meeting.

November 30. Oil and Colour Chemists' Association (Bristol Section). Grand Hotel, Broad Street, Bristol, 6.15 p.m. Mr. E. S. Fisher: "Polyvinyl Chloride."

November 30. Institute of Fuel (Scottish Section). Royal Technical College, Glasgow, 5.45 p.m. Dr. G. E. Foxwell: "British Fuel Utilisation Policy."

December 1. Institute of Physics (South Wales Branch) and **Royal Institute of Chemistry** (South Wales Branch). University College, Swansea, 3 p.m. Dr. W. C. Price: "Some Industrial Applications of Spectroscopy."

December 3. Society of Chemical Industry (London Section). Chemical Society's Rooms, Burlington House, Piccadilly, London, W.1, 6.15 p.m. Mr. W. G. Atkins: "Jute and the Chemical Industry," and Dr. A. J. Turner: "The Properties and Uses of Flax."

Company News

E. I. du Pont de Nemours are paying a year-end dividend of $1.50 (same).

The British Plaster Board, Ltd., has declared an interim dividend of 10 per cent. (same).

Shotts Iron Co., Ltd., reports a net profit, for the year to September 30, of £69,332 (£64,617). An ordinary dividend of 5 per cent. has been declared (same).

Palestine Potash, Ltd., announce a trading profit for 1944 of £170,363 (£194,915) and a net profit of £24,107 (£11,136). No ordinary dividend is being distributed (same).

Genatosan, Ltd., has made a net profit, for the year to June 30, of £41,516 (£22,893). A final ordinary dividend of 20 per cent. makes a total distribution of 30 per cent. (25 per cent.).

Imperial Smelting Corporation, Ltd., has made a net profit, for the year to June 30, of £119,548 (£119,524). An ordinary dividend of 4 per cent. (same) has been declared.

Birmid Industries, Ltd., report a trading profit, for the year ended October 31, of £124,979 (£123,637), and are paying a dividend of 10 per cent., plus a bonus of 10 per cent. (same).

Manbré & Garton, Ltd., report a net profit, before tax and debenture service, for the year to September 30, of £470,186 (£455,627). A final ordinary dividend of 13 per cent. (12 per cent.), makes a total distribution of 18 per cent. (17 per cent.).

Tube Investments Co., Ltd., reports a group profit, before income tax, but after E.P.T. and depreciation, of £2,027,195 (£2,096,656). Net income of the parent company for the year to October 31 (excluding income from subsidiaries) totals £136,910 (£143,785). A final ordinary dividend of 12½ per cent. (same), makes a total distribution of 22½ per cent., payable also to holders of liaison shares. A special distribution of 10 per cent., on ordinary stock and ordinary liaison shares, is being made from a war contingency reserve of £400,000.

Commercial Intelligence

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

Mortgages and Charges

(Note.—The Companies Consolidation Act of 908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

EDWARD WIGGINS & CO., LTD., London, E., manufacturing chemists. (M., 19/11/45.) October 25, mortgage, to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on freehold premises 24a/30 High Street, Stratford, E., and fixtures; also October 25, charge, to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on leasehold premises 24a and 26 High Street, Stratford, E. *Nil. May 1, 1945.

XENIT PRODUCTS, LTD., London, S.W., dealers in chemicals and fabrics, etc. (M., 19/11/45.) October 23, debenture, to Martins Bank, Ltd., securing all moneys due or to become due to the Bank; general charge.

Satisfaction

SKUSE & CO., LTD., London, N.W., manufacturing chemists. (M.S., 19/11/45.) October 24, of debentures registered October 7, 1944.

Chemical and Allied Stocks and Shares

BUSINESS was well maintained in stock markets with industrial shares firm; but British Funds receded, the disposition being to await the result of the Anglo-U.S. loan talks, and oil shares lost ground. Sentiment was unaffected by the statement of the Govment's nationalisation programme, though the latter confirmed that the various schemes are to be brought forward rather earlier than had been expected a short while ago. Prevailing views in stock markets are that at current levels colliery shares and home rail stocks appear moderately valued, assuming that "fair compensation" for holders is to be obtained under the Government's schemes.

Imperial Chemical were little changed at 41s. 3d., while Turner & Newall further strengthened to 85s. 3d. on market hopes of an improved dividend. United Molasses were favoured up to 45s. 6d., and Lever & Unilever showed firmness around 53s. 3d. A further sharp rise to 123s. in Lewis Berger was attributed to higher dividend hopes; while paint shares generally were firm, with British Paints higher at 47s., and Goodlass Wall 10s. ordinary at 25s. 3d. De la Rue strengthened to £11 1/16, and there was rather more business in shares of other companies with plastics interests, British Industrial Plastics 2s. shares being 7s. 3d., and Erinoid 12s. 6d., while there was a sharp rise to 10s. in Catalin 5s. ordinary.

Associated Cement at 63s. 6d. showed response to the dividend which, although unchanged, was regarded as indicating confidence in the future. British Plaster Board were good at 36s. Iron and Steels have been well maintained. with Tube Investments £5 13/16 xd on the special bonus from contingency reserve, while Stewarts & Lloyds were good at 57s. on the company's shareholding in Tube Investments. T. W. Ward rose to 44s. 3d. and have been active since the meeting. Dorman Long at 26s. 9d., Guest Keen at 41s. 9d., and Babcock & Wilcox at 60s. were little changed, while United Steel kept firm at 24s. 4½d.; and on the capital proposals, John Summers "A" gained 1s. 3d. at 30s. In other directions, Cannon Iron have been firm at 19s. 9d. on the maintained dividend. Hilton Main Colliery shares rose to 27s. 6d. on the higher dividend, Staveley were 49s., Bolsover 51s., Sheepbridge 43s. 6d., and Allied Ironfounders 58s. 6d. British Aluminium, however, eased to 39s. 9d., Amalgamated Metal were 18s., and Imperial Smelting 15s. xd., while Murex receded slightly to 92s. 6d.

Wall Paper Manufacturers deferred kept at 43s. 6d. on the results, and at 118s. 3d. the units of the Distillers Co. were steady, also Nairn & Greenwich at 80s., and Barry & Staines at 54s. 6d. B. Laporte were 87s., with W. J. Bush 78s. 9d., and British Drug Houses have been more active with dealings up to 50s. British Glues & Chemicals 4s. ordinary remained at 12s. 9d., Fisons at 58s. Monsanto Chemicals 5½ per cent. preference were 23s., and Greeff-Chemicals Holdings 5s. ordinary 9s. 6d. In other directions, Griffiths Hughes rose to 50s. pending declaration of the interim dividend; Sangers were 31s., Boots Drug 55s. 9d., and Timothy Whites higher at 44s.

A feature in textiles was a good railly in British Celanese to 35s. 6d., while Courtaulds at 58s. 9d. were also higher; but Calico Printers 21s., Bradford Dyers 26s. 10½d., and Bleachers 14s. were little changed. Dunlop Rubber showed activity around 54s. 3d. Gas Light & Coke were 23s. 3d. Morgan Crucible first preference marked 28s., and Johnson Matthey 5 per cent. preference changed hands around 25s. 6d. William Blythe 3s. ordinary marked 12s. 6d., while dealings over 25s. took place in Blythe Colour 4s. shares, at 12s. 6d. in British Tar Products, and at 5s. 6d. in British Lead Mills 2s. shares. United Glass Bottle have been firm at 72s. 6d., with Canning Town Glass 5s. shares 10s. 7½d., and there was more activity around 39s. 9d. in Triplex Glass.

Oil shares lost ground partly owing to a disposition to await the result of the Anglo-U.S. loan talks; Shell went back to 81s. 10½d., Burmah Oil to 80s., and Lobitos to 57s. 9d., while Anglo-Iranian receded to 107s. 6d. on the news from Persia, but later the tendency was firmer.

British Chemical Prices

Market Reports

HOME trade in the London general chemicals market is reported to be brisk, while the volume of export business has been well maintained and a strong price position is in evidence throughout the market. In the soda products section the demand for caustic soda has been on steady lines, while there has been no quotable change in the position of chlorate of soda, supplies of which are insufficient to meet current requirements. Among the potash chemicals, British makers of permanganate of potash are well booked and supplies of the pharmaceutical and technical qualities are being steadily disposed of. A good inquiry has been reported for acid phosphate of potash. In other directions glycerine is a brisk market, and white powdered arsenic and formaldehyde continue in good call. Red and white lead are firm, and no change is reported from the acid section. A steady trade is passing in the coal-tar products section, with pitch in steady demand for both home and export account. Contracts for cresylic acid are being steadily drawn against, while a continued demand is reported for the toluols and benzols.

Manchester.—Additional export inquiry for the alkalis and other heavy chemicals has been a feature of operations on the Manchester market during the past week, and the tendency is for actual overseas business in this branch of trade to show a welcome expansion. Home industrial users are taking fairly steady deliveries of a wide

range of products under contracts, and, here again, replacement buying has been in evidence. A fair seasonal trade is passing in some of the leading fertilisers, especially slag, lime, sulphate of ammonia and superphosphates. In the tar-products market there is a steady export inquiry covering pitch and some of the light materials, but, on the whole, only moderate activity is reported in the home trade.

Glasgow.—Business in the Scottish heavy chemical trade during the past week has maintained the improvement shown the previous week. Prices remain firm. Export trade is still rather restricted owing to the scarcity of shipping space.

SITUATIONS VACANT

None of the situations advertised in these columns relates to a man between the ages of 18 *and* 50 *inclusive or a woman between the ages of* 18 *and* 40 *inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order,* 1945, *or the vacancy is for employment excepted from the provisions of that Order.*

ASSISTANT Lady Analyst required in Chemical Works, E. London. Must have B.Sc. or A.R.I.C. with Industrial Experience. Write giving details of training, experience, salary, etc. Box ZL. 934, Deacons Advertising, 36, Leadenhall Street, London, E.C.3.

APPLICATIONS invited for the post of Technical Manager to British firm of Laboratory instrument and apparatus manufacturers.

Applicants should be fully qualified scientifically with good knowledge of apparatus designing in metal and glass, preferably with chemical engineering experience. Box No. 2244, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

DRAUGHTSMAN required for Chemical Works in Bedfordshire. Experience of Plant Design and Structural Steelwork desirable. Salary according to experience and ability, £500 p.a. for a senior man. Write Box No. 2245, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

CHEMIST required for laboratory of Brick, Block, Pipe and Tile manufacturers. 50 miles from London. Some knowledge of geology or ceramics an advantage. Write stating age, qualifications to Box 2246, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

JUNIOR Chemist wanted by firm of Water Treatment Engineers in Westminster; previous experience not essential. Applications with full details to Box No. 2247, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

THE MOND NICKEL CO., LTD., Clydach, Swansea, invite applications for the following vacancies:—

ONE Designer Draughtsman, 30–40 years af age, experienced in Chemical Plant Layout and Design and having good technical qualifications. This post offers good prospects of advancement to successful applicant.

ONE Draughtsman, 30–35 years of age, having general Mechanical Engineering experience and corresponding technical qualifications.

Applications stating salary required and giving full particulars of experience and technical qualifications should be addressed to the Chief Engineer.

SERVICING

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).

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

PULVERISING and grading of raw materials. DOHM LTD., 167, Victoria Street, London, S.W.1.

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.

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