# The Chemical Age

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# Notes and Comments

## Training the Chemical Engineer

PROFESSOR Gibbs's stimulating address to the Liverpool section of the Society of Chemical Industry, reported last week, contains much upon which comment might be made. Professor Gibbs, having been himself an industrialist, is now able from the Olympian heights of a Professorial Chair to survey the struggles of lesser men in the industrial arena. His survey has led him to lay down certain fundamental lines upon which the training of a chemical engineer should proceed. He has, moreover, had the experience of personally conducting that training and of observing the effects of the process upon the raw material. Whatever Professor Gibbs says must therefore be treated with the utmost respect; his advice is the counsel of perfection. After suggesting that the chemical engineer is a "curious hybrid"—and therefore by inference a *rara avis in terris*, an abnormality—Professor Gibbs describes in considerable detail the ways in which this bird flies into industry. He may graduate B.Sc. at a university and thence "drop" into his job; he may graduate and then find a firm willing to provide him free of charge with the postgraduate course that it considers necessary for its specialised branch of work; or he may take the complete course in chemical engineering at a university. As a university teacher himself, Professor Gibbs, however, is perhaps intentionally blind to another way in which the plant managers of the future enter industry. Many of them enter industry directly from school and pick up their knowledge as they go, learning in the best school of all, that of practicale experience, how to manage plant and, equally important, how to manage men. There are thousands of such men in industry to-day; there are some branches of chemical industry in which the number of degree men employed is distressingly few. But these semi-trained men are in many instances the technologists of the future.

Professor Gibbs lays stress upon the need for the chemist to study the economics of his work and of industry; but does he not himself fail to appreciate the economics of his own raw material—students. A four years' course at a university is highly desirable, but unless there are special circumstances, the course cannot attract many students, since only those whose parents are wealthy, or are prepared to make grave sacrifices, can afford the education which is recommended. Is there a solution to the difficulty? We believe there is. The course in chemical engineering at London University is attracting forty students. Forty students, taking a three or four years' course, must be very small when compared with the number of juniors who enter the industry every three or four years. London University, however, is the university of the external student. If the students cannot come to the university, cannot some means be found which will enable the university to go to the students? We recommend the thought to the powers that be.

## A Task for the Professional Institution

ELSEWHERE in this issue there is a reply to the paper by Professor Gibbs, and whilst, in our opinion, the views of Mr. West are nearer the truth than the academic point of view put forward by Professor Gibbs, individual opinions on this subject can never settle the matter. There is one authority, and one only, which can do so, and that is the Institution of Chemical Engineers. We think that the Council of the Institution would be doing a considerable service to their profession if they laid down once for all an authoritative ruling as to the status, functions, and legitimate scope of the chemical engineer, adding recommendations regarding the best methods of training chemical engineers. Any such recommendations would be of value to parents, teachers and the young men who desire to enter this profession. There is considerable truth in what Mr. West says regarding the reason for the dearth of young men coming forward to become chemical engineers. Chemical engineering is one of the most recent branches of engineering to become recognised as a definite profession. It is rapidly becoming known to professional men through the medium of joint meetings and conferences, but it is still more or less unknown to many executives in industry. In consequence there is a definite need for propaganda on the subject and this could not follow better lines than the American pamphlet to which we gave editorial reference last week.

## Knowledge and Personality

"THE chemist is the man who matters in industry to-day. It is to him that industry should look for inspiration and leadership. He should be playing an active part in its control and administration. His advice should be sought by the large financing houses. He should be at once the apostle and architect of the new order. But, unfortunately, the facts are quite otherwise." These words by Professor Gibbs carry the stamp of truth, and they carry within them the germ of a fundamental difficulty in the world of industrial chemistry. Why is it true that the chemist is "a person of little account"? Professor Gibbs ascribes, it to the type of training that the chemist receives in schools and colleges. If the type of laboratory cramming so vividly described in a letter from our contributor "Ab initio," last week is practised to any considerable extent, of which there is unfortunately little

doubt, there may be a solid foundation of fact in that reason. Is not a fundamental difficulty the personal outlook of the "man at the top"? The "man at the top" may be of three types: He may be content that his works, his plant or his department ambles along peaceably and without incurring the wrath of the higher management; he may be small minded and desperately determined that no one shall "take his job"—and how many there are of that type in industry!—or he may take a real interest in everything that goes on and in the welfare of his staff, workmen and juniors. If a chemist has the misfortune to work under either of the first two types, he will have to be very determined indeed if he is to succeed. A man of the third type, alas! all too rare, will gather around him a band of zealous and efficient workers, many of whom are destined to find positions of responsibility.

## Co-operative Selling of Chemical Plant

THE discussion on co-operative selling in overseas markets at the annual dinner of the British Chemical Plant Manufacturers' Association, which is fully reported in this issue, may well mark the beginning of a new era in the development of our chemical plant making industry. The results already obtained from this method of marketing by the British Steel Export Association show that it is a thoroughly practicable and successful proposition. Mr. Julian Piggott, manager of that association, stated that the British imports of structural steel into Canada had increased from 6 per cent. in 1928 to 66 per cent. in the last half of 1932, and those of steel sections from 1 per cent. to 32 per cent.; a remarkably fine achievement. There is really no reason why some method similar to that adopted by Mr. Piggott's organisation should not be applied to chemical plant, though it will not be so easy, chiefly because chemical plant can never become fully standardised as in the case of steel products.

The principal advantages would be four-fold. All the standard lines offered by British manufacturers and their resources for special plant could be presented as a complete picture to the overseas buyer in his own country, and propaganda could be undertaken on the spot in a way that no single manufacturer could contemplate. First-class representatives and technical advisers would be available to push sales in the buyer's own office, and to give efficient after-sales service, including the starting up of the plant, dealing with any complaints, and the prompt supply of renewals and spare parts. This question of after-sales service is an extremely important one, and one which cannot be properly dealt with under the present system of individual selling. First-hand and up-to-date information would always be available regarding the special requirements of each particular market, and the nature of the competition to be faced. Orders for urgent delivery could be placed with the firms best able to deal with them at the moment, and in busy times (may they soon come), when some firms would otherwise have more orders than they could cope with, the available work could be more evenly distributed.

## Delivering the Goods

THE British chemical plant manufacturer can deliver the goods to meet any and every requirement, if given a fair chance. In the home market the users of chemical plant must be educated to realise this, and to overcome the extraordnary prejudice in favour of foreign plant which some of them have, as was mentioned by Mr. Alliott and Mr. Reavell. We have on several recent occasions deplored their prejudice, which, we are convinced, is based upon an entire fallacy. They must further be educated out of their attitude of secrecy and be made to see that they will best serve their own interests by taking the plant manufacture fully into their confidence. This task is pre-eminently one for the B.C.P.M.A., which is in such close touch with the Association of British Chemical Manufacturers. In overseas markets, such as Canada, the same prejudices are not so much to be feared, but there is the keen American competitor, much nearer at hand to the buyer, and only too willing, as Dr. Armstrong puts it, to supply any amount of special plant and send engineers across the border at five minutes notice.

The British manufacturer must prove himself equally keen and ready to supply the customer with what he wants and when he wants it, and also to give him willing, prompt, and efficient service after the order is secured. Mr. Alliott sounded a timely note of warning about not going ahead too fast. Progress on the new lines must be tentative at first, each step being consolidated before going on to the next, but too close adherence to the motto of "safety first" leads nowhere, whilst a bold and courageous but wise policy is undoubtedly called for to meet the new conditions.

## Finding Work for Chemists

THERE are some respects in which we should be the last to advocate the adoption of Chicago methods in this country, but we believe that those British chemical organisations that are concerned with the problem of unemployment among chemically trained men might do well to study the lines along which the same problem has been approached there. The Chicago section of the American Chemical Society has dismissed the possibility of persuading firms already employing chemists to employ more, and has decided that a much more hopeful approach is to interest firms which have never employed chemists and to do this by studying their specific problems and then making practical recommendations. The committee concerned feels that it is no disgrace for a chemist who has spent some years in acquiring a chemical education to enter a business career, for he should be a better business man because of his chemical training. Avenues leading to types of employment other than that usually held by chemists were therefore examined, and a letter and leaflet was therefore sent to about a thousand firms in the Chicago area, inviting them to consider the greater reliability of a purchasing agent whose decisions have a technical as well as a price basis.

Because it is often difficult for the executive to determine where he can most profitably use men with chemical training, the section suggests in its leaflet that one or more widely experienced business chemists will discuss a firm's particular situation with its executive free of charge and will then recommend the type of chemist needed, or actually furnish prospective applicants for their consideration. The response has been gratifying and, as the committee predicted, the inquiry has been for men to become salesmen, particularly where the products are of a chemical nature. In recent times an encouraging number of chemists have found employment through the efforts of the committee.

# Co-operative Selling in Overseas Markets

## Views of Chemical Plant Manufacturers

An illuminating discussion on co-operative selling in overseas markets—one of the most important subjects in British industry at the present time—took the place of the formal toast list at the annual dinner of the British Chemical Plant Manufacturers' Association at Jules Restaurant, Jermyn Street, London, on January 26. Mr. Eustace A. Alliott, chairman of the Association, presided, and amongst those present were Dr. E. F. Armstrong, chairman of the Association of British Chemical Manufacturers, Mr. Julian Piggott, manager of the British Steel Export Association, Mr. T. Nightingale, managing director of Sheffield Steel Products, Ltd., Dr. R. H. Pickard and Mr H. J. Pooley, president and secretary of the Society of Chemical Industry, Mr. H. W. Cremer and Mr. F. A. Greene, hon. secretary and hon. treasurer of the Institution of Chemical Engineers, Mr. D. McDonald, hon. secretary of the Chemical Engineering Group, Mr. J. Kewley, president of the Institution of Petroleum Technologists, Mr. L. Ryan, representing the Canadian chemical plant manufacturers, Mr. D. A. Bremner, director of the British Engineers' Association, and Mr. D. Hutchinson, a senior member of the Import Duties Advisory Committee.

### Growing Membership

The Chairman said the Association had been in being for twelve years and its membership had never once gone back. Even in times of trouble the number of members had grown. The membership now numbered about fifty, including the bulk of the principal manufacturers of chemical plant in this country. Its principal function had been the arrangement of exhibitions of chemical plant, which had met with increasing success. It had chosen the most favourable times and places for those exhibitions so that its members might get the best possible return for the money expended. The Association's directory was distributed throughout the world, and it was of interest to know that although the 1933 edition had only been issued within the past few days one member had already received inquiries from abroad as a result of that edition.

The Association was closely linked with the Association of British Chemical Manufacturers through Mr. Davidson Pratt, who was the secretary of both associations, and they were indebted to him for the courteous and charming manner in which he had always sought to promote co-operation between the two bodies. In the Association of British Chemical Manufacturers they were in touch with an organisation representing some £200,000,000 of capital invested in industry, all its members being potential users of chemical plant. That Association's officials had always been most helpful and sympathetic in regard to the special problems of the chemical plant manufacturers. The chief claim of the British Chemical Plant Manufacturers' Association was that its members could manufacture in this country all the plant required by the user. Its members insisted that the fullest co-operation was necessary between the manufacturer and the user if plant contracts were to be entirely satisfactory.

### The Problem of Secrecy

There was no doubt that the manufacturer, the engineer and the chemical engineer between them were equal to any requirements in this country, given a fair chance. Their view was that a chemical industry dependent upon foreign chemical plant and foreign advice could never be a self-sufficient and self-supporting industry. They could neither get the best plant nor the best advice from the foreigner. The problem of secrecy was an urgent and difficult one, but it was necessary if chemical plant was to be suitable and built in the right way, and run satisfactorily, that the fullest information should be given by those who wanted it to those who were to construct it. It was entirely a matter of good faith.

Turning to the question of co-operative selling in overseas markets, Mr. Alliott said it was quite a common thing for chemists and physicists who went abroad to return home and report that on account of lack of co-operation British manufacturers were losing this market or failing to enter that market, but they seldom heard how the British manufacturer was to enter those markets or to capture that trade, or how, when he had spent all his money in getting into a market, he was to reap the benefit in an improved balance sheet within a few years. The job of any manufacturer was not primarily to turn out particular goods or to enter a particular market, which in theory they said he ought to do, but to keep his bank manager convinced that the manufacture of chemical plant was still the best form of investment. That was the point of view from which these problems had to be approached.

### The Most Difficult Market

Dr. E. F. Armstrong said he had never tried to sell chemical plant, least of all in Canada or the Empire, but he had tried indirectly to sell other commodities, sometimes of a chemical nature. His experience in Canada commenced in 1909 and had been revived frequently since and culminated in a lengthy stay at Ottawa. He could not think of anything more difficult than the particular problem of selling in Canada at the present time. Canada was the most difficult market in the world for British people. The line that divided Canada from America was a very definite one, but on the other hand it could be crossed by any kind of railway truck with a minimum of difficulty, whereas in this country they had to put their goods on rail at the works, send them to the port, ship them and then send then on another railway journey before they reached their destination.

Canada had a future; to his mind she had a wonderful future. If he were given supreme power and had to reconstitute the British Empire he thought Canada, of all parts of the Empire, would be the most favoured for starting industries, particularly chemical industries. There must be something in Canada which gave it opportunities to make chemicals. It followed that a country that made chemicals was a country in which chemical plant was going to be used. At present Canada had a population of about ten millions, or about a quarter of the population of these islands, but those people were to some extent the salt of the earth; they were all workers and all go-getters and he-men. Those ten million people meant business. Those who went to Ottawa went with an open and receptive mind. There were things which Canada could make and would go on making. To make those things Canada had to have chemical plant, and therefore the issue was who was going to supply that chemical plant?

Chemical plant was a difficult thing to define. It was not standardised, like soda ash or bismuth salts. There was a minimum of standard plant and a maximum of special plant. It was easy to deal with special plant at home, but it was a different matter to supply it to, say, Hamilton, Ontario. They must do it collectively. If they were going to do it successfully they had to make up their minds here and now to form through their own Association or some other means some collective organisation which was going to have a chance in the Canadian market. They must have out there a representative who was a presentable person, someone who was representative of the best interests of the chemical plant manufacturers and who would be a business getter. Mr. Ryan, who was a prince of hospitality in a country that was famous for its hospitality, would agree with him that if they were going to do business out there they could not do it in any other way than by sending out the best they had got.

### Competition with America

Their organisation must be the Alpha and Omega of all that was meant by chemical plant. They had also to consider the question of spare parts, as obviously a plant could not stand idle while they cabled to London and had the parts made in this country and sent over to the plant user. They must keep spares in Canada and that in itself brought another problem. It seemed to him that they must strive to sell standard plant and keep spares in the country and have competent men on the spot who could go anywhere and start up any plant, and get the best results out of it.

When it came to special plant they must have the men at the head prepared to give it, and prepared to say to the user "We would rather give you standard plant, for which we have spares at hand." On the other hand, America, just across the border, was chock full of engineers. America

would supply any amount of special plant and send any number of engineers across the border at five minutes' notice to put it in. In facing that American competition they were "up against it." Canada had to decide whether the chemical industry which she was going to create was going to be built up on British plant or American plant. His own belief was that the Canadian manufacturers would just love to buy British plant, but it was not for them to sit down and join a correspondence course to write to the British plant makers. It was for the British makers to get into touch with them and tell them what they could do, and they had to keep their word. It was no use boasting, but by keeping their word they should be able to gain a large share of the Canadian market.

To-day everything was depressed, and Canada was no exception, but Canada was not so depressed as the United States, and Canada had the British backbone. He believed that the United States was going to continue to go down, and Canada was going to take the opportunity of going up, and there were, therefore, going to be opportunities in 1933, 1934 and 1935 which might never recur.

To sum up, he believed in the first place that Canada had potentialities for the chemical industry. Secondly, he was sure Canada was full of patriotism and would like to buy British chemical plant. Thirdly, Canada expected the British plant makers to tell her what plant they had available. She did not expect to have to send people over here to find out. Fourthly, they had to go out first with standard stuff, and persuade Canada to have standard stuff with spares and technical staff at hand, to show the manufacturers there how to start up the plant. No individual firm could finance a programme like that alone, but collectively there was a chance that they could do it.

## The Steel Industry's Example

Mr. JULIAN PIGGOTT, manager of the British Steel Export Association, said British manufacturers, whether of chemical plant or of steel, possessed the same qualities. They were intensely individualistic, but in the heavy steel industry they had gradually come to acquire a feeling that it was necessary to act nationally. Recalling his earlier experience as a steel salesman in London and his later experiences abroad as a representative of the British steel trade as a whole, he said he had found an extraordinary difference. Whereas in the first place he used to creep quietly and frightened into the office of the steel buyer, as soon as he went abroad to represent the steel industry as a whole he went into the offices of the buyers with a large measure of "swank." It gave him an entirely new sensation; he could not describe just what it meant in regard to one's ability to sell. One was able not only to represent British steel as the best in the world, as everyone knew it was, but one could stand up to all sorts of people.

With every respect to their distinguished guest from Canada, his view was that the Canadian purchasing agent was perhaps one of the hardest nuts to crack. If he had gone out representing a single firm he would have failed, but going as a representative of the British steel trade he made some sort of a show. Not only with the Canadian purchasing agent, but with the railway systems and various other institutions one could keep one's end up, because one had the entire resources of the industry behind him. To show they had made some progress, he cited some recent increases in the percentages of British steel imports in Canada. British imports of structural steel in Canada had increased from 6 per cent. in 1928 to 66 per cent. in the last six months of 1932, and in steel sections the percentage had gone up from about 1 per cent. to 32 per cent. They could not expect to get all their business, but he thought that very largely as a result of the co-operative effort they had been able to put forward they had secured, and were going to secure, a much larger share of the business.

## Selling Below Cost

He had only the vaguest idea of what the members of their Association made, but he could tell them something about the stages which led to the British heavy steel industry introducing its co-operative scheme. During the years just after the war there were various prices for export, but after a few years they found that they were selling steel abroad at far below cost, merely through internal competition amongst themselves. Some of the makers got together and decided that that must stop, and they fixed a minimum price for export. That certainly stopped ruinous competition to a large degree, but as they must all realise, a fixed minimum price was the most inelastic system they could devise and they found their export sales diminishing seriously, owing to undercutting by the foreigner. They had an export sales committee representing the principal manufacturers. That committee met in London, and all inquiries above a certain tonnage were submitted to it. Having considered the question of price one or other of the members of the committee was deputed to deal with the order, and they found in that way that there was a large tonnage of additional business to be secured. The committee quoted the price and possibly got the order, and it was then allocated to some firm, and there it ended. The firm itself looked after shipment and there was an entire lack of a sense of responsibility. It was therefore decided to replace the committee by an export agency, which was authorised to quote certain competitive prices in the different markets of the world.

## Advantages of Centralised Control

The advantage of that system was that when a customer stipulated for a certain date of delivery they were able, by organisation and the allocation of freightage, shipment, etc., to draw upon the works most suitably situated with regard to the particular port of shipment. They found that they could in most cases comply with delivery requirements efficiently, and at the same time, over a period of time, they could still keep their various members' quotas filled and avoid unnecessary rail haulage. There was no need for any actual amalgamation, the scheme being run by a purely voluntary association.

By having this centralised control they were able to pay proper attention to customers' requirements, and there were many other advantages, such as those in dealing with the various shipping lines. In Canada one of the big advantages was in negotiating with the Canadian railway systems for special commodity rates for their steel. One of their biggest achievements was just before the Ottawa conference, when they actually made an agreement with the Canadian steel industry. By having this centralised control they were able to negotiate and conclude an agreement with the Canadian steel industry which preserved to them the Canadian market in those products which they could produce economically and enlisted their aid in importing into Canada the balance of a range of steel products.

Mr. Pratt would remember that steel and chemicals were singled out by the Government for particular comment, and he ascribed that largely to the fact that they each acted collectively. This policy of the steel industry had commended itself not only to the Canadian steel producers but to the Canadian Government and to the Canadian purchaser. The leading steel producer in Canada had now joined their Federation. He believed that by some sort of co-operative action the chemical plant industry would achieve a lasting success in that country.

## Export Refund Scheme

Chemical plant manufacturers were big consumers of steel The steel makers felt when tariffs were introduced and thereby some of them were deprived of their former supplies of steel from across the Channel that they should do something to enable them to get their steel at something like the old prices. They had now what they called an export refund scheme, by which consumers of steel might apply to the Association for a particular rebate on the steel to be used in export jobs, where naturally they were up against foreign competition. Like many other new ideas on the part of producers and consumers there was opposition in the early days and a certain amount of suspicion the one of the other. He had watched the meetings during the past year or 18 months and could tell them that the suspicion was melting like snow in the summer.

Mr. T. NIGHTINGALE, managing director of Sheffield Steel Products, Ltd., said he represented the makers of the lighter steel products. They had not been able to co-operate to any extent and they had not even partially put their house in order. He thought they would be compelled to do it, and the sooner the better. Up to now they had gone on individually fighting for the trade. He happened to control seven works,

some of them small, stretching from Kidderminster to Warrington and engaged in manufacturing articles for the lighter trades. They had to make and to sell files, saws, etc., and when the shrinkage in the volume of orders occurred during the past few years, owing to circumstances over which they had no control, they had to give up their ideal of direct selling and find some substitute, pro rata to the cost and volume of the business. They had had to organise their sales by group selling methods. They had tried to create an ideal in group selling for their principal concern. Having regard to what they believed would be the best method, they came to the conclusion that they should seek other firms of repute, non-competitive in character, so that they could combine jointly their forces and their resources and secure really sound sales representation in the overseas markets. They had been successful to a considerable extent. First of all they had to find their associates and to decide more or less how many in number would be sufficient. They realised the danger of over-weighting their representation by giving one who was a subordinate too many interests to represent. Finally they came to the conclusion that not less than four or more than six should be the number. They sought their associates carefully, and they were honoured by having as their companions in this effort some of the finest firms in the country.

## Finding Suitable Agents

The next problem was to find suitable agents, and that was a great deal more difficult. Having secured an agent who knew how to work they had to educate him if they were going to get anything useful out of his representation. He must understand their products if he was going to do them justice in overseas markets so widely separated from the works. Where they could arrange it—and this was where the limit of four to six firms was convenient—they selected an agent to come into the works and familiarise himself with their goods so that he could sell on quality. Four or five or six firms could share in an arrangement of that kind, where it would be impossible for one. They had pursued that course in several instances for periods of two to four weeks and had found it beneficial. Where they had not been able to do that they had solved the problem in another way. Some of the best men in their organisation had gone overseas to the agents on the field. They stressed the importance of sending the best men, not only for the sake of seeing the agent but also for the purpose of making goodwill towards their concern. The agent endeavoured to surround himself with a connection and tried to make it his own connection.

If they were going to do their work through agents they had to take some steps to make that connection have a bearing on their concern, and in his own experience he had found no substitute for the personal contact established by the principal himself or someone in high authority going out and meeting the customer face to face.

## Supporting the Agent

After educating the agent they had to control him and that was a most difficult task. One of the most difficult fellows in the world to control was the salesman. It was difficult to control his representations and his terms, and sometimes his commission account, and still more his expenses account. But those things had to be controlled. After educating and controlling they must support him, and that was a very important point in group selling. If a man had four, five or six different masters they had to see how they could get the best out of him. He knew of nothing better than sound support; it was the firm that helped him most that got the best out of his efforts.

They were facing a new world with new conditions, and so far as their own experience was concerned what they had done was more than negatived by internal competition. If they were a strong band, closely associated for their common good, then for God's sake control their prices. He repre sented a number of industries which were rapidly destroying themselves from within. They had been fighting for co-operation with people in their own competitive business. Their future lay in co-operation in advertising, co-operation in selling, and possibly even co-operation in production, rather than in suicide by competition.

Mr. W. R. GORDON, of the Coal Utilisation Council, spoke of sales experiences in India and Germany, and said that one of the difficulties particularly in India was that co-operative selling had somehow gone wrong. There was in India, and throughout the Far East in fact, a system of managing agents, firms with impressive offices where, when the salesman called, he invariably found that all the directors had gone out to lunch. Unfortunately those firms often imported young and enthusiastic people from England who did not know very much about the goods they had to sell. His experience had been that British manufacturers trusted far too much to firms of that kind selling their goods. Obviously if they had a better and more expensive article than the foreigner had, they had to emphasise the quality of the goods, and it needed somebody with special knowledge of the subject to understand why they were more expensive and better than foreign articles. He believed there was considerable scope in countries like India and on the Continent for combined selling efforts such as they had been discussing that night. There was no great advantage in a British manufacturer taking one of his own staff and putting him in the managing agent's office. It usually meant that he was stultified and was given a desk and was more or less under the control of the people on the spot who were the agents.

## The Problem of India

On the other hand, if a firm was able, with other firms possibly selling not directly competitive goods, but complementary goods, to set up an efficient organisation, able to conduct market investigations, effective sales forces and advertising in the language of the country itself, it would be of inestimable benefit to the firms concerned.

In India, for example, there were, unfortunately, some 222 various languages spoken. Fortunately, perhaps, only about 20 of them were principal languages, but the Indian to-day had undoubtedly become a much more economically minded person than he was a few years ago. It should, therefore, be possible for manufacturers to set up effective organisations in combination one with the other to cover a tremendous field such as there was in India, with its 350 million of people.

Mr. J. ARTHUR REAVELL, speaking as a past chairman of the Association, said one of the great difficulties at home was a preference on the part of some of the users of chemical plant to listen to a salesman who only spoke broken English in preference to the British sales representative. Over and over again the manufacturers of plant found when they tried to sell their products that the foreigner came in with something like a 25 per cent. advantage over the Englishman. He was perfectly convinced that they could manufacture plant in this country just as successfully as they could abroad.

## Some Unnecessary Imports

Some of them had had the privilege of giving a few suggestions to the Import Duties Advisory Committee, and they had been amazed at the stories some people told of being unable to get the plant they wanted in this country—some of it perfectly simple stuff that anyone in this country could produce. Thanks to Mr. Bremner and Mr. Pratt and others who had handled the matter in an intelligent way, some of those people were not getting away with it and they ought to be thankful for that. It was jolly nice, of course, for some people to go to Paris or Berlin and inspect plant; it was much more interesting than going to London or to Nottingham, but they had to convince the plant users that there was nothing imported from abroad that could not be made here.

Mr. L. RYAN (Canada) said he realised the difficulty of the British manufacturer in selling in Canada, and he thought they should deal with standard machinery to begin with. They must remember they were a long way away from Canada and they were all lazy when it came to wanting goods and waiting for them.

Mr. J. KEWLEY, president of the Institution of Petroleum Technologists, said the petroleum industry afforded an excellent example of co-operation in selling. Their co-operation had a beneficial effect on the public as a whole.

The CHAIRMAN, in closing the discussion, said the whole secret of selling to-day was first of all to get hold of the right man to sell their goods. A good deal of money might be wasted on the salesman who promised all sorts of things. The only way was to work with a man who was keen and willing to take some risks with them. If they were going to make any success at all they must begin in a small way and gradually work up from that.

# The Functions and Training of a Chemical Engineer

## A Reply to Professor W. E. Gibbs

By J. H. WEST, M.I.Chem.E.

PROFESSOR Gibbs has once again raised this important and highly controversial question with a statement of his own opinions, which must command a great interest and attention, coming as they do from the head of one of the principal training centres for chemical engineers in this country. Perhaps, therefore, I may be permitted, as one who has had a long and varied practical experience of chemical engineering, and some experience of training would-be chemical engineers, to put forward the industrial as opposed to the academic aspect of the question.

Professor Gibbs gives the following amazing definition: "A chemical engineer is essentially a chemist who has been trained to be industrially effective," adding that "his job in life is to make good the deficiencies in the practical training of the chemist and the theoretical equipment of the engineer." A "curious hybrid" indeed, as Professor Gibbs calls him, but such a man is certainly not a chemical engineer in the true sense of the word, nor indeed *a priori* an engineer at all. This is not a definition that would commend itself to the Institution of Chemical Engineers, and a smattering of strength of materials and the elements of machine drawing do not constitute an engineering training, nor qualify a man to design chemical plant or superintend the erection of it. Chemical engineering is a branch of engineering, just as much as is electrical engineering or mining engineering. It is not a branch, or even an offshoot of chemistry or chemical technology. Professor Gibbs says very truly that "the domain of chemical engineering appears to be all embracing and almost without limit," but he goes on to say that it "consists primarily in the application of the principles of physics, chemistry, mathematics and economics to the design of unit plants, in the selection of the necessary auxiliary plant, in the arrangement of the different unit plants and their auxiliaries in the complete scheme, and finally, with the control and operation of the complete process." Engineering, apparently, does not come into it.

### Establishing a New Factory

The special physics of chemical engineering, heat transmission, fluid flow, and so on, and the unit operations, on which Professor Gibbs lays so much stress, are an important part of the picture no doubt, but the auxiliaries, which he so lightly touches upon, and the site and buildings, means of transport, and construction of plant, which he rules out altogether, are at least equally important. In a laboratory the buildings exists, the materials are all on the shelves, the units of apparatus are in the cupboards ready to be assembled, and all services of steam, water, gas, electricity are ready laid on. That is the atmosphere which gives rise to such a one-sided point of view. But what are the circumstances when a new chemical factory, to employ new processes, has to be built on a bare plot of ground? The processes will have been worked out in glass in the laboratory. They can be sorted out into unit operations, and plants be designed to carry them out, but, and this is what Professor Gibbs does not seem to realise, that is only a small fraction of the work necessary before the factory can come into being. It would take too long to catalogue all the items here, but the point is that all this work, the selection of the site, the lay-out of the buildings, the provision of suitable steam and power plant according to the balance between the respective requirements of the two, the supply of cooling water and boiler feed, road and rail transport facilities, the design of process buildings, the provision of suitable repair shops, and so on, can only be done satisfactorily by a competent chemical engineer, because no one else can know just what is required.

Professor Gibbs would apparently leave all this to the vague "engineers," with whom his hybrid chemical engineer-chemists are to collaborate. None of this work can be left to ordinary engineers or builders without risk of disaster. For instance, when the new works of a well-known dyestuff manufacturer were being built, the design of the steam and power plant was placed in the hands of an eminent firm of consultants. But apparently nobody told the consultants what the consumption of process steam would be, and they provided pass-out steam from the turbines barely sufficient for the first two plants. This had later to be supplemented by huge batteries of low-pressure boilers. A man who is competent to do this work, must, as Professor Gibbs says, be a mature and experienced professional man, and his training can only at best fit him to become such a man, but, given that there are the real functions of a chemical engineer, it is obvious that he must start with a proper engineering training.

### The Technical Side of the Industry

The pronouncement of Professor Gibbs, to the effect that a chemical engineer must be a first-class chemist, is sheer nonsense. Apart from the fact that chemistry is now such a huge subject that a man can only become first-class in one branch, or perhaps one section of one branch of it, the chemical engineer is not directly concerned with chemical reactions or processes from the chemical point of view, except as regards the causes of corrosion. He must, of course, have a sufficient knowledge of the principles of chemistry and of chemical technology to enable him to understand and discuss with the chemist the plant requirements for a given process, which may be connected with any of the innumerable branches of industrial chemistry, organic or inorganic. A mining engineer must have a good knowledge of geology, but it is not essential for him to be a first-class geologist.

My contention, expressed briefly is that the chemist should be trained to do chemical work, and the chemical engineer should be trained to do engineering work, in connection with the chemical industry, and that the industry will be served best when the two work together in the closest co-operation, but each in his own sphere. A brief analysis of the field of activities on the technical side of the chemical industry may make the matter clearer.

Dealing in the first place with research, it will be recalled that Professor Gibbs has some very sound things to say about research, but he does not refer to one point which seems to me to be the crux of the whole matter, and that is the dearth of really able men qualified to be directors of research. It is sheer waste of money for chemical manufacturers to set up elaborate research departments, unless they can find the right men to direct them. It is not so much the lack of men capable of doing research as of men capable of initiating it and directing it into the right channels. Such a man, besides possessing the very highest scientific attainments, must be intensely industrially minded, have the vision to think five or ten years ahead, a comprehensive grasp of economic trends and possibilities, and be a born leader of men with personality and driving power, so that he can impart to his staff his own enthusiasm and determination to overcome difficulties and get results. Such men are very rare. Chemical research, of course, is not the chemical engineer's job, but he will design the semi-commercial scale plant on which laboratory processes must be tried out before going on to the manufacturing scale, and he will study the processes from the plant point of view while they are being so tried out. He will then prepare in collaboration with the research chemists, flow-sheets and preliminary plant lay-outs which forms the basis of the designs for the large scale plant. Apart from the development of new processes, corrosion problems and other failures of materials of construction at the factories will also need co-operation between the chemical engineer and the research department.

### Planning and Development Work

Secondly, let us consider what is sometimes called the general works department, and sometimes the planning or development department. I am here dealing with large organisations, but the work is the same in the smaller concerns, though it has to be carried out with a much less specialised staff and consequently the various functions be-

come more merged one into another. This is the domain *par excellence* of the chemical engineer. Every phase of the complicated progress, from the preliminary flow-sheets obtained in the research department to the completed factory ready to start manufacture, is his province, but in everything he must work in close co-operation with the chemist. Not the research chemist, but a fully experienced technical chemist, who has a totally different mentality to the research man. These two jobs are entirely different, and a man who is suitable for the one will never be any good at the other. Besides new development work this department will deal with alterations and extensions of plant at the factory, and will keep in close touch with the works engineer on questions relating to the satisfactory working and maintenance of the plant and equipment, whether process plant or not.

Thirdly, there is the factory in operation. The working of the chemical processes is emphatically not the chemical engineer's work, but that of the industrially-minded chemist whom Professor Gibbs has mistaken for a chemical engineer. Maintenance and repairs of plant, and the running of service equipment, steam, power, water, and so on, is the works engineer's job, and he should also be a chemical engineer. If he is an ordinary mechanical engineer he will not have the special experience necessary for repair and maintenance work, and furthermore he will not work in full co-operation with the production side, which is essential for the good results. In many chemical factories the chemists and engineers are often at loggerheads, but this is much less likely to happen with chemical engineers who can appreciate the production point of view.

The work of the chemical plant makers is chemical engineering if anything is, yet Professor Gibbs asserts that the actual construction of plant or machinery is not the job of the chemical engineer. Here I can agree that the plant manufacturer would not have much use for the Professor's hybrid.

### The Question of Training

With regard to the best lines on which a chemical engineer should be trained, the great difficulty is to get in everything that is necessary without consuming more years than can be afforded. I do not think it can be done under 5 years, but 6 years is better. Before leaving school he should have acquired the rudiments of chemistry and physics. He might then serve a year in the workshops of a small firm of general engineers, or perhaps better still in those of a chemical plant maker. While he is doing this he can attend evening classes in chemistry, mathematics, practical electricity, and machine drawing. If he can afford to take 6 years altogether, he would then take a three years course in mechanical engineering, followed by two years in chemical engineering and chemical technology. If he can only afford to take 5 years in all, he could probably omit the first year's course in mechanical engineering.

Finally let me add a few words about the " raw material " for chemical engineers. At present the great majority of entrants come from the chemical side and not from the engineering side. This is no doubt due to the fact that the profession of chemical engineering is still practically unknown to the ordinary parent or young man about to decide upon his career, whilst men who go in for the profession of chemist quickly hear about chemical engineering when they go to the college, and may then decide to go in for it. There is great need that the opportunities of the chemical engineering profession, and its attractions for young men of suitable aptitudes should be made more widely known to parents, teachers, and the public generally.

## Spanish Calcium Carbide and Cyanamide

CALCIUM carbide and calcium cyanamide have not a very good outlook in Spain. In that country there are eleven carbide factories, small and out-of-date. Their total capacity is 40,000 tons. The most modern installation is that at Sabiñánigo, and the largest is that of Corcubion, at Le Corogne. All these factories owe their existence solely to the high tariffs on foreign carbides, and consequently they are expensive. The use of cyanamide is not yet general in Spain, in spite of the advertisements of importers, only 2,000 tons being imported in 1931, local climatic conditions not being suitable for home manufacture.

# Empire Copra and Coconut Oil

## Prospects of an Increasing Output

THAT the output of copra will be on the increase for several years is stressed in the Empire Marketing Board's second volume of a survey of oilseeds and vegetable oils, entitled " Coconut Palm Products." More than 1,000,000 tons of copra are annually exported from the various producing areas, and of this amount the British Empire furnishes about 40 per cent., principally from the British South Sea Islands, British Malaya and Ceylon. Among copra-importing countries, however, the United Kingdom ranks fifth, but the largest part of these imports comes from Empire sources.

It is pointed out that coconut oil derived from copra is by far the most important ultimate product of the coconut palm, and that the future prospects of the industry depend almost entirely on the demand for the oil. Within the last ten years there has been an increase of about 30 per cent. in the world acreage under coconuts, bringing the total to 7,250,000 acres in 1931. Since 1921 British Empire countries have accounted for slightly more than half this amount. The increase noted has been largely due to developments in the United States, but the needs of that country can be, and are, met by the production from the Philippines. Other producing countries must be chiefly dependent on European consumption. It follows, therefore, that any decrease in the American demand releases Philippines production to enter into competition in the European market, where, owing to the heavy production of whale oil, there is no present sign of an increased demand.

The demand for coconut oil, it is stated, depends on the expansion of the soap and margarine industries, which in their turn depend on the growth of populations and a rise in their standards of life. The prospect of the increased utilisation of any particular oil or fat in these industries cannot be easily defined. Much depends on price considerations, and efforts are being made to reduce the costs of competing vegetable oils against the probable rise in price of animal and marine fats. Annual world exports from producing to consuming centres during the pre-war quinquennium aggregated 391,500 tons of coconut oil and copra in oil equivalent. The peak was reached in 1929 with 1,012,000 tons. Since then there has been a decline, but it is thought there will again be an upward trend as the new areas under cultivation come into full bearing and more favourable conditions rule the world market.

# High Pressure Boilers

## Need for Cheapening the Cost of Special Steels

HIGH pressure boilers were the subject of a paper read at a recent meeting of the Institution of Electrical Engineers, when C. H. Davey and C. H. Sparks gives an interesting account of the development of the use of very high pressure steam in modern boilers. Prior to 1918, no plants had been placed in commercial service with steam pressure exceeding 350 lb. per sq. in. In 1923 the Edison Co., at Boston, ordered the first boiler unit suitable for a pressure of 1,200 lb. per sq. in. The construction of this boiler was made possible by the use of the first seamless forged steam boiler drum. Recent developments of X-ray technology have given the manufacturer of welded drums the long sought non-destructive test. A definite proof of the satisfactory condition of a metallic arc fusion weld can now be given by radiographic examination. By means of scientifically controlled welding, drums can be produced which are more suitable for working conditions than the riveted structures used in the past. The drums forming part of the 1,400 lb. per sq. in. pressure sectional boilers at present being installed at the Dagenham plant of the Ford Motor Co. are 45 ft. long, 48 in. in internal diameter, 5 in. thick and weigh 62 tons. Whilst the trend of invention has been definitely towards higher final steam temperatures, it is probable that these will be limited, at least for the present, to below 850° F. This is due to the fact that the cost of special steels is still very high and so it is not economical to use them. The Philip Carey Works, at Ohio, which started last year, use a steam pressure of 1,800 lb per sq. in. The demand for high pressures and consequently high temperatures continues for power stations but super-pressure boilers are mainly used in industrial work.

# Modern Methods of Air Filtration

## The Advantages of Filters of the Viscous Film Type

FOR effecting the removal of solid particles from gas streams there are available many different types of plant, the use of any particular class depending on the nature of gas to be purified. In place of settling chambers, which act too slowly for most industrial purposes, there are washing and spraying devices; cyclone and millicyclone dust collectors; electrical precipitators such as the Lodge Cottrell; filters of the bag type or specially prepared cloths or porous fabrics; and finally the various forms of metal screens which are irrigated with viscous oils. The filtration of air demands high efficiency combined with economy of space and low maintenance costs, since no by-product is obtained as in the stripping of gases. Further, it is essential that little or no attention should be required beyond the renewal of filter surfaces, with minimum of labour in cleaning the dirty frames. Dry cloth filters have proved rather costly in upkeep in addition to increasing fire risks, so that it is not surprising to find few descriptions of this type in recent patents. One of these proposes to maintain bag filters under reduced pressure by use of an induced draught fan, cleaning being effected by cutting out the particular section from the main stream, and reversing the current by opening the mouths to the atmosphere. Wet or spray filters have not proved so efficient in cleaning air as in treating other gases, an explanation being the lack of affinity between water and fine carbon particles. Other types which have been studied include glass wool pads with fibres arranged alternately in

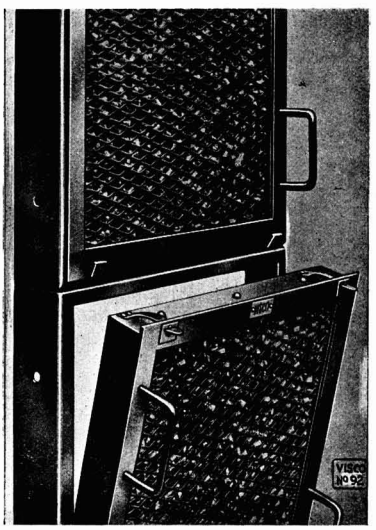

Fig. 1.—The "Visco" Filter showing Clips for securing Standard Cells in their Frames.

different layers, tubular fabric filters supported horizontally, and a filtering device for compressed air which used adsorbent carbon or silica gel.

### Filters with Viscous Films

Since 1921 a wide selection of air filters using film-covered surfaces have been placed on the market. The "Vertex" filter consists of a series of corrugated plates spaced a short distance apart in frames 18 in. by 4 in. These frames are dipped into a viscous liquid, they have a capacity of 800 cu. ft. per minute, and are cleaned by immersion in a solution of caustic soda. In the "Simplex" design a woven metal fabric runs around two drums which revolve at regular intervals and dip the mesh into a bath of oil. In one recent patent clean oil is fed by sprays; so popular has this viscous oil method proved, that attention is being given to the method of distributing the oil in the filtration unit.

The "Visco" filter first appeared in England in 1921, and quickly overcame the natural prejudice against revolutionary novelties. It is now supplied in two principal forms, the "Standard" type with an efficiency of about 98 per cent., and the "Duplex" type for all cases where 100 per cent. efficiency is desirable or necessary. The standard filter consists of a frame and cell in standardised section 20 inches square, made entirely of mild steel. The cell rests in two brackets on the frame, and is held in position by spring fasteners (Fig. 1), which allows the cells to be fixed and removed in a few seconds. The cells themselves have expanded metal faces, the space between being filled with innumerable short

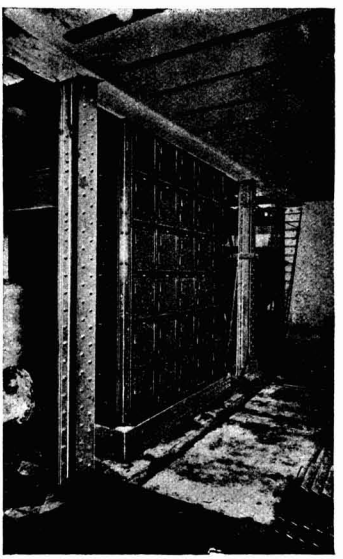

Fig. 2.—A Typical "Visco" Filter Installation dealing with large Volumes of Air.

ferrules, made of thin coppered or rustless steel. These ferrules are covered with a thin film of "Viscinol," a specially blended odourless oil with a high flashpoint, non-inflammable, practically non-evaporative, unaffected by frost or heat and therefore rendering the filter independent of atmospheric influences. This oil is supplied in three different grades, for temperate, tropical, and arctic climates. It possesses an extraordinary covering capacity and adhesion, so that even after months of use it still effectively catches and retains the impurities which are present in the air.

### High Air Filtration Capacity

The oil covered rings forming the filtering medium lie quite irregularly in the cell space, where they offer a very large filter surface, which is about 35 times the face area of one cell, yet leaving about 80 per cent. free space for the passage of the air. The air current passing through the cell is sub-divided into innumerable small streams which, due to the irregular position of the rings, are deflected from the straight path a great number of times without producing any undue resistance. The relatively heavy dust particles are thrown against the oil coated surfaces by centrifugal force and are retained, and as the deposited dust becomes saturated with the Viscinol oil it assists the filtering process. Each standard cell has a rated capacity of 600 to 700 cu. ft. of air per minute, with a resistance of 0.18 W.G. (when clean)

rising to 0.25 inch W.G. (when dirty). The requisite number of cells, with frames, are assembled to fit any specified opening in the hall of the building (Fig. 2). Box filters can also be built-up where more convenient (Fig. 3). The reproduction of an untouched photograph showing the front of the filter cell when clean (Fig. 4) and the same cell after 480 hours work (Fig. 5) strikingly illustrates how efficiently the dust is caught.

Visco filters of the "Duplex" type are designed on the same lines as the "Standard" type, but have two cells arranged in series. The second cell, with smaller filter rings will catch the impalpable dust passing the first cell. An absolutely air-tight felt joint is provided to make by-passing impossible. When required for not only retaining dust and bacteria, but for destroying the latter, the cells are specially prepared and covered with a germicidal preparation "Stericidol." The resistance offered by the "Duplex" cell is approximately double that of the "Standard" cell, the rated capacity being 600 to 700 cu. ft. of air per minute.

As this Visco filter accumulates the dust removed from the air, it must be cleaned from time to time. The length of the interval after which this becomes necessary depends on the amount of dust contained in the raw air and the length of the daily run. On an average the necessity arises every eight to ten weeks. Small filters are cleaned at one time, but with large filters a certain percentage of the cells is, for convenience, taken every week in rotation. The cleaning operation is extremely simple—the dirty cells are bodily rinsed in hot soda water (Fig. 6), dried, immersed in a bath of "Viscinol" and allowed to drain, the whole of operation only occupying a few minutes per cell. It is not an advantage to clean too often, as the filter has its maximum efficiency when fairly dirty, and likewise it is not necessary to get the rings perfectly clean. The right moment for cleaning is soon found by experience; an excellent guide is to measure the resistance by an air gauge and clean the filter when the resistance reaches 0.4 inch W.G.

## Rotating Filters

Various devices have been introduced in order to avoid the necessity of removing cells for the purpose of cleaning them and re-charging them with oil. One example (U.S. Pat. 1,747,694) contains a screen of spongy metal which dips into an oil bath, clean oil being fed by a spray, whilst the screen is washed in a counter-current direction. Stationary filters which are washed *in situ* by use of an oil pump are less efficient than the rotating types, such as the "Simplex" and "Visco" self-cleaning filter. The latter consists of a number of filter baskets built from sinuous filter plates which are covered with a thin film of Viscinol. The filter baskets are fitted with guide pins sliding in guides, a toothed wheel at the base engaging the lower pins and maintaining the whole vertical column in position. By the rack and pinion action thus provided the lowest dust-charged basket falls into the oil bath, where it receives a vigorous rinsing action, the filter plates being vertical to the oil surface. When lifted out of the bath at the back of the cell the basket takes up a full charge of oil which, on draining, carries off the dust which has collected on the plates. Continuity of action is provided by clean baskets moving into position at the top of the filter frame whilst dirty baskets are passed into the oil bath. The rotating mechanism is operated by a hand crank, but for large installation a motor with automatic time switches can be used. According to the height of the filter, *i.e.*, the number of filter baskets and the dust saturation of the air, one basket is passed through the oil bath after one, two, or three days' work. One complete cycle of placing the clean cell on top of the column, washing the lowest dirty cell, and placing it in drainage position, occupies one man's time for one minute. Occasionally the sludge in the bath has to be removed after running off the surplus oil.

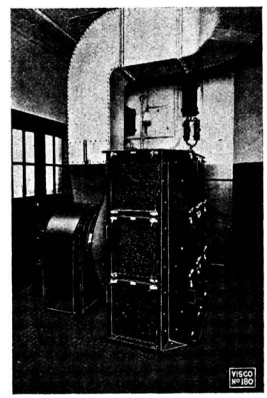


Fig. 3.—A "Visco" Filter in Box Form comprising Cells of the Duplex Type


Fig. 4.—Front of "Visco" Filter Cell before Use

Fig. 6.—The Operation of Cleaning the Cells. (a similar Tank is used for Re-charging the Cells with Oil. Note the Shelf provided for Draining Purposes)

*Illustrations by Courtesy of the Visco Engineering Co., Ltd*

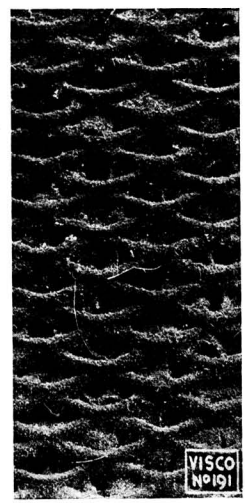


Fig. 5.—"Visco" Filter Cell after being in Use for 480 hours

# Trade in Southern Rhodesia

## Severe General Depression Recorded

TRADE conditions in Southern Rhodesia are the subject of a report which has recently been published by H.M. Stationery Office (price 1s. 6d. net). It is stated that Southern Rhodesia has suffered severely during the past eighteen months both from the effects of the world conditions and from internal causes. She has suffered not only from the cause common to all—the decrease in demand coupled with the fall in price of the commodities she has to export—but in addition she has been most injuriously affected by the loss of consuming markets for her cattle and agricultural produce owing to the restrictions imposed following an outbreak of foot and mouth disease within the territory. Imports in 1930 showed a decrease is all classes of commodities with the exception of metals, metal manufacturers, machinery, etc., while in 1931, imports had fallen from approximately £7,350,000 to £5,400,000, the United Kingdom share having fallen from £3,845 to £2,210,458. As regards exports, these had declined from £7,356,762 in 1930 to £5,680,545 in 1931.

### Oils, Paints and Chemicals

It must be remembered that certain countries from their natural resources in oil and paint must necessarily be predominant in importing them to Southern Rhodesia. In general greases and oils, and in lubricating oil, the United Kingdom holds her own, more or less, against other suppliers, but in such items as illuminating oil and motor spirit, she is, of course, non-competitive. As regards distemper and paints the United Kingdom's chief competitor is the United States, who, it is stated, put up a cheaper production, in more attractive from, than does the United Kingdom. The Union of South Africa is also a large competitor in the paint market, and has actually displaced the United Kingdom in the supply of polishes and blacking. The Union has, too, captured with her locally manufactured soap the market in Southern Rhodesia, for both common and toilet soap, but here local industry is likely to prove an increasing competitive factor in the near future.

The United Kingdom appears to hold the lead in acids, but in other chemicals the United States, Germany and Czechoslovakia are dangerous competitors largely on the score of price. The supply of cattle dips is chiefly in the hands of the Union of South Africa, as is also the case with fertilisers, where she shares the market with Holland.

With regard to iron and steel, Belgium on account of price considerations is the chief competitor with the United Kingdom, whilst Sweden in drill steel, owing to quality and price, has captured 50 per cent. of this market. In pipes, piping and pipefittings the United Kingdom's share has been heavily affected by German competition; the Union of South Africa is also coming into the field.

### Production of Economic Minerals

The position with regard to Southern Rhodesian asbestos, chrome and coal output is one of great difficulty, the value of all metals and minerals, other than gold, shipped overseas amounted in 1931 to £944,147, as compared with £2,201,549 in 1930—a decrease of £1,257,402. The total sales of mineral products for the year therefore was £3,218,022 as compared with £4,518,198 in the previous year, showing a decrease of £1,300,176. From these figures it will be seen that nearly the whole of the very serious fall for the year was due to base minerals. In actual tonnage asbestos showed a decrease of 13,724 tons valued at £684,353, chrome ore a decrease of 136,697 tons valued at £295,395 and coal a decrease of 387,444 tons valued at £172,259—a loss in value of £1,152,007 from these three minerals—the proportion of the total production of base minerals having fallen during the year under review to below 30 per cent. of the figure for the previous year.

## Protecting Aluminium Alloys in Sea Water

PROFESSOR G. Gallo and Dr. D. Corbi, of the University of Pisa, have discovered a method for protecting certain aluminium alloys against the corrosive action of sea water. The plating which they have employed, and which has given excellent results, is chromium, which shows good resistance to those chemical agents found in sea water.

# Soviet Chemical Industry

## Results of the First Five Year Plan

WITH the conclusion of the first Five Year Plan for the development of the national economy of the Soviet Union official data has been issued regarding the actual progress made. Before the revolution the chemical industry of Russia was a combination of semi-artisan enterprises, the principal chemical products being imported. A radical reconstruction of the industry started in 1928. Investments made in the chemical industry from 1928 to 1932 totalled 1,460 million roubles. During that period 58 large plants were put into operation, these plants being distributed over the different branches of the industry as follows: Basic chemistry 13, composition material (bakelite, etc.) 2, paints 1, artificial fibre 3, chemical and pharmaceutical 4, synthetic rubber 2, coke and by-products 13, wood distillation and treatment 19.

Successful assimilation has been made of new processes never before carried on in the Soviet Union. Up to 1928 there was no nitrogen production, but in 1928 the first synthetic plant—the Chernoretchie—was opened. The last year of the Five Year Plan has seen the opening of the Bereznikovski plant (first series) and construction is now progressing on the second series. During 1933 the Kuznetsk and Gorlovka ammonia plants, working on coke oven gas, will be put into operation. An ammonia plant is also being built at Magnitogorsk. The production of sulphuric acid has been increased from 199,000 tons in 1928 to 510,000 tons in 1932. In 1913 the production was only 121,000 tons. Hand pyrite ovens have been replaced by powerful mechanical ones, working on the turret system.

### Hydrolysis of Wood

A new superphosphate industry has been created, the output of which is 25 times greater than the pre-war. The discovery of the Khibini apatite deposits has been of vast importance to the development of the chemical industry. The discovery of deposits of potassium fertilisers has also provided a new branch of the chemical industry. Two new plants have been put into operation for the production of synthetic rubber, the processes of which have been worked by Soviet chemists. Combines are in the course of formation for the production of composition materials to take the place of metal. An experimental plant has been constructed for the hydrolysis of wood, and an aniline dye industry is being firmly established. Attention was devoted to the pharmaceutical industry from the very beginning and many pure chemical reagents are now being prepared.

The plan for 1933 estimates for an increase in the output of the chemical industry, as compared with 1932, of 1,839 million roubles (at 1926-27 prices).

# Industrial Production of Pure Yeast

## Rapid Development Due to Dutch Breweries

IN the "Journal of the Institute of Brewing" for January attention is drawn to a recently published monograph on the history of pure yeast culture, by H. Lüers and F. Weinfurtner. The monograph is considered to be incomplete and in some respects inaccurate. It is contended that the production of pure yeast had its inception at the beginning of 1886 in the installation of the Hansen-Kühle apparatus in Copenhagen, since Hansen's earlier method of working with small open vessels could not be considered to give a pure product. Records show that the amount of yeast distributed from Rotterdam during the next few years was greatly in excess of that sent out from Munich, many breweries in Germany and other parts of the Continent being supplied from the Heineken Brewery in Rotterdam. This information goes to prove that the process of pure yeast production, conceived in Denmark, owed its rapid development to Holland and not to Germany, and that the work of Elion at Rotterdam did not, as has often been stated, follow along paths already prepared by the station at Munich. Michel, director of the school of brewing in Munich, in 1897, acknowledged the Heineken brewery to have been foremost in the industrial development of pure yeast culture.

# Compositions for the Protection of Ships

## Combating the Effects of Sea Water and Barnacles

SHIPS compositions was the subject of a paper read at the meeting of the Oil and Colour Chemists' Association, held at the Institute of Chemistry, on January 26. The author, Mr. H. W. Keenan, said the old idea of relying upon the expedient of a cement wash was fast giving way to well designed compositions. These are known as "non-drying grease paints" and divide themselves into groups according to their melting points. They are applied hot, using the stumps of old paint brushes. Low melting point paints are suited to the forepeaks, the afterpeaks and tanks in these cool quarters, whilst nearer the engine room the coatings applied have to be unaffected by a higher mean temperature and, therefore, the melting point must be higher. For the same reason, compositions applied in the engine room itself must have a fairly high melting point. One of the difficulties, however, is to preserve a balance between the melting point and the spreadin power. Compositions used in the hold must vary with the nature of the cargo, but for general cargo and passenger carrying ships the compositions are designed to yield hard elastic films capable of withstanding the effects of acid condensations following the process of fumigation, a point sometimes overlooked. Although much progress has recently been made, compositions for petroleum cargoes are by no means uniformly satisfactory and attention is being concentrated in that direction at the present time. Particular interest attaches to the experiments of Montgomerie and Lewis in this connection. They demonstrated the fact that neither petroleum oils nor molasses are inherently corrosive, but that the contact of an electrolyte with the tank is necessary. They attacked the problem as a cell, superimposing an e.m.f. in the presence of a soluble ferrous salt which was, therefore, oxidised, taking the brunt of the attack away from the actual tank metal. So far this work is in an early stage but practical installations are being undertaken.

In the case of the superstructure of a ship such as deckhouses, bridge, etc., corrosion is invariably due to paint failure and the paints used differ from the ordinary decorative paints only in special cases where the incorporation of a small quantity of rubber solution may be resorted to. Deck plates need careful watching and where corrosion begins to show it is recommended that the parts should be cleaned and scraped and given a coating of red lead followed by a composition based either on a hard resinous vehicle or on a bituminous compound.

### Water Line Corrosion and Fouling

Water line corrosion is most difficult to contend with, the conditions appearing to afford ground for more than one theory of corrosion. A good "boot-topping" composition, as it is called, is difficult to formulate and the problem is definitely not solved by a good coat of red lead. There is, however, no reason why red lead should not provide a perfectly satisfactory key for the manufacturers' compositions. The modified resins of to-day, although costly, do well here, as the hardness, adhesion, water resistance and finish they impart to the film justifying many of the high claims made for them. The most serious form of under-water corrosion is pitting due ot blisters that have enclosed alkaline liquid and often there is considerable penetration into the metal. Countless materials have been pressed into service as anti-corrosive bodies in the past but the most modern compositions consist either of selected damar resin or a pitch or blend of pitches dissolved in solvent naphtha.

The fouling of ships by animal life is initiated principally whilst the ship is lying in harbour. Anti-fouling compositions divide themselves into non-drying and drying. The first division includes compositions of the wax and fat type, sometimes requiring pre-heating before application. Non-drying oils, with which poisons are incorporated, represent compositions that are known as "peeling" anti-fouling compositions, and they are supposed to function by growth being permitted in the first instance and erosion then causing the composition to break up, carrying the growth with it. The second division comprises a host of compositions, all more or less having the same object in view, viz., the gradual disintegration of the film whereby poisons are released and react with the sea water; to this division belongs the bulk of the anti-fouling compositions applied to-day. One exception is the attempt to produce arsine, stibine and the like, as the result of the action of sea water upon finely divided metallic compounds. The secret of a good anti-fouling composition is in the preparation of the poisons and the vehicle. With cuprous oxide, for instance, there are several methods of preparation, each one yielding a product different in nearly every physico-chemical aspect. In the same way, there are several qualities of mercuric oxide, all depending upon the conditions of precipitation. Copper aceto-arsenite does not vary so much since colour development in the vat and stability are closely related. The use of arsenic in the form of the oxide is no longer in general use. Iron oxide is the main colouring pigment and a good contrast is struck between first and second coats so that the painters shall have no difficulty in following their work.

### Points from the Discussion

The CHAIRMAN said a point which had often been raised was whether red lead was undesirable for an under-coat on steel due to the possibility of the top coat failing and action being set up between the sea water and the lead. No mention had been made by the author of cellulose and information on that would be valuable.

Mr. KEENAN said that although red lead was recognised as an inhibitive it did not act in that sense under water. If a spirit varnish was placed over a composition like red lead, there were unnatural contractions which immediately permitted contact between the lead and the sea water which aggravated the conditions rather than improved them. As regards cellulose, the disadvantage was the necessity for some form of primer and a cellulose primer was subject to alkaline peeling under marine conditions. If an endeavour was made to overcome this difficulty by introducing an oil primer matters were made worse. However impervious nitro-cellulose might be considered it was not so impervious as was necessary under marine conditions and his experience from a large number of test panels indicated that there was a permeability, and an oil primer was very quickly softened.

Mr. A. KAGAN asked the author's opinion as to which was the best method of preventing corrosion of propellor blades, namely, zinc plates or anti-galvanic compositions. He also asked whether spraying or brushing was better for painting the ship. A number of shipyards used spraying machines but his own opinion was that these were very unsatisfactory, especially under adverse climatic conditions. Another interesting problem was the protection of the interior of oil tanks. Ordinary oil paint did not last very long and information as to the best method of treatment in order to prevent corrosion would be valuable.

### Linings for Ship's Tanks

Mr. KEENAN said that zinc plates and anti-galvanic compositions were not in competition for the prevention of corrosion of propellor blades. The anti-galvanic compositions for the most part consisted of a highly insulating film in some cases of a bituminous character and the object was to spare the zinc plates rather than to take their place. There were several objections to spraying, an important one being that it was impossible to get the proper penetration of the metal in a manner required for marine purposes. Another point in connection with spraying was that the ingredients were far too dangerous to be allowed to disseminate into the air. However much one tried it, it was extremely difficult to get the average workman to protect himself against breathing a dangerous atmosphere. From all points of view, brushing was the best method. The question of painting under wet conditions with wet surfaces was a difficult one to discuss in detail but such work could be done. For instance, if there was present some form of emulsifying agent, any water that might be on the surface would be taken up and evaporated on the outside of the film, although even so he agreed that unsatisfactory results were sometimes obtained. The trouble

with linings for tanks was, on the one hand, that the nature of the cargoes was very often changed and on the other, that the owners expected the coatings to last not for six months or even twelve months but for a matter of four years. Very often a ship would start with heavy oil, because it was less corrosive but then it might change to some other liquid cargo for the purpose of which the hold was treated with live steam to wash down the sides, and the original painting on the inside of the tanks had to stand that. It might even be that the next cargo would be carbolic acid or anything else.

Mr. S. W .KENDALL said with regard to the linings of oil tankers, it could definitely be said now that success had been achieved for certain classes of cargo. The trouble, however, was when a cargo was suddenly changed, for instance, from whale oil, cotton seed oil or any of the edible oils to, for instance, a cargo of creosote or paraffin oil or white spirit, whilst in between the change the vessel came back in ballast with salt water. Provided the nature of the cargo was more or less constant this problem could be dealt with but otherwise it became almost impossible.

### The Need for a Smooth Surface

Dr. W. H. J. VERNON said the question of anti-fouling agents called for a great deal of research because it involved at the present time incompatible factors. It seemed from what the author said that most of the fouling took place in port where the conditions were more or less quiescent. It was interesting to know that copper compounds were found beneficial and this brought to mind the early form of protection given with copper bottoms. The toxicity of copper compounds was remarkable and this was brought out particularly in tests carried out by Dr. Friend where every sample was covered with barnacles except the copper, which was quite clean. Although the author had mentioned the use of petroleum jelly he had not said anything about lanolin and it would be interesting to know to what extent lanolin was being used, as he understood it was very protective. Also to what extent was it possible to use bituminous coatings over a red lead base. Moreover, to what extent did the smoothness of the surface have an effect in preventing corrosion. Coal tar and resin, he believed, was favoured very much in American practice to-day.

Mr. KEENAN, referring to the question of smoothness, said this was all important and was what was being striven after. At the same time, it was only possible to go to a certain point in the matter of smoothness under marine conditions. Even glass in constant contact with sea water would in the course of time become surprisingly rough. As regards coating over red lead, crazing was very common, but that did not mean corrosion would take place and it was possible to adjust the movement of the bituminous coating to that of the red lead so that crazing did not take place. The objection to the use of lanolin was that if any foreign body was present the film of lanolin would be too thin to contend with it. The compositions that he had referred to were in some cases sufficiently firm to allow a man to walk over them without creating any impression whatsoever. On the other hand, he had seen compositions rolled up into little balls by the movement of the ship where the composition had been badly applied. Although lanolin had been found to be an excellent protective, he did not think it would serve for ship purposes.

## More Orders and More Hands

### Wm. Gardner and Sons' Staff Dinner

MR. C. E. GARDNER, chairman of directors, presided at the annual staff and works dinner of Wm. Gardner and Sons (Gloucester), Ltd., at Gloucester, on January 27, at which it was announced that the company had extended its scope in the home market and abroad during the past year, with the result that it had not only maintained its position but had increased the number of workpeople employed.

Mr. F. Gardner, managing director, responding to the toast of the company, said that taking things as a whole the company had been extraordinarily lucky during 1932 and the directors hoped that 1933 would be a better year, not only for themselves but for the engineering trade as a whole. The spirit of loyalty displayed by all the employees had enabled the company to secure at least its share of business in the face of the most intensive competition and the most ridiculous price cutting he could ever imagine. Many firms had gone to the wall through price cutting and taking orders at any price, but owing to their own reputation and sound workmanship they had been able to maintain their prices, and more than hold their own. The policy of the directors, which they would constantly endeavour to maintain, was to give a really sound job at as economical a price as possible.

The CHAIRMAN, who has completed 51 years with the firm, said there were 18 members of the staff who had been with the firm for periods ranging from 24 to 36 years. Owing to increased business in the North of England during the past year they had opened an office at Manchester, under the management of Mr. W. Hanna.

## An Outstanding Judgment

### The Question of Infringement of Trade Mark

A QUESTION of some importance to the chemical industry was raised on a motion by Irvings' Yeast Vite, Ltd., against Fredk. Alexander Horsenail, of Canterbury, which again came before Mr. Justice Bennett in the Chancery Division on Monday.

Sir Leslie Scott, K.C., appeared for the plaintiffs, and said they were asking for an interim injunction to restrain infringement of the trade mark "Yeast Vite," and from passing off a pharmaceutical preparation not made by the plaintiffs as and for Yeast Vite. The defendant did not appear and had written to the plaintiff company's solicitors that he would consent to a perpetual injunction. The alleged infringement involving the use of the trade mark on or in connection with the defendant's goods by passing off and by means of a label, was that the defendant had published printed matter to the effect that his goods and "Yeast Vite" tablets were made according to the same formula.

The plaintiffs' case was that the defendant offered for sale bottles bearing the label "Yeast tablets. A substitute for Yeast Vite," and that an analysis showed that the defendant's yeast tablets were deficient in certain ingredients contained in "Yeast Vite" tablets and therefore the formula was not the same.

His lordship raised the point whether the label referred to was an infringement, as the defendant did not seem to have used the trade mark to describe his goods.

Sir Leslie argued in the affirmative. The plaintiffs had a trade mark and here the defendant was using the mark "Yeast Vite" for the purpose of catching the eye of the public, and this he had no right to do. His submission was that the defendant had no right to use plaintiffs' trade mark at all, or to sell his goods by reference to plaintiffs' goods, instead of on their own merits.

### The Argument Leading to Judgment

His lordship, after long legal argument, said the plaintiffs sought an injunction for infringement of trade mark and from passing off. So far as passing off was concerned he was satisfied that the defendant had committed acts which amounted to passing off and this entitled plaintiffs to an injunction in that respect. So far as the action went to the question of slander of goods, the evidence was not sufficient to warrant him granting the plaintiffs an injunction restraining defendant from doing the acts complained of till the hearing of the case and he did not propose to make any order on that part of the case. The important question argued was whether the defendant had been, in doing what he was doing, infringing the plaintiffs' trade mark. His lordship was grateful to Sir Leslie Scott in putting before him authority in the matter and so fully dealing with the case. Certain patent cases had come before the Court of Appeal and he had to be guided by the findings of that Court. What he had to ask himself was whether defendant by using the label in question on his bottles, was using the words Yeast Vite for the purpose of indicating that the goods were the goods of the plaintiffs. That was the question. In his lordship's judgment it was not possible to come to the conclusion that the defendant was representing the tablets as the plaintiffs' upon a fair interpretation of defendant's label. He was bound by the decision of the Court of Appeal and therefore had to refuse that part of the motion. The plaintiffs would have the costs.

Sir Leslie Scott intimated that there might be an appeal.

# Thorium and the Rare Earths

## Difficulties of Separation and Identification

ON Monday, January 30, Dr. J. Newton Friend lectured before the University of Birmingham Chemical Society on "Rare Earths." The study of the rare earths, said the lecturer, is one of peculiar interest. Their properties are in many ways unique, and the problem of their separation and identification is one of special difficulty. In consequence they offer a wide field for research which, if patiently carried out, is bound to yield results of great value. Empedocles (B.C. 490-430) postulated that the material world consists of four elements, fire, air, earth and water, an idea that entered a century later into the philosophy of Aristotle (B.C. 384-322). In popular language we not infrequently refer to these four "elements" to-day, but to the chemist the word element has a different meaning, a meaning given to it by Boyle (1627-1691). The name earth is conveniently retained as a generic name, to indicate lustreless, more or less amorphous refractory oxides characterised also by their incombustibility, infusibility and relative insolubility in water.

The earths are commonly grouped into four classes, namely (*a*) alkaline earths, including CaO, MgO, etc.; (*b*) acid earths, including $ZrO_2$, $Nb_2O_5$, etc. (*c*) earths proper, *e.g.*, $Al_2O_3$, $Fe_2O_3$, etc., and (*d*) the rare earths, 16 in number if yttria is included, 15 being oxides of the elements of atomic numbers 57 to 71 inclusive, all essentially trivalent.

### Occurrence of Rare Earths

The rare earths occur widely disseminated in nature, but often in very small amounts. Thus traces may occur in scheelite and apatite, and in certain varieties of colcite, fluorite, cassiterite and wolframite. The minerals in which they occur to appreciable extents number some 150 species and may be roughly classified as follows:—

(*i.*) *Oxides*: Of these uraninite, which consists essentially of $UO_2.2UO_3$, is perhaps the best known example, which may contain nearly 10 per cent. of thoria and appreciable quantities of the lanthana and yttria earths, usually less than 2 per cent., although 11 per cent. has been observed. The best known varieties are pitchblende, from which Madam Curie extracted radium in 1908, and cleveite in which Ramsay first discovered helium in 1894. Baddeleyite, essentially $ZrO_2$, and thorianite, which appears to be a solid solution of $UO_2$, $ThO_2$ and $CeO_2$, may also be mentioned.

(*ii.*) *Phosphates*: Here the best known example is monazite, probably first found in Scandinavia. Rolled grains of monazite, known as monazite sands, were later found in Carolina, having been produced by the weathering of rocks and natural concentration of the monazite in consequence of its superior density (5.0 to 5.5). The discovery of these deposits made the gas mantle industry a commercial possibility, for the sands are rich in thorium, present probably as phosphate, along with phosphates of the rare earths, more particularly those of the cerium group. The ordinary gas mantle is approximately 98 per cent. $ThO_2$. In 1895 further supplies of the sand were found in Brazil; these were ultimately largely controlled by the German Thorium Syndicate. In 1913 important monazite sands were discovered in Travancore in Southern India and these constitute the source of British thorium and rare earth supplies.

(*iii.*) *Niobotantalates and titanates* include a few minerals of considerable historial interest, notably aeschynite, euxenite and wükite. The last named contains up to 1 per cent. of scandia, which, however, we do not include amongst the rare earths, for reasons to be given later. This mineral was used by Crookes as his source of scandium when carrying out his classical researches on that element. It was in euxenite that Nilson discovered an element in 1879, which corresponded to the Eka-boron predicted by Mendeléeff when he drew up his periodic table as published in 1871. Nilson found the same element in gadolinite, and named it Scandium after his native Scandanavia. Aeschynite was so named by Berzelius from the Ek. meaning "shame," because he considered it a disgrace that chemists could not analyse it.

(*iv.*) *Silicates*: These comprise many minerals, notably cerite which is essentially a hydrated silicate of the cerium earths. Berzelius named it cerite and the metal cerium in 1804 in honour of Piazzi's discovery in 1801 of a minor planet which he called Ceres after the Roman goddess of corn. Gadolinite, named after the Finnish mineralogist Gadolin, is rich in beryllium, the composition usually ascribed to it being $2BeO.FeO.Y_2O_3.SiO_2$. Other silicates deserving of mention are Allanite, Thorite, zircon, thortveitite (the only mineral containing scandium as an essential constituent, namely $(Sc,Y)_2O_3.2SiO_2$) and yttrotitanite.

### Separation Proccsses

After concentration by flotation and by magnetic processes the thorium sand is broken down by heating with concentrated sulphuric acid, and the product extracted with water. Thorium and the rare earth metals pass into solution and are separated from the insoluble residue of silica, etc. In separating the thorium advantage is taken of the fact that thorium phosphate is less soluble in dilute mineral acid than are the rare earth metal phosphates. The solution is partially neutralised with magnesia or some other suitable agent, and the thorium precipitated as phosphate. From the solution the rare earth metals are precipitated as oxalates, which salts are relatively insoluble in dilute acid. The thorium phosphate is dissolved in hydrochloric acid and thorium oxalate precipitated out, ignited to oxide, dissolved in sulphuric acid and purified by chrystallisation as the nonahydrate, $Th(SO_4)_2.9H_2O$. In practice the actual process is not quite as simple as the above would indicate, it being necessary to repeat the different stages several times in order to ensure the production of pure products, but the guiding principle is the same.

In separating the rare earths serious difficulties begin. The rare earth metals may be conveniently divided into three groups, the adjacent members of which, however, cannot usually be easily separated:—

| *Cerium Group.* | *Terbium Group.* | *Yttrium Group.* |
|---|---|---|
| Cerium | Europium | Dysprosium |
| Lanthanum | Gadolinium | Holmium |
| Praseodymium | Terbium | Erbium |
| Neodymium | | Thulium |
| Illinium | | Ytterbium |
| Samarium | | Lutecium |
| | | Yttrium. |

In mineral form we never find any one of the rare earth metal compounds alone; there are always several of them associated in varying amounts. In monazite, for example, the cerium group predominates.

Since cerium can function as a tetravalent element as well as a trivalent rare earth element, several methods are available for separating it chemically from the rare earths in its ceric condition. One very convenient method is to oxidise it in alkaline solution with permanganate whereby insoluble $Ce(OH)_4$ is thrown out, the other rare earths remaining in solution. This reaction is quantitative, and may be used to estimate the cerium. The oxalates are ignited and the oxides dissolved in dilute nitric acid, magnesia is added in excess, and the whole is titrated on the water bath in accordance with the equation:—

$$3Ce(NO_3)_3 + KMnO_4 + 4MgO + 8H_2O = 3Ce(OH)_4 + MnO_2.Aq. + KNO_3 + 4Mg(NO_3)_2.$$

### Fractional Crystallisation of Salts

The cerium group is characterised by giving well defined crystalline double nitrates with magnesium, namely, $3Mg(NO_3)_2.2R(NO_3)_3.24H_2O$, where R stands for a rare earth metal; Mg may be replaced by Zn, Co, Ni or Mn. The order of solubility in diluted nitric acid solution follows the order of the metals as given above, the double cerium salt being least soluble, the samarium salt most soluble. By systematic fractional crystallisation, therefore, it is not experimentally difficult to separate samples of fairly pure Sm, Nd, Pr, and La salts provided an ample supply of original material is available. Illinium, if it occurs at all, is present in extraordinarily minute quantities and need not be considered. The cerium may be removed chemically beforehand or separated from the lanthanum by the same method after fractionation,

This is sometimes convenient as it swells the head fraction containing the lanthanum, and may render the separation of the latter from the praseodymium a little more easy. Under the best conditions, however, the process is tedious; several thousand fractionations may be necessary, and of course only small samples of the pure material can be isolated. The progress of the fractionation can be roughly controlled by a qualitative examination of the absorption spectra of solutions in successive batches. Thus a colourless head fraction shows that the lanthanum is free from praseodymium, and the absence of the latter and of samarium from the neodymium fraction can similarly be established. But obviously the freedom of the praseodymium batch from (colourless) lanthanum salts cannot be ascertained in this way. As a final control the arc spectrum is extremely valuable. The elements in the terbium and yttrium groups may be even more tedious to separate.

### Rare Earth Metals

Although typically trivalent, none of the rare earth metals yield alums, none yield alkyl or aryl derivatives, whilst hydrides are few. The chlorides are non-volatile but readily soluble in water without hydrolysis. The solubilities of their sulphates frequently fall with rise of temperatures as do those of such selenates as are known; in contrast to this, the solubility of scandium sulphate rises with the temperature. The oxalates are relatively insoluble in water, oxalic and dilute mineral acids, a property that is largely utilised in separating the rare earths from most other substances. Finally, it may be mentioned that bismuth nitrate yields a stable penta- and labile hexa-hydrate. The nitrates of Nd, La and Yt are isodimorphous with these.

Scandium is not usually regarded as a true rare earth metal for several reasons; it will suffice to mention two. Like thorium and zirconium, it gives an insoluble basic thiosulphate, whereas the rare earths proper yield soluble thiosulphates, with sodium thiosulphate; secondly, the sulphate tends to yield complete ions in solution, which suggests that it is in reality the scandium salt of scandium sulphuric acid, namely $Sc[Sc(SO_4)_3]$.

## Lautaro Nitrate Co. Ltd.

### Bondholders Asked for Guarantee

In a circular signed by the secretary to the committee appointed to protect as far as possible the holders of the 6½ per cent. first mortgage debenture stocks of the Lautaro Nitrate Co., Ltd., it is stated that the present chaotic position of the nitrate industry makes it of importance that in the reorganisation of the industry, which is inevitable, the holders' interests should be represented and their preferential position in regard to the fixed assets maintained. The trustees for the debenture stockholders and the committee have no funds whatever at their disposal, and they can only take action on behalf of the bondholders if they are prepared to guarantee the money for indispensable outlays. It is therefore suggested that each holder should agree to guarantee one-half of 1 per cent. of the face value of his holding, of which only a moiety would be immediately called up. Any unexpended balance will be returned pro rata, and, in addition, the committee will do its utmost in any reorganisation to secure that these payments should be reimbursed out of the first moneys available.

### Achema VII and Rubber Industries Exhibition

As a result of further conferences between the "Dechema" (Deutsche Gesellschaft für chemisches Apparatewesen), the Verein deutscher Chemiker, the Verein deutscher Maschinenbauanstalten and the civic authorities of Cologne, it has been decided that, without interfering with the preparations in hand for the chemical plant exhibition "Achema VII," the date should be changed. In accordance with the wishes expressed by plant and equipment manufacturers who will be exhibiting, the date for the exhibition, which will be held in Cologne, has been finally fixed for the week May 18-27, 1934. The exhibition "Kautschuk" of the German Society for Rubber Industries which was to be held in conjunction with the Achema will take place independently during 1933, in Cologne.

## German Dye Trust Report

### Improvements in Business

According to the report of the German Dye Trust (I. G. Farbenindustrie) for the final quarter of 1932, the business of the trust has improved in practically all departments. The signs of an economic revival, anticipated since the autumn, have on the whole continued, and in some cases even increased, notwithstanding complications in foreign trade relations. The customary seasonal decline at the beginning of winter was balanced by a slight recovery from depression. Business in dyes and auxiliary products continued to improve in Europe. Sales of nitrogen fertilisers still showed a rising tendency, especially in the home market, and hopes were justified that sales during this year's season would exceed last year's figures. Trade in synthetic nitrogen likewise rose slightly in quantity, but international competition and the difficulties confronting foreign trade depressed export prices.

Business in pharmaceutics and insecticides was still meeting with considerable difficulties abroad. The turnover in this branch was decreasing, but at a slow rate. Apart from the seasonal shrinkage in general photographic business, the German Dye Trust sales in photographic products abroad were hampered by foreign import duties and exchange restrictions, which, however, were offset to some extent by better sales at home. The generally favourable points in the German Dye Trust's latest report are a further improvement in the dye business as well as the recovery in its nitrogen trade. During the last quarter of 1932 and up to the present this concern has been able to increase its staff by about 5,000 new hands.

## Future Paint Materials

### Protective Function Anticipated to Decline

The introduction of synthetic materials in the manufacture of paints in recent years has caused much speculation as to the lines on which the paint industry will develop in future. This subject is specially dealt with in "The Times Trade and Engineering Supplement," of January 21, and it is of interest to notice that the writer thinks that the natural basic raw materials, such as linseed oil, turpentine, and gum-resins, will continue to be used for some years provided their price remains at an economic level. At the same time, he points out that synthetic materials made from cheap raw materials will continue to play an increasingly important part in the industry. He considers that in the future paints of all types, whether for metal, wood, or plaster, will be used almost entirely for embellishment and decoration, as the importance of their protective function will gradually decline with the solution of the problem of corrosion, particularly in respect of metals. In addition, it is indicated that the day may come when all main walls, interior and exterior, will be "poured" or moulded from special types of suitably coloured concrete or plaster, and that in this way not only the requisite structural strength but also a matte finish of pleasing colour and unlimited permanence will be secured.

Other points to which reference is made include the use of non-brittle grades of opaque coloured glass and of coloured sheets of non-inflammable celluloid, the possibility of the displacement of natural turpentine as a diluent, and the commercial development of large-scale peptising and fermentation of starches and sugars for the production of solvent liquids. While the author admittedly is frequently looking far ahead, the tendencies to which he draws attention are of undoubted importance to both manufacturers and users of paint and paint materials.

### Paint Problems in Building Research

In the January issue of the Journal of the Oil and Colour Chemists' Association is a paper entitled "Some Paint Problems of Building Research" by Mr. H. M. Llewellyn, which was read by him at a meeting held on December 7. The paper gives an account of investigations recently carried out at the Building Research Station, relating to problems of painting on plaster and cement. The action of dangerous salts contained in lime, plaster, calcium sulphate plaster and cement is explained.

# News from the Allied Industries

## Rubber

THE BRITISH GOODRICH RUBBER CO. has given notice to redeem its outstanding 6½ per cent. debenture stock at 105 per cent. on July 31 next. We understand that the directors have under consideration a proposal to create new debentures carrying a lower rate of interest.

## Paper

IT IS ANNOUNCED that the £800,000 4½ per cent. first mortgage debenture stock of Bowaters Mersey Paper Mills, Ltd., recently offered to debenture stockholders and shareholders of the company, was heavily over-applied for. The issue was made partly for the conversion of the existing 6½ per cent. debenture stock and partly in connection with important extensions, estimated to cost £850,000, now being carried out to the company's mills at Ellesmere Port.

## China Clay

THE CHINA CLAY STATISTICS for the whole of 1932 show that a total volume of 624,625 tonnage was dealt with. This was made up as follows: 557,543 tons of china clay, 32,380 tons china stone, and 14,702 tons ball clay, and compared with 1931 the total is down by 62,515 tons, the decline in china clay being 58,6444 tons, china stone 2,743 tons, ball clay 1,128 tons. The main factors accountable for the decline have been the failure of the American demand to reach its normal consumption and the effect of the operation of the French quota system limiting the export of china clay to France. There has been, however, a welcome expansion of demand in the home markets. The trades worst year was 1921 when the total reached only 345,250 tons. In 1912 and 1925 the output reached a level of 900,000 tons.

## Tanning

BARROW, HEPBURN AND GALE, LTD., have reported a further decline in profits, but the accounts for 1932 are somewhat more favourable than might have been expected in view of the exceptional circumstances. When this country went off the gold standard in September, 1931, there was considerable buying of leather, and, as a result, the company's trade for the first half of the past year was on a much reduced scale. In addition, prices of both raw hides and finished leather fell to a point lower than had been known for more than twenty years. In consequence, the net earnings of £44,552 reported for the past year do not compare unsatisfactorily with the total of £50,793 secured in 1931, when the company's operations were assisted by the special demand for leather previously referred to. The fixed dividend on the 6 per cent. participating preference shares has been sanctioned, but once again it is not possible to make any distribution on the ordinary capital. The balance to be carried forward, however, is increased from £18,428 to £22,480. Stock is now valued at £165,343, against £204,062 a year ago, while debtors have fallen from £102,828 to £82,747.

## Artificial Silk

GERMANY'S FOREIGN TRADE IN RAYON YARN developed favourably during the past year. Against imports valued at £2,186,000, compared with £3,109,000 in 1931, the exports were valued at £1,501,000, against £1,915,000. Thus, the adverse balance of £1,194,000 in 1931 was reduced to £685,000 in 1932. In volume, the imports were 124,000 tons lower at 1,016,000 tons, while the exports increased by 84,000 tons, to 682,000 tons.

THE HEAVY SUMS PAID FOR EXCISE DUTIES were stated to be the chief cause of failure of the Rayon Manufacturing Co. (1927) Ltd., of Erwyn Way, Leatherhead. The audited accounts showed that up to the end of March, 1932, the company had made a gross profit of £256,000, out of which the Excise authorities received £223,000 in respect of duty, and a net loss of £79,000 was incurred.

THE SOCIETE DES TEXTILES CHIMIQUES due Nord et de l'Est, one of the largest French rayon concerns, controlled by the Kuhlmann group, is to undergo reconstruction. It is proposed to reduce the present capital of 100 million francs to 20 million. At the same time there is to be an increase of this 20 to 50 millions, to be met by the parent concerns largely by cancelling previous advances.

## Matches

THE LATVIAN PARLIAMENT has resolved to maintain the agreement with the Swedish Match Co., as it is contended that the closure of factories would increase unemployment in Latvia.

## Non-Ferrous Metals

A DEFINITE AGREEMENT among the representatives of the zinc cartel, whose negotiations are still proceeding at Brussels, is apparently more difficult to reach than had been generally anticipated in market circles. The market has been influenced by the fear of additional output. The current quotation for prompt metal of £13 11s. 3d. shows a loss, as compared with the close of the year, of nearly £1 10s., and well over £2 per ton from the highest point touched in the previous quarter.

# Prices of Chemical Products

## Current Market Conditions

THE DEMAND for chemicals in the London market remains good, with prices generally firm. There has been little change in the market for coal tar products. The export market for sulphate of ammonia continues quiet and the price remains unchanged. On account of the exceptionally fine weather and the advance in price for February quite a number of purchases for home consumption were made during the second half of January. Occasional slight easiness has been in evidence on the Manchester chemical market during the past week, but it is still the case that chemical products generally are steady in tone. Buying interest during the week has been on moderate lines only, but rather satisfactory accounts are forthcoming as to the rate at which deliveries are being called for against contracts entered into earlier on. In Scotland a steady demand for chemicals has to be reported. Numerous export inquiries are being received. With the following exceptions the prices of chemical products remain the same as reported in THE CHEMICAL AGE of January 28 (pp. 84-85).

### General Chemicals

ACID, CITRIC.—LONDON: 10d. per lb. less 5%. MANCHESTER: 9¾d. to 10d.

ANTIMONY OXIDE.—SCOTLAND: Spot, £24 per ton, c.i.f. U.K. ports.

ARSENIC.—LONDON: £22 14s. c.i.f. main U.K. ports for imported material; Cornish, nominal, £23 f.o.r. mines. SCOTLAND: White powdered £27 ex wharf; spot, £27 10s. ex store. MANCHESTER: White powdered Cornish, £24 at mines.

LEAD, ACETATE.—LONDON: White, £34 per ton. Brown, £1 per ton less. SCOTLAND: White crystals, £34 to £36. Brown, £1 per ton less. MANCHESTER: White, £33; Brown, £31.

NICKEL AMMONIUM SULPHATE.—£53 per ton d/d.

NICKEL SULPHATE.—£53 per ton d/d.

POTASSIUM CHLORATE.—3¾d. per lb. ex wharf London in 1-cwt. kegs. LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100% powder, £37. MANCHESTER: £37.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¾d.

SULPHUR.—£12 per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9. Ground American, £10 ex store.

### Pharmaceutical and Fine Chemicals

ACID, SALICYLIC.—B.P. pulv., 1s. 5d. to 1s. 8d. per lb.; technical, 1s. 2d. to 1s. 4d.

AMIDOPYRIN.—18s. 0d. to 20s. per lb.

PHENACETIN.—4s. 6d. to 4s. 9d. per lb. LONDON: 4s. 6d. to 4s. 9¾d. per lb.

PHENOLPHTHALEIN.—4s. 5d. to 5s. 8d. per lb.

SODIUM SALICYLIC.—Powder, 2s. to 2s. 8d. per lb.; crystal, 2s. 1d. to 2s. 2d. LONDON: Powder, 2s. to 2s. 8d., including packing and delivery; crystals, 1d. extra.

### Coal Tar Products

ACID, CARBOLIC (CRYSTALS).—9d. to 11d. per lb. Crude, 60's, 1s. 11d. to 2s. per gal.; 2% water, 2s. MANCHESTER: Crystals, 9½d.; crude, 2s. 4d. SCOTLAND: Sixties, 1s. 7d. to 1s. 8d.

ACID, CRESYLIC.—99/100, 1s. 7d. to 1s. 8d. per gal.; Refined, 1s. 8d. to 1s. 9d.; Pale, 98%, 1s. 5d. to 1s. 7d.; Dark, 1s. 2d. to 1s. 3d. LONDON: 98/100%, 1s. 3d. Dark 95/97%, 11d. SCOTLAND: Pale 99/100%, 1s. 3d. to 1s. 4d.; 97/99%, 1s. to 1s. 1d.; dark 97/99%, 11d. to 1s.; high boiling acid, 2s. 6d. to 3s.

PITCH.—Medium soft, £4 17s. 6d. to £5 per ton. MANCHESTER £4 15s. to £5 f.o.b. LONDON: £4 10s. to £4 12s. 6d. f.o.b. East Coast port.

# Inventions in the Chemical Industry

## Specifications Accepted and Applications for Patents

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications Accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

### Milling Dyes in Aqueous Media

IN grinding or milling insoluble or difficultly soluble dyestuffs or pigments in aqueous media, frothing is prevented by the addition of an organic liquid having a low-surface tension relative to that of water. Suitable organic liquids are alcohols, *e.g.*, methyl, ethyl and butyl alcohols, ethers, *e.g.*, ethyl ethers, esters, *e.g.*, ethyl acetate, ketones, *e.g.*, acetone, and aromatic, hydroaromatic or aliphatic hydrocarbons, *e.g.*, benzene or paraffin oil. The grinding may be carried out in the presence of additional abrasive materials, which may be water-soluble to facilitate their removal from the finely divided material. Examples of such abrasives are boric and sodium chloride; thus an insoluble dyestuff may be ground with sodium chloride in the presence of a saturated solution of sodium chloride to which methylated spirit has been added to prevent frothing. (See Specification No. 374,437 of British Celanese, Ltd., and E. Stanley.)

### Recovery of Sulphur Dioxide

SULPHUR dioxide is recovered from gas mixtures containing it by washing them with a substantially anhydrous solvent consisting of aniline or its homologues or N-alkyl derivatives of aniline or their homologues or mixtures thereof, the used solvent being regenerated by the application of heat and reduction of pressure, whereby concentrated sulphur dioxide is obtained. The washing may be effected under increased pressure, say 10 atmospheres, and at as low a temperature as possible without the solvent congealing. The gases to be treated should preferably be preliminarily dried for example by washing with concentrated sulphuric acid. The absorbed gas may also be set free by passing an inert gas or steam through the used solvent preferaby at raised temperature. Traces of solvent may be removed from the gas by passing it over active charcoal. (See Specification No. 371,888 of J. S. Dunn and Imperial Chemical Industries, Ltd.)

### Applications for Patents

SEPARATION OF ACETYLENE. Air Reduction Co., Inc. Jan. 27. (United States, Feb. 11, '32.) 2637.

APPARATUS FOR TREATING WATER, ETC. Aktiebolaget Filtrum. Jan. 25. (Germany, Feb. 1, '32.) 2128.

ALUMINIUM BRONZE POWDER. Aluminium, Ltd. Jan. 23. (United States, May 13, '32.) 2135.

ALUMINIUM SILICON ALLOYS. Aluminium, Ltd. Jan. 23. (United States, June 2, '32.) 2137.

PRODUCTION OF THYMOL FROM PARA-CYMENE, ETC. A. G. Bloxam (*Soc. of Chemical Industry in Basle*). Jan. 26. 2527.

MANUFACTURE OF AZO DYESTUFFS. A. Carpmael (*I. G. Farbenindustrie.*) Jan. 26. 2576.

PROCESS OF MANUFACTURING ALUMINIUM AND BARIUM COMPOUNDS. Coframet Soc. Anon. Jan. 23. (France, Jan. 22, '32.) 2215.

MANUFACTURE OF DYESTUFFS. F. B. Dehn (*Deutsche Hydrierwerke Akt.-Ges.*) Jan. 26. (Germany, Jan. 26, '32.) 2579.

OBTAINING SULPHUR FROM SPENT GAS-PURIFICATION MASSES. H. Deneke. Jan. 26. (Germany, Jan. 26, '32.) 2579.

PREPARATION OF CATALYSTS FOR HYDROGENATING, ETC., REACTIONS. E. I. Du Pont de Nemours and Co. Jan. 27. (United States, Jan. 27, '32.) 2713.

MANUFACTURE OF EASILY-SOLUBLE ESTER-SALTS *of* LEUCO-VAT-DYESTUFFS. Durand and Huguenin Akt.-Ges. Jan. 24. (Germany, Jan. 25, '32.) 2299.

MANUFACTURE, ETC., OF BARIUM FLUOSILICATE. Grasselli Chemical Co. Jan. 28. (United States, Jan. 29, '32.) 2747.

CATALYTICALLY TREATING MINERAL OILS, ETC. C. J. Greenstreet. Jan. 25. 2437.

MANUFACTURE OF NICKEL CARBONYL. I. G. Farbenindustrie. Jan. 24. (Germany, Feb. 3, '32.) 2319.

MANUFACTURE OF QUINOLINE DERIVATIVES. I. G. Farbenindustrie. Jan. 26. ((Germany, Jan. 26, '32. 2526; and (Germany, Nov. 4, '32.) 2526.

MANUFACTURE OF DYESTUFFS. I. G. Farbenindustrie. Jan. 27. (Germany, Jan. 27, '32.) 2653.

MANUFACTURE OF COMPLEX METAL COMPOUNDS OF ORTHO-HYDROXY AZO DYESTUFFS. I. G. Farbenindustrie. Jan. 27. (Germany, May 10, '32.) 2672.

EMULSIONS. Imperial Chemical Industries, Ltd. Jan. 26. 2561, 2562.

PROTECTIVE TREATMENT OF STONE, ETC. Imperial Chemical Industries, Ltd. Jan. 26. 2565.

PRODUCTION OF ARTIFICIAL FILAMENTS, ETC. Imperial Chemical Industries, Ltd. Jan. 26. 2566.

RECOVERY OF SULPHUR FROM SPENT OXIDE. Imperial Chemical Industries, Ltd. Jan. 26. 2567.

MANUFACTURE OF POLYETHYLENE GLYCOLS. Imperial Chemical Industries, Ltd. Jan. 27. 2464.

MANUFACTURE OF PURE SULPHUR. J. Y. Johnson (*I. G. Farbenindustrie*). Jan. 23. 2164.

MANUFACTURE OF ALDEHYDES. J. Y. Johnson (*I. G. Farbenindustrie*). Jan. 26. 2529.

IMPROVING LUBRICATING OILS. J. Y. Johnson (*I. G. Farbenindustrie*). Jan. 26. 2530.

SEPARATION OF MIXTURES OF ALKALI METAL NITRATES WITH AMMONIUM CHLORIDE. J. Y. Johnson (*I. G. Farbenindustrie*). Jan. 28. 2760.

MAKING NON-TOXIC ARSENIC CONTAINING AMINOBENZENE COMPOUNDS. S. Kielbasinski. Jan. 26. 2508.

PRODUCTION OF MALEIC ANHYDRIDE. A. L. Mond (*National Aniline and Chemical Co.*). Jan. 27. 2622.

CATALYTICAL MANUFACTURING OF ACETONE. A. Neumann. Jan. 23. 2069.

TREATING ACID SOLUTIONS. T. C. Oliver. Jan. 28. 2789.

MANUFACTURE OF POLYETHYLENE GLYCOLS. H. A. Piggott. Jan. 27. 2646.

### Specifications Accepted with Dates of Application

TREATMENT OR MANUFACTURE OF HYDROCARBONS. H. Dreyfus. July 9, 1931. 386,669.

PRODUCTION OF ANTIMONY TRI-FLUORIDE. Kinetic Chemicals, Inc. Feb. 18, 1931. 386,654.

PROCESS OF PREPARING HYDRATED CITRIC ACID. C. Pfizer and Co. July 15, 1931. 386,705.

OXIDATION OF ORGANIC COMPOUNDS. J. Y. Johnson (*I. G. Farbenindustrie*). Sept. 16, 1931. 386,715.

OXIDATION OF ORGANIC COMPOUNDS. J. Y. Johnson (*I. G. Farbenindustrie*). Sept. 28, 1931. 386,725.

MANUFACTURE OF YELLOW VAT DYESTUFFS. A. Carpmael (*I. G. Farbenindustrie*). Oct. 13, 1931. 386,733.

PRODUCTION OF PHOSPHATE COATINGS ON METALS. Metal Finishing Research Corporation. July 7, 1931. 386,739.

MANUFACTURE AND PRODUCTION OF ASSISTANTS FOR THE TEXTILE AND RELATED INDUSTRIES. J. Y. Johnson (*I. G. Farbenindustrie*). Nov. 19, 1931. 386,752.

ELECTROLYTIC PRODUCTION OF IRON. Vereinigte Stahlwerke Akt.-Ges. Jan. 19, 1931. 386,790.

SENSITISING SILVER HALIDE EMULSIONS. I. G. Farbenindustrie. Jan. 13, 1931. 386,791.

ARTICLES FROM SYNTHETIC RESIN COMPOUNDS AND A METHOD FOR THEIR MANUFACTURE. Saureschutz Ges. March 23, 1931. 386,826.

MANUFACTURE OF COMPOSITIONS, FILMS, AND THE LIKE, FROM PRIMARY ACETYL CELLULOSES. C. F. Boehringer and Soehne Ges. April 24, 1931. 386,839.

PROCESS FOR THE DECOMPOSITION OF COMPLEX SALTS COMPOSED OF DOUBLE SULPHATES OF POTASSIUM AND CALCIUM. A. L. Mond (*Chemische Fabrik Buckau*). May 23, 1932. 386,854.

MANUFACTURE OF DERIVATIVES OF THE ANTHRAQUINONE SERIES. I. G. Farbenindustrie. June 3, 1931. 386,861.

PROCESS AND PRODUCT FOR ELIMINATING TARTAR IN BOILERS, GENERATORS, PIPING, AND SO ON, AND METHOD OF OBTAINING SAID PRODUCT. F. Lecomte. June 5, 1931. 386,865.

STEAM CIRCULATING JETS FOR HEATING CORROSIVE AND EROSIVE LIQUIDS. Phosphor Bronze Co., Ltd., C. G. T. Hyslop and E. E. Wynn. June 16. 1932. 386,876.

PROCESS FOR THE MANUFACTURE OF β-ACETOETHYL ALCOHOL. I. G. Farbenindustrie. Aug. 13, 1931. 386,897.

PROCESS OF SENSITISING PHOTOGRAPHIC EMULSIONS. I. G. Farbenindustrie. Aug. 12, 1931. 386,903.

1-PHENYL-3-METHYL-4-ALKYL- AND- 4-ARALKYL-PYRAZOLONES AND PROCESS FOR THE MANUFACTURE OF SAME. F. Hoffffmann-La Roche and Co. Akt.-Ges. Sept. 7, 1931. 386,918.

1-PHENYL-2, 3-DIMETHYL-4-ALKYL-5-PYRAZOLONES AND PROCESS FOR THE MANUFACTURE OF SAME. F. Hoffffmann-La Roche and Co., Akt.-Ges. Oct. 9, 1931. 386,920.

SACCHARIFICATION OF CELLULOSE-CONTAINING SUBSTANCES WITH MINERAL ACIDS. Holzhydrolyse Akt.-Ges. E. Farber, F. Koch, and H. Specht. Sept. 27, 1932. 386,927.

MULTIPLE ALLOYS OF MAGNESIUM WITH ZINC AND/OR ALUMINIUM. Oster-Reichisch Amerikanische Magnesit Akt.-Ges. Feb. 19, 1932. 386,929.

CHROMIUM NICKEL STEEL ALLOYS. F. Krupp Akt.-Ges. July 21, 1930. 386,690.

# From Week to Week

THE GERMAN DYE AND CHEMICAL TRUST (I.G. Farbenindustrie) has taken on 4,400 additional workers since October.

MR. J. ROGERS, a director of Imperial Chemical Industries, was the guest of honour at the annual supper and dance of the foremen at Ardeer factory, last week.

AFTER SEVEN MONTHS OF PREPARATION, a new factory is to be opened at Crook within the next few days under the name of the Crook Chemical Works.

CLAYTON ANILINE CO., LTD., of Clayton, have recently sent us a wall calendar, with a reproduction of an oil painting of the Grand Canal, Venice, by Bouvard.

MR. FRANK ARNOLD GREENE, treasurer of the Institution of Chemical Engineers and a member of the college chemical engineering committee, was appointed Fellow of King's College, at a meeting of the Senate of London University on January 25.

MELDRUMS, LTD., HAVE RECEIVED a repeat order for additional destructor plant to be installed at Jerusalem. The plant consists of a No. 10A steel cased destructor arranged for front feed, with carcase chamber, engine driven forced draught fan and steel chimney.

MR. P. MALCOLM STEWART, who was to have given an account of the extensive profit-sharing scheme conducted by the Associated Portland Cement Manufacturers, Ltd., at the Industrial Co-partnership lunch on February 2, was unavoidably prevented from attending, and the lunch had to be postponed.

PROFESSOR J. B. S. HALDANE, the famous scientist and nephew of Lord Haldane, has resigned the Sir William Dunn Readership in bio-chemistry at Cambridge, which he has held since 1922. He is to take up a new appointment at University College, London. A Chair of Genetics has been created for him, and it is in consequence of this appointment that he has resigned.

THE INTERNATIONAL SUPERPHOSPHATE MANUFACTURERS' ASSOCIATION has recently published a supplement to "Phosphates and Superphosphates," by A. N. Gray. The object of the supplement is to bring up to date the statistical information which the original work contains. This supplement, price 1s., can be obtained from the Association, Aldwych House, Aldwych, London, W.C.2.

THOMAS BOLTON AND SONS, LTD., Widnes, have secured the entire order of 3,000 tons of sulphate of copper required by the Agricultural Bank of Greece. This is the largest single order ever placed with the firm and represents the season's requirements of insecticide and fungicide used by Greek currant growers.

THE MEMORY of the late Lord Melchett is to be perpetuated by endowing the Commercial Road Talmud Torah, an institution with which he was identified. The fund is to be inaugurated on February 21, and the members of the council of the fund, of which Mr. R. D. Blumenfeld is chairman, include the Lord Mayor, Lord Ebbisham, Sir Herbert Austin, Sir Charles Higham and Sir Hugo Hirst. The secretary to the fund is Councillor H. Newman, 9-11 Christian Street, London, E.1.

AMONG EMINENT ACADEMIC VISITORS to the University of Birmingham is Professor Max Bergmann, one of Germany's most distinguished chemists, who lectured to chemistry students at Edgbaston, on January 25. He spoke on proteins. A pupil of Emil Fischer, Professor Bergmann has applied his knowledge to original investigations dealing with problems in organic and biochemistry. In this connection he has contributed numerous papers on the chemistry of proteins and amino acids, and also on carbohydrates.

THE BOARD OF TRADE announces that regulations have been made under Section 8 (1) of the Finance Act, 1919, and paragraph 1 of the 3rd Schedule to the Import Duties Act, 1932, prescribing that certain classes of goods manufactured in and consigned from, a part of the Empire, must contain a minimum of 50 per cent. of Empire material and labour in order to qualify for Imperial Preference, instead of 25 per cent. as at present. The regulations, which come into force on April 1, 1933, are being published as the Import Duties (Imperial Preference) No. 1 Regulations, 1933, and copies of the regulations, including the schedule of goods to which the increased percentage applies, will be obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, either direct or through any bookseller.

THE BUREAU OF THE DISARMAMENT CONFERENCE, at its meeting on January 30, discussed the replies to the questionnaire submitted to the Bureau by the special committee on chemical, incendiary, and bacteriological weapons, and agreed, on the proposition of the president, Mr. Henderson, in favour of the principle of special measures for the prohibition of the use of the weapons in question. Mr. Eden (Great Britain) and the Italian representative opposed the prohibition of the use of reprisals. The former said in effect that a country attacked by chemical weapons would have recourse to reprisals whether they were forbidden or not, and therefore it was hypocritical to forbid them. This is no doubt true, and that in the event of war all the belligerents will disregard the prohibition of the use of the weapons in question.

THE EMPLOYEES AT THE ARDEER FACTORY of Imperial Chemical Industries contributed £671 to charities during 1932.

MR. J. B. BURNARD, of Burnard and Algar, Ltd., the Cattedown chemical works, has been returned as one of the new councillors of the Port of Plymouth Chamber of Commerce.

CONTRACTS HAVE BEEN MADE with Thomas W. Ward, Ltd., of Sheffield, for the immediate dismantling of the steel plant at Penistone.

MR. H. HUMPHREYS JONES was re-elected president of the Liverpool Chemists' Association at the annual meeting on January 25, and Mr. Martin S. Hughes was re-elected hon. treasurer. Mr. Alec Rae was elected secretary in place of his brother, Mr. John Rae.

PROFESSOR J. C. M'LENNAN gave a lecture on low temperature phenomena, at the Royal Institution, on January 30. Liquid helium was used to illustrate super conductivity, which occurs in many chemical substances at low temperatures.

THE HI-WAY OIL CO., of British Columbia, Ltd., is about to establish a refinery at South Westminster (across the Fraser River from New Westminster) the cost being estimated at approximately £20,000. Oil supplies will be piped from the dock to the plant. The refinery is expected to be completed and in operation about the middle of February.

THE SECRETARY FOR MINES announces that the explosive "Superkoll," manufactured by Nobel's Explosives Co., Ltd., has been added to the list of permitted explosives for general use in mines to which Part II. of the Explosives in Coal Mines Order applies.

CHANGE OF ADDRESS AND TELEPHONE NUMBERS is announced by the National "Safety First" Association (Inc.). Its new address is Terminal House, 52 Grosvenor Gardens, London, S.W.1; and its new telephone numbers are: Sloane 2188-9. The telegraphic address—"Safeguards, Sowest, London"—is unchanged.

IN A COMMUNICATION to the Westmeath County Committee of Agriculture regarding the starch factory which is being established at Athlone, the Irish Free State Minister for Industry and Commerce stated that the Government would grant any reasonable assistance for the project.

A JOINT MEETING of the Chemical Engineering Group and the Birmingham Section of the Society of Chemical Industry will be held at Birmingham on March 17. An address on "Personnel in Industry," will be delivered by Mr. W. A. S. Calder. An invitation has been received from the directors of Cadbury Bros., Ltd., for members to visit the works at Bournville, if a sufficient amount of support is forthcoming from group members.

THE PRESIDENT OF THE BOARD OF TRADE has appointed the following committee to report whether any, and if so what, changes in the existing law and practice relating to trademarks are desirable: Viscount Goschen (chairman), Mr. F. Gilbert Brettell, Sir Edward T. F. Crowe, Mr. Eric Davies, Mr. J. Rankine Finlayson, Mr. J. E. James, Sir Duncan M. Kerly, Lieut.-Colonel Arthur N. Lee, Mr. M. F. Lindley, Sir Frederick H. Richmond, Mr. Charles B. L. Tennyson, and Mr. W. Trevor Watson, K.C. The secretary is Mr. R. W. Luce, Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

IN THE CHANCERY DIVISION on Tuesday, the action of the Attorney General, at the instance of the Epsom Rural District Council, against the Rayon Manufacturing Co. was mentioned to Mr. Justice Luxmoore. Mr. Heckscher, for the compay, moved for the discharge of the writ of sequestration granted against the company. Counsel said in July, 1928, an injunction was granted restraining the company from emitting fumes so as to create a public nuisance. In July, 1931, Mr. Justice Clauson granted a writ of sequestration against the company for breach of injunction, but allowed it to lie in the office until the end of October of that year. The writ had continued to lie in the office until to-day. The position now was that the works had been closed since November last, and they were now in the hands of a receiver appointed by debenture holders. The company was now being wound up by the Court and the writ of sequestration was therefore void. As long as the writ laid in the office, there was nothing for the liquidator and it interfered with the chances of a sale. Mr. Spens, K.C., for the Attorney General said he left the matter in the hands of the Court, but he submitted that the motion was misconceived and ought to be dismissed with costs. His lordship said he was not going to dissolve the writ and as nothing could happen under it, he held the motion was misconceived and he dismissed it with costs.

## Obituary

MR. ALFRED HAROLD WIGGIN, at his residence, Bordesley Hall, Alvechurch, near Birmingham, on January 29. He was formerly managing director of Sir Henry Wiggin and Co., metal manufacturers of Birmingham. He was a member of the Committee of the Birmingham Canal Navigation, and a director of the Forth Bridge Railway Co. He had also been a director of the London, Midland and Scottish Railway Co.

# Commercial Intelligence

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

## Mortgages and Charges

[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts 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.]

CERAMIC PRODUCTS, LTD., London, S.E. (M., 4/2/33.) Registered January 23, £100 debentures; part of £500 (not ex.); general charge. *Nil. July 23, 1931.

### Satisfactions

COOKSON & CO., LTD., Newcastle-on-Tyne, smelters, etc. (M.S., 4/2/33.) Satisfaction registered January 24, of debentures, registered March 15, 1920, to extent of £8,900.

STRONTIUM PRODUCTS, LTD., Bristol, mine owners. (M.S., 4/2/33.) Satisfaction registered January 21, of C debentures registered April 3, 1930, to extent of £1,000.

## County Court Judgment

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

X LENT CHEMICAL MANUFACTURING CO., 1 Great North Road, Doncaster, manufacturers. (C.C., 4/2/33.) £36 1s. 1d. December 14; £25 7s. 7d. December 13.

## London Gazette, &c.

### Companies Winding Up

SENSIBLE HEAT DISTILLATION, LTD. (C.W.U., 4/2/33.) Winding-up Order January 23.

ATLAS ARTIFICIAL SILK PROCESSES, LTD. (C.W.U., 4/2/33.) Statutory meetings at Bankruptcy Buildings (Room 53), Carey Street, Lincoln's Inn, London, W.C.2, February 8; creditors 2.30 p.m., contributories at 3 p.m.

X-RAYS, LTD. (C.W.U., 4/2/33.) Statutory meetings at 33 Carey Street, Lincoln's Inn, London, W.C.2, February 8; creditors 11.30 a.m.; contributories at 12.15 p.m.

# Forthcoming Events

**Feb. 6.**—Society of Chemical Industry (London Section). "Hormones." Professor E. C. Dodds. 8 p.m. Burlington House, London.

**Feb. 6.**—Royal Society of Arts. "Thermal Insulation." Ezra Griffiths. 8 p.m. John Street, Adelphi, London.

**Feb. 8.**—Institute of Fuel. "Notes on the Practice of Heat Insulation." Lindsay Forster. 6 p.m. Burlington House, London.

**Feb. 8.**—Society of Chemical Industry (Food Group). Joint discussion with the Institute of Metals. "The Use of Non-ferrous Metals in the Food Industry." T. N. Morris, J. M. Bryan, N. D. Sylvester and others. 8 p.m. Burlington House, London.

**Feb. 8.**—Institute of Fuel (North-Western Section). "Post-war Experimental Work on Coal Blending." H. Hollings.

**Feb. 8.**—Royal Society of Arts. "Design and Form as Applied to the Manufacture of Glassware." James H. Hogan. 8 p.m. John Street, Adelphi, London.

**Feb. 9.**—Oil and Colour Chemists' Association, Joint meeting with the Borough Oil and Colour Students' Association. "Fuel." W. Carrott. 7.30 p.m. 30 Russell Square, London.

**Feb. 9.**—Institute of Chemistry (Manchester Section). "On Gaining Experience." Dr. W. R. Ormandy. 7 p.m. Reynolds Hall, College of Technology, Manchester.

**Feb. 10.**—Institute of Chemistry (London and South Eastern Counties Section). Annual Dinner and Dance. Empire Restaurant, Wilton Road, London, S.W.1.

**Feb. 10.**—Society of Chemical Industry (Chemical Engineering Group) "Creep in Steels." H. J. Tapsell. 8 p.m. Burlington House, London.

**Feb. 10.**—Institution of the Rubber Industry (Manchester Section). Annual Dinner-Dance.

**Feb. 10.**—Chemical Engineering Group. "Creep in Steels." H. J. Tapsell. Burlington House, London.

**Feb. 10.**—Oil and Colour Chemists' Association (Manchester Section). "Physical Tests and their Bearing on the Manufacture and Use of Protective Materials." Dr. G. F. New.

**Feb. 10.**—Society of Dyers and Colourists (London Section). "Dyes and Dermatitis." Dr. W. J. O'Donovan.

**Feb. 10.**—Institute of Metals (Sheffield Section). "Soft Solders and Fluxes." O. F. Hudson. 7.30 p.m. University, Sheffield.

# Chemical Trade Inquiries

**The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).**

**Australia.**—A Melbourne agent desires to secure the representation for Victoria, on a commission or consignment basis, of United Kingdom manufacturers of drugs, patent medicines, druggists' sundries, synthetic resins. (Ref. No. 154.)

**Czechoslovakia.**—A commission agent established at Prague wishes to obtain the representation of United Kingdom manufacturers of perfumes and cosmetics, on a commission basis. (Ref. No. 178.)

# Company News

**Fairy Dyes, Ltd.**—The report for the year ended November 30 states that profits, including interest and transfer fees received, amounted to £21,043, as compared with £22,289 last year. It is proposed to pay a dividend of 12½ per cent. on the ordinary shares, participating dividend of 2½ per cent. on the 7½ per cent. cumulative preference shares, requiring £900, to carry to reserve £5,000, leaving to be carried forward £4,643.

**Gas Light and Coke Co.**—The accounts for 1932 show that the balance to the credit of the net revenue account will enable the directors to recommend the payment of dividends for the half-year to December 31 last on the 4 per cent. consolidated preference stock at the rate of 4 per cent. per annum, on the 6 per cent. Brentwood redeemable preference stock at 6 per cent. per annum, on the 3½ per cent. maximum stock at 3½ per cent. per annum, and on the ordinary stock at 5 3-5 per cent. per annum, carrying forward the sum of £215,550. These payments are the same as a year ago, when a balance of £139,121 was carried forward.

# New Companies Registered

**Browns' Dryers (British), Ltd.** Registered on January 25. Nominal capital £1,000 in £1 shares. Manufacturers of and dealers in all kinds of machinery, apparatus and appliances used in heating, drying, impregnating and chemical manufacture, etc. Directors: Francis J. Morgan, 7 Park Street, Swinton, Manchester, and Isabella C. Morgan.

**Economic Water Softeners, Ltd.,** 7 Mill Lane, Solihull, Warwickshire. Registered on January 31. Nominal capital £2,000 in £1 shares. Manufacturers and erectors of and dealers in all types of water softening apparatus, manufacturers of and dealers in all kinds of chemical compounds, etc.

**Fleming & Whitelaw, Ltd.,** Australia House, Strand, London, W.C.2. Registered on January 27. Nominal capital of £150 in 1s. shares. Importers, exporters, manufacturers of and dealers in oils, and oleaginous and saponaceous substances, soap manufacturers, grocers, drysalters, dealers in drugs, chemicals, etc. Directors: Arthur E. Whitelaw and Geoffrey R. Whitelaw.

**McKesson & Robbins, Ltd.** Registered on January 25. Nominal capital £100 in £1 shares. Manufacturing chemists, dealers in and importers and exporters of crude medical and technical drugs, essential and animal oils and products, importers, exporters and manufacturers of and dealers in perfumes and toilet requisites, brushes, etc. A subscriber is Gordon S. Daniel, Kingsley, Hazelwood Lane, Chipstead, Surrey.

**New G. & S. Processes Syndicate, Ltd.,** King William Street House, Arthur, Street, London, E.C.4. Registered on January 30. Nominal capital £22,000 in 1s. shares. To adopt an agreement with New G. & S. Processes Syndicate, Ltd. (in liquidation) and D. Haslett, the liquidator thereof, to develop and turn to account the business comprised therein, and to carry on the business of manufacturers of and dealers in materials used in the manufacture of splinterless, safety, non-breakable, reinforced or protected, and

every other kind of glass; cellulose, acetate and artificial silk pulp and all fibrous substances, chemicals, drugs, paints, etc. Directors: Col. Sir George L. Courthope, M.P., James H. Nicholson, and Philip C. Chase.

**Resistant Highway Surfacings, Ltd.,** National Buildings, The Parsonage, Manchester. Registered on January 25. Nominal £5,000 in £1 shares. Manufacturers of, agents for and dealers in chemicals and chemical products, and other goods, etc. Directors: F. Gysin, Alfred E. Peak, Harold P. Addleshaw.

**Speak, Greenall & Co., Ltd.** Registered on January 28. Nominal capital £1,000 in shares of £1 each. Manufacturers of and dealers in paints of all kinds, petrol, varnish, enamel, polish, lacquer, shellac, cellulose, tallow, size, pigments, compositions, oils, wax, greases; manufacturing chemists, drysalters, etc. Directors are: Arnold L. Speak, 7 Holly Grove, Halifax, and Alfred Greenall.

**Stanford, Wylie & Fraser, Ltd.,** 109 Hope Street, Glasgow.—Registered in Edinburgh as a "private" company on December 29. Nominal capital, £3,000. Objects: to acquire the business of Stanford, Wylie and Fraser, oil and chemical manufacturers, and merchants, Argyle Oil and Chemical Works, 123-5 Mansion Street, Possilpark, Glasgow, and to carry on the business of oil, grease, paint and chemical manufacturers, etc. Directors: A. Wylie, and E. G. Brown.

**Woodside Laboratories, Ltd.** Registered as a "private" company in January 5. Nominal capital £10,000 in £1 shares. Manufacturers of and dealers in size, glue, resin, soap, dyes, dyeware, paints, varnishes, drugs, benzol, naphtha, oils, creosote, prepared tar, sulphite of ammonia, naphthalene and Glauber salts, chemical preparations, etc. Directors: D. Crabtree, "Woodside," Hebden Bridge, master dyer, and Mrs. E. Crabtree.

# Books Received

**British Chemicals and their Manufacturers, 1933.** London: Association of British Chemical Manufacturers. Pp. 429. Free on application.

**Bulletin of the Imperial Institute.** Vol. XXX No. 4, 1932. London: John Murray. Pp. 154. 3s. 6d.

**Economic Conditions in the Republic of Panama and the Panama Canal Zone 1931-32.** Report by G. L. Rogers. London: H.M. Stationery Office. Pp. 36. 1s.

**Les Colloides.** By Paul Bary. Paris: Dunod. Pp. 586.

**Official Directory of the British Chemical Plant Manufacturers' Association, 1933.** London: The British Chemical Plant Manufacturers' Association. Pp. 100. Free on application.

**The Methods of Cellulose Chemistry.** By Charles Doree. London: Chapman and Hall. Pp. 500. 21s.

**Life and Experiences of a Bengali Chemist.** By Prafulla Chandra Ray. London: Kegan Paul, Trench, Trubner & Co., Ltd. Pp. 557. 7s. 6d.

# Town Gas as Substitute for Petrol

## Improved Equipment for Gas-Driven Vehicles

A REVIEW of the work which has been done in the development of equipment for the use of town gas as a substitute for petrol was made by Dr. C. M. Walter, the head of the Research Department of the Birmingham Gas Committee, in a lecture given to the Midland section of the Junior Institution of Engineers on January 10.

It would be remembered, said Dr. Walter, that during the war period gas was used to a considerable extent as a substitute for petrol because of the shortage of that fuel. The figures then obtained even with the crude methods which were employed, more or less in a temporary manner, were exceedingly satisfactory, and even low compression engines, which were not suited for running on gas, gave quite reasonable performance. In those days, however, the gas had to be stored in flexible bags, with the result that the range of action for each charge would only amount at most to about ten to fifteen miles, or in extreme cases to twenty miles. With regard to the actual cost of running, it was found that vehicles could be run on approximately half the cost of petrol at the price ruling at that time. The question of continuing the use of gas when petrol became available dropped, not because of the unsatisfactory performance of the engines, but because of a limited radius of action owing to the difficulty of storing a sufficient quantity of the fuel, although it was fully realised that it it was found possible to store gas in light containers, so that a mileage of about eighty to 100 miles could be covered with one charge, then there were great possibilities in the future.

### Post-War Investigations

In 1927 investigations were being made by certain manufacturers into the possibility of using light-weight alloy-steel high-tensile bottles, and these investigations seemed to show there was every possibility of a high tensile steel container being manufactured which could be used for gas storage at very high pressures. Metallurgical developments had resulted in the production of cylinders of this type, and for some years light-weight alloy steel cylinders, composed of nickel chromium molybdenum had been made for storing gas of very high pressures. This type of cylinder was employed for the storage of town's gas for running vehicles, and it was found to be commercially possible to carry sufficient gas at a pressure of approximately 3,000 lb. per sq. in. with which to run heavy type of venicles a distance of eighty-five miles on one charge.

Simultaneously a good deal of research had been undertaken to develop suitable pressure-reducing valves and also suitable air gas mixers, the last-named taking the place of the ordinary carburettor. These investigations resulted in the application of gas to the engine in a much more efficient manner than with the cruder methods previously employed. That higher efficiency and power outputs were possible had been proved by bench tests and further confirmed by road tests where a van had covered a distance of more than 2,000 miles.

## Control of Dry Rot in Timber

MR. J. RAMSBOTTOM, Keeper of the Department of Botany in the Natural History Museum, presided at a meeting of the British Wood Preserving Association, which was held on January 25 at the Auctioneers' and Estate Agents' Institution, Lincoln's Inn Fields. In a paper on "The Control of Dry-rot in Floors," given by Mr. Alex. H. Dewar, chairman of the Greenwich Inlaid Linoleum Co., recent experiments were described, the lecturer showing from lantern slides the ill-effects of lack of ventilation in the reconstruction of floors. The use of fungicides alone was not sufficient, though these acted as deterrents. Undoubtedly the best method was to treat the wood with a suitable preservative and couple with this thorough ventilation in constructing the floors of a house.

## Natural Gas in Canada

ACCORDING to estimates made by the Turner Valley Gas Conservation Board, the continuance of a daily flow of 200,000,000 cu. ft. from the oil and gas field in the Turner Valley can be expected for a period limited to twelve years. The estimate was made in a preliminary report compiled from data obtained through tests conducted during the last few months. The preliminary estimate calculates the gas reserves in the Valley at 599,929,248,000 cu. ft.; this estimate is much lower than the one previously made by Mr. F. P. Fisher, Alberta Government consulting engineer, of between seven and eight hundred thousand million cubic feet.

## Solvent Recovery Practice

IN "Australian Chemical Engineering and Mining Review" for December 5 there is an article entitled "Solvent Recovery," by W. L. Brogan. The processes for solvent recovery are dealt with under various headings—direct condensation; condensation after compression; processes of adsorption in liquid, and in solid media. In recent years development in solvent recovery has mainly been concerned with the employment of solid absorbents. The two principal adsorbents employed are silica gel, and activated carbon. The article closes with an account of the production and practical applications of the latter.

## Industrial Electric Boilers

A NEW edition of their booklet on the "Practical Application of Electrode Boilers," has been published by Bastian and Allen, Ltd. It gives an account of the Bastian electrode boilers both for steam raising and for hot water supply. Good controls, simplicity of operation, robust construction, and small size have brought these boilers to the forefront. Steam boilers and hot water circulators are also illustrated and described.

## Oxy-Acetylene Welding Tips

IN the issue of Oxy-Acetylene Tips for December, published by the Linde Air Products Co., is an article entitled "The Bronze Welding of Cracked Cast Iron Boiler Sections." The repair of cast iron by means of brass welding has long been used for grey iron equipment, but until quite recently it has not generally been the practice to apply this process to boiler-section repairs. The preparation of the section, and the method of welding are fully explained.

## Stainless Steel and their Uses

THE Electro Metallurgical Co. of New York have produced a booklet showing some of the uses of chromium alloy steels. These steels, they claim, because of their superior physical properties have made possible many advantages in engineering; they have greater strength than ordinary steels, and in chemical and allied industries they show a greater resistance to heat and the corrosive action of certain chemicals. The publication is fully illustrated.

## New High-Pressure Steam Generator

THE "Sulzer Technical Review," No. 4 of 1932, issued by Sulzer Bros., shows examples of heating, ventilating plant, constructed by this firm. Of particular interest is the new Sulzer high-pressure steam generator. It is of the single tube type; a special feature being the provision made for increasing the speed at which the working medium flows, in order to avoid steam bubbles clinging to the tube walls. Expensive boiler drums, moreover, are eliminated.

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