The Chemical Age

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Notes and Comments

Scientific Management

SIR GEORGE BEHARRELL met the editors of a number of technical and trade journals, including THE CHEMICAL AGE, at the offices of the Federation of British Industries at Westminster, on February 1, to discuss the objects of the Sixth International Congress for Scientific Management, which is to be held in London in July of this year. The Congress takes place every three years, and this will be the first occasion on which it has been held in Great Britain. No pains are being spared to ensure a really successful event and it is expected that at least 2,000 members will participate. The Congress is being organised by a self-constituted Council in the absence of a permanent organisation, and Sir George Beharrell is the chairman. Every business undertaking, whether large or small, has a direct interest in management problems, and previous Congresses have amply demonstrated the need for exhaustive study of the principles of management. It is safe to say that increased attention is being paid to this subject and that it is becoming a really live topic for discussion.

The Congress will fulfil a useful purpose by demonstrating, not only here but also abroad, that British industry can, and does, produce some of the finest examples of organisation in the world. There is a further consideration that labour should appreciate that great efforts are in fact being made to assist it to be efficient. In these endeavours the promoters of the Congress are aided by the goodwill of the Prince of Wales, who has shown, as always, his interest in efforts to improve the efficiency of the nation. His Royal Highness has consented to preside at the opening session on July 15, at the Central Hall, Westminster. The ensuing sessions, which will last until July 18, will include two plenary sessions at which some subjects of general interest to all will be discussed. During the two middle days of the Congress more specialised subjects will be discussed by sections representing those with a practical interest in manufacturing, agriculture, distribution, education and training, development and domestic problems.

Social Activities

THE value of the Congress will not lie solely in the sessions. Maximum opportunities will be afforded for informal interchange of ideas between people from all over the world and every effort will be made to enable people with similar interests to benefit from these contacts. All the papers, which will number nearly two hundred, will be circulated to members well in advance, and the sessions will be devoted to discussion of points of particular interest. These discussions will be inaugurated by a rapporteur in a brief summary. Receptions have been offered by the Government, at Lancaster House, and by the Lord Mayor, and Corporation of the City of London at the Guildhall; an official banquet, tea party on the terrace of the House of Commons and an entertainment at the B.B.C. are amongst the further activities of a varied and crowded week.

Factory tours after the Congress itself will enable members to appreciate the success of the practical efforts made by the industry of this country during a difficult period. The reports of the Congress, which will include a description of the actual proceedings, will be of great value for subsequent reference. The financial arrangements are nearly completed, generous contributions from a large number of firms having been granted. It only remains for us to add that the chemical and allied industries are well to the fore in the arrangements. The members of the executive committee appointed by the Council include Dr. E. F. Armstrong, Sir Christopher Clayton, Sir Kenneth Lee, Lord Leverhulme, Sir David Milne-Watson and Sir Josiah Stamp. Dr. E. F. Armstrong has accepted the chairmanship of the organisation committee. The Council includes representatives of the Association of Scientific Workers, British Association for the Advancement of Science, British Association of Chemists, British Science Guild, the Imperial Institute, Institute of Chemistry, Institution of Chemical Engineers, Institution of Gas Engineers, Institution of Production Engineers, Society of Chemical Industry and the Textile Institute.

Industrial Professorships

THE pathway of an industrial professor is beset with many difficulties. Generally he occupies a chair that has been endowed for a particular purpose and that is often maintained by funds derived from a particular industry. He is not altogether free to pursue that independence of action which is generally so necessary to the greater teachers and experimentalists. The professor of pure chemistry, for example, can more or less teach what he thinks is desirable in his own way, provided that the results are deemed satisfactory by the university authorities. His researches, if his mind should travel in that direction, may have for their object any goal that appeals to him. The most erudite and theoretical of subjects are quite rightly encouraged, and it is in investigations of this character that the university professor is seen at his best. These are investigations which it is in the interest of the world

to make, but which few outside the happy band of the academic institution have the opportunity to perform. Sometimes an industrialist, controlling a sufficiently large laboratory, is able, almost by stealth, to detach a man to follow a brilliant train of theoretical reasoning, but that is comparatively rare.

In most industrial laboratories, researches must have for their object something of which the possibility of financial return exists. The holder of an industrial professorship is almost equally the servant of industry. On the one hand, industry looks to him for a supply of adequately trained men to carry on the work in factory and laboratory alike, and equally it demands research work of a high quality that shall assist to elucidate the more theoretical problems of those processes of manufacture in which the professor specialises. Too often some manufacturers look also to the professor and his staff for free information upon matters in regard to which they should pay a consultant; that is, of course, reprehensible and should be discouraged by the professor himself.

Finding Posts for Students

IT is to be deplored that certain industrial professors seem to consider that the teaching is quite an unimportant part of their work which can be left to juniors and assistants, whereas it is surely true that the great professors of the past were all great teachers whose words and examples have been a constant model and incentive to their students for many years after they have left the university. One of the difficulties is that the holder of a Chair in "pure" subjects is not necessarily expected to conduct researches save only by way of training his senior and post-graduate students so that he is free to teach, whereas the professor of an applied science is expected to perform the most difficult researches, generally upon subjects that have been imposed upon him.

Another function of any professor is to find posts for his students. There is, of course, no onus upon him to do this, but not unnaturally most of them endeavour to do so. The professor is called upon to advise students whether they should enter his faculty or not. If he cannot find posts for those now being trained, how should he conscientiously advise others to follow the same calling? It is a gratifying sign of the improved conditions that the number of students in one department at Leeds has decreased from 30 to 22 during the last year, wholly because post-graduate students who stayed on, waiting like Mr. Micawber, have now found posts. The report further states that inquiries for the services of graduates exceed the number coming forward and can only be met by those due for their final degree examinations next June. This increasing demand for trained men comes from all branches of industry—manufacturing, sales and distribution—and manufacturers of plant and appliances.

Standardisation

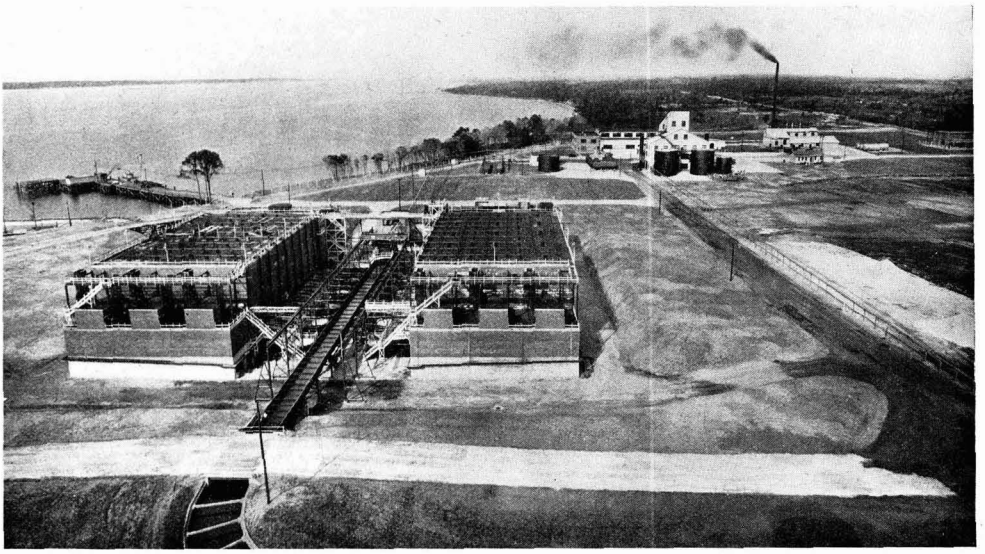
THE modern age of mass production has been made possible only by standardisation, but standardisation must not thereby be condemned or approved. There is everywhere a desire to encourage and increase trade within the Empire, but in the past this has been hindered by insufficient knowledge of requirements, unsuitable supplies and differences of trade practice. To ensure success it is necessary to establish complete confidence as to the suitability of the goods offered and mutually agreed standards are one of the best methods of so doing. The Imperial Conferences in London in 1926 and 1930 directed attention to the urgent necessity for the co-ordination of specifications within the Empire and to the desirability of a central standardising authority. It was largely this that led the chemical industry to invite the British Standards Institution to undertake the preparation of British standards for the industry. In the past in the absence of these standards even our Colonies were disposed to adopt foreign standards, with consequent detriment to British trade.

Standardisation should not, of course, be adopted simply for the sake of the principle when there is no real need for it, but there can be no question of the advantages to be gained from the adoption of standard and interchangeable plant and products. The manufacturing costs are reduced, the capital idle is decreased due to fewer patterns and so forth, stocks do not become obsolete so readily, second-hand goods are of more value when certain of their parts can be fitted to other manufacturers' goods, the product is more reliable and of better price, delivery is quicker, the cost of preparing drawings and estimates is decreased materially and with less risk of errors.

Pooling of Information

THESE reflections arise from a perusal of an interesting paper recently delivered to the London and Southern Junior Gas Association upon the question of standardisation by Mr. S. F. Dunkley. The company to which Mr. Dunkley belongs, the Gas Light and Coke Co., has recently carried into effect a comprehensive private standardisation with gratifying results and we are constrained to ask whether more standardisation would not be possible in the domain of chemical plant. Crystallisers, autoclaves, filters, heaters, stills and a host of other chemical plant might very well be standardised in a few patterns with a few sizes. We question whether as between one type of standard chemical plant and another there is so much difference in performance as to make it worth while perpetuating the numerous designs and types that exist. Would it not be possible for the committee of users and makers to get together and to eliminate many of these, so that makers could work to a few designs and sizes?

The less efficient could be eliminated and the chemical manufacturer would have a type of plant in his works that had been found reliable throughout all similar works in the country. In that way a British standard chemical equipment might be built up that would result, in the end, in a pooling of information among the plant makers and would greatly increase the prestige of the industry in the international markets. British steel has a name throughout the world for quality and reliability; why cannot British chemical plant attain a similar reputation, possibly as the result of, and certainly aided by, standardisation along the lines suggested. There is a definite call for more specialisation among plant manufacturers. Would not standardisation, coupled with the allotment of different types of plant to different firms, bring about this result? Possibly Lord Melchett may consider this in his Industrial Reorganisation Bill. A pooling of information and technical staff among our plant manufacturers, and among our chemical makers, would go far towards making the British chemical industry second to none.



General view of the Ethyl-Dow Chemical Co.'s plant for extracting bromine from sea water and manufacturing it into ethylene-dibromide.

Extraction of Bromine from Sea Water

IN 1924 the production of free and chemically combined bromine in the United States amounted to approximately 2,000,000 lb. In 1931 this quantity had risen to about 9,000,000 lb., all of which was being produced from natural brines and from bitterns resulting from evaporation of sea water. This remarkable increase in consumption of bromine was due largely to the use of ethylene dibromide in conjunction with tetraethyl lead in the treatment of motor fuel.

A number of years ago it became evident that the demand for bromine was becoming so great that its ordinary sources were inadequate and that sea water should be considered for this purpose, in spite of the fact that its bromine content is less than 70 parts per million. It was up to the chemist and engineer, however, to develop a practical and economical method of extracting this desirable element, and the Ethyl Gasoline Corporation was one of the pioneers along this line. In 1924 they operated a small-scale plant with sea water as its source of bromine and produced tribromo-aniline which can be used with tetraethyl lead in the treatment of gasoline. Some months later the same organisation operated the process on board a boat, the S.S. Ethyl, their method involving the addition of aniline to chlorinated sea water to form tribromo-aniline according to the reaction :—

$$3NaBr + 3Cl_2 + C_6H_5NH_2 \longrightarrow C_6H_2Br_3NH_2 + 3NaCl + 3HCl$$

The Dow Chemical Co. also undertook the problem of extracting bromine from sea water but proposed to obtain it in the pure, elemental state by a process somewhat similar to that in use on natural brines at their plant in Midland, Mich. It was recognised that modifications and refinements would have to be made in the old procedure, but the basic principle was considered practical and economically sound. This process consists essentially of (*a*) oxidising a natural bromide-containing brine with chlorine to liberate the bromine, (*b*) blowing the free bromine out of solution with air, and (*c*) absorbing the bromine from the air with an alkali carbonate solution from which it subsequently can be recovered in a commercially desirable form.

Through many years of experience and effort the Dow process has now been developed to the point where it is possible to recover, consistently, 95 per cent. of the bromine content of the natural brines.

It was about the middle of July, 1933, the Ethyl-Dow Chemical Co. was incorporated and the decision was made to construct a plant having a capacity to extract about 15,000 lb. of bromine per day from sea water and to manufacture it into somewhat more than 16,000 lb. of ethylene dibromide per day. Within a period of 5 months the plans were drawn, materials assembled, and the plant was built and put into operation. The design and construction was executed by The Dow Chemical Co. organisation, with the exception of some of the common building operations. A detailed description of the plant was ultimately published in our American contemporary, "Industrial and Engineering Chemistry," April, 1934, from which the following particulars are taken.

Description of The Ethyl-Dow Chemical Co's Plant

In planning the ocean water intake for the new plant, it was decided to cut a channel out into the ocean for a short distance and to protect it with a rigid wall on each side. For the intake walls, 50-foot lengths of interlocking sheet steel piling were driven to a depth of about 42 feet below mean low-tide level. Altogether the intake (p. 117) is about 200 feet long. The channel between the walls is 15 feet wide and the depth is 9 feet below mean low-tide level.

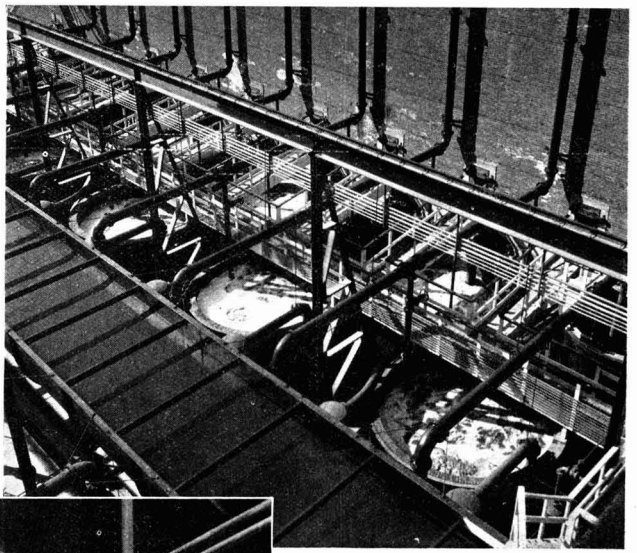
The sea water flows through the intake into a settling basin which is 112 feet long, 76 feet wide, and 12 feet deep. The pump house contains two 30-inch centrifugal pumps. One of these has a capacity of about 26,000 gallons per minute and the other can deliver approximately 32,000 gallons per minute. They are operated by 300 h.p. synchronous motors.

The canal is about 6 feet deep and extends about 4,000 feet across the peninsula to the plant. Approximately 2,200 feet of the canal are diked off from a pond through which the sea water is by-passed during the summer months. With some 900,000 square feet of exposed surcace, the pond permits an increase in temperature during warm weather. This increases the efficienccy of the process during several months of the year. After the water has been pumped over the dam and into the canal or pond, it flows to the extraction plant with a loss in head of only about 3 inches. A view of the canal is shown in page 117.

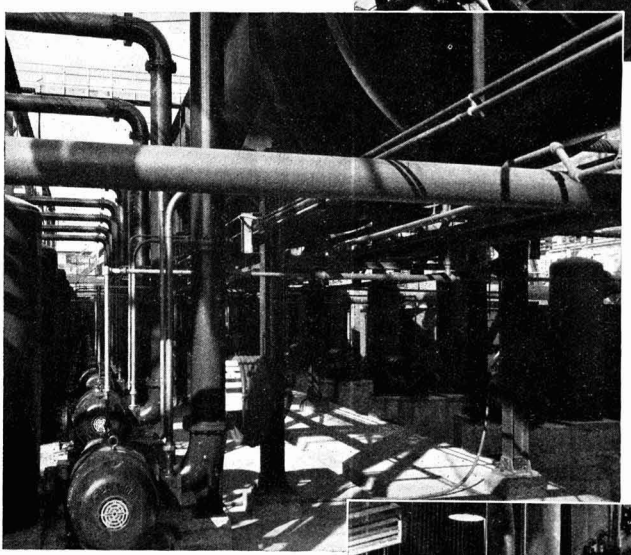
The extraction of bromine from sea water takes place in two identical units which are located at the exit of the canal; a diagram of one of them is shown in page 118. Each unit consists chiefly of a blowing-out tower in which a current of air removes the bromine from acidified and oxidised sea

water, and an adjacent absorption tower in which the bromine is extracted from the air by means of a soda ash solution. The towers are built of brick and have concrete floors and foundations. The foundations of each unit cover an area 197 × 84 feet.

A horizontal steel flume, which is semi-circular in cross section and 10 feet in diameter, extends between the two extraction units and connects with the canal which brings in the sea water. Because the bases of the towers and the area between them are below the canal level, the flume is carried on steel supports so that it is at the same level as the canal. The absorption towers are located at the end of the flume which is nearest the canal. Hence, the water passes by them on its way to centrifugal pumps which elevate it to the tops of the blowing-out columns. Before entering the pumps, however, the water flows through a travelling screen at the end of the flume, to filter out any leaves or debris which may fall into the water after it enters the canal or pond.

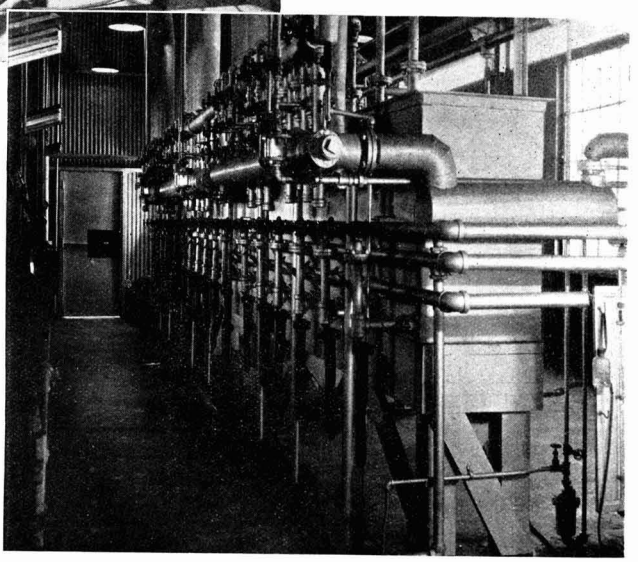


Above.—Looking down on bromine absorption liquor Tanks.

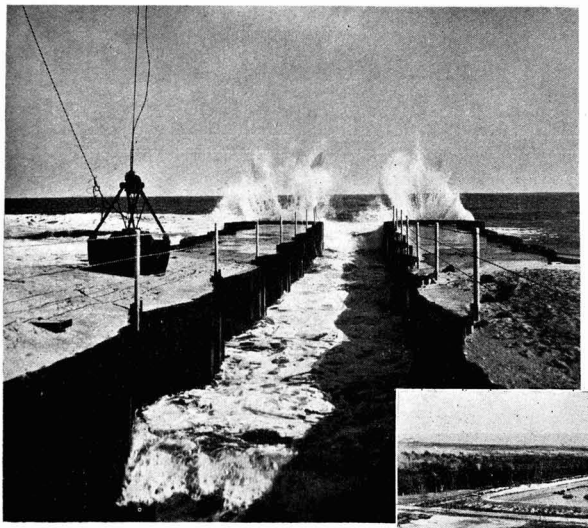


Left.—Battery of Pumps for circulating bromine absorption liquor.

Below.—A battery of Valves for controlling ethylene production.

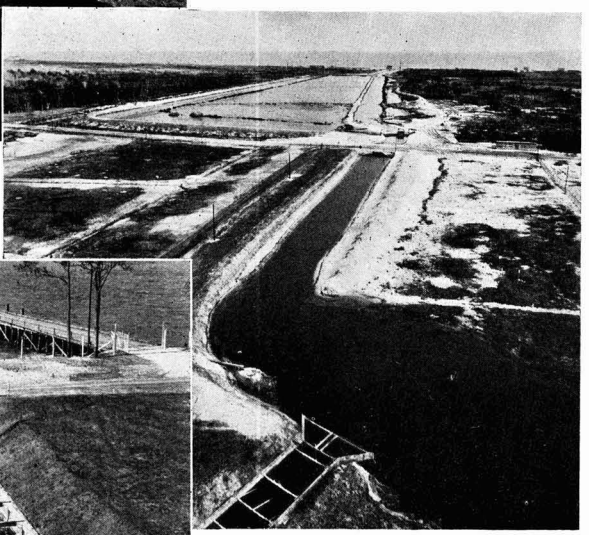


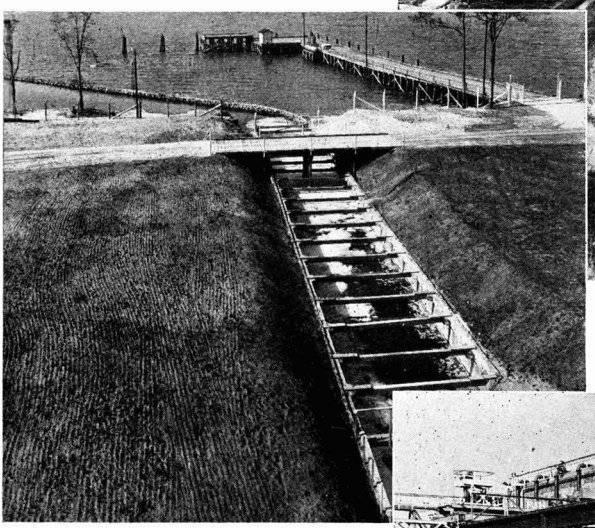
In each extraction unit the sea water is pumped to the top of the blowing-out tower through a vertical 42-inch rubber-lined pipe. Near the bottom of this, a 10 per cent. sulphuric acid solution is introduced into the water through a group of small rubber-lined pipes. A short distance higher the chlorine is introduced through similar rubber-lined pipes. At the top of the blowing-out tower the water passes through a series of large and small distributor boxes and pipes so that it eventually is divided up into about 3,200 small streams. These flow down through the tower which is partitioned off into narrow chambers extending the full width of the structure. These chambers are filled with wood packing and are operated in parallel. A stream of air is sucked up through the tower counter-current to the sea water. The bromine that has been liberated by the chlorine is thus blown out of the sea



Above.—Sea water intake.

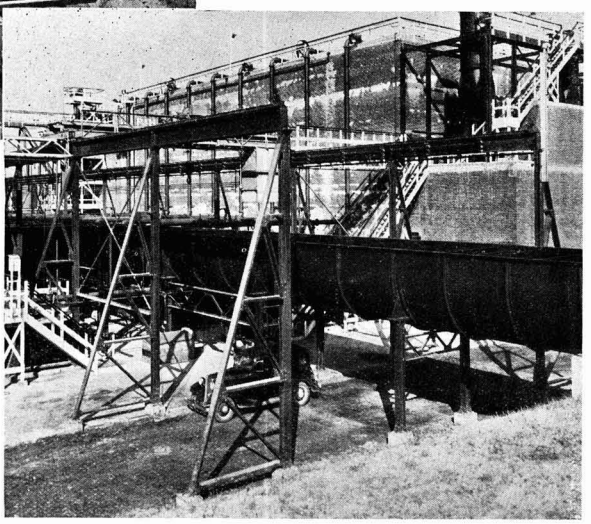
Below.—Effluent sea water passing from blowing-out Towers to river.





Above.—Storage basin and canal showing sea water passing to bromine extraction plant.

Below.—Flume conducting sea water to blowing-out Towers.

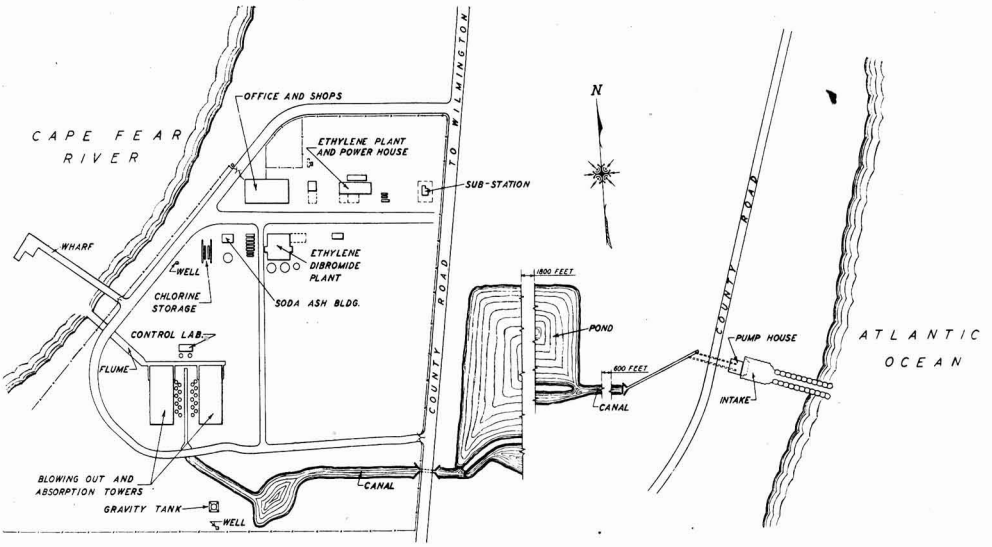


water, and the latter passes out of the bottom of the tower through exit flumes to the river and thence into the ocean about 12 miles south of the intake.

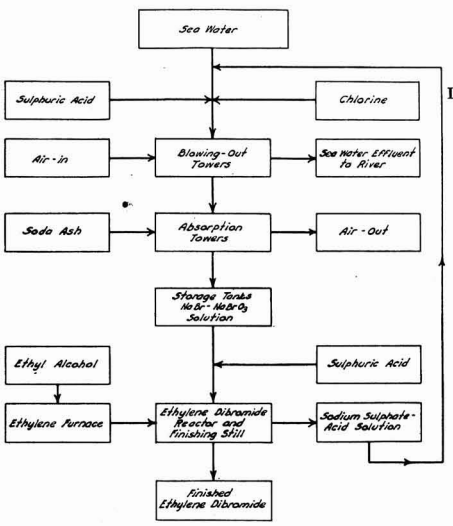
The treatment of the sea water on its way to the blowing-out towers is regulated from a control laboratory. Meters on a wall of the laboratory continuously show both the pH of the acidified sea water and its oxidation potential with respect to bromine liberation. Valves in the sulphuric acid and chlorine lines which lead to the 42-inch vertical mixing pipes are operated by hand from the control laboratory; at a later date it is probable that the control of these valves will be made automatic.

The chlorine which is used in oxidising the sea water is obtained from cylinders having a capacity of one ton. A group of 16 of these is placed in each of two wooden compartments. These are kept at a temperature of not less than 70° F. The cylinders are connected to the chlorine line and their contents, in liquid form, flow to the chlorine vaporiser. This is a steam-jacketed iron pipe and is located adjacent to the control laboratory. The sulphuric acid is delivered to the plant in the concentrated form, but it is diluted to a 10 per cent. solution before it is added to the sea water. This dilution is accomplished in two rubber-lined tanks, 16 feet in diameter and 10 feet high.

In each extraction unit the air from the blowing-out tower is drawn through its adjacent absorption tower by three fans which are located on a concrete platform at the end of the unit. The air, just before entering the fans, passes through a small wood-filled chamber which catches any spray of soda ash

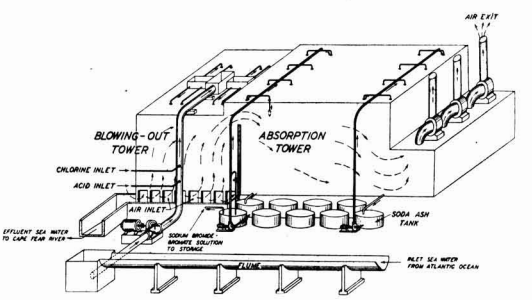


Above.—Layout of the plant



Left.—Flow sheet for manufacture of ethylene bromide from sea water.

Below.—Diagram of the bromine extraction Unit.



solution that might otherwise be carried out of the system. In the absorption tower the bromine is removed from the air by a soda ash solution to form a dissolved mixture of sodium bromide and bromate according to the formula:—

$$3Na_2CO_3+3Br_2 \longrightarrow 5NaBr+NaBrO_3+3CO_2$$

Each absorption tower is divided into nine chambers which are connected in series so that the air, passing in at the end adjacent to the blowing-out tower, follows in succession through these absorbing chambers and out through the suction fans. Soda ash solution is circulated continuously in each chamber. This is done by pumping it from a tank at the bottom and spraying it in at the top through 36 nozzles from which it falls by gravity and drains again into the tank.

At proper intervals the strong bromide-bromate solution formed in the absorption chamber adjacent to the blowing-out tower is pumped to a storage tank. The charges of partially brominated soda ash liquor in the other members of the series are then pumped forward, in turn, to the next tank nearer the one which has just been emptied to storage. When the tank farthest from the blowing-out tower has been emptied, it is charged with a fresh solution of soda ash. The centre photograph in page 116 shows the battery of pumps which circulate the soda ash solution; the inlet flume may be seen overhead.

After the bromine from the sea water has been collected in the form of a solution of sodium bromide and bromate, the remainder of the process is performed according to methods which have been previously in use in the industry. The bromide-bromate liquor is treated with sulphuric acid to liberate the bromine. The free bromine vapours are then steamed out of the acidified solution and are condensed into pure liquid bromine. The bromine is used in the manufacture of ethylene dibromide. Ethylene is made by passing ethyl alcohol vapour over heated kaolin catalyst to form ethylene gas, which is in turn brominated according to the standard method to form pure ethylene dibromide.

The power house employs hand-fired boilers and makes steam only for heating and evaporating purposes. Its capacity is about 15,000 lb. of steam per hour at a pressure of 150 lb. per square inch. Electric power is delivered to the plant at 33,000 volts where it is stepped down to 2,300 volts in two transformer banks. The entire plant is functioning as anticipated and is removing about 15,000 lb. of bromine per day from sea water.

As It Should Be To-Morrow

Professor H. E. Armstrong Talks to the Frankland Society

PROFESSOR H. E. ARMSTRONG, founder-president of the Lancaster Frankland Society, attended a dinner of the Society at Lancaster on January 17 and afterwards delivered an address on "As it Should be To-morrow." Chemistry in association with physiology—which is but chemistry applied to the living organism—must necessarily soon be recognised as the ruling natural science, he said. By it alone can we understand ourselves and the world; we have to judge ourselves and the world now and in the future, by its canons. To the general public, however, it is but an ugly duckling—thought of mainly in terms of purgatives and the female figure, if not of poison gases to be used in war; it is in no way thought of usefully. Chemists have done everything for chemistry, except make it of educational avail—a public weapon. A vast wealth was squandered during the war; an equivalent cannot well be built up afresh—raw materials are becoming scarce. The advent of machinery has given all intelligent peoples the power of more than meeting their own needs—when all have a surplus of practically the same goods competitive commerce on the average can no longer be remunerative; some agreed division and limitation of sales must be made, if the nations are to avoid a commercial war that must embitter and ruin all in the end. Honest freedom of trade has been made an impossibility. The terrible task is before us of regulating and controlling man's actions against his most deeply ingrained instinct—the sin of coveteousness, the essential mainspring of all commerce. Yet there is within us a lurking spirit of love and regard for beauty; we can but hope that this may be more developed by conscious use of intelligence. To-day we are controlled by the ignorance of the learned. The people perish, not for want of knowledge but for lack of vision and wisdom in their leaders; from inability of most even to think outside their own very limited sphere of action—a disability we shall never overcome, as we have never been "fed up" to a higher standard.

Our to-day has been made by a new class of workers, making conscious use of knowledge. To-morrow can only be properly fashioned by men who will understand, discover and meet immediate needs.—Professor H. E. Armstrong at Lancaster.

The Attitude of the Teacher

As is usual at the New Year, teachers have been busy declaring their own inefficiency but not a constructive word has been uttered. Teachers generally know the present industrialised system of public examinations to be murderous of intellect, yet they are so commercialised themselves that they continue to wallow in it. The poor devil of a child is but a shuttlecock, to be played with for pence, not for the good of his little soul. Only recently, in "The Times," a report is given under the heading "Fear of Examinations," of a discussion at the Public Schools Junior Masters' Conference held at Harrow. The headmaster of Merchant Taylors' School, headmaster-elect of Winchester, speaking on Education for Citizenship, could only advise that boys should be taught history of the modern type, French, German and Spanish, if possible, also certain kinds of geography in connection with commerce and trade. That such weak doctrine should be delivered at such hands is astounding. One asks oneself: Is it to this end that we made education compulsory upon all sixty-five years ago?

We all know what wishy-washy stuff the geography of the schools is—that geography is only to be learnt by travel, although pictures such as are now published by the press are of great help in inciting curiosity. There is no inspiration, no motive, behind ordinary school geography; this subject must needs be taught, in future, from a far wider point of view.

All countries, it is clear, will be more or less forced to be self-supporting. Trade with the outside world will be possible only to certain agreed amounts and the main exchange of each country will be in articles which are either not producible in it or are only producible at a disadvantage. Sugar is an illustration; the conditions for its production are so superior in tropic lands that its manufacture elsewhere can never be made economic. Each country will need to consider, with the utmost care, its own productive capacity; and having balanced produce against consumer will deduce the possible extent of employment. It will then need to adjust its population to its possibilities. The Mussolini method of estimating this in terms of cannon-fodder is scarcely one that can prevail in the long run, if civilisation last. Some method of securing fitness needs to be introduced. Most countries will have to be satisfied with reduced populations. The freedom we have hitherto enjoyed has been the freedom of ignorance; there has been no freedom to use knowledge, especially in curbing ignorance. Anything and everything has been allowed to happen—individual freedom has run riot. Individual initiative no longer suffices to meet public needs; unfortunately, corporate management, at present, is far too often led by ignorance. The sin of covetousness, if possible, must be so curbed that it will be possible to organise industry more upon a public basis, to operate with efficiency, not merely to private ends. A hard task is before us to make proper use of our inherited sins. Advertisement merely for the purpose of selling what someone chooses to produce in the hope of profit will not be allowed in a state in which intelligence prevails. Proof of quality will be demanded of every producer.

Commercialised to the Backbone

We have to decide what we should have—what we must have. We have to decide what we can produce ourselves—what we must produce ourselves. We have to decide what we must have from others and what exchange can be made of our goods for those produced elsewhere. A difficulty arises from our being commercialised to the backbone; our whole press is commercialised in its tone; we have no ideal before us. From what platform can we start?

The supply of food is the first issue. We have to ask what is proper food? A few years ago, the question could not have been answered, except in general terms on a broad basis of experience. The combined labours of chemists and physiologists, especially since the war, have provided us with much exact knowledge, from which it is permissible to deduce trustworthy conclusions. We may already assert, the experimental evidence is so strong, that if we were properly fed, we should suffer little from disease. Proper feeding means our securing, in proper balance, a very great variety of materials to be obtained from the natural foods at our disposal, provided always that these have been grown under conditions which enable them to live complete lives, as it were. In fact, we are ultimately dependent upon the soil and upon the sun.

Our Primary Food

Milk is our primary food. As a people we have yet to learn to drink milk and in maximum quality; to revere it as a foodstuff; to worship the cow, by tending her with the same care as we would have taken of ourselves. The medical profession has played little short of a disgraceful part, in the past, in failing to advocate if not by discouraging the use of milk, especially for children. They have done so in ignorant fear of micro-organisms, through over-worship of Pasteur. Our first agricultural inquiry must be to determine the extent to which the cultivation of grass and such other crops as go to the production of milk can be carried. We know that we can produce more milk than will be needed as milk—that left over will give us butter and cheese, besides helping in the production of bacon and eggs. Incidental to the production of milk will be that of meat. Upland grass will be used to produce mutton.

While speaking of animal food, let me say that, as an island people, we have to make far more use of fish.

In producing milk, we must aim at making it of the highest quality. To this end, we have to learn almost everything as to what is perfect quality in milk and in the foods used in producing it. A vast scientific inquiry is before us. We know that our crops vary in value as animal food—seasonally, climatically and according to the fertility of the soils upon which they are grown—still, we have very little exact knowledge. Incidentally, let me repeat, there is little doubt that when our animals are perfectly fed they will be healthy like ourselves. We have to learn to feed out animal disease as we shall do from ourselves.

Possibilities of Potato Cultivation

Leaving milk, we have to consider the production of starchy and vegetable foods for our direct use. We know that potatoes will suffice us—the Irish have long lived on milk and potatoes. The probability is that the potato is a far better starchy food than any cereal, on account of the mineral and other matters it contains. The possibilities of potato cultivation must therefore be explored and full inquiry made into its food value when grown under these or those conditions. We know how to cultivate cereal crops—we only need to determine where we could produce these and in what amount. The more potato we eat the less we shall need wheat and other cereals.

Lastly, we have to study our fresh vegetable foods—to ascertain the conditions of growth under which they have maximum value. It is not improbable that we cultivate much of the value out of them by forcing growth, as we do by the excessive use of fertilisers or in soils deficient or unbalanced in minor constituents, which even may not be needed for the growth of the plant, yet with special needs we have developed. Iodine is an example; it is known to be lacking in places far from the sea.

We cannot consider the future of agriculture without taking into account the question of water supply, not only to meet our own exaggerated needs but in farming. During the past two summers, there has been great shortage of grass because of the absence of water. Water meadows, we know, are of special value as feeding grounds. Might we not irrigate some of our agricultural land with advantage? Should we not also consider whether we might not return all sewage to the land instead of sending it to sea? Alternatively, we might lead it into reservoirs and grow water plants in these, which could be collected and made into the vegetable humus that we now so greatly need for our land. A variant on this would be to encourage vegetable growth in some of our estaurine areas. The suggested commission on water supply should probe into all these problems.

Great Scientific Service Needed

We shall need a great scientific service for the inquiries foreshadowed. We have yet to lay the foundations of this service—in the schools. We are thus faced with the problem of education from the beginning of our survey. Considering what we know, the vast extent of our knowledge, the overwhelming use we make of this in mechanical applications, the condition of our school system, of whatever grade, is scandalous: a disgrace to our civilisation! It is still carried on in a monastic spirit, under monastic traditions: the men conducting it, for the most part, are but monks in disguise—they would be monks to-day, if the monastery had survived. Even as monks, they are degenerate, they but misuse the old shibboleths and take no notice of our present great knowledge of the world. They do not even train their pupils to read—to read the old books properly; writing is systematically and knowingly neglected; arithmetic is forced upon all without thought of its practical value and application, its study is made nauseating. The universities give no training in method they but teach results and leave students to spy out what method there may be in the background. No profession, no trade, no other occupation is carried on with the careless disregard of national needs with which general education is conducted. Such education as we have we gain not from school but in the world. To-day, if we will we can gain a far richer experience from the world than was formerly possible; per contra, that derived from the schools is a diminishing quantity in inverse proportion to the growth of technical knowledge. We are mainly governed by experience and mother wit, not by considered application of scientific method. Machinery alone is the outcome of scientific thought—poor man is left undeveloped.

Internationalism in Trade

Effect of Trade Barriers

SPEAKING on January 25 on International Trade and International Agreements to a joint meeting of the Liverpool branches of the Incorporated Accountants' Society and the Institute of Bankers, Dr. W. H. Coates, who is a director of Imperial Chemical Industries, Ltd., called attention to the fact that the world recovery which had so far taken place was concerned with domestic markets only and had not yet spread to world trade. It was agreed, he said, that world activity would be depressed until there was an end or a mitigation of trade barriers. Turning to international agreements for the control of the volume of production, Dr. Coates stated that the chief external signs of the great world depression had been the large volume of industrial unemployment, the great fall in the price level and the reduction in the output of manufactured goods. There were still many who believed that the tragedy of dislocation in industry and agriculture should be played to the bitter end in the trust that the world would then be better off than it could possibly be by direct interference with production. But the price mechanism as an automatic regulator of supply to demand had failed during the present depression in its main purpose of reducing agricultural production.

That restriction schemes were essential to success in curing the problem of overproduction was rapidly becoming recognised, but what the world really needed was a more uniform policy designed to bring production into harmony with effective demand for commodities. The greatest service that international co-operation between responsible governments could render to the welfare of the world would be to come together to consider and adopt measures for the cure of world depression.

With regard to international agreements in respect of currency, Dr. Coates showed how, as contrasted with the improvement in the countries with depreciated currencies, the gold *bloc* countries were still suffering from falling production, falling prices, increased insolvency and a growing volume of unemployment. He suggested that the most useful step in the currency field which could be taken would be an international agreement between the United States, the United Kingdom and France.

In the sphere of industry, international agreements were much more common and much more easily negotiated than in the case of primary products. They covered a wide sphere of operations, but to be successful they must of necessity be based upon national organisations. In some respects it was still true that there was no body in this country which could speak authoritatively for the industry as a whole, but in the case of the cotton industry and the iron and steel industry attempts were now being made to remedy this disadvantage.

National Physical Laboratory

PAPERS published by the staff of the National Physical Laboratory during December, 1934, included: "The Work of the Alloys of Iron Research Committee." By C. H. Desch, D.Sc., F.R.S. Published in the "Proceedings of the Institution of Mechanical Engineers," *127*, 277. Papers published in January included the following: "The protection of radium workers from gamma radiation." By G. W. C. Kaye, G. E. Bell and W. Binks. "British Journal of Radiology," *8*, 6. "An apparatus for the measurement of the thermal conductivity of metals at high temperatures." By R. W. Powell. "Engineer," *159*, 68. "The work of Walter Rosenhain." By J. L. Haughton. "Journal of the Institute of Metals," *55*, 17.

Financial Position in the Chemical Industry

By S. HOWARD WITHEY, F.C.I.

LABOUR troubles, and an increase of works costs in order to keep the factories operating during the strike, were mainly responsible for the serious decline of profit reported by the directors of the Avon India Rubber Co., Ltd., the trading profit for the financial year to the end of September last working out at only £39,098, which contrasts very unfavourably with £80,543 shown in the 1932-33 account, and with £95,016 realised during the preceding twelve months. The depreciation charge amounted to £36,714 and after debiting interest on advances and directors' fees and providing for exchange losses, and bringing in £7,592 from the tax reserve no longer required, also £3,000 from the bad debts reserve, the account disclosed a loss of £3,183. The company manufactures rubber floorings, motor tyres, tiles and footwear, etc., and has an authorised capital of £600,000, of which a total of £546,842 has been issued and fully paid, consisting of £250,000 in the form of 6 per cent. cumulative preference £1 shares—the dividend on which is paid half-yearly in June and December—and £296,842 in ordinary £1 shares. After meeting the preference dividend there remains a credit balance of £17,442 to go forward to the next account, as against the sum of £27,750 brought in from 1932-33. The reserve has been reduced from £86,418 to £72,836 as the result of allocating £6,279 for development charges on modernisation, £6,120 for obsolete plant and £1,183 representing cost of capital increase. Against current liabilities for £207,062 the balance sheet showed floating assets totalling £268,909, while the fixed assets were valued at £588,855. The increase of capital has enabled the overdrafts to be reduced from £136,644 to £67,723.

Capital Reorganisation

Capital reorganisation and the introduction of new methods of management were reflected in the audited accounts of the India Rubber, Gutta Percha and Telegraph Works Co., Ltd., for the twelve months to the end of September last. The trading profit proved to be £84,398, which figure compares very favourably with £15,182 shown in the previous account, and, after charging £36,204 for depreciation of wasting assets, £20,000 for interest on the £400,000 of 5 per cent. debenture stock, and directors' fees, etc., the account disclosed a net profit of £26,053, which contrasts with a loss of £48,211 sustained in 1932-33. The authorised capital of the company is £1,250,000, of which a total of £500,000 has been issued and fully paid, comprising £250,000 in the form of 5½ per cent. non-cumulative preference £1 shares—the dividend on which has been paid to September last, absorbing £13,750—£150,000 in preferred ordinary £1 shares, and £100,000 in ordinary £1 shares. The current assets totalled £523,893 and the current liabilities £151,933.

An increased demand for pig-iron enabled stocks to be substantially reduced without increasing the number of furnaces, and during the twelve months ended June 30 last a gross profit of £468,973 was realised by the Staveley Coal and Iron Co., Ltd. This figure compares very favourably with a gross profit of £404,819 shown in the preceding tabulation and was arrived at after debiting taxation. No less than £187,748 was provided for depreciation and at £274,774 the balance of net profit, after charging directors' fees, was £44,106 higher than in 1932-33. The dividend was consequently raised from 5 per cent. to 6½ per cent., while the reserve allocation of £50,000 was repeated, as also was the provision of £10,000 for workmen's houses. The company has an authorised capital of £4,000,000, of which £3,385,356 ranks for dividend in the form of £1 shares of one class. The balance sheet exhibited a strong liquid position, the current assets aggregating £1,166,805 against creditors for £205,303. The carry forward now amounts to £103,282.

Improvement in Heavy Industries

The improvement in the heavy industries was reflected in the figures submitted by the directors of United Steel Companies, Ltd., the margin of gross profit for the twelve months ended June last being £1,191,665, which registers an encouraging expansion when compared with £506,034 made in 1932-33. After deducting interest on fixed mortgages, income tax and directors' fees, the profit balance was £947,680, enabling a first dividend of 5½ per cent. to be paid on the ordinary shares. The taxation reserve received a further allocation of £150,000, and after providing £275,000 for depreciation and £25,000 for the staff provident fund there remains a credit balance of £446,037 to go forward to 1934-35, as against £230,380 brought in from 1932-33. Apart from the depreciation reserve, which now amounts to £900,000, other reserves total £717,505, and against creditors for £800,385 the balance sheet showed floating assets to the value of £2,520,580, comprising stocks, debtors and cash. The authorised capital is £6,650,000, of which £6,616,365 rank for dividend in the form of £1 shares of one class, the majority of which are held by Steel Industries of Great Britain, Ltd.

Steel and Iron Results

Increased tonnage and turnover resulted in an expansion of profit in the case of the South Durham Steel and Iron Co., Ltd., the margin realised during the financial year ended September last being £105,198. After adding £3,000 transferred from the income tax account, and deducting debenture interest, depreciation and fees, the disposable balance enabled a dividend of 9 per cent. to be paid on the ordinary shares, also a dividend of 3 per cent. on the "B" ordinary shares. A transfer of £25,000 was also made to reserve, which fund now amounts to £1,000,000, after reducing the book value of plants out of operation by £300,000. The balance sheet displayed an excellent position, the current assets totalling £712,696, against creditors and dividends for only £185,316. The authorised capital is £1,250,000, of which a total of £1,237,820 has been issued and fully paid, composed of £300,000 in the form of 6 per cent. cumulative preference £1 shares—the dividend on which requires £18,000, payable half-yearly in January and July; £350,000 in ordinary shares of £1—the dividend on which takes £31,500; and £587,820 in "B" ordinary shares, the 3 per cent. dividend on which absorbs £17,635. The final appropriation account shows a credit balance of £111,621 to be carried forward to 1934-35, as against £136,267 brought forward from 1932-33.

Considerable satisfaction was expressed by shareholders of Dorman, Long and Co., Ltd., regarding the profit figures for the year ended September, the gross profit working out at £481,725, which compares very favourably with £209,335 disclosed in the previous profit and loss account. Interest on debenture stocks and loans absorbed £391,025, and after debiting sundry charges the net profit amounted to £38,154, reducing the deficit to £411,924.

Expectations Fulfilled

Expectations regarding the accounts of Murex, Ltd., were fulfilled, the trading profit and other income for the year to June last amounting to £156,812, or nearly double that shown in the 1932-33 tabulation. The net figure, after charging £5,567 for depreciation and reserving £25,190 for income tax, was £119,435, which contrasts favourably with £55,412, enabling a final dividend of 2s. per share to be paid on the old ordinary shares, making 35 per cent. for the year, less tax, and 1s. 6d. per share to be paid on the new ordinary shares which were issued in October, 1933. The sum of £15,000 was allocated to an obsolescence reserve, and in view of the developments that are taking place in metallurgical science and the consequent improvement in processes, the decision of the directors to build up such a reserve is undoubtedly a good one. The sum of £36,000 was provided for staff pensions and the final account showed a credit balance of £50,666 to be carried forward to 1934-35, representing an increase of £6,516. The head office of the company is now at Thames House, Millbank, S.W.1, but the registered and transfer office is still at 61 Moorgate, E.C.2.

The extraction of petrol from coal has progressed rapidly, and during the twelve months ended October last, Low Temperature Carbonisation, Ltd., made a trading profit of £87,287. This figure compares favourably with £60,821 realised in 1932-33 and includes certain investment income and other interest, and the balance of net profit was £37,234, as compared with £13,456. This enabled a dividend of 3 per cent. to be paid, absorbing £27,908, and after charging £5,986 for expenses of new issue and £8,098 for premium

on conversion of debentures, there remained a credit of £2,790 to be carried forward, as against £7,548 brought in. The dividend was payable on the shares issued during the year.

The consolidation of the activities of Ilford, Ltd., photographic plate and paper manufacturers, is proceeding, and for the twelve months to the end of October last a small recovery was reported, the balance of profit being £1,639 higher at £96,250. For the third successive year the dividend of 6 per cent. on the ordinary shares was repeated, and after reducing the book value of investments in subsidiaries by £20,000 the carry forward was shown at £20,045, as compared with £22,147. The company manufactures photographic plates, papers and films, and has an authorised capital of £1,400,000, of which a total of £1,264,200 ranks for dividend, composed of £190,000 in the form of 6 per cent. cumulative preference £1 shares; £500,000 in 6½ per cent. "A" cumulative preference £1 shares; and £574,200 in ordinary £1 shares. The preference dividends are paid half-yearly in May and November, and require £43,900. Against floating liabilities for £399,280 the balance sheet showed current assets totalling £739,156.

Despite a drop in the prices of certain metals during the second half of the year the Imperial Smelting Corporation, Ltd., was able to show increased income and profits, and after meeting the dividend on the 6½ per cent. cumulative preference shares the carry forward was raised from £12,680 to £33,126. The paid-up capital amounts to £4,494,766, comprising £2,060,809 in preference shares and £2,424,957 in ordinary £1 shares.

The report of Burt, Boulton and Haywood, Ltd., creosote and tar distillers, was very satisfactory, for including profit on the sale of investments, etc., the net profit worked out at £43,739 for the twelve months ended June last as compared with £10,500 realised in 1932-33. The rate of ordinary dividend was consequently increased from 3½ per cent. to 5 per cent., while the sum of £8,000 was transferred back to the reserve, leaving a carry forward of £9,363 or an increase of £6,168. The strength of the company's financial position may be judged by the fact that apart from fixed assets totalling £314,844 the floating assets aggregated £514,863, while the creditors amounted to only £193,467. Issued capital is £669,790, consisting of £150,000 in the form of 7 per cent. cumulative preference £1 shares—the dividend on which is paid half-yearly in January and July—and £519,790 in ordinary £1 shares. There is also an issue of 6 per cent. first mortgage debenture stock, recently quoted at 105.

House-building activity contributed largely to the excellent results reported by the directors of Lewis Berger and Sons, Ltd., paint manufacturers, for the twelve months to the end of July last. The gross profit amounted to £119,533 and the net profit to £102,460, the latter figure comparing with £74,405 realised in 1932-33, and with £57,322 in the preceding year. The dividend on the £527,275 of ordinary shares was increased from 7½ per cent. to 10 per cent., and as no special allocation was made to the reserve the carry forward was raised from £53,337 to £75,069. The reserve amounts to £100,000 and the floating assets were valued for balance sheet purposes at £442,942. There are no debentures or loans.

The Future for Lac

Trend of Present-Day Researches

A JOINT meeting of the London Section of the Society of Chemical Industry and of the Plastics Group of the Society was held at Burlington House, London, on Monday, when some interesting information was given with regard to the research work concerning "lac."

Mr. A. J. GIBSON (Shellac Research Board) gave a general survey of the position, pointing out that India produces 97 per cent. of the world output of "lac" and has a virtual monopoly. In 1934 the principal "lac" importing countries were, in their order of importance, the United Kingdom, United States, Germany, and the continent of Europe, and to a smaller extent Japan. It was added that due to the competition of synthetic resins, the user soon had at his command so many raw materials that he was able to specify stringent conditions in terms of stability and uniformity of qualities, whilst technical advice and service became part of the normal modern selling organisation. Mass production gave rise to another series of problems which found "lac" vulnerable and unprepared, such as the speeding up of operations, the use of larger machines, heavier loads and increasing stresses under such heads as working temperature, humidity, resistance to solvents, oil, alkali and acid reactions, all of which called for a much more exacting level of performance in the raw materials used.

The Constitution of "Lac"

Dr. BHATTACHARYA discussed in considerable detail the constitution of "lac" and pointed out that "lac" itself, however it is purified, is never a chemical entity. Remarking that we do not know much about the chemical constitution of "lac," he suggested that it will need several years' very patient investigation definitely to establish it. There was evidence to suggest that the component resins exist in the original "lac" in some very intimate form of solid solution or are even joined by some kind of weak chemical bond; at any rate, once the original relationship is disturbed it can never be restored, and this fact might explain some of the peculiarities observed with "lac" solution.

A purified and dewaxed "lac" resin—ignoring traces of free acids of the fatty acid type, and dyestuff—appears uniform in character, but it is easily separated into an ether-soluble and an ether-insoluble resin. The latter is referred to as pure "lac" resin because it is the material upon which the excellent qualities of "lac" depend, and it exists in ordinary "lac" to the extent of about 70 per cent.

A description was given of the methods adopted at the Paint Research Station to separate the acid components obtained by the hydrolysis of "lac" resin, a procedure substantially different from, although admittedly an adaptation of, the methods first published by Harries and Nagel. It was pointed out that Dr. Nagel's shellolic acid has been found to be different from the shellolic acid found at the Paint Research Station in the melting points of the acid and dimethyl ester. It was also pointed out that there is present in the "lac" some acid component which is unsaturated and decolorises bromine in chloroform and that the iodine value of "lac" is due to this constituent. This, however, is not in the aleuritic acid or the shellolic, but is in the lost 50 to 60 per cent.

Possibility of Pure "Lac" Resins

Dr. VERMAN, dealing with some of the industrial possibilities of pure "lac" resin said that shellac, as such, had often been criticised as a moulding, coating or impregnating material, mainly for three reasons, *viz.*, slow heat-hardening, water sensitivity and difficulty of finding suitable plasticisers, but a good measure of success had been attained in overcoming these defects. For instance, a prolonged heating operation gradually hardens shellac so that it can withstand temperatures of the order of 200° C. for short periods, and the small extra expense involved is claimed to be well justified where excellent electrical properties are demanded. The water sensitivity of shellac can be considerably reduced by baking and the objection to such a process can only apply to wood finishes and the like where it is physically impossible to bake the product. In addition, various plasticisers (such as tricresyl phosphate and tributyl phthalate) have come into use and are quite successful in many shellac finishes.

The work being done in London, continued Dr. Verman, approached the problem of present-day requirements from another point of view. As the ether-insoluble resin of "lac" has a quicker rate of hardening than the original "lac," why not make this ether-insoluble resin the basis of investigation with a view to overcoming certain of the objections to shellac? That was being done and it was thought that it might help progress towards the ideals mentioned by Mr. Gibson. Already pure "lac" resin of sufficient purity for general use could be prepared at a reasonable cost and investigations now in hand indicated that it might be equal to expectations in its properties and usefulness.

Deodorisation and Fume Elimination

Superphosphate Works—Oil Works—Viscose Spinning

METHODS for the prevention of fume and gas emission were discussed by Dr. B. Wylam in a paper read before the Edinburgh Section of the Society of Chemical Industry and the Institute of Chemistry, on January 22.

The author pointed out that the subject may be broadly divided into two categories: (1) The retention of the gases within the plant by the efficient design, maintenance, and operation of the plant where such gases form an integral part of the reagents employed in the specific manufacturing process, and (2) the absorption or destruction by chemical or other means of gasses evolved by a process where the gases are inevitably produced as an unwanted part of the process or as a by-product. Under the first section fall such processes as hydrochloric and sulphuric acid manufacture, the use of chlorine, sulphur dioxide, etc., in industry, and the use of volatile solvents. In the second category are included processes such as the manufacture of sulphate of ammonia from gas liquor (where large volumes of hydrogen sulphide are generated), the distillation of crude petroleum oil (liberating gases containing sulphur bodies), the manufacture of superphosphates (where silicon tetrafluoride is evolved), processes of chlorination (where hydrochloric acid is produced), nitrations, the spinning of viscose, etc.

Under the first heading there is not much to be said as it is obviously to the advantage of the manufacturer to maintain an efficient plant and to prevent losses by the discharge of reacting gases to the atmosphere. From the point of view of the alkali inspector it is necessary to see that a plant is maintained in a reasonable state of repair and that it is not overloaded, but it should be borne in mind that low level escapes are equally as important as final outlet emission; large losses are sometimes due to an accumulation of comparatively small leaks throughout the plant.

Superphosphate Works

In processes which fall under the second category conditions are somewhat different. Here it is necessary for the manufacturer to spend money upon the absorption or destruction of unwanted by-products and so to add to the overall cost of the process, and there is not the same urge for the owner to maintain a high efficiency of gas absorption.

In the manufacture of superphosphate fertilisers, phosphate rock is treated with sulphuric acid in a mixing pot and successive mixings are discharged to a "den" for the completion of the reaction. Natural phosphates always contain a certain amount of combined fluorine and part of this is liberated during the acid treatment as silicon tetrafluoride, which is a most objectionable and poisonous gas. The mixing vessel and den are therefore draughted by means of a fan and the gases are passed through an absorption system. When silicon tetrafluoride is subject to the action of water, hydrofluosilicic acid is produced with the liberation of silica. This reaction, however, takes time for completion and provision is made for this in the absorption system. In practice, after leaving the mixing vessel and den the gases are first wetted with a spray of water and then passed through a settling or reaction chamber where they are forced to take a tortuous path over a number of trays. Here silica is deposited and may be removed from time to time. Thereafter the gases are subjected to a counter-current scrubbing with water and this is carried out in a multi stage void scrubbing tower fed by efficient sprays. The aqueous effluent is run to drain and the final gases discharged to atmosphere. In an efficient absorbent plant the condensation (as determined by tests on the gases before and after treatment) is usually at least 99 per cent. and sometimes almost reaches theoretical.

Oil Works

The distillation of crude petroleum gives rise to most objectionable gases containing a comparatively high proportion of sulphur bodies and hydrogen sulphide. Oil refining is carried out by two principal processes, namely, straight distillation of the crude and cracking of the heavier fractions from the straight run stills. Both of these give rise to large amounts of hydrocarbon gas of high calorific value, which invariably contains hydrogen sulphide and organic sulphur derivatives in varying proportions; it is liable, when allowed to escape to the atmosphere, to give rise to most objectionable smells, not only in the vicinity of the factory, but for considerable distances down wind. Another cause of nuisance from oil works is the aqueous effluent which contains impurities removed from the oil.

Here the aqueous effluent should be collected in closed pipes to one central point where it can be passed through an oil separator. It may then be discharged below the surface of *tidal* waters and the outfall must be well away from the shore. Gas must be carefully collected and not allowed to escape from the main gas system. Where compression is resorted to, great attention should be paid to the glands of compressing plant and this also applies to any other reciprocating machinery employing compressed gas. It is also essential that arrangements be made for the disposal of any surplus gas which cannot be dealt with by the system, for example, when a sudden rush of gas occurs; this is best done by means of an automatically-ignited flare where any surplus gas can be completely burned.

Viscose Spinning

The manufacture of rayon from a solution of viscose presents a very difficult problem. During this process the viscose solution is forced through the spinnerette into a bath of dilute sulphuric acid where the cellulose is regenerated in the form of thread, whilst gas is liberated containing hydrogen sulphide and organic sulphur bodies. In order to prevent harmful effects upon the health of the operators the gas evolution must be continually removed, and this is carried out by means of a hood over the spinning bench connected to the main draughting system. It is necessary to circulate a very large volume of air and, for a medium-sized factory, this amounts to about 100,000 cu. ft. per minute, and the whole of this is polluted to the extent of about 25 parts per million with hydrogen sulphide and organic sulphur material. This air is being constantly discharged to the outside atmosphere and is capable of causing considerable nuisance in the vicinity of the factory.

Much work has been done on the subject of fume destruction as applied to the viscose process, but so far no method has been evolved which is entirely satisfactory and of universal application. The whole of the gases have been scrubbed with caustic soda solution, but this is an extremely costly method, for a very large plant is necessary, which will be appreciated when it is remembered that at least 100,000 cu. ft. per minute of air must be treated and a time of contact of some half minute must be allowed. Eventually, chlorination was resorted to and found to give satisfactory results when carefully applied. It was not necessary to add sufficient chlorine to the exhaust to ensure complete oxidation of the whole of the hydrogen sulphide; in fact, such a step was found to make matters worse for an extremely pungent smell resembling sulphur chloride resulted. It transpired, however, that when the chlorine was reduced to one one-eighth of the theoretical, the viscose smell was destroyed and that of sulphur chloride not produced. It seemed that the chlorine acted selectively upon the organic sulphur bodies, for the hydrogen sulphide content of the gases was not materially affected. After a good deal of experiment with a home-made chlorinator, an automatic plant was designed and installed; it was found to work with entire satisfaction and now has been in operation for almost two years.

Chlorine, from a 15-cwt. drum, is admitted to the exhaust gas duct immediately on the inlet side of the fans which act as efficient mixers and the amount of chlorine is controlled by an automatic chlorine administrator and recorded on a recording flowmeter. After chlorination the gases are passed to atmosphere through a high fume stack.

SPANISH imports of "commercial chromates and bichromates" increased from 862 metric tons in 1932 to 1,017 tons in 1933. Suppliers in 1933 were Germany, 326 tons; United States, 255; Great Britain, 145; Belgium, 162; and France, 129 tons.

Letter to the Editor

Inventions at the British Industries Fair

SIR,—As official advisers on patents, designs and trade marks to the British Industries Fair may we again, owing to the importance of the subject, draw the attention of your readers who are exhibiting to one point in particular upon which inventors must act very carefully?

The Fair is certified by the Board of Trade to be an industrial exhibition and one in which, if an inventor exhibits his invention before he has applied for protection, such exhibition and disclosure does not invalidate his subsequent application for patent. If, however, an inventor decides to show an unpatented or unprotected device he must file an application, or obtain a certificate from the Patent Office authorities of his intention. It is to be noted that this procedure only prevents a subsequent application for patent being anticipated by the act of the exhibitor but in no case does it prevent anyone copying his invention, putting it on the market, taking the idea to another country and exploiting it or patenting it before the inventor has applied for protection in accordance with the ordinary laws regarding the obtaining of patents for inventions.

In view of the fact that this year no fewer than seventy-three countries are sending buyers to the Fair the importance of this question of new inventions, of which more than one hundred will be on view in London alone, cannot be too strongly emphasised.—Yours faithfully,

G. DRURY COLEMAN.
General Secretary.

Institute of Patentees,
10 Victoria Street, S.W.1.

A New Protective Coating

Complete Immunity from Corrosion

AN enormous field of usefulness has been opened up by the production of protective coatings. Such coatings, as supplied by Detel Products, Ltd., provide a complete protection against the corrosive action, not only of water, sea water and brine, but also both concentrated and dilute acids and alkalies (such as hydrochloric, sulphuric, nitric and chromic acid, caustic potash, caustic soda and ammonia). They are also immune from attack by petrol, paraffin, lubricating oils, white spirit, methylated spirits, and alcohol.

Detel coatings owe their protective properties to two main causes. "Detel" itself is unattacked by these corrosive agents and "Detel" coatings are of such a continuous character that they do not admit of the corrosive agent finding its way to the material to which they are applied; they are not porous. "Detel" is applied in the form of a liquid, much like ordinary paint, with which it should not be confused. It is applied by either brush or spray and dries quickly by evaporation, not oxidation. It leaves a hard smooth, non-inflammable coating, which is undamaged by reasonably high temperatures and is electrically a non-conductor. It does not spread or soak in, it remains where it is put. For instance, on a paper surface there is no discolouration or marking of the surface, except where the brush has travelled. On the end grain of wood it does not soak in like ordinary paint, and consequently provides a saving in the number of coats necessary and at the same time it leaves a surface to which ordinary paint adheres exceptionally well.

Detel protective coatings all have a common base, "Detel," which may be described as a clear liquid, not unlike a high-grade varnish. They can be made in any colour, though the stock colours manufactured are confined to red, grey, aluminium and white. In addition, Detel metal undercoatings (zinc and lead) are made for particular purposes, the former giving a genuine anodic protection. Another unique product is "Detel white undercoating," manufactured for use on new or undried walls, plaster, cement, stone, brick, etc. This coating admits of the structure to which it is applied drying out, and as all Detel products are immune from attack by alkalies it remains unaffected by these destructive agents. For the same reason Detel coatings can be used with complete success on asbestos sheeting, thus overcoming the great difficulty that has always been experienced in easily giving a decorative finish to these sheets.

Overcrowded Education

Problem of Science Teachers

MODERN engineering may be defined broadly as the application of scientific knowledge to supply the material needs of mankind, said the Marquess of Linlithgow, chairman of the Governing Body of the Imperial College of Science and Technology, at the jubilee celebrations at the City and Guilds College, London, on February 4. The engineer had not only increased man's opportunity for healthy work and recreation, said the Marquess, but no less than the medical man, he had played his part in increasing the average span of life.

A full measure of the spirit of scientific adventure was necessary to the life of a nation. Unfortunately, neither the engineer nor the scientist had succeeded in lengthening the day. Since it was difficult to prolong the period of studies, university teachers of science were continually faced with the problem of adapting new knowledge to an already overcrowded curriculum. The difficulty was not what to teach, but what not to teach. The City and Guilds College aimed to educate men in such a way that they should have the greatest possible chance of becoming engineers of the first rank. No university or school of engineering could fulfil its object unless it was a centre of research as well as of higher education.

To mark the jubilee, it was announced that Honorary Fellowships of the City and Guilds Institute were being given to Professor H. E. Armstrong, the only surviving member of the original professorial staff, Professor W. E. Dalby and Professor T. Mather.

Action over Broken Carboy

Damage from Nitric Acid

IN the King's Bench Division on January 31, Mr. Justice MacKinnon continued the hearing of an action by the Southern Railway Co. against Boots Pure Drug Co., Ltd., to recover £203 16s. 3d. on an indemnity contained in a clause in the consignment note for the carriage of dangerous goods. Defendants claimed to be indemnified by James Wilkinson and Son, Ltd., of Sheffield, who were joined as third parties.

Mr. Henn Collins, K.C., appeared for the Railway Co., Mr. Norman Birkett, K.C., for Boots, and Mr. Jardine, K.C., for the third party.

Plaintiffs claimed for damages they had suffered through a fire in one of their trucks on October 12 last, alleged to have been caused by the breaking of a carboy of nitric acid consigned by Boots at Brighton to Beeston, Notts. The consignment note contained an indemnity clause releasing the Company from the consequences of carrying dangerous goods. It was alleged that the glass of the carboy was too thin and was unfit to stand the stress of railway travel. Any other cause of the fire had been eliminated. The fire was discovered by a signalman at Clapham Junction. There was nothing in the nature of an accident to the train. The contents of the truck were destroyed and the Railway Co. had to meet claims for £186. The damage to the truck was placed at £17. The carboy with its contents was supplied by the third party. The carboy was in an iron frame, which was carefully packed with straw in a wooden crate wired at the top and nailed in a corner of the truck. It was alleged that the glass carboy broke and set fire to the straw.

The defence of Boots was that the carboy was as fit for transport as reasonable care and skill could make it. They did not admit that the glass was so thin as not to comply with the regulations.

The third parties pleaded that they were not aware that the carboy was to be carried by rail and further that the carboy did not fit tightly in the straw in the crate.

His lordship, in his judgment, said he could not find otherwise than that the carboy was properly fixed in the iron frame and crate. The carboy had travelled safely from Beeston to Brighton and the accident occurred on the return journey. He accepted the evidence that the glass was thin and cracked. Unfortunately for the third party they did not know from whom they got the carboy. He gave judgment for plaintiffs against defendants for the amount claimed with costs, and judgment for the defendants against the third party for that sum with costs.

Alkali Works Regulation Act

Additions to the Regulations

THE Minister of Health has issued regulations extending the list of noxious or offensive gases mentioned in Section 27 of the Public Health (Smoke Abatement) Act, 1926, and extending the list of works mentioned in the First Schedule to the Alkali, etc., Works Regulation Act, 1906, and a public inquiry concerning the proposals was held at the Ministry of Health on Wednesday. The inquiry was presided over by Mr. W. A. Damon, Chief Inspector, Alkali, etc., Works.

The Inspector, in opening the inquiry, said copies of the Draft Order had already been circulated. Section 4 of the Public Health Act of 1926 empowered the Minister of Health to add to the list of processes registrable under the Alkali Act of 1906 and to add to the list of noxious gases contained in Section 27 of the Alkali Act of 1906. The interests concerned with this Order had already, so far as could be ascertained, been consulted and had been invited to make observations upon the proposals. Many observations had, in fact, been made and he believed they had been met satisfactorily. The scanty attendance at this public inquiry was perhaps explained by the fact that the proposals had already been fairly well thrashed out, but it was necessary, in order fully to comply with the requirements of the Public Health (Smoke Abatement) Act, 1926, that this public inquiry should be held. The Order would come into operation on April 1, 1935.

Discussion took place upon the proposal to extend the description of certain works scheduled in the Alkali Act of 1906, the first being muriatic acid works (a). The description of these works under the Act of 1906 read: "(a) Muriatic acid works, or works (not being alkali works as defined in this Act) where muriatic acid gas is evolved either during the preparation of liquid muriatic acid or for use in any manufacturing process." It is proposed under the present Order to add the words: "or as the result of the use of chlorides in a chemical process."

Description of Sulphide Works

An extension is also proposed of the description of sulphide works. This, at present, reads as follows: "Sulphide works, that is to say, works in which sulphuretted hydrogen is evolved by the decomposition of metallic sulphides or in which sulphuretted hydrogen is used in the production of such sulphides." It is now proposed to add the words: "or any works in which sulphuretted hydrogen is evolved as part of a chemical process." The next extension of the description of works in the Alkali Act of 1906 concerned bisulphide of carbon works. The present description reads: "Bisulphide of carbon works, that is to say works for the manufacture of bisulphide of carbon." It is proposed to add, after the word "manufacture," in this description, the words "use or recovery." The final case of an extended description of works concerned paraffin oil works. The present description is: "Paraffin oil works, that is to say, works in which crude shale oil is refined and works in which crude petroleum is refined." The addition proposed is: "or in which any product of the refining is treated so as to cause the evolution of gases containing any sulphur compound."

The inspector pointed out that the existing description confined the registrable process to the distillation of crude petroleum, but there were many processes which did not necessarily use crude petroleum but which it was felt ought to be under control. It had been necessary to add to the list of gases and fumes mentioned in the Alkali Act of 1906 and it was now proposed to include "Fumes from Paraffin Oil Works containing any sulphur compound."

Mr. R. C. BROWN, on behalf of Cory Bros., asked for some amendment of the proposed definition of a paraffin oil works. He mentioned that the works of Cory Bros. are at Coryton, Essex, and contained plant erected at considerable expense. There were inevitably small leakages and escapes of gas, with some smell in consequence. To prevent gases containing any sulphur compounds coming away from such a works would be an exceedingly expensive matter. There had never been any complaint of the works of Cory Bros.

The inspector said it seemed to him that there was a good argument in favour of the registration of the whole of Cory Bros. works, bearing in mind the description that had been given of the manner in which gas was leaking into the atmosphere. So far as expense was concerned, the company was protected by the words of the Act which stated that certain things should be done "where practicable." If an expense was involved which was altogether unreasonable and unnecessary, obviously it would not be "practicable" and the company could be perfectly sure that the Ministry would not ask it to do something which was unreasonable or unnecessary.

Mr. D. C. MITCHELL (Anglo-Persian Oil Co.) asked whether it was intended that these regulations should apply to gases which were not noxious.

The inspector pointed out that the words in the Draft Order were "gases containing any sulphur compound." There was no concentration mentioned in the Act which said "any sulphur compound," whatever the quantity. It would have to be a matter of discretion.

Part II of the Draft Order was then considered. This proposes to add to the list of works mentioned in the First Schedule to the Alkali Act of 1906, cement works, in the following terms: "Cement production works, that is to say, works in which argillaceous and calcareous materials are used in the production of cement clinker and works in which cement clinker is ground or packed."

Conditions in Cement Works

Mr. H. R. COX, representing the Associated Portland Cement Manufacturers, Ltd., said that in principle his company agreed that if cement works were to be registered then they should all be registered. At the same time, he gathered that this was being dealt with as a question of public health and from that point of view he doubted whether the position had been quite appreciated. The Order referred to works manufacturing cement and also works in which cement clinker is ground and packed, and there was a distinct difference between the two. In the latter class of works they received the clinker from the cement-making works which would be some miles away, and the grinding and packing was carried out in a place where there was no chimney—because electric power was purchased from outside sources and electric motors were used—and there was nothing whatever discharged into the atmosphere. Therefore he suggested there was no case for including works which were engaged in grinding and packing clinker received from another place.

The inspector said the real object of this proposed alteration was to include the process of grinding cement in works already registered for the manufacture of cement. He gathered that if the second part of the definition dealing with grinding and packing were deleted it would meet the views of the manufacturers and that would be given consideration.

Dr. R. LESSING, referring to the inclusion in the list of noxious or offensive gases and fumes of "fumes containing silicon, calcium or their compounds," asked whether that classification would include flue gases.

The inspector replied that it would not because the noxious gases must be evolved from a registrable process and boiler operation was not a registrable process under the Alkali Act. As a matter of fact, that point had been raised by several people in correspondence and had been disposed of.

The inquiry then closed and the Inspector will report to the Ministry in due course.

EXPORTS of chemicals and allied products from the United States were maintained at relatively high levels during the year just ended, particularly industrial chemicals, paint products, and fertilisers. Mr. C. T. Murchison, director of the Bureau of Foreign and Domestic Commerce, reports that exports of these products were valued at $113,000,000 during the first eleven months of the year, a value increase of 18 per cent. over the corresponding period of 1933, when exports amounted to $95,500,000. Every major group on the list, except naval stores and sulphur, shared in the value gain, and many groups showed substantial increases in tonnage. Industrial chemicals led the list with export shipments valued at $19,588,000 during the first eleven months of the year, a gain of almost $5,000,000 over the same period of 1933.

Notes and Reports from the Societies

The Royal Society

Thin Films of Metals on Solid Surfaces

THE structure and physical properties of thin films of metals on solid surfaces was the subject of a paper by Professor E. N. da C. Andrade and Mr. J. C. Martindale, communicated to the Royal Society on February 7. The films were prepared by cathodic sputtering under carefully controlled conditions, with a water-cooled anode, many of the conflicting results of previous workers having been traced to heating of the film during preparation. All traces of mercury vapour were also excluded, the effects of contamination by this metal being described in detail.

The films obtained were uniform, and appeared to be amorphous with all types of microscopic examination. When they are maintained at a temperature of about 230° for silver, and somewhat higher for gold, the first stage of crystallisation takes place, which consists in the formation of birefringement aggregates, of the order of 1 μ across, showing the spherulitic figure in polarised light. Prolonged heating at a somewhat higher temperature lead to rapid growth of the particles, which eventually become well-formed cubic crystals. The first aggregates were formed by the movement of the upper layers of the films, which are about 50 atoms thick, the further growth of the crystals being accompanied by the formation of areas from which the metal has retreated, leaving a thinner film. Crystallisation in such thinner films does not take place until a much higher temperature is reached than that required for the thicker films.

These effects were found to be independent of the nature of the supporting surface. With glass and quartz surfaces, but not with cleavage faces of mica, another phenomenon was observed, *viz.*, the arrangement of minute crystals in lines.

Institution of Mining Engineers

Decline in Coal Consumption

SPEAKING at the annual meeting of the Institution of Mining Engineers in London on February 1, Mr. Laurence Holland discussed the recent decline in coal consumption. When the increased efficiency of generation was added to increasing efficiency in use, he said, it could be seen that, probably so far as electricity was concerned, the expansion in the electrical industry was not causing such an increased consumption of coal as one might have thought. In the gas industry it was found that the substitution of vertical retorts for horizontal retorts, the improvements in the processes whereby the by-products were recovered and the improvement in gas-burning plants of all descriptions had led to a relative decrease in the consumption of coal. The decline in consumption due to efficiency and economy was likely to continue in the fullest relative sense, though it might be subject to fluctuations following improvements in trade and commerce, but there remained ways in which the coal industry could be benefited. The industry had for many years fostered the production and use of electricity in the industrial and in the domestic spheres by providing public utility concerns with fuel at prices considerably less than the cost of production. Now that the electricity industry was on its feet and was effecting such great economies in its costs of production it was well able to pay a reasonable price for its fuel. This could be done without any increased charge to the public, since any small increase in the cost of fuel would be more than counterbalanced by the increasing operation of the more efficient modern stations as they displace the older and less efficient ones. It could not hope for many years to regain the position held in 1913. One of the chief reasons was that economies were being effected in other countries as well as in our own. Also, the coal-producing countries of the Continent took advantage of the disastrous conditions in our mining industry during the early part of the last decade, and had made progressive increases in output. As far as home consumption was concerned, trade was definitely improving, but fresh outlets should be found for the use of coal. Mr. Holland concluded by saying that one of the most hopeful avenues to explore was the one by which coal and coal products were found to replace imported fuels and their products.

Pharmaceutical Society

The Work of the Government Laboratory

A LECTURE on "The Work of the Government Laboratory" will be given by Sir Robert Robertson, F.R.S., Government Chemist, at a meeting of the Pharmaceutical Society of Great Britain to be held in the Society's House on Tuesday, February 12. A short history of the Government Laboratory with its branches and staff will be given, followed by a description of some of the work undertaken there. The Department of the Government Chemist is directly under the Treasury and carries out chemical work for a large number of Departments of State; in addition to reporting on the current work, it carries out investigations on methods of analysis and also on various problems submitted by them. Examples will be given of the nature of the work which is done and of some of the special investigations that have been carried out. The chair will be taken by the president at 8.30 p.m.

Society of Chemical Industry

Manchester and Liverpool Sections

THE annual joint meeting of the Manchester and Liverpool Sections of the Society of Chemical Industry was held at Manchester on February 1. During the afternoon a party of the members visited the works of the Manchester branch of the Dunlop Rubber Co., Ltd., where the manufacture of general rubber goods from smoked and creped rubber, also from latex, was being carried out. By the kindness of the management, tea was provided at the works at the conclusion of the tour. In the evening, Mr. C. J. T. Cronshaw, managing director of the Dyestuffs Group of Imperial Chemical Industries, Ltd., delivered a Jubilee Memorial Lecture entitled "In Quest of Colour" at the Engineers' Club. He traced the history of the dyestuffs industry from Sir William Perkin's original discovery in 1856, from which date its growth was so rapid that by 1878 the production of coal tar colours had reached a value well over £3,000,000. He examined the various causes to which the recent slump has been attributed, and although enumerating many reasons, inclined to the view that it was at least partly due to a lack of imagination or courage on the part of the original English pioneers, many of whom retired at an absurdly early age; beyond dispute the British industry declined because the pioneer spirit and creative instinct which brought it into being abandoned it too early. Mr. Cronshaw followed the development of different dyes and how they displaced the old vegetable and other dyes. More interesting to the chemist was his analysis of the stages by which dyestuffs chemistry was built up, and his examination of some of the problems which the dyer has to meet in producing, for example, dyes to serve such different purposes as naval overcoats, ladies' stockings, and carpets. Each new industry, such as first viscose and then acetate silk, presents an entirely new set of problems to be overcome. Moreover, to the needs of the dyer and finisher have to be added the enormous complexity of needs of the ultimate user. Mr. Cronshaw concluded by trying to lift the curtain on the scene of dyestuffs production and showing how the dyestuffs industry attempts to do its job.

Dr. A. Schedler, chairman of the Manchester Section, presided, and was supported by Professor C. O. Bannister, chairman of the Liverpool Section, and Alderman Edwin Thompson, J.P., the president of the Society. After the address, about 70 members and guests attended a dinner at the Engineers' Club, Dr. A. Schedler being in the chair.

Jubilee Memorial Lecture at Glasgow

FATS were discussed in a Jubilee Memorial Lecture of the Society of Chemical Industry which was delivered by Professor T. P. Hilditch at a joint meeting of the Glasgow and Edinburgh Sections of the Society of Chemical Industry, at the Royal Technical College, Glasgow, on February 1.

The lecture dealt chiefly with the organic chemistry, that is, the chemical constitution, of natural fats and their derivatives, with special reference to the marked advances which have been made in this field during the past 20 or 25 years. Reference was made to the curious circumstances that, from

1780 to 1830, more discoveries were probably made with regard to the chemistry of the fats than any other branches of the then nascent science of organic chemistry; and that there then followed a long period (until nearly the close of the nineteenth century) in which fundamental study of fats and fatty acids languished, and the organic chemistry of this field fell far behind that of other groups of natural products. The renaissance of the subject was illustrated in the lecture by descriptions of existing knowledge of certain phases of the subject, rather than by an account of the development of new lines of investigation or technique.

The basal similarities in glyceride structure which exist throughout the natural vegetable and animal fats, whether from aquatic or terrestrial sources, were considered, and it was shown that independently of this the component fatty acids of many fats frequently align themselves closely with considerations of biological species. Thus, in the vegetable kingdom, whilst the majority of fats seem to contain only oleic, linoleic and palmitic acids as major components, there is a development of other specific fatty acids in the case of certain plant families, or occasionally even in isolated species. In the animal kingdom, some sort of a progressive variation in fatty acid composition can now be traced in fats, commencing from the lowest forms of aquatic animal life and proceeding to the larger forms of land vertebrates.

Attention was drawn to some of the more peculiar acids found in nature and also to the chemical structure of the numerous unsaturated acids whose constitution has now been determined. The marked tendency for chains of 3, 6 or 9 carbon atoms to occur between centres of unsaturation will probably prove an important clue to the mechanism by which fatty acids are produced *in vivo* from carbohydrates.

In another field, that of hydrogenation, the preferential manner in which different unsaturated groups in fats are attacked during catalytic hydrogenation was described. Recent work, it was pointed out, has indicated that different types of mixed glycerides are preferentially hydrogenated according to whether the unsaturated acid is attached to the primary or secondary hydroxyl groups of the glycerol, and this has led to fresh studies of glyceride structure, by means of which in some cases the precise arrangement of the radicals of fatty acids in a natural glyceride molecule can be ascertained. On the other hand, hydrogenation of fats under very high pressure leads to the production of the corresponding higher fatty alcohols, which are of importance in the manufacture of certain modern detergents.

Institute of Chemistry

Bristol Section: Calcium Sulphate Research

A BRIEF survey of researches on calcium sulphate, extending from 1847 to 1934, was given in a lecture which Professor F. G. Donnan, F.R.S., delivered to the Bristol and South Wales Section of the Institute of Chemistry on January 29. The details given were sufficient to show that calcium sulphate and its hydrated forms present a very interesting example of the metastability and transformation of crystalline phases.

Professor Donnan dealt with the subject in a comprehensive manner and stated that calcium sulphate occurs naturally in two forms, as the dihydrate $CaSO_4.2H_2O$ (gypsum), and as the anhydrous salt $CaSO_4$ (anhydrite). Although not occurring naturally, the crystalline hydrate $2CaSO_4.H_2O$ has been known for a long time. Its formula is commonly written $CaSO_4.\frac{1}{2}H_2O$, hence the name hemihydrate or half hydrate. It was obtained by Hoppe-Seyler. Le Chatelier pointed out in 1888 that the proportion of combined water contained in plaster of paris corresponded roughly to that of the half hydrate and suggested that the setting of the plaster was due to the half hydrate dissolving in water to form a solution supersaturated with respect to gypsum, the latter then separating out in the form of a mass of feathery interlacing and interlocked crystals. This theory has been largely confirmed in recent years by Chassevent. The stability relations and transition points of the $CaSO_4.\frac{1}{2}H_2O$ system were elucidated in the years 1898-1903 by the classical researches of van't Hoff and his collaborators (E. F. Armstrong, Weigert and Hinrichsen). The transition temperature corresponding to $CaSO_4.2H_2O \longrightarrow CaSO_4.\frac{1}{2}H_2O$ plus saturated solution was found to be 107°, though this transition point turned out to be metastable with respect to the transition $CaSO_4.2H_2O \longrightarrow$ soluble hydrite plus saturated solution which was found to correspond to 93°. It was discovered, however, by van't Hoff and his collaborators that both these transition points are metastable with respect to the definitely stable transition point $CaSO_4.2H_2O \longrightarrow$ natural anhydrite plus saturated solution which was found to correspond to 63.5°.

In recent years accurate determinations of the solubility curves of $CaSO_4.2H_2O$, $CaSO_4.\frac{1}{2}H_2O$ and $CaSO_4$ (natural anhydrite) have been made, and the intersections of these curves confirm the accuracy of the transition temperatures 107° and 63.5°. One of the most interesting results of van't Hoff's work was his proof that the half hydrate is metastable with respect to the transformation $4CaSO_4.\frac{1}{2}H_2O \rightarrow 3CaSO_4$ plus $CaSO_4.2H_2O$. During the last ten years the interesting work of Jolibois and Chassevent on the soluble form of calcium sulphate obtained by low-temperature dehydration of $CaSO_4.2H_2O$ seems to show that it is not identical with van't Hoff's soluble anhydrite. Chassevent's α-anhydrite on heating to 300° to 313° is converted into another form which is called β-anhydrite. D'ans has recently suggested that van't Hoff's soluble anhydrite probably corresponds more or less to Chassevent's β-anhydrite.

When the half hydrate is dehydrated at low temperatures the recent work of Linck and Jung and of Caspari indicates that there is only a slight and gradual change of the crystal lattice, thus suggesting a zeolitic type of continuous dehydration, without formation of a new and different crystallographic form. It is curious, however, that this reversible dehydration-hydration process corresponds, according to Balarew to a definite water-vapour pressure at a definite temperature. The anhydrous product obtained by low temperature dehydration of the half hydrate is called by D'ans the half anhydrite, who regards it as a metastable crystalline pseudomorph of the half hydrate, and from the solubility curve of $CaSO_4.\frac{1}{2}H_2O$ and the vapour-pressure curve of Balarew, calculates that the metastable transition temperature, $CaSO_4.\frac{1}{2}H_2O \longrightarrow$ half anhydrite plus saturated solution, will correspond approximately to 190°. We may perhaps assume that the half anhydrite of D'ans and Balarew is identical with Chassevent's α-anhydrite. The work of Gallitelli and Bussem and of Partridge and Ramsdell appears to show that $CaSO_4.\frac{1}{2}H_2O$ is essentially iso-structural with soluble anhydrite and rather suggests a zeolithic nature for the former (in agreement with the views of Linck and Jung, and of Caspari).

Society of Dyers and Colourists

Scottish Section: Sulphonated Fatty Alcohols

SOME interesting properties of surface active substances were dealt with by Mr. J. G. Evans, M.Sc.Tech. (Manchester), in a lecture delivered to the Scottish Section of the Society of Dyers and Colourists, at the Royal Technical College, Glasgow, on January 25, when Mr. Jas. Bruce presided.

The work described had reference to those surface active bodies which have, during the past few years, appeared on the market under the general name "sulphonated fatty alcohols." Attention was drawn to the ambiguity of this name which does not necessarily indicate that the bodies are essentially alkyl sulphuric esters of the type R O SO_3Na and not as might be inferred true sulphonates of the type R SO_3Na; it is therefore preferable to describe the products as sulphated fatty alcohols. Fundamental differences in properties exist between sulphates and sulphonates of this character. A comparison of some of the properties of the following products in the pure state had been made:—

(1) Cetyl sodium sulphate $C_{16}H_{33}O\ SO_3Na$.
(2) Cetyl sulphonic acid (sodium salt) $C_{16}H_{33}SO_3Na$.
(3) Dodecyl sodium sulphate $C_{12}H_{25}\ O\ SO_3Na$.
(4) Dodecyl sulphonic acid (sodium salt) $C_{12}H_{25}SO_3Na$.
(5) Cetyl pyridinium bromide $C_{16}H_{33}-N\ C_5H_7$ (Br).

The first four products are anion active and the last a cation active body included for comparative purposes as a matter of interest. Reference was made to earlier work.

The work described formed part of a larger scheme to examine in detail the detergent and wetting properties and related phenomena exhibited by these bodies ultimately with a view to correlating the results with some of their physico-chemical properties and perhaps thus throw some light on the mechanism of detergent action. The wetting power was examined by the Herbig method which expresses wetting

power as the percentage solution absorbed by a given fibre when immersed in the solution. The influence of temperature and concentration on wetting power were shown. When expressing wetting power against concentration in log.-log. co-ordinates, it was shown that a linear relationship held, and a numerical expression of the comparative wetting powers of different agents was explained. A simple and quick method of comparing detergent powers was described and tests on the various compounds examined by this method shown.

Some of the differences between a sulphonate and a sulphate were summarised as follows. Cetyl sodium sulphate surpasses the sodium salt of cetyl sulphonic acid in (1) solubility, (2) wetting power, (3) scouring power. As regards (2) a similar comparison exists between dodecyl sodium sulphate and the corresponding sulphonate. Comparing cetyl sodium sulphate with dodecyl sodium sulphate it can be said: (1) Dodecyl sodium sulphate has somewhat better solubility in the cold than the cetyl ester, (2) dodecyl sodium sulphate has better wetting power in the cold than cetyl sodium sulphate, but at temperatures above 40° C. the cetyl ester surpasses the dodecyl ester, and (3) the cetyl sodium sulphate is a very much better detergent under the conditions examined than is dodecyl sodium sulphate. The practical significance of some of these results was indicated with particular reference to the possible presence of sulphonates in commercial brands of sulphated fatty alcohols.

Dyers' Wage and Hours Demand

Strike Threat at a Bradford Meeting

A JOINT meeting, organised by the Federation of Unions in the Bleaching, Dyeing, Finishing and Calico Printing Trades, and embracing members of the Amalgamated Society of Dyers and the National Union of Textile Workers, was held at Bradford on February 3, to consider the report of the Executive Committee on the question of a new wages agreement and the limitation of hours.

Mr. Charles Bloor presided, the principal speakers being Mr. George H. Bagnall (general secretary, Amalgamated Society of Dyers), and Mr. Arthur Shaw (secretary of the Federation). Numerous speakers expressed their dissatisfaction with the present agreement and said they intended to recommend members to vote in favour of ending it and, if necessary, to hand in a week's notice. The Allied Association of Bleachers, Dyers, Printers and Finishers had framed proposals to secure an Enabling Bill with statutory powers for regulating and controlling the industry. The unions would oppose this ligislation unless provisions were included for amply safeguarding wages and restricting hours. If the men showed a united front there should be no difficulty in compelling the employers to take up a more reasonable attitude.

Expansion in Purchasing Power

Mr George H. Bagnall asserted that their wage reductions since 1931 had been greater than in any other industry, and had effected no improvement in trade. Only by expansion in purchasing power could it be possible, at least so far as the home market was concerned, to improve trade, and, far from the home market having reached saturation point, the fringe of development had hardly been touched.

In most of the districts affected the meetings called to explain the situation to the members have been held, and in some areas the ballot has just been started. The five unions comprising the Federation have all received supplies of the ballot form, and it is hoped that the decision of the members on the following three questions (which constitute the ballot paper) will be known before the end of the month:—(1) Are you prepared to authorise the Executive Committee to give three months' notice to terminate the Common Agreement? (2) Are you prepared to authorise the Executive Committee at the end of the three months' period to hand in on your behalf one week's notice to cease work if satisfactory arrangements have not then been made with the employers? (3) Are you prepared to refuse to work in work in excess of 48 hours per week during or at the end of the three months' period if so requested by the Executive Committee? Approximately 80,000 operatives are to participate in the ballot.

Midland Chemists' Dinner

Proposed House of Science

SPEAKING at the dinner of Midland Chemists at the Midland Hotel, Birmingham, on February 2, Mr. Edwin Thompson, president of the Society of Chemical Industry, made an earnest plea for a national House of Science, and said he was in communication with the Prime Minister on the matter in the hope that such a scheme might be brought into being. The dinner which was attended by representatives of the Institute of Chemistry, the Society of Chemical Industry, the British Association of Chemists, the Chemical Society, and the Birmingham University Chemical Society, was presided over by Mr. W. A. S. Calder, Birmingham.

Mr. THOMPSON, proposing "The Midland Chemists," said it would be agreed that scientific societies in England were by no means co-ordinated as they should be, and to repair this defect he hoped they would support any scheme for a home of science, and that it would be taken up seriously. He suggested building on the site of Burlington House. The building was antiquated and out of date but, the site was a magnificent one, and if only they could secure the support of the Government upon such lines it would be a great thing for the country. Recently there had been opened in Paris the Maison de la Chimie, a building which housed all the French chemical societies. A chemical house had long been needed in England, but he thought it would be wiser to go one step further and have some scientific headquarters in London. In such a building there could be housed all the leading scientific societies in the country—not merely chemical societies as in France, but all branches of science. There they could have their headquarters, committee rooms, meeting rooms and lecture halls. In the Maison de la Chimie they had a banqueting hall where they could accommodate five hundred or more.

Industrial Conditions at Widnes

Stupidity of Rationalisation

DR. E. L. BURGIN, Parliamentary Secretary of the Board of Trade, was the chief guest at the annual luncheon of the Widnes Chamber of Commerce on February 1. He said there was considerable unemployment in Widnes, although conditions now showed considerable improvement over those in 1931 and 1932. This unemployment was due in large part to the closing of some of the works of the United Alkali group of the Imperial Chemical Industries, Ltd., and the reorganisation of the remaining units. Moreover, changes in technical processes had led to redundancy in labour. He deplored, through the process of rationalisation, the loss of a great soap works like Gossages; the derelict place as he had seen it was a local eyesore. He hoped the time was near when many derelict works would be operating in competition with others. All neighbourhoods were units of a great whole, and there must not be any self-contented units, if the country was to flourish.

Palmolive Soap Infringement

Order by Consent

IN the Chancery Division on February 1, Mr. Justice Farwell had before him a motion in an action by Colgate Palmolive, Peet, Ltd., against Revroil Products, Ltd., of Hillingdon, Middlesex, for an interim injunction restraining the defendants from infringing the plaintiffs' trade mark Palmolive, and for alleged passing off.

Mr. Bray appeared for the plaintiffs and stated that the defendants had issued a circular advertising Palmolive soap. An order was sent and soap not of the plaintiffs' manufacture was supplied bearing the words, Palm and Olive, not very clearly printed. The defendants were represented by counsel and were prepared to treat the motion as the trial or action, give an undertaking and pay the taxed costs, if a sum was not agreed. The plaintiffs were not asking for damages.

Mr. Reviere, for the defendants, said that what happened was a pure mistake.

His lordship said there would be an order by consent in the terms agreed.

Continental Chemical Notes

Italy

THE MONTECATINI CONCERN has declared a dividend of 8 per cent. for 1934 (unchanged).

Norway

TANNING EXTRACT MANUFACTURE, to the extent of 800,000 litres annually, is said to be contemplated by the A.S. Toten Cellulose Factory.

Holland

IT HAS BEEN DECIDED TO ABANDON the acetate rayon manufacturing project of the "Dreya" concern and the experimental plant at Arnhem is closing down.

Sweden

THE SULPHITE CELLULOSE FACTORY of the Laxa Bruks A.B., at Laxa, in Central Sweden, is in course of being modernised and will be followed by a 35-40 per cent. increase in the present annual capacity of 4,500 tons.

Roumania

COPPER SULPHATE PRODUCTION has now commenced at the new Bucharest factory of Fratii Goldenberg.

PRODUCTION OF RED LEAD has now been started at the new Bucharest works of Carl Zimmer and Co. in a preliminary monthly output of 4½ waggon loads.

Greece

ACCORDING TO THE REPORT of the Salonika Chamber of Commerce for 1933, chemical products manufactured in Greece include carbonic acid (33 tons), soap (1,500 tons), oxygen and acetylene (34,100 tons), and calcined magnesia (8,461 tons).

France

OVER 10,000 TUNG OIL TREES have been planted since 1931 in French Morocco, where the tree has been successfully acclimatised.

THE EZORALITH CO., of Courbeyoie (Seine), recently registered with a capital of 200,000 francs, will engage in the manufacture of a plastic material, Ezoralithe. The newly registered Soc. Francaise de Produits Chimiques et Insecticides, of Paris (capital 400,000 francs), will engage mainly in the manufacture of insecticides.

Austria

EXPERIMENTS BY KISSER AND PORTHEIM in the Biological Experimental Station of the Vienna Academy of Sciences indicate that 30 per cent. hydrogen peroxide is an effective and stable disinfectant for a wide range of seeds and may possibly be used in place of the usual poisonous mercury, arsenic and copper compounds. Treatment consists in agitation with the peroxide solution until the seeds are uniformly wetted. No loss of germinating power was observed in the case of peas, beans, lentils, maize and tomatoes. Good results followed its use with wheat but not with rye, barley and oats.

Germany

WHERE THE THAWING OF FROZEN WATER PIPES by introduction of concentrated salt solutions is not practicable, passage into the pipe of an ammonia gas stream is said to be a convenient alternative ("Chemiker-Zeitung").

AN ADHESIVE FOR PLYWOOD MANUFACTURE on the basis of a urea-formaldehyde resin has been perfected which hardens sufficiently quickly to permit cold application. Comparative tests are said to reveal superiority on the part of this new synthetic resin plywood bonding agent to the usual casein and albumen glues in respect of water-resistance and outdoor durability.

A SUBSTANTIAL RISE IS SHOWN in German iron and steel production in 1934 as compared with the previous year. The production of raw steel of various qualities and processes totalled 11,886,043 tons, as compared with 7,585,735 tons in 1933—an increase of 55 per cent. Raw iron production rose from 5,266,769 tons in 1933 to 8,741,661 tons in 1934—an increase of 66 per cent. The most striking increase in iron production is shown by the Rhineland and Westphalia district.

Far Eastern Chemical Notes

Japan

PHOTOGRAPHIC GELATINE is to be manufactured by Gelatin-Kogyo K.K. in a monthly output of 6,000 lb.

A DAILY OUTPUT OF HYDROQUINONE to the extent of 200 kg. is ascribed to the Shinko Kagaku Kogyosho.

NIPPON SODA K.K. is now producing 10 tons of benzyl chloride monthly at its Nihongi factory.

FOLLOWING ITS ENLARGEMENT, the Okizu factory of Nippon Denki Kogyo K.K. has a daily production capacity for sodium ferrocyanide of three tons.

Personal Notes

MR. JOHN BARLOW, retired chemical engineer, of Rutherglen, who died recently, left estate valued at £1,083.

MR. GEORGE HENRY WATTS BLICK, general manager of David Moseley and Sons, Ltd., indiarubber manufacturers, of Manchester, died on February 2, aged 58.

MME. RAMART LUCAS has been elected a professor at the Sorbonne, Paris. She is the second woman to be elected to a chair at the Sorbonne, the first being Mme. Curie.

PROFESSOR S. BRODETSKY gave an address on "The Limitations of Scientific Knowledge" at a luncheon of the Leeds Rotary Club at Leeds on February 1.

MR. WILLIAM BISHOP, manager of the by-product plant of the Cardiff Collieries, Llanbradach, Glam., died last week-end.

MR. ARTHUR J. BATY has been elected president of the Seed, Oil, Cake and General Produce Association for the ensuing year.

LORD BEARSTED, chairman and a managing director of the Shell Transport and Trading Co., Ltd., and a director of M. Samuel and Co., Ltd., has been elected to a seat on the board of Lloyds Bank.

THE ENGAGEMENT is announced of Paul Alfred Shinkman, of New York, second son of Mr. and Mrs. J. C. Shinkman, of Grand Rapids, Michigan, and Elizabeth, elder daughter of Sir Ernest and Lady Benn, of Blunt House, Oxted.

LORD TRENT, chairman of Boots Pure Drug Co., Ltd., has become a vice-president of the Nottingham and Notts Historical Pageant which will be staged in Nottingham from June 10 to 15. The pageant will in ten episodes portray nearly two thousand years of Nottingham's history.

PROFESSOR ARTHUR LAPWORTH, who, as was announced last week, is retiring in September next from the University of Manchester, joined the staff of the university in 1909 as senior lecturer in chemistry, on vacating his lectureship at Goldsmiths' College, London. He was appointed professor of organic chemistry in 1913, Sir Samuel Hall professor and director of the laboratories in 1922, and pro-vice-chancellor in February, 1933. During his time at Manchester, Professor Lapworth has published work in a number of branches of pure organic and physical organic chemistry; he will be remembered for his investigation of the terpenes, his work on certain natural products carried out in association with the Oil and Fats Committee of the Food Investigation Board, and especially for his studies on reaction mechanism and molecular reactivity, which led to the initiation of the now famous "electronic" theory of organic reactions. He has been awarded honorary degrees by the Universities of Birmingham and St. Andrews, and received the Davy Medal of the Royal Society in 1931.

PRELIMINARY STATISTICS FOR 1934, as published by the Hague Statistical Office of the International Tin Research and Development Council, show that world production of tin is estimated at 107,700 tons in 1934, against 84,963 tons in 1933, and 92,908 tons in 1932. World consumption of tin in manufacture was approximately 130,000 tons in 1934, compared with 134,000 tons in 1933, and 106,000 tons in 1932. There was a decrease in the amount of tin used for tinplate, attributable to a fall in the United States' output of tinplate, but there was an increase in the consumption of tin in other industries. It is stated that the trend of world tin consumption, which has been downward since the middle of 1934, has with a production of 7,289,166 tons, as against 4,415,654 tons in 1934.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no price changes to report in the markets for general heavy chemicals, wood distillation products, coal tar products, perfumery chemicals, essential oils and intermediates. In the rubber chemical section cadmium sulphide shows a slight reduction in price, while vermilion has been advanced. In the pharmaceutical section citric acid has been reduced from 11¾d. to 11½d. per lb. Unless otherwise stated the prices quoted below cover fair quantities net and naked at sellers' works.

Price Changes

Rubber Chemicals.—CADMIUM SULPHIDE, 2s. 4d. to 2s. 8d. per lb.; VERMILION, pale or deep, 4s. 3d. to 4s. 5d. per gal.

Pharmaceutical Chemicals.—CITRIC ACID, 11½d. per lb.

All other prices remain unchanged.

LONDON.—Markets for practically all products continue firm and there is a good general demand. The amount of business booked is up to the usual average. There is little change to report in prices, figures continuing exceptionally steady. Prices of coal tar products continue firm, with no change to report from last week. Pitch is quoted at about 42s. 6d. to 45s. per ton f.o.b. East Coast port.

MANCHESTER.—From the point of view of fresh bookings, comparatively slow conditions have been reported by the majority of traders on the Manchester chemical market during the past month. The closing months of last year witnessed a fair flow of contract business, and this was added to to some extent last month. So far, however, February has proved a disappointment in this respect and new business since last report has not amounted to a great deal altogether. On the other hand, there has been the customary beginning of the month increase in the flow of delivery specifications and the quantities covered by these have been not unsatisfactory. A moderate spot and early delivery business has been put through during the past week. Quotations are well held on the whole and apart from a few easy spots continued steadiness seems to be anticipated in most quarters.

SCOTLAND.—Business generally in the Scottish heavy chemical market shows signs of improvement.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. less 5%. MANCHESTER: 11¾d.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex storee. MANCHESTER: £48 10s. to £55 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 0¼d. to 1s. 0¾d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE. SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6¾d. to 1s. 2d. per lb.; crimson, 1s. 5d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £21, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton. SCOTLAND: £10 10s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—2s. 4d. to 2s. 8d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¾d. per lb. LONDON: 4¼d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 2s. 6d. per cwt. SCOTLAND: £4 2s. less 2½ per cent.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £32.

LEAD NITRATE.—£27 10s. per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—30%, £17 to £17 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

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PHENOL.—7¾d. to 8¼d. per lb. for delivery up to June 30.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38 10s.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5% d/d U.K. Discount according to quantity. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38 10s.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NIRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10¼d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¾d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks. Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton

lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND. Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 10s. per ton.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £15.

SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON. Spot, £18 to £20 per ton d/d station in drums.

SODIUM PERBORATE.—LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

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

SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.

SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £14 to £14 5s. per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 4s. 3d. to 4s. 5d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 7¾d. to 8½d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¾d. per lb.; crude, 2s. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 5½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5½d. to 5¾d. per gal, f.o.r. Home, 3¾d. d/d. LONDON: 4¼d. f.o.r. North; 5d. London. MANCHESTER: 4¼d. to 5¾d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4¼d.

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 2¼d. to 1s. 3¼d.; heavy, 11d. to 1s. 0¼d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3¼d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—Medium soft, 48s. per ton. LONDON: 45s. per ton, f.o.b. East Coast port.

PYRIDINE.—90/140, 6s. 9d. to 2s. 6d. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 2d. to 2s. 3d.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Feb., £7 3s. 6d. per ton; Mar./June, £7 5s.; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CYANAMIDE.—Feb., £7 2s. 6d. per ton; Mar., £7 3s. 9d.; Apr./June, £7 5s.; delivered in 4-ton lots to farmer's nearest station.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935, in 6-ton lots, carriage paid to farmer's nearest station for material basis 15.5% or 16% nitrogen.

NITRO-CHALK.—£7 5s. per ton to June, 1935, in 6-ton lots carriage paid for material basis 15.5% nitrogen.

CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents, for delivery up to June, 1935, in 6-ton lots carriage paid.

NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton, for delivery up to June, 1935, in 6-ton lots carriage paid.

Latest Oil Prices

LONDON, Feb. 6.—LINSEED OIL was barely steady. Spot, £21 5s. (small quantities 30s. extra); Feb., £19 17s. 6d.; March-April, £20 5s.; May-Aug., £20 17s. 6d.; Sept.-Dec., £21 7s. 6d. SOYA BEAN OIL was quiet. Oriental (bulk), Feb.-March shipment, £22 15s. per ton. RAPE OIL was quiet. Crude extracted, £32; technical refined, £33 10s., naked, ex wharf. COTTON OIL was quiet. Egyptian crude, £26; refined common edible, £31; deodorised, £31 10s., naked, ex mill (small lots 30s. extra). TURPENTINE was slow. American, spot, 47s. 6d. per cwt.

HULL.—LINSEED OIL, spot, quoted £21 per ton; Feb., £20 10s.; March-April, £20 12s. 6d.; May-Aug., £20 17s. 6d.; Sept.-Dec., £21 7s. 6d. COTTON OIL.— Egyptian, crude, spot, £26 10s.; edible, defined, spot, £29; technical, spot, £29; deodorised, £31, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £19 10s., naked. GROUNDNUT OIL.—Extracted, spot, £33; deodorised, £36. RAPE OIL.—Extracted, spot, £31; refined, £32 10s. SOYA OIL.—Extracted, £25; deodorised, £28 per ton. CASTOR OIL.—Pharmaceutical, 42s. per cwt.; first, 37s.; second, 34s. TURPENTINE, American, spot, 49s. 6d. per cwt.

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).

British India.—The British Trade Commissioner at Calcutta reports that the Indian Stores Department is calling for tenders, to be presented in New Delhi by February 27, for the supply of one cold starting, crude oil engine-driven, vertical spindle, tube well turbine pump—capacity 12,500 Imperial gallons per hour. (Ref. G.Y. 14749.)

Canada.—The Officer-in-Charge of H.M. Trade Commissioner's Office at Winnipeg reports that a local firm is desirous of receiving quotations from United Kingdom manufacturers of metal line flexible cotton-covered gasoline pump hose and couplings. (Ref. G.Y. 14748.)

Holland.—The management of the municipal gasworks, Bloemsingel, Groningen, is preparing plans with the co-operation of the Department of Municipal Works for an important extension of the Municipal Gasworks, consisting of a new pressure installation, regulating and measuring station, the laying down of pressure pipe lines, and an extension of the machine rooms. The work is estimated to cost 215,000 fl. and is expected to be put in hand in the course of the next two months. This is advance information only and that no further details are available at the Department of Overseas Trade. It is suggested that British firms interested should consult their Dutch agents concerning any further information they may require. (Ref. D.O.T. 32575/1934.)

Siam.—H.M. Consul-General at Bangkok reports that the Stores Department of the Royal State Railways of Siam is calling for tenders (Tender No. P. 247-18/4/35), to be presented in Bangkok by April 18, 1935, for the supply of 3,200 tins of ready-mixed paints. (Ref. B.Y. 7967.) Bangkok reports that the Royal State Railways of Siam are calling for tenders, to be presented in Bangkok by April 5, 1935, for the supply of steel superheater tubes and elements. (Ref. G.Y. 14755.)

Syria (Aleppo).—A commission agent desires to represent manufacturers and dealers in scents, pharmaceutical preparations. (Ref. No. 144.)

Company News

International Nickel Co. of Canada.—A dividend of 15 cents on the common stock has been declared (same as in the two previous quarters). In March and June, 1934, dividends of 10 cents were paid. The company was unable to distribute dividends during 1932 and 1933.

Redfern's Rubber Works, Ltd.—A net profit of £18,526 is disclosed by the accounts for 1934 of Redfern's Rubber Works, Ltd. This is the highest figure returned since 1930 and compares with £8,285 for 1933, £7,308 for 1932, and £12,010 for 1931. The larger profits enable the directors to raise the ordinary dividend from 2½ per cent. to 7½ per cent. and to increase the "carry-forward" from £3,434 to £6,960. Floating assets total £122,927, against current liabilities, including dividend requirements and income-tax account, of £29,935. Meeting, February 15.

Inventions in the Chemical Industry

Patent Specifications and Applications

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.

Reconditioning Used Lubricating Oils

USED lubricating oil is passed through a mass of an artificially-formed fibrous mineral fusion product adapted to neutralise acid compounds in the oil. Slag wool or glass wool may be used, alkaline material being added to the fused mineral before blowing if the material is not otherwise sufficiently basic. The mineral wool may be mixed with cotton linters, wool or asbestos. See specification No. 412,767 of C. Arnold.

Complete Specifications Open to Public Inspection

RESINOUS COMPOSITIONS.—E. I. du Pont de Nemours and Co. July 24, 1933. 13792/34.

WASHING AGENTS, preparation.—H. T. Böhme A.-G. July 28, 1933. 15320/34.

FINISHING ARTIFICIAL SILK.—I. G. Farbenindustrie. July 28, 1933. 17495/34.

VISCOSE, manufacture.—I. G. Farbenindustrie. July 28, 1933. 17757/34.

POTASSIUM NITRATE, production.—Kali-Forschungs-Anstalt Ges. July 25, 1933. 18869/34.

FLUORESCENT SUBSTANCE, producing.—J. D. Riedel-E. de Haën A.-G. July 22, 1933. 18897/34.

IMPREGNATING FILLERS and fibrous materials with resins of the amino-aldehyde series, method.—Allgemeine Elektricitäts Ges. July 27, 1933. 20841/34.

BLUE DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. July 27, 1933. 20900/34.

PHOTOGRAPHIC SILVER-HALIDE EMULSIONS.—I. G. Farbenindustrie. July 22, 1933. 21478/34.

THERAPEUTICALLY-ACTIVE TETRAZOLE DERIVATIVES of the terpene series, production.—Knoll A.-G. Chemische Fabriken and K. F. Schmidt. July 22, 1933. 21521/34.

CONVERSION PRODUCTS of natural resins, manufacture.—I. G. Farbenindustrie. July 24, 1933. 21552/34.

RECOVERING VOLATILE HYDROCARBONS from gases and regenerating the wash oil.—Naamlooze Vennootschap Machinerieen-en Apparate Fabrieken. July 24, 1933. 21649/34.

SEPARATING SULPHUR from gases containing hydrogen sulphide.—Dr. C. Otto and Co., Ges. July 25, 1933. 21760/34.

DYESTUFFS, manufacture.—I. G. Farbenindustrie. July 25, 1933. 21789/34.

CELLULOSE MASSES, methods of producing.—British Thomson-Houston Co., Ltd. July 26, 1933. 21905/34.

WETTING AND DETERGENT PROCESSES.—Selden Co. July 28, 1933. 21908/34.

CHEMICAL COMPOUNDS, methods of preparing.—W. E. Austin. July 26, 1933. 21920-1/34.

PURIFICATION OF WATER, process and apparatus.—Soc. D'Etudes pour L'Epuration des Eaux, Procédés G. et B. July 28, 1933. 22024/34.

Specifications Accepted with Dates of Application

CARBAMATES of the alkali metals other than potassium, production.—Mathieson Alkali Works. July 6, 1932. 422,908.

PLASTIC MASSES, manufacture.—I. G. Farbenindustrie. July 16, 1932. 422,957.

HARD SINTERED CARBIDE MATERIALS, production.—Siemens and Halske A.-G. July 19, 1932. 422,961.

PROTECTION OF ANIMAL FIBRES from textile pests.—I. G. Farbenindustrie. July 22, 1932. 422,923.

ISOTHIOCYANATE SULPHONIC ACIDS, process for the manufacture. I. G. Farbenindustrie. July 23, 1932. 422,930.

SAFETY PAPER and like materials, manufacture.—E. I. du Pont de Nemours and Co. July 22, 1932. 423,046.

COOLING SYSTEM for utilising solid carbon dioxide.—D. S. Lees and Imperial Chemical Industries, Ltd. July 25, 1933. 423,105.

AZO DYESTUFFS, process for the manufacture.—I. G. Farbenindustrie. July 26, 1932. 423,107.

AZO DYESTUFFS and their manufacture.—E. I. du Pont de Nemours and Co. July 26, 1932. 423,183.

AZO DYESTUFFS and their manufacture.—E. I. du Pont de Nemours and Co. July 27, 1932. 423,185.

SOAP AND GLYCERINE, manufacture.—Garbinton, Ltd., and J. B. E. Johnson. July 27, 1933. 423,188.

PHYSIOLOGICALLY-ACTIVE PREPARATION from embryonal tissue, manufacture.—I. G. Farbenindustrie. July 29, 1932. (Addition to 366,503.) 423,192.

SILICA SANDS and the like, purification.—Rockware Glass Syndicate, Ltd., and F. W. Adams. Sept. 5, 1933. 423,053.

FAST TINTS ON THE FIBRE, process for producing.—Soc. of Chemical Industry in Basle. Sept. 17, 1932. 423,055.

SULPHURIC ACID DERIVATIVES of organic sulphur compounds, manufacture.—Henkel et Cie, Ges. Nov. 18, 1932. 422,937.

CELLULOSE ACETATE SOLUBLE in acetone, production.—A. H. Stevens (E. Berl). Dec. 5, 1933. 423,062.

MILK POWDER, manufacture.—N. M. Kronberg. Dec. 6, 1933. 423,063.

POLYMERISED DRYING OILS, distillation.—Imperial Chemical Industries, Ltd. Dec. 20, 1932. 422,941.

NON-KNOCKING BENZINES, production.—International Hydrogenation Patents Co., Ltd. May 5, 1933. 423,001.

METALLIC SELENIUM, process for recovering.—A. R. Lindblad. Sept. 4, 1933. 423,084.

ARTIFICIAL SILK, manufacture.—Vereinigte Glanzstoff-Fabriken A.-G. Oct. 2, 1933. 423,090.

Applications for Patents

(January 24 to 30 inclusive.)

PLANTS FOR THERAPEUTIC PURPOSES, treatment.—J. Abrahamowicz. (Austria, Jan. 29, '34.) 2910. (Austria, March 2, '34.) 2911. (Austria, May 29, '34.) 2912.

DYEING CELLULOSIC MATERIAL.—Imperial Chemical Industries, Ltd., H. Blackshaw, and A. W. Baldwin. 2686.

HALOGEN-METHANE SULPHONIC ACIDS, etc., manufacture.—A. Binz. 2835.

COLOURATION OF MATERIALS.—British Celanese, Ltd. (United States, Jan. 26, '34.) 2641.

HYDROCARBONS OF THE TERPENE SERIES, conversion.—British Xylonite Co., Ltd., and R. S. Colborne. 2417.

HIGH-POLYMERIC NITROGEN-CONTAINING COMPOUNDS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 2661.

GLUCOSIDE-LIKE COMPOUNDS, manufacture.—A. Carpmael (Schering-Kahlbaum A.-G.). 2971.

ESTERS, production.—Celluloid Corporation. (United States, Jan. 26, '34.) 2640.

SOLID CARBONACEOUS MATERIALS into liquid hydrocarbons, conversion.—Compagnie des Mines de Vicoigne Noeux and Drocourt. (France, Oct. 10, '34.) 2975.

UNSATURATED ETHERS, production.—I. A. Davies. 2819.

ORGANIC COMPOUNDS, manufacture.—H. Dreyfus. 2743.

OXYALKYLATED NITROGEN BASES, manufacture.—W. W. Groves. 2375.

ARTIFICIAL SILK, manufacture.—W. W. Groves. 2527.

YELLOW AZO DYESTUFFS, manufacture.—W. W. Groves. 3078.

SOLIDIFYING AQUEOUS EMULSIONS.—G. E. Heyl. 2488.

GASEOUS WEAK ACIDS from gases, removal.—I. G. Farbenindustrie. (Germany, Feb. 1, '34.) 2380.

DYEING PROCESS.—Imperial Chemical Industries, Ltd., and A. W. Baldwin. 2443.

COLOURED PLASTERS.—Imperial Chemical Industries, Ltd., and V. Lefebure. 2816.

LEAD-COATING ALUMINIUM.—Imperial Chemical Industries, Ltd., and T. J. Pawson. 2817.

UNSATURATED ETHERS, production.—Imperial Chemical Industries, Ltd., and K. I. Russ. 2819.

POLYNUCLEAR CARBON COMPOUNDS from bituminous substances, production.—J. Y. Johnson (I. G. Farbenindustrie). 2986.

SILICIC ACID ESTERS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 3069.

SOLID INORGANIC, ETC., CONSTITUENTS from oils, separation.—J. Y. Johnson (I. G. Farbenindustrie). 3070.

CARBON BLACK, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 3071.

PHENOLS from waste aqueous liquors, removal.—J. Y. Johnson (I. G. Farbenindustrie). 3072.

POTASSIUM NITRATE, production.—Kali-Forschungs-Anstalt A.-G. (Germany, March 29, '34.) 2411.

AMMONIUM CYANIDE, production.—W. König. (May 10, '34.) 2435.

ZINC, etc., production.—Metamine Ges. (Germany, Feb. 1, '34.) 2594.

ACTIVATED CARBON, manufacture.—F. N. Pickett. 2745.

ORGANIC COMPOUNDS, production.—H. E. Potts (International Hydrogenation Products Co., Ltd.). 2461.

FAST DYEINGS ON FIBRE, producing.—Soc. of Chemical Industry in Basle. (Switzerland, Jan. 27, '34.) 2377. (Switzerland, May 7, '34.) 2378. (Switzerland, Dec. 18, '34.) 2379.

AZO DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, Jan. 30, '34.) 2762.

BROMHYDRINS, production.—H. P. Stephenson and R. G. Israel. 2822.

LOW-BOILING HYDROCARBON OILS, etc., production.—H. P. Stephenson and R. G. Israel. 3094.

From Week to Week

BRITISH COAL SUPPLIES for Luebeck and Stettin blast furnace works have been exchanged for steel and foundry iron.

HYDROCARBON OIL DUTIES were stated by Mr. Neville Chamberlain on January 29 to have yielded £38,586,000 in 1933 and £41,994,000 in 1934.

W. AND R. HATRICK, LTD., manufacturing chemists, of Glasgow, announce that the wholesale business of Mr. John H. Ramsay, Glasgow, has been incorporated in the company.

BRADFORD CORPORATION was fined £5 at the local court on January 31 for contravening the regulations by having an unfenced plank across a vitriol vat at its chemical works in Shipley.

AN EXPLOSION in St. Andrew's Hospital, Bow, on January 31, caused by a spark from diathermic apparatus igniting ether, led to the death of a patient who was undergoing an operation at the time.

A STRIKE of 800 workpeople at the British Bemberg silkworks, Doncaster, was settled on February 1, the employees withdrawing their objection to the engagement of three new workpeople and agreeing to return to work on the old terms and conditions.

A GAS SUPPLY to over forty square miles of a fruit-growing district in Lanarkshire is to be introduced at a cost of £80,000 by the Clyde Valley Gas Supply Co., Ltd., giving more than 400 men several months' work.

TRADE UNIONS in Rotterdam have agreed to a decrease in the wages of workers in the metallurgical industry, hoping that this will enable Dutch firms to compete with their foreign rivals and give employment to some of the 9,000 men out of work.

TWENTY THOUSAND PEOPLE working in the sulphate mines on the east coast of the Caspian Sea in a desert region have been cut off from their supplies of food and drinking water by a storm which has blocked the narrow mouth of the Kara-Bugaz Gulf, through which their ships came from Krasnovodsk.

IN A SUPPLEMENTARY CIVIL ESTIMATE for £1,247,828, issued on January 31, is £1,150,000 required for the beet sugar subsidy. This additional payment is because the acreage under beet, the yield per acre and the rate of sugar extraction has been greater than was anticipated.

LEAD FUMES were said to be responsible for the death of R. L. Middleton, at the inquest at Grimsby on January 31. It was stated that scrap lead was melted down to be cast into sinkers at the premises of which Mr. Middleton was manager, and that he occasionally inhaled lead fumes while carrying out his duties.

THE INSTITUTE OF BREWING (Scottish Section) held its annual meeting at Edinburgh on January 29. Mr. S. H. Hastie was elected chairman, Mr. John H. Hardie, vice-chairman, and Mr. Louis Fletcher hon. secretary and treasurer. At the conclusion of the annual meeting an ordinary meeting was held, at which Captain W. Drummond read a paper on "Transport."

EXTENSIONS ARE being carried out and new plant installed at the North British Aluminium Works, Burntisland, to meet a growing demand for alumina. The bauxite residue, which has been used to a small extent for the painting of the underside of linoleum, is now in much demand in the manufacture of paint suitable for coarse ironwork.

THE HOUSE OF LORDS will deliver reserved judgment on February 11 in the appeal of British Celanese, Ltd., from a decision of the Court of Appeal (in favour of Courtaulds, Ltd.), affirming a decision by Mr. Justice Clauson, who made an order revoking two of the Celanese company's patents on the ground that they had been anticipated by prior specifications and lacked patentable subject-matter.

THE STRIKE BALLOT among 6,000 members of the Chemical Workers' Union has resulted in a temporary stalemate. The ballot was taken after the refusal of employers to entertain proposals for an increase in wages and regarding working conditions. Mr. A. J. Gillian, general secretary of the union, announced on February 3 that 81 per cent. of the ballot papers were returned, and of these 62 per cent. voted in favour of the action. The majority in favour was 34 per cent., but because under the union rules a majority of 75 per cent. is necessary no action at present can be taken. Mr. Gillian said a national conference of shop stewards would be called to intensify the union's case. Another ballot would probably be taken in March.

AN INSURED CONTRIBUTORY STAFF PENSION SCHEME, towards which the company is also generously contributing, has just been inaugurated by Bakelite, Ltd., for the benefit of its staff. It is based upon the endowment assurance principle, providing substantial benefits. Full allowance has been made for past years of service in the case of each eligible employee, the normal pension age being 65. It is believed that the more widespread adoption of such schemes in industry would not only help to maintain general efficiency, but at the same time do something towards the solution of the problem of looking after employees when they cease to be employable.

A FIRE OCCURRED on February 2 at the premises of R. Shaw and Co., Ltd., paint manufacturers and oil merchants of Salford, extensive damage being done to the two lower storeys.

THE CARDIFF COMMITTEE of the Society of Chemical Industry has decided to organise a dinner to follow the business meeting on March 22.

THE CALICO PRINTERS' ASSOCIATION, whose mills at Thornliebank were closed down a few years ago, has sold property in the village for over £30,000.

NEARLY 1,000 PEOPLE are idle as a result of a strike at the works of British Bemberg, Ltd., artificial silk manufacturers of Doncaster, on January 31.

THE YORKSHIRE SUGAR CO., at Selby, has completed its 1934-35 campaign, after the greatest run since the factory started in 1927. Since September 17 2,800 growers have delivered 20,700 loads of beet by road and over 8,000 truck-loads by rail.

AT THE GENERAL MEETING of the Societé Chimique de France on January 11, M. P. Jolibois was elected president and Mm. Dufraise, Palfray, Guillet, Marquis, Damiens, and Tebeau, vice-presidents.

COAL AND ALLIED INDUSTRIES, LTD. (formerly Motor Fuel Proprietary, Ltd.) reports that work at the company's site at Vane Tempest Colliery, Seaham Harbour, commenced on January 1, and since then such progress is reported by Mr. H. P. Stephenson that it is evident the work done is well ahead of schedule.

RUMOURS ARE CIRCULATING in Amsterdam to the effect that Unilever N.V., will pay a final dividend of 3 per cent. on the ordinary shares. Last year both the interim and final payments were reduced from 3 per cent. to 2 per cent. An interim of 2 per cent. has already been paid in respect of 1934.

IN THE CHANCERY DIVISION on Monday, Mr. Justice Bennett had before him a petition by Carbic, Ltd., for the sanction of the court to a reduction of its capital from £500,000 to £354,531 10s. After hearing Mr. C. Turner for the company, his lordship said the only order he made was to confirm the reduction of the capital as asked.

IMPORTANT DEVELOPMENTS at Sadler and Co.'s chemical works, Middlesbrough, were started on January 30, when Mrs. C. Norman Sadler, wife of the general manager, began the excavations for the foundations for one of the new boiler plants, which will have 25,000 lb. an hour evaporation, and will work at a pressure of 210 lb. per square inch. The contractors are Clarke, Chapman and Co., of Gateshead.

THE ANNUAL DINNER of the Finsbury Technical College Old Students' Association takes place at the Trocadero, London, on March 9. The president will be Dr. J. Vargas Eyre, F.I.C. If any old Finsbury students have not received a notice, particulars can be obtained from the hon. secretary, Mr. F. R. C. Rouse, c/o Venner Time Switches, Ltd., Kingston By-Pass Road, New Malden, Surrey.

THE CONFERENCE of European cellulose organisations, attended by representatives from Finland, Norway, Sweden, Germany, Austria, Czechoslovakia and Memel-land, has concluded at Malmoe. Although consumption during 1934 showed an increase, the conference decided to maintain both for 1935 and 1936 the existing 25 per cent. limitation of production. It was also decided to continue the existing price policy, and to increase prices on markets where the level is regarded as unsatisfactory.

SIR RICHARD GREGORY, editor of "Nature," addressed the Oil Industries Club at its monthly luncheon on February 5, on the subject of "Science and Technology in the Public Press." Sir Richard urged that more attention to developments in science and technology could be undertaken by the Press. From the editor's point of view the general reporter was considered to be quite competent to deal with scientific subjects. The way to deal with the matter properly was not to take a scientific man and make him into a journalist, but to take a journalist who had an intensive training and allot him a responsible position on the editorial staff to deal with and advise on matters of science and technology.

THE GERMAN ENGINEERING, electrical, motor and aviation, building, chemical, and other technical professional organisations have been combined in the Reichsgemeinschaft der Technisch-Wissenschaftlichen Arbeit for the national organisation of technical work. The purpose of this organisation is to give the German nation the means of controlling its fate, and the measure of its success as the standard of living of our working compatriots, who have a right to participate in the results of economic advance. The modern German view is that the recent troubles have come through the segregation of the technical workers each in his own scientific compartment and their isolation from the general community; they had their own special duties and had not the time to attend to the solution of the thousands of questions which had been conjured up by technical progress itself, while the layman, beset with these questions, has not the technical knowledge to dispose of them.

British India Imports

Customs Tariffs and Valuations for Chemicals

THE "Board of Trade Journal" for January 31 contains a reprint of the Customs Tariff for British India in which the following items are of interest to the chemical and allied industries:—

Name of Article.	Standard Rate of Duty.	Preferential Rate of Duty for the United Kingdom.
CHEMICALS, DRUGS AND MEDICINES, all sorts not otherwise specified*	30% *ad val.*	20% *ad val.*
	Rs. A. P. per cwt.	
Alkali, Indian (sajji-khar)	2 0 0	
Ammonia gas, anhydrous, including compressed or liquefied gas	per lb. 0 9 6	
Ammonium carbonate or bicarbonate	per cwt. 17 12 0	
Ammonium chloride:—		
Muriate of ammonia, crystalline	11 0 0	
Salammoniac, sublimed	23 8 0	
Other sorts, including compressed	18 0 0	
Boric acid (in bulk)	16 4 0	
Calcium chloride	4 6 0	
Carbonic acid gas, including compressed or liquefied gas	per lb. 0 5 0	
Caustic potash	per cwt. 27 0 0	
Chlorine	per lb. 0 5 0	
Copper sulphate	per cwt. 12 4 0	
Menthol (peppermint) crystals	per oz. 0 7 0	
Potassium bichromate	per cwt. 30 0 0	
Soda ash, including calcined natural soda and manufactured sesqui-carbonates	5 4 0	
Soda, caustic, flake	12 12 0	
Soda, caustic, powdered	13 4 0	
Soda, caustic, solid	10 4 0	
Soda crystals	6 4 0	
Sodium bichromate	26 0 0	
Sodium hydrosulphate	42 0 0	
Sodium hyposulphate (in bulk)	9 10 0	
Sodium sulphide	5 8 0	
Tartaric acid in kegs or in bulk	69 0 0	
Trona or natural soda uncalcined	4 0 0	
Calumba root	4 0 0	
China root (Chobchini), rough	10 0 0	
China root (Chobchini), scraped	19 0 0	
Cubebs	35 0 0	
Galangal, China	11 0 0	
Salep	98 0 0	
BLEACHING PASTE AND BLEACHING POWDER	Free	—
COPPERAS, green (ferrous sulphate)	2½% *ad val.*	—
SULPHUR	Free	—
LIQUID GOLD for glass-making	25% *ad val.*	15% *ad val.*
HEAVY CHEMICALS, the following, namely:—		
Magnesium cloride	Re. 1-5 per cwt. or 25% *ad val.*, whichever is higher.	—
The following chemicals, namely:—		
(*a*) Alum (ammonia alum, potash alum and soda alum	25% *ad val.*, or Re. 1-6 per cwt., whichever is higher.	—
(*b*) Magnesium sulphate or hydrated magnesium sulphate	25% *ad val.*, or Re. 1-4 per cwt., whichever is higher.	—
The following chemicals, namely, cadmium sulphide, cobalt oxide, selenium, uranium oxide and zinc oxide	25% *ad val.*	15% *ad val.*
The following chemicals, drugs and medicines, namely, acetic, carbolic, citric and oxalic acids, naphthalene, potassium chlorate and potassium cyanide, bicarbonate of soda, borax, sodium silicate, arsenic, calcium carbide, glycerine, lead, magnesium and zinc compounds not otherwise specified, aloes, asafœtida, cocaine, sarsaparilla and storax	25% *ad val.*	—
Tariff values:—	Rs. A. P. per lb.	
Acetic acid	0 4 6	
	per cwt.	
Arsenic (China mansil)	37 8 0	
Borax, granular, powdered or crystalline (in bulk)	9 12 0	
Calcium carbide	14 6 0	
Chlorate of potash	22 0 0	
Glycerine	34 8 0	
Naphthalene balls	10 8 0	
Oxalic acid	28 8 0	
Sodium bicarbonate	6 8 0	
Sodium silicate (in liquid form)	6 12 0	
Asafœtida, coarse (hingra)	20 0 0	
SACCHARINE (except in tablets) and such other substances as the Governor-General in Council may, by notification in the Gazette of India, declare to be of a like nature or use to saccharine	Rs. 6-4 per lb.	—
SACCHARINE TABLETS	18¾% *ad val.*, or Rs. 6-4 per lb. of saccharine contents, whichever is higher.	—
ALKALOIDS OF OPIUM and their derivatives	Rs. 30 per seer of 80 tolas or 18¾% *ad val.*, whichever is higher.	—
ALKALOIDS extracted from cinchona bark, including quinine and alkaloids derived from other sources which are chemically identical with alkaloids extracted from cinchona bark	Free	—
ANTI-PLAGUE SERUM	Free	—
PAINTS, COLOURS AND PAINTERS' MATERIALS, all sorts, not otherwise specified, including paints, solutions and compositions containing dangerous petroleum within the meaning of the Indian Petroleum Act, 1934	30% *ad val.*	20% *ad val.*
Tariff values:—	Rs. A. P. per cwt.	
Cuttle fish bone	3 4 0	
	per lb.	
Gamboge	1 0 0	
Vermilion from China	2 4 0	
DYES derived from coal-tar, and coal-tar derivatives, used in any dyeing process	10% *ad val.*	—
Tariff values:—	Rs. A. P. per cwt.	
Alizarine, moist:—		
(*a*) not exceeding 16 per cent.	58 0 0	
(*b*) over 16 per cent. not ceeding 20 per cent.	72 4 0	
(*c*) exceeding 20 per cent.	144 8 0	
Alizarine, dry:—	per lb.	
(*a*) not exceeding 40 per cent.	1 10 0	
(*b*) exceeding 40 per cent.	3 8 0	
Congo red	0 9 0	
Coupling dyes of the naphthol group:—		
(*a*) Naphthols	4 0 0	
(*b*) Rapid fast colours (rapid salts)	7 12 0	
(*c*) Bases	3 0 0	
(*d*) Other salts	1 12 0	
Vats:—		
(*a*) Indigo	1 10 0	
(*b*) Carbazole blue	3 4 0	
(*c*) Other sorts:—		
(i) Paste	4 14 0	
(ii) Powder	16 4 0	
Sulphur black	0 5 0	
Metanil yellow	1 0 0	
Aniline salts	0 5 9	
All others	1 10 0	
PAINTS, COLOURS AND PAINTERS' MATERIALS, the following, namely:—		
(*a*) Red lead, genuine dry, genuine moist and reduced moist	30% *ad val.*, or Rs. 4-12 per cwt., whichever is higher.	20% *ad val.*
(*b*) White lead, genuine dry	30% *ad val.*, or Rs. 5-12 per cwt., whichever is higher.	20% *ad val.*
(*c*) Zinc white, genuine dry	30% *ad val.*, or Rs. 6 per cwt., whichever is higher.	20% *ad val.*
(*d*) Paints, other sorts, coloured, moist:— (i) in packing of 1 lb. or over	30% *ad val.*, or Rs. 8-8 per cwt., whichever is higher.	20% *ad val.*
(ii) in packing of ½ lb. and over, but less than 1 lb.	30% *ad val.*, or Rs. 11-4 per cwt., whichever is higher.	20% *ad val.*
(iii) in packing of ¼ lb. and over, but less than ½ lb.	30% *ad val.*, or Rs. 17 per cwt., whichever is higher.	20% *ad val.*
(iv) in packing of less than ¼ lb.	30% *ad val.*, or Rs. 24 per cwt., whichever is higher.	20% *ad val.*
PAINTS, COLOURS AND PAINTERS' MATERIALS, following, namely:—		
(*a*) Red lead, reduced dry	25% *ad val.*, or Rs. 4-12 per cwt., whichever is higher.	—
(*b*) White lead, genuine moist, and reduced dry or moist	25% *ad val.*, or Rs. 5-12 per cwt., whichever is higher.	—
(*c*) Zinc white, genuine moist	25% *ad val.*, or Rs. 6 per cwt., whichever is higher.	—
(*d*) Zinc white, reduced dry or moist	25% *ad val.*, or Rs. 4-4 per cwt., whichever is higher.	—
The following paints, colours and painters' materials, namely, barytes, turpentine, turpentine substitute, and varnish not containing dangerous petroleum within the meaning of the Indian Petroleum Act, 1934	25% *ad val.*	—

Name of Article.	Standard Rate of Duty.	Preferential Rate of Duty for the United Kingdom.
PLUMBAGO AND GRAPHITE	30% *ad val.*	—
PRINTERS' INK	10% *ad val.*	—
NATURAL ESSENTIAL OILS, all sorts not otherwise specified	30% *ad val.*	20% *ad val.*
Tariff values :— Cassia oil, natural, from Ceylon, Straits, China, Japan and the Far East	Rs. A. P. per lb. 0 14 0	
The following natural essential oils, namely, citronella, cinnamon, and cinnamon leaf	30% *ad val.*	20% *ad val.*
Tariff value :— Citronella oil, natural, from Ceylon, Straits, China, Japan and the Far East	Rs. A. P. per lb. 1 0 0	
The following natural essential oils, namely, almond, bergamot, gajupatti, camphor, cloves, eucalyptus, lavender, lemon, otto-rose and peppermint	25% *ad val.*	—
Tariff values :— Gajupatti oil, natural, from Ceylon, Straits, China, Japan and the Far East	Rs. A. P. per lb. 1 2 0	
Peppermint oil, natural, from Ceylon, Straits, China, Japan and the Far East	3 0 0	
ESSENTIAL OILS, synthetic	30% *ad val.*	20% *ad val.*
CAMPHOR	50% *ad val.*	—
Tariff values :— Camphor, refined, other than powder	Rs. A. P. per lb. 1 5 0	
Camphor, powder, other than synthetic	0 14 0	
Camphor, synthetic, tablets and slabs	1 4 0	
Camphor, synthetic, powder	0 13 0	
GLUE, not otherwise specified	30% *ad val.*	20% *ad val.*
GLUE, clarified, liquid	10% *ad val.*	—

*Under Government of India, Finance Department (Central Revenues) Notification No. 14, dated April 9, 1932, as amended subsequently, calcium acetate and radium salts are exempt from payment of import duty.

Forthcoming Events

LONDON

Feb. 11.—Chemical Club. "Dyeing to Live, 1189-1935." J. Blair. 8 p.m. Whitehall Court.

Feb. 11.—Institution of the Rubber Industry (London Section). "Rubber in the Gas Industry." C. R. Austen. 7.30 p.m. 12 St. James's Square, London.

Feb. 12.—Pharmaceutical Society of Great Britain. "The Work of the Government Laboratory." Sir Robert Robertson. 8.30 p.m. 17 Bloomsbury Square, London.

Feb. 13.—Institute of Fuel. "The Value of Scientific Research to Industry." T. M. Herbert (L.M.S. Railway Research Department). 6 p.m. Burlington House, London.

Feb. 13.—Society of Chemical Industry (Food Group). Discussion on "Training of the Food Technologist," opened by Dr. H. B. Cronshaw. 8 p.m. London School of Hygiene and Tropical Medicine, Keppel Street, London.

Feb. 13.—Society of Chemical Industry (Road and Building Materials Group). "Road Research." R. E. Stradling. London.

Feb. 14.—Institute of Metals (London Section) Joint meeting with the Electrodepositors' Technical Society. "The Protection of Metals by Coatings." Dr. W. H. J. Vernon. 8 p.m. Rooms of the Society of Motor Manufacturers and Traders, 83 Pall Mall, London.

Feb. 14.—The Chemical Society. Fifth Liversidge Lecture. "The Process of Coagulation in Smoke." Professor R. Whytlaw-Gray. 5.30 p.m. Meeting Hall of the Institution of Mechanical Engineers, Storey's Gate, London.

Feb. 14.—Oil and Colour Chemists' Association. "Electron Diffraction and Surface Structure." Professor G. I. Finch. 7.30 p.m. 30 Russell Square, London.

BIRMINGHAM

Feb. 12.—Institute of Metals (Birmingham Section). Symposium on Pickling Problems. 7 p.m. James Watt Memorial Institute, Birmingham.

BRISTOL

Feb. 15.—The Chemical Society. "The Properties and Chemistry of Heavy Hydrogen." Dr. L. Farkas. 5.15 p.m. Department of Chemistry, University, Bristol.

GLASGOW

Feb. 11.—Institute of Metals (Scottish Section). "Recent Developments in Electric Furnaces for Non-Ferrous Metals." A. G. Robiette. 7.30 p.m. 39 Elmbank Crescent, Glasgow.

HUDDERSFIELD

Feb. 13.—Institute of Chemistry (Huddersfield Section). "Chemistry in the Service of the Railway." Dr. P. Lewis-Dale. Huddersfield.

MANCHESTER

Feb. 14.—Institute of Chemistry (Manchester Section). Joint meeting with the Chemical Society. "Recent Work on Chemistry in the Service of Medicine." Dr. J. F. Wilkinson. 7 p.m. Manchester.

Feb. 15.—Society of Dyers and Colourists (Manchester Section). "Sulphonated Fatty Alcohols." Dr. A. F. Kertess. 7 p.m. 36 George Street, Manchester.

NEWCASTLE

Feb. 12.—Institute of Metals (North-East Coast Section). "Melting Furnaces for Non-Ferrous Metals." G. L. Cassidy. 7.30 p.m. Armstrong College, Newcastle-on-Tyne

NOTTINGHAM

Feb. 14.—Society of Chemical Industry (Nottingham Section). Joint meeting with the Institute of Fuel. "Gas Purification." H. Hollings (Gas Light and Coke Co.). 7.30 p.m. University College, Shakespeare Street, Nottingham.

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