The Chemical Age

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Notes and Comments

Constructional Work and Trade Improvement

THE past years may have been bad ones for the chemical manufacturer, no less than for the manufacturer of other goods, but his difficulties have been less than those of the constructor of plant. The maker of sulphuric acid, for example, knows that once his product has been used it is consumed utterly and cannot be again used. If more is required, more must be made. There is thus a continuous demand, even though that demand may have slackened until the acid works is operating on an unremunerative level; it is unusual for there to be a complete cessation involving the discharge of essential employees and all the manifold disadvantages attending completely suspended activity. The constructor, on the other hand, makes plant that can be used for many years. When the plant is old and in bad repair, it is still possible by the skill of those operating it to make it last for a few more months, or even years.

Too often in times of financial stringency, inefficient working is tolerated as a substitute for capital expenditure. The result is not good for the chemical manufacturer, nor for the chemical plant manufacturer. It is under such circumstances that one might excuse a certain lack of initiative on the part of the maker of plant—lack of initiative born of idleness and of absence of outlet for any new products he may devise. It is to the everlasting credit of our plant manufacturers that the past years of intense difficulty have found them even more alert than during the fat years that preceded the industrial famine. Depression is accompanied by keen and ever keener competition, competition often run wild so that orders are accepted below cost to keep the works running and the staff together.

Competition and Export

BAD as the competitive conditions are in the home country those in the export market are infinitely worse when foreign governments sometimes make wild competition even more impossible by subsidies, long term loans to manufacturers and the like. In view of these difficulties it is a matter for profound satisfaction that many of the constructional companies have succeeded not only in making ends meet but even in paying a little dividend. Where this position has been achieved it has arisen largely as the result of increased initiative in developing new lines of manufacture and in introducing new processes. The chairman of one of the companies forming the British Chemical Plant Manufacturers' Association, recognising this position, said in his annual speech: " In these days of specialisation and keen competition the introduction of new kinds of work is an expensive and often hazardous matter. It has necessitated on our part an increase in our technical and research departments and a large amount of investigation into new classes of engineering. . . These researches have resulted in new types of plant. . . Our works have been practically rebuilt and we have spared no expense to maintain them in the highest state of efficiency."

The chemical industry is indeed fortunate in that those who make its plant are at least as efficient, as vigorous, and as convinced of the value of research as are the manufacturers of chemicals. We have not mentioned the name of the company to which we have referred, not because we fear to give them a deserved advertisement, but because what they have done is but typical of the efforts of the majority of plant manufacturers. The chemical industry does not always realise how great is its debt to the plant maker.

The Time to Place Orders

AN army marches on its stomach; an industry marches on its plant. The skill, the industry, and the invention of those who provide that plant are worthy of every possible measure of support. It is therefore sad to read in the remarks of the chairman that " while there are some indications that the industrial tide has turned for the better, only a ripple of this has reached the industries in which we are mainly concerned, but I hope that any advance of the tide may be marked by saner competition and by more remunerative price levels." It is a fact, of course, that constructional work comes last in a trade revival. Existing plant either is sufficient or is made to be sufficent until it wears out altogether or demand necessitates extension.

Whether trade improves or not, the lot of the chemical plant manufacturer must be hard yet awhile. There is, however, every reason why those who are to be in need of plant in the reasonably near future should take their courage in their hands and place their orders now. They will benefit the plant manufacturer in so doing, they will assist the wheels of industry to revolve more quickly, and they will do themselves a service since the present low price levels will not much longer be maintained. But therein is a further danger. Many there are who measure value by price; there are too many firms in which it is considered

an attribute of the good businessman to obtain low quotations and then by open or implied lying (the word is not too strong) to induce the lowest tenderer to cut his price still further. The result is that he makes no profit, he has thus no money to spend, and the manufacturer loses in the long run. We admit that it is but human nature to get something for nothing. We admit that it is bad business to pay " through the nose " for goods. But there is a world of difference between paying a fair economic price which allows everyone to live, and beating down the plant manufacturer—who is the chemical manufacturer's best friend—to absurdly low figures. That is not good business. It is sophistry.

Synthetic Rubber Tyres

IT is reported from New York that the Dupont Chemical Co. and the Dayton Rubber Manufacturing Co., working in co-operation, have succeeded in producing motor car tyres of synthetic rubber which, they claim, have all the qualities of real rubber. The cost of synthetic rubber—about $1 per lb—is too high to make its commercial use practical when natural rubber is selling, as now, at about 15 cents a pound, but the invention is considered to have great value as an insurance against unduly high prices of imported rubber and as making the United States independent of outside sources in time of war.

As synthetic rubber has the same qualities as natural rubber, the Dayton Co. was able to use the same machinery for making it into tyres as is used in the manufacture of natural rubber tyres. Both casings and inner tubes were made of the synthetic product. Prolonged trials on the roads have convinced the producers that the new material wears as well as natural rubber. The credit for the invention of synthetic rubber goes to the Rev. J. A. Nieuland, of Notre Dame University. When he was working on acetylene as a young chemist at Notre Dame in 1906 he conceived the idea, and two years later one of his assistants, Dr. R. R. Vogt, produced a highly elastic material from acetylene. The product was perfected by Nieuland in 1931.

Atmospheric Sulphur and the Chemist

THOSE who attended the meeting of the National Smoke Abatement Society, at which the provision of solid smokeless fuel was discussed, were intrigued by a particularly difficult problem set before them. For many years we have been regaled with stories of the damage done by smoke. Black smoke was the " Big Bad Wolf " of modern civilisation; its injury to health and buildings was put at ten shillings for every ton of coal burnt, and double that figure in London. One past director of the Fuel Research Board seriously suggested that a considerable proportion of that ten shillings should be taken into account when considering the cost of the fuel—presumably in the form of a national subsidy to producers!

It now appears that smoke is not the real culprit after all. Smoke certainly blackens our buildings and dirties our laundry, but that is to the good of the soap manufacturer. Undoubtedly, also, it shuts off the ultra-violet rays which have such valuable health-giving powers. It is a detriment to health, but even so it may not be so detrimental as sulphur. Its damaging effect on buildings appears to be nil. That again is due to sulphur. Each day London discharges into the atmosphere sulphur, in the form of its oxides, equivalent to no less than 1,000 tons of sulphuric acid. Industrial black smoke has already been minimised and can be virtually eliminated. The problem is a difficult one and concerns everyone save the large power stations and others who burn coal by the hundreds of tons per day. Thanks to recent agitation and to chemical research the sulphur emission from power stations has been limited. It is difficult to wash the gases from small boiler installations, and it is likely to be impossible to remove sulphur from the domestic chimney. There are only two ways that suggest themselves to us. In the first place there is the heroic way; let us burn no raw coal or coke in our towns. Let us see that everyone uses gas or electricity or oil—the only fuels that contain no noticeable proportions of sulphur. Objection would probably come from the user who could not pay the price—and from the tax-payer called upon to keep the unemployed. Something may one day be done in that way to get rid of domestic sulphur, but not of sulphur from the smaller industries. The other method is to find a substance which can be added to the coal or coke in small quantities and which would fix the sulphur in the ash on combustion. Unfortunately most sulphates cheap enough to consider decompose at the temperature of the fire; and we are left with nothing feasible. Is it completely certain that sulphur can do the damage if there is no tarry smoke adhering to the stone-work to absorb the oxides? Sulphur oxides are very soluble in rain water and easily removed in absence of tar. It is up to the chemist to solve the latest problem that civilisation has put before him.

Civil Service Scientists' Salaries

SIR RICHARD REDMAYNE is president of the Institution of Professional Civil Servants, which represents professional, scientific and technical officers in the Civil Service and has a membership of some 9,000. In its annual report for 1933, just issued, the Institution complains of the inadequacy of the salaries at present paid to scientific members of the staff compared with those paid to other classes in the Civil Service, and ponts out that the salary scales recommended by the Treasury Committee on the Staffs of Government Scientific Establishments in 1930 have not yet been put into operation, although the recommendations were accepted by the Treasury. The findings were endorsed by a Royal Commission.

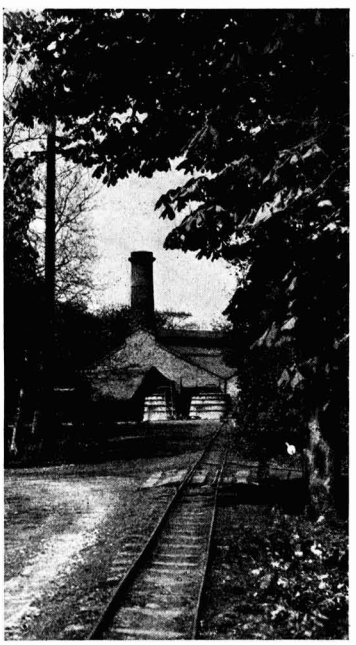
During 1933 the Treasury, while adhering to the decision taken at the time of the financial crisis in 1931 to defer putting the report into operation so far as it affected the scientific staff proper, agreed that the Committee's recommendations for the " assistant " class, *i.e.*, subordinate officers recruited on an inter. B.Sc. basis, should be put into operation in certain departments. This partial reorganisation has been given effect to in the National Physical Laboratory and is in process of being carried out in the Admiralty and Air Ministry. The War Office has, however, up to the present refused to reorganise its assistant staff on the same lines. In view of the recent evidence of national recovery the Institution has again renewed its representations to the Treasury that effect should be given to the remaining recommendations of the Committee in order to provide for improvements in salary scales.

The Passing of Faversham Powder Factory

After 350 Years

WE are indebted to the Editor of the "I.C.I. Magazine," the monthly journal of Imperial Chemical Industries, Ltd., for permission to reproduce the following notes in commemoration of the passing of the Faversham factory, which appeared in the June issue of the magazine. The powder mills at Faversham, which constitute the oldest factory of Imperial Chemical Industries, Ltd., closed down at the end of June, and these notes give some idea of their picturesque site and equipment. An editorial note in the same issue remarks that it is sad to think that the pressure of our times compels the closing of such a place, but there is no alternative to concentration where it is a question of retaining competitive power. As a kind of by-product, the Faversham factory for many years has sent some hundreds of pounds' worth of fruit to market.

The old-timers in the explosives industry knew how to do things. They had to have a range for testing purposes and having plenty of space they planted avenues of conifers—magnificent trees they are now. One range remained in occasional use until quite recently, complete with its pair of mortars, like stumpy little cannons, which remind one of pictures of sieges and battles in the eighteenth century. The gun-cotton mentioned in the article as having been buried after the disaster of 1847 has been dug out of the marsh in order to ensure that the site is absolutely safe for handing over to the owners. A small sample has been tested and showed signs of retaining some of its original properties. Not bad after eighty-seven years in a marsh! Some of the protection round danger buildings will present a problem when it is demolished. One concrete wall about 16 ft. high is over 7 ft. thick at the bottom and there are others approaching these dimensions. In an old production building a large store of ancient papers relating to the factory site dating back to 1660 has been discovered. Many of the documents are on parchment and vellum and include the original seals. They are in a remarkable state of preservation and will no doubt find a home in a museum devoted to the explosives industry one of these days.



The Charcoal Burning Plant at Marsh Works.

Two early Kentish histories, Hasted's (1782) and Jacob's History of Faversham (1764), trace the manufacture of gunpowder at Faversham back to Queen Elizabeth's day, if not earlier. It is uncertain which factory is actually the oldest in the country, but Faversham can certainly claim the second if not the first place. In 1590 George Evelyn received the royal licence "to set up powder mills at Long Ditton and Godstone, and the mills at Faversham were established about the same time as those of the Evelyns, though the latter were of the greater importance.

Faversham works continued in private hands until 1760, when Thomas Pearse conveyed the premises now known as the Home Works to Charles, Duke of Marlborough, Master General of the Ordnance, for the use of the public. Thus this portion of the present Faversham works became a royal factory under the charge of His Majesty's storekeeper, for whom a suitable residence and offices were built at St. Ann's Cross in 1764, and manufactured about eighty barrels of service powder a week. The mills were worked both by water and by horses; accidents must have been frequent, as we read in Jacob's history an account of "a contrivance for the preservation of the horses that grind the powder" in the shape of a sort of suit of leather armour to protect them from explosions.

What are now known as the Oare (or, in older times, the Davington) works, seemed never to have formed part of the royal factory, though they are of equal if not greater antiquity. Hasted says "they have been employed for many years in the manufacture of gunpowder in private hands, much for the use of the East India Company. They have recently been much augmented and improved at a great expense by Miles Peter Andrews and Frederick Pigou, Esqs., the present lessees and occupiers." It is curious to note in this connection the name of Pigou, which is usually entirely associated with the Dartford powder works. It is also on record that a Mr. Grueber was at an earlier period in occupation of the Oare works; he may very well have been an ancestor of one of the members of the firm of Harvey and Grueber, of Hounslow.

Oare works seem to have been the first to introduce the modern method of stoving in place of the primitive and dangerous "gloom-stoves," which not infrequently became red-hot! Jacob says "the act of drying the gun-powder is there effected by the means of a constant stream of hot water, conveyed under the copper frame whereon it is placed to dry. This new contrivance is said to answer the purpose exceedingly well."

In 1781 the Corning House and Dusting House of the royal factory (which were situated almost within the town of Faversham) exploded, killing three men, and doing much damage to the north-west side of the town and destroying one of the towers of the neighbouring church of Davington. The explosion is said to have been heard in Hyde Park! After five years an act was passed for the removal of the Corning House and other dangerous buildings from the town, and a new site was secured for them about a mile away, which is the origin of the present Marsh works.

In 1794 a company of volunteer soldiers, called the "Powder Mill Volunteers," was enrolled. From that day to this the employees have always been conspicuous supporters of the volunteer movement.

In 1812, Mr. John Hall, an engineer, of Dartford (where he founded the business now known as J. and E. Hall, Ltd.), turned his attention to gunpowder making, being no doubt attracted thereto by the fame of the Dartford powder made by Pigou and Wilks. In this year he accordingly acquired the Oare works at Faversham from their private owner (a Mr. Stephen Gillow or his son, of Cooksditch, Faversham) and began manufacture. He seems at first rather to have traded on the fact that he resided at Dartford, as he always alludes to himself on early billheads and show-cards as "John Hall of Dartford," and even goes so far sometimes as to describe his manufacture as "Dartford gunpowder."

After the peace of 1815 the Government thought it desirable to remove the royal factory from Faversham, as being so near the sea it was considered liable to be easily seized by an invading force. They therefore determined to concentrate the manufacture at Waltham Abbey, which was already a royal factory. John Hall took this opportunity to obtain a lease of the Home works, subsequently purchasing them outright in 1825. It would appear that the Government re-

tained for some years the Marsh works, which were from this time only used by them for breaking up unserviceable powder and extracting the saltpetre. However, these seem to have been leased from the Government not very long after Messrs. Hall, and the entire stock of gun-cotton was got rid of by burying it in the vicinity. Sixteen years later a sample of the cotton was disinterred at the request of Professor Abel for analysis and examination, and was found to

The Foreman's House at Oare Works is set against the side of a Wooded Hill. In the background is the Old Clock Tower.

and were ultimately purchased by W. and P. B. Hall (John Hall's sons) in 1854.

In 1847, Professor Schonbein, the inventor of gun-cotton, entered into an agreement with Messrs. Hall for the first manufacture of the new explosive in England. Operations were accordingly started at the Marsh works, and considerable quantities of gun-cotton were produced. But on July 14th in the same year a disastrous explosion occurred, due doubtless in some way to ignorance of the properties of this, the first high explosive. Twenty-one lives were lost, and the destruction to property was enormous. After this disaster the danger arising from gun-cotton was deemed to be so uncontrollable that its manufacture was abandoned by

have undergone very little deterioration—though, of course, by that time the art of nitration had made very great strides since the first crude attempts by Messrs. Hall.

During the Crimean War (1854-8) the factory was very largely engaged in the manufacture of powder, and the three firms, Curtis's and Harvey, John Hall and Son, and Pigou and Wilks, were actively employed for the Government. At this time the Marsh works were very considerably extended.

On October 1, 1864, occurred the disastrous explosion of the Erith magazine belonging to John Hall and Son. It would appear that the accident originated in one of the two powder barges that were lying alongside the jetty, the explosion of which communicated first to the large magazine of

Water Transport at Faversham dates back, as far as is known, to the beginning of the factory's existence, 350 years ago. Here is one of the "boatmen-service-waiters" in action.

Messrs. Hall adjacent, and then to a smaller magazine of the Lowwood Gunpowder Company about 300 yards off. It is estimated that from 1,200 to 1,500 barrels of powder exploded, and although fortunately not many lives were lost, some years carried on a considerable Scottish trade with powders manufactured there. After an explosion, however, in 1883, the works were never restarted, mainly owing to difficulties with the Home Office over a question of licences.

Marsh Works in May. In the background are the Compressed Pellet Shops. The roads through the Factory run between groves of fruit trees. One of Faversham's regular "by-products" is its consignment of fruit to Covent Garden every year.

the damage to surrounding property was enormous, and a company of Royal Engineers had to be called out in all haste to repair the damage to the river wall.

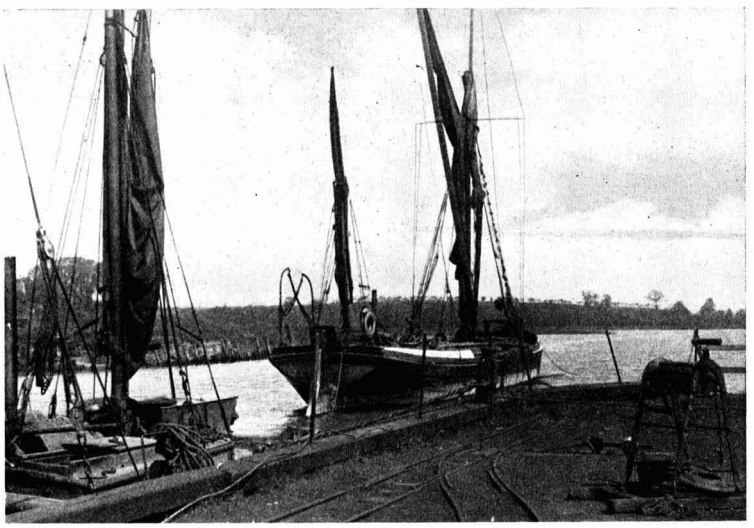
In 1867 a very serious explosion occurred at the Press House and Cornering House of the Marsh Works, after which that factory was completely remodelled.

In 1875, Messrs. Hall commenced the manufacture of compressed cartridges or blasting pellets under licence from Messrs. Davey and Watson, of Rouen, the original patentees, and the popularity of this form of blasting powder soon became evident by its adoption throughout the trade.

In 1879 the firm acquired the works of the Loch Fyne Gunpowder Company, at Furnace, in Argyllshire, and for This factory, though derelict, is still the property of Messrs. Curtis's and Harvey, Ltd.

In 1894, John Hall and Son introduced a new smokeless powder, "Cannonite," manufactured by the War and Sporting Smokeless Powder Co., Ltd., at Trimley, in Suffolk. A descendant of this powder is the present well-known "Smokeless Diamond," the manufacture of which has been transferred by Curtis's and Harvey, Ltd., to their works at Tonbridge.

In 1896, on the retirement of the existing partners in the firm, John Hall and Son was converted into a private limited company, which two years later, after protracted negotiations, was incorporated with Curtis's and Harvey, Ltd.



Thames Sailing Barges at one of Curtis's and Harvey's wharves at Oare Creek, due to load with powder for transfer to steamers in the Thames.

Industrial Applications of X-Ray Crystal Analysis

Facilities Provided at the National Physical Laboratory

THE National Physical Laboratory at Teddington has facilities for carrying out investigations on X-ray crystal analysis, and is prepared to undertake such work or to give advice as to the probable results of such examinations. If occasion requires, officers of the Laboratory are also prepared to pay visits to works or industrial centres to discuss problems on the spot. Work which is undertaken is charged for in such a way as merely to cover the costs of the investigations themselves. The fees payable will vary considerably with the nature of the material and the amount of work necessary for a complete study; they normally vary from a few guineas for a simple investigation requiring a relatively small number of photographs to a larger amount for a test which involves considerable expenditure of time in obtaining and interpreting the X-ray patterns. No charges are made for advice, and the Laboratory will welcome inquiries and is willing to put such experience as it has at the disposal of those interested.

In consequence of this development a pamphlet has been published by H.M. Stationery Office, giving an explanation, with photographic illustrations, of the ways in which X-rays are now used to determine the structure and condition of materials used in industry. It has long been known that many bodies are essentially crystalline. It has also been recognised that the character and properties of such bodies depend on the nature, form and arrangement of their crystals. Two recent discoveries have immensely widened this field of useful work. In the first place it has been found that the X-rays are capable of examining this crystallinity in detail giving information which can be obtained in no other way. In the second place it is now clear that crystallinity is far more prevalent than was suspected. Consequently the X-rays can give information which may be of the greatest importance to the users of materials.

The earliest investigations of the properties of X-rays led immediately to practical applications of importance. These depended on the fact that the X-rays penetrated certain types of matter much more readily than others and thus provided a means of examining the interior of opaque bodies. Von Laue predicted, and the prediction was promptly verified, that if X-rays were passed through a crystalline substance, diffraction effects would be produced very similar to those which characterise the passage of ordinary light through a line grating. This discovery was immediately applied by W. H. and W. L. Bragg to the study of the arrangements of the atoms in crystals and has had far-reaching effects in pure and applied science.

Crystal Diffraction Patterns

The crystal is produced by the continued repetition in all directions of a small unit of pattern or cell. The linear dimensions of this cell are comparable with the wave-length of X-rays as ordinarily used. The repetition of the cell gives rise to a three dimensional grating which interacts with the X-rays and produces a diffraction pattern in precisely the same way as the spectrum is produced by the interaction of the light waves with regularly spaced lines of the optical grating. These lines are ruled with an interval which is comparable with the wave-length of the light. Each different arrangement of atoms therefore gives rise to its own characteristic X-ray pattern and a study of this pattern makes it possible to deduce the nature of the atomic arrangement. Any change in the nature of the arrangement produces a corresponding change in the nature of the X-ray pattern. This use of X-rays is by no means confined to the study of single crystals. It can equally well be applied to the investigation of such materials as are composed of aggregates of small crystals, and this is tantamount to saying that it can be applied to the study of almost every solid substance.

The method adopted consists in allowing a fine pencil of X-rays to fall on the specimen to be examined. The diffracted rays are received and recorded on a suitably placed photographic plate or film. The nature of the pattern depends not only on the chemical structure of the material but on other factors, such as the size of the crystal grains, the distribution in direction of these grains, and on the approximation to perfection attained by the crystals during their growth. The single crystal and the crystal aggregate give different types of diffraction pattern. A single crystal rotated in an X-ray beam yields a pattern consisting of isolated spots. An aggregate, which need not be rotated, gives a series of continuous lines. The positions of the spots in the one case and the lines in the other, determine the size and shape of the unit cell of the crystal. Their intensities reveal the manner in which the atoms are distributed in the cell. Amorphous solids and liquids give only traces of diffraction effects, consisting of one or two very broad and diffuse haloes surrounding the undeflected X-ray beam.

Crystal Orientation

The crystals of an aggregate may be distributed entirely at random, or may show a more or less marked tendency to take up some particular orientation. The latter occurs frequently as a result of such cold work processes as the rolling and drawing of metals, while it is also characteristic of many fibrous substances such as cotton, wool, silk, asbestos and the like. For example, when aluminium wire is drawn the final result is one in which the small cubic crystals of the material are so arranged that a diagonal of the cube is approximately parallel to the direction of drawing. Any tendency for the crystals to orient themselves in such a way is immediately revealed by the X-ray pattern.

It is well known that many properties, magnetic, electrical and tensile, are affected by the state of internal strain of the material. It is no easy matter to detect or measure such strain by ordinary methods, and the fact that the X-ray method of examination can be used in many cases for such a purpose has proved of great value. The presence of internal strain results in a distortion of the crystal cells, and this distortion shows itself in the X-ray pattern by a loss of sharpness of the diffraction lines. If the breadth of the lines is measured, a measure of the degree of strain is obtained. It has been pointed out that a somewhat similar increase in breadth occurs when the average size of the crystals becomes very small. In practice, however, it is generally possible to say to which of these two causes the broadening is due. These effects are by no means confined to metals.

Chemical Analysis by X-Rays

Since each chemical compound (not merely each chemical element) has its own characteristic atomic arrangement, it has also its own characteristic X-ray diffraction pattern by which it can be definitely identified. This fact immediately makes the X-ray study a valuable aid to the ordinary methods of chemical analysis. It is important that while ordinary chemical analysis gives the proportions of the different kinds of atoms in a substance, X-ray analysis gives directly the state of chemical combination of these atoms. Thus iron has one pattern, carbon another, while the pattern of iron carbide is peculiarly its own and different from that of its constituents. The X-ray method of analysis has the further advantage that it can usually be carried out without treating or destroying the material, of which, it must be added, only a minute quantity is required. On the other hand, exact quantitative analysis by X-rays presents considerable difficulties, although an approximate analysis is usually practicable. The X-ray method also fails to take account of amorphous material.

X-ray analysis may also be used in favourable circumstances to detect the presence of impurities. If these are crystalline they will show by the presence of additional lines in the pattern. The sensitivity of the method depends on both the nature of the material and of the impurities, and the minimum quantity which can be detected varies from 0.05 per cent. to 2 per cent., according to circumstances.

An important question which frequently arises in the study of a complex material is that of deciding whether its components have formed a solid solution or merely an intimate physical mixture. The X-ray method is admirably suited for distinguishing between these alternatives. If the substance is

a mixture of crystalline constituents, its X-ray pattern will consist of the patterns of the components superimposed on each other. If, on the other hand, the process has resulted in the formation of a solid solution, the X-ray pattern will, in general, resemble that of one or other of the constituents but will differ from it in certain details, usually in a small shift of the lines due to a slight change in the size of the unit cell caused by the penetration of the one component into the crystal cell of the other. Certain changes may also occur in the distribution of intensity among the lines of the pattern. The formation of a new compound will, of course, show itself by the appearance of a pattern different from that of the original constituents.

It is well known that a single chemical compound can exist in more than one crystalline modification. Silicon dioxide can exist as α or β quartz, as cristobalite or as tridymite. Iron can exist as either the body centred cubic crystal of the α-iron type or as the face centred cubic crystal known as γ-iron; calcium carbonate as calcite or aragonite and so on. X-rays give, naturally, an immediate method of determining which form is present in any material or of detecting the transformation of one form into another. This is of importance, since the different crystal forms have very different physical properties, and while one form may be suitable for a given purpose the other may be entirely unsuited, although their chemical constitution is identical. For instance, there are two forms of ferric oxide Fe_2O_3, (*a*) the common trigonal form and (*b*) the strongly ferro-magnetic form, which has a cubic structure; the use of these in the manufacture of paint materials results in paints of different quality. In the same way the "smoothness" of a chalk precipitate may vary markedly according as it is in the calcite or the aragonite form.

Any change which results in a change in the structure or composition of a material must result in a corresponding change in the X-ray pattern. The X-ray method gives accordingly a useful means for the details study of a manufacturing process or for the control of such a process, since at each stage an examination can be conducted to detect the change produced by the previous treatment, and this can be done without destroying the material The structure of an electrodeposited chromium deposit depends upon the conditions under which the metal is deposited. Cold work may also cause structural changes. As typical of such effects the conversion of an austenitic steel into the α form may be quoted.

There is almost no limit to the materials which can be examined by X-rays, since the only necessary condition is that the material should be crystalline. The method has been successfully applied to the study of a great variety of problems connected with metals and alloys, inorganic and organic materials, refractory substances, paints, china clays and porcelains, vegetable and animal fibres, textiles rubber and metallic minerals.

Honours at Birmingham University

A Degree Congregation was held at Birmingham University on June 30, when the honorary degree of Doctor of Laws was conferred on Sir Harry McGowan, of Imperial Chemical Industries, Ltd. (back row, centre); Professor G. T. Morgan, Director of the Chemical Research Laboratory, Teddington (middle row, second from left); and Sir John Cadman, of the Anglo-Persian Oil Co., Ltd. (middle row, first from left). The Pro-Chancellor of the University, Mr. Walter Barrow, is also in the photograph (front row, second from left).

The Petroleum Production Bill

Mr. Runciman Replies to M.P. Critics

MEMBERS of the House of Commons who expressed doubts as to what was behind the Petroleum (Production) Bill, and as to the need for the introduction of the measure, were answered by Mr. Walter Runciman (President of the Board of Trade) on July 2, when the Committee stage of the Bill was taken.

Mr. Runciman denied that there was any conspiracy behind the Bill. Everything, he said, was perfectly straightforward and above-board. There was nothing fishy about it. If there was any oil in the country the Government wished to see it developed. The Government was open to receive applications from anyone who wished to develop oil resources, and who had the necessary resources.

On the motion that Clause One (which vests property in petroleum in the Crown) be agreed to, the Marquis of Hartington (Derbyshire, W.) said they were all agreed that oil should be controlled, but that could be done without this measure of expropriation.

Sir Percy Harris (Bethnal Green, S.W.) asked Mr. Runciman to contradict the insinuation that a big oil monopoly was behind the Bill.

Captain C. Waterhouse (Leicester, S.) said all minerals except gold and silver were vested in the owner of the land, and these rights should not be taken away without compensation.

Government Departments Show no Mercy

Lord Cranborne (Dorset, S.) thought the House ought to know why the Bill was brought in, and whom the Government consulted. Failing satisfactory answers to these questions, he and other Unionist members would be obliged to vote against the Government.

Mr. Macquisten (Argyllshire) wondered what was at the back of the Bill and why the House was not told. He said one could appeal to and reason with a commercial company, but a Government Department had no mercy whatever.

Mr. Walter Runciman (President of the Board of Trade) said the Bill had been known in the country for three months, and during that time it had been debated at considerable length in another place. Critics asked who and what was behind the Bill, who inspired it, and what was the conspiracy that was going on about which the Government gave the House no information. There was nothing of that nature behind the Bill any more than behind the Budget of any year. Objection had been taken apparently to the fact that there was no information that the Government had consulted any sources which had some knowledge of getting oil. He was not going to tell members for their amusement who might or might not have been consulted. It was not necessary for the Government to go to the technical societies for advice any more than it was necessary for the Chancellor of the Exchequer to go to the Statistical Society when he reduced the income-tax. The Government accepted full responsibility for everything that appeared in the Bill. It had obtained information from sources it could trust. That it had done without any sacrifice of the national interest, and he would like the House clearly to understand that there was nothing fishy in regard to the Bill.

Five Licences Already Refused

Having stated the reasons why five licences had been refused, Mr. Runciman said there was not a large number of people who were prepared to undertake drilling operations. A single borehole of a maximum depth of 10,000 feet might cost £30,000. Very few companies or organisations were prepared to undertake such an expensive adventure. What the Government wanted and hoped to get was a business enterprise by those who felt they could embark upon an expenditure of this nature, and do it with the object of getting some profit in return. When a Government Department communicated with an oil company it was not doing something wrong. If it were to be allowed to negotiate it must be trusted. If it were not to trusted there must be some change. If there was any oil in the country the Government wished to see it developed. He did not know whether the adventure would be undertaken, and if it were undertaken by whom it would be undertaken. The Government was open to receive applications from anyone who had the resources, who would comply with the law, and would abide by the rulings of Government Departments for the protection of private interests which might be involved. The Government had gone a long way to protect private interests. Clause Three contained more generous terms of compensation than had ever been given in an Act of Parliament for the preservation of the amenities of a locality. When the Government was asked to give compensation for property which did not exist, it was really throwing away public money.

Colonel Acland-Troyte (Tiverton) asked if Mr. Runciman accepted the view that oil under the land does not belong to the Government.

Mr. Runciman replied that there was so much doubt about it that it was absolutely necessary to make it clear in the Bill. So far as the future is concerned, the rights in oil are vested in the Crown.

The clause was carried by 243 to 30.

An amendment by Mr. John Tinker (Leigh), omitting the power of the Board of Trade to grant licences to search for petroleum and confining it to the Board of Trade itself to carry out such operations, was rejected by 194 to 31.

The Question of Royalty

Lord Hartington moved an amendment that no royalty should, in respect of any year or other period, exceed 10 per cent. of the value of the net production of oil during that period. Now, he said, that the Government had acquired a monopoly in oil, there was a risk that so high a royalty might be charged as to make the commercial development of oil resources impossible.

The amendment was negatived by 176 to 22.

Lord Hartington then moved an amendment to ensure that the proceedings in connection with the granting of licences should not be conducted in secrecy. Neither Parliament nor the developers nor the local authorities should be in the dark as to what was being done.

Mr. Ernest Brown, opposing the amendment, said the Government's fundamental purpose to get development by competent persons would not be carried out if publication was insisted upon in advance of a licence being granted. The Government had gone as far as public and private interests demanded in arranging that publication of name and area should take place the moment a licence was granted.

The amendment was withdrawn.

Sugar Research in India

A New Institute Established at Cawnpore

THE Government of India have decided to take over the Harcourt Butler Institute of Cawnpore from the U.P. Government and reconstitute it as an efficient Sugar Research Institute for India at a cost of Rs.2 lakhs. The recurring expenditure on the Institute will be Rs.3 lakhs annually. The original proposal was to establish an independent institute, but that would have cost Rs.16 lakhs in buildings alone and would have required considerably more time. The programme of the Insiitute will include research in Indian sugar factory problems and sugar technology with specific reference to Indian conditions; research on the utilisation of by-products from the sugar industry; provision of scientific assistance to sugar factories; extended tests on new varieties of cane; and the training of students in all branches of sugar technology. The idea of establishing such an Institute was first mooted by the Sugar Industry Committee and it was successively approved by every committee which had to consider the sugar industry problems. It has now materialised after an interval of nearly fifteen years.

The Engineer and Modern Civilisation

Sir Frank Smith Speaks of " Mechanical Slaves "

SIR FRANK SMITH, Secretary of the Department of Scientific and Industrial Research, delivered the Gustave Canet Memorial Lecture in connection with the Jubilee celebrations of the Junior Institution of Engineers, on June 28, his subject being " The Engineer and Modern Civilisation." The lecture was delivered at the rooms of the Royal Society of Arts, and the president of the Institution, Mr. W. J. Tennant, was in the chair.

In these days, said Sir Frank, it was not sufficient to speak of the engineer in Lord Macaulay's words as " he who moulds things " in contradistinction to the philosopher who " moulds only words," but it is necessary to define him as one who also studies Nature and moulds things in accordance with the facts learned. If we examine one of Nature's structures, such as a corn stalk, or the shell of a snail, or the wings of a bat, we observe that Nature designs her structures with a minimum of material to withstand the stresses to be borne, and the most expert mechanical engineer of to-day, if he possessed complete knowledge of the mechanism of stress and was aware of all the properties of all materials, would probably be able to design nothing so good and certainly nothing better for its purpose than the shell of a snail.

The engineer of to-day is distinguished from his predecessor inasmuch as he studies the structures of microscopic size as well as those of gigantic proportions, and in this way is able to improve his materials and discover new ones. Moreover, in the field of electrical engineering, when years ago it was found that light incident on a metal surface made it lose a negative charge the fact appeared to be of trivial importance. The engineer had to go to the atom to find out why, and when he had found out all he could the results were applied to the talking picture and other industries.

Electrical Machinery and Equipment

Modern civilisation, continued Sir Frank, is a blend of two cultures—the engineering culture embracing the sciences, industry and commerce, and an idealistic culture including the fine arts and philosophy. The composite work which makes up our civilisation looks quite different when surveyed through the spectacles of an electrical, civil or mechanical engineer. The electrical engineer would emphasise that in the last fifty years the output of electrical machinery in Great Britain alone has increased from zero to over £21,000,000 in 1930. He would point out how the work of Maxwell, Marconi, Lodge and others had led to nearly £7,000,000 worth of wireless apparatus and £6,000,000 worth of batteries and accumulators being made in this country alone. He would remind us that the gas-filled filament lamp, which seems so simple, represents the results of more research on the structure of matter than any other single article in common use, while the carbon lamp, which appeared nearly perfect in Kelvin's time, would be termed wasteful to-day, for the power it consumed would in a modern vapour lamp give out 16 times as much light. Finally the electrical engineer would point to the 4,000 route miles of the electrical grid over which 13,500 million units of electricity are generated a year.

The Work of the Civil Engineer

The civil engineer would describe a very different kind of picture. He would remind us of the great harbours, the roads, the railways and bridges he had constructed. He would point with pride to such examples of his work as the dam and canal system in the Sudan by means of which over 300,000 acres of cotton-growing land have been brought into cultivation. He would remind us that in India risk of famine for the huge population had been removed by irrigation schemes covering an area of 30,000,000 acres. He would point to the reduction of epidemics due to water-borne disease resulting from the improvement in water supply sanitation.

The civil engineer would also point to work in the field of sewage disposal, such as the work of the Birmingham, Tame and Rea District Drainage Board which deals with a dry-weather flow of 35,000,000 gallons of sewage per day. In Birmingham the gas evolved from the purification of this sewage is utilised in engines which develop more than 1,000 horse power and supply the power requirements of the whole works which serve an area of 157 square miles and a population of about 1,200,000 persons. Domestic refuse in England alone amounts to 12 million tons and costs 7s. to 9s. per ton for disposal. If this refuse were used for generating electricity, most municipalities could save 4s. to 6s. a ton and could feed electricity into the grid at less than 0.2d. per unit.

Mass Production Methods

The mechanical engineer, on the other hand, would look at the materialistic picture with the eye of a general contributor, since he produces all the machinery used by the others. He would surprise some of us when he told us that quantitative production is more than two hundred years old, for Polhen, a Swede, more than two centuries ago, manufactured ploughshares, hammer heads, clock wheels and other articles by quantity production machinery. An even more interesting example is that of Brunel and Bentham, who in 1808 manufactured all the wooden blocks for the Navy, the output being more than 130,000 blocks per year, valued at over £250,000. The blocks were made by the use of 44 machines for sawing, boring, shaping, etc., and 10 unskilled men did the work formerly performed by 110 skilled workers. It was only in 1895 that John Knight, who had invented the four-wheel motor car, was being prosecuted by the police for travelling at eight miles an hour. In the 39 years that has elapsed since that day the motor engineer has produced tens of millions of motor cars, and to-day one firm alone in this country can and does, at times, produce 2,000 cars a week.

Displaced Labour

Turning to the picture of labour displaced by machinery, Sir Frank said he did not intend to make any lengthy remarks on that difficult subject, but a discussion of the results of the engineer's work would be incomplete without some reference to it. Sweeping economies in labour had been made in practically every industrial pursuit in the country. It seems quite likely that in the near future one ship will be able to carry as much cargo per annum between two ports as two or three did some years ago. As an example of a different order of magnitude he referred to a British bottle-making machine which, attended by one man, blows 90 bottles a minute. On the underground railways the signalman has been displaced by electrically-operated devices, and the ticket office clerk is now a piece of mechanism like the escalator. Even the traffic control policemen in the streets of the city are being superseded by an orderly-minded Neon lamp placed in a suitably arranged electric circuit, whilst in the cotton industry one weaver now does work which it took 57 weavers to do 65 years ago.

It would be easy to go on giving instances of this kind; and it would be equally easy to draw unsound deductions on such a small part of the big picture we have been considering. One of our most up-to-date motor car factories has improved its methods of production so much since 1920 that the ratio of men employed to cars produced is now one-seventh of what it was. It seems quite easy to draw a definite deduction from this, but what are the facts? The reduction in price of the cars has increased demand to such an extent that, whereas the firm employed 3,167 men in 1922, they now employ 16,000 men. Fifty years ago there was practically no electrical industry, and there was no motor car industry or aircraft industry. In 1930 in Great Britain alone the electrical industry employed 191,970 persons, the motor car and cycle industry 195,281 persons, and the aircraft industry 21,322 persons —a total for these three industries of over 400,000 persons. The value of the products in 1930 was £134,000,000.

If, for a moment, we look through the spectacles of those who regret our modern mechanisation, we shall try to see, or imagine that we see, the English countryside of a hundred

years ago, with the picturesque cottages, the hay wains and the reapers, the millstream, and all that goes for beauty. At the same time these country folk had to be clothed, and many products had to be obtained from the factories, and we can but picture these factories of a hundred years ago in the realistic light of the Report of the Factories Enquiry Commission of 1832. The Report states that a few children of five years of age and many more of six years and upwards were employed in factories, the hours of labour being twelve per day, exclusive of time for meals, and they worked six days per week. The engineer, by his inventions, has made all such child labour unnecessary, and the labour on the farm is now much less exacting because of the improved agricultural implements.

Dealing with the prime mover, Sir Frank said that Hero's steam engine had remained the toy for 2,000 years. It had remained undeveloped because knowledge of the physics of gases and liquids and of pressure was almost non-existent. It was not until the seventeenth century that it was discovered that the atmosphere exerted a pressure and Boyle demonstrated the elastic properties of gases. From such scant knowledge of the internal mechanism of gases sprang the early steam engines. But the steam engine and the internal combustion engine did not become the tremendously efficient instruments of power we know to-day until, as the result of the work of Joule and others, the discovery was made that heat and work are mutually convertible at a fixed rate of exchange. This was the greatest generalisation in physics and the greatest engineering discovery of the nineteenth century. *Engineering could not have developed in the way it* has without it. It showed how the vibrating motion of the minute particles of matter, which we call heat, can be integrated through an appropriate medium into a large single motion, say that of a flywheel.

Sir Frank quoted an estimate, made by Stuart in the early part of the nineteenth century, that the 10,000 steam engines then in use in Great Britain " could develop from sunrise to sunrise a power superior to that of 4,500,000 labourers, an effect greater than the entire manual population of England." To-day in factories, industrial undertakings and electricity supply undertakings in this country, steam reciprocating engines and steam turbines develop more than 20 million horse power, equivalent to 450 millions of Stuart's labouring men. On such a basis every man, woman and child in this country has on an average ten slaves working for him in the factory and supply stations in the form of steam power. This power turns the machines in our factories for producing manufactured goods, operates generators for the supply of electric light, heat and power, sweeps many of our floors, carries us up in lifts, causes great pumps to force water to our cities, and operates numerous other mechanisms including those for which the steam engine was first invented, namely, pumps for freeing the mines from water. In addition to these 20 millions of steam horse power, probably another 20 millions are produced on the railways for the transportation of people and goods, and we must add to this total the power of internal combustion engines, of which there were none in Stuart's time. To-day the rated horse power of private motor cars is over 15 millions, and that for motor lorries is over 12 millions. For motor vehicles alone there is therefore a total of 27 millions of rated horse power.

How many mechanical slaves, in all, the people of this country have at their command, it is very difficult to say. In the United States an estimate has been made that every individual there has an average of 900 of such slaves and this is on a much more moderate basis than that of Stuart's, the new basis being that one horse power is equivalent to the power of ten men. In this country we are no doubt more modest in our demands, but it is obvious to all that the harnessing of coal and oil in the service of man is easily the greatest contribution of the engineer or anyone else to our materialistic progress.

Death of Mme. Curie

The Discovery and Isolation of Radium

MME. CURIE, whose claim to fame rests primarily on her researches in connection with the radioactive bodies and particularly for her discovery and separation of radium, has died in her 67th year.

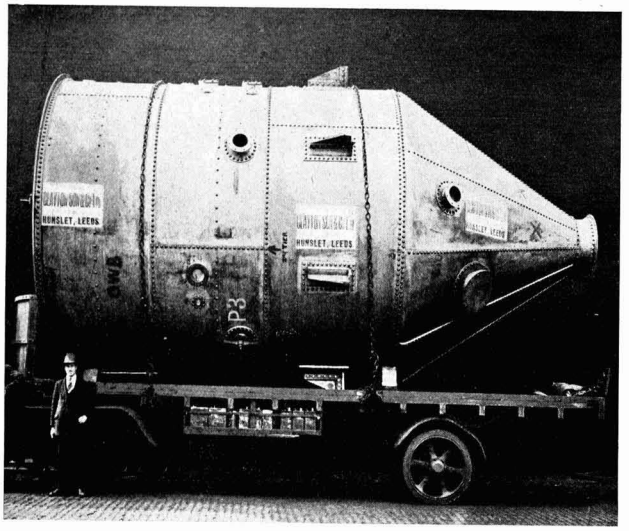
Marie Sklodowska, as she was before her marriage, was born at Warsaw. Showing a deep interest in science, she went to Paris to attend lectures in the Sorbonne. In 1895 she married Pierre Curie, a young scientist of great promise, who had already made several notable discoveries in magnetism and in the physics of crystals. Mme. Curie continued her scientific work in collaboration with her husband, but the direction of their work was changed as the result of the discovery by Henri Becquerel in 1896, that the element uranium showed the surprising property of emitting penetrating types of radiation, which blackened a photographic plate and discharged an electrified body.

Mme. Curie investigated this remarkable property using the electric method as a method of analysis. She showed that the radioactivity of uranium was an atomic property, as it depended only on the amount of uranium present and was unaffected by the combination of uranium with other elements. She also observed that the uranium minerals from which uranium was separated showed an activity four to five times the amount to be expected from the uranium present. She correctly concluded that there must be present in uranium minerals another substance far more active than uranium, and she then undertook the laborious chemical examination of the mineral pitchblende, and discovered a new strongly active substance which she named polonium, after the country of her birth. Later she discovered another new element, allied in chemical properties to barium, which she named radium. The Austrian Government presented her with the radioactive residues necessary for the separation of radium in quantity, and she was in this way able to obtain sufficient material to determine the atomic weight and physical and chemical properties of the new element.

In 1903 the Davy Medal of the Royal Society was awarded jointly to Professor and Mme. Curie, and they shared the 1904 Nobel Prize with Henri Becquerel. After the death of Pierre Curie in a street accident in Paris in 1906, Mme. Curie was awarded the 1911 Nobel Prize in Chemistry for the discovery and isolation of radium. In 1906 she was appointed to a special Chair in the Sorbonne. Later a special Radium Institute, called the Pierre Curie Institute, was founded for investigations in radioactivity, and Mme. Curie, who became the first director, held this post at the time of her death. In the course of the last 20 years this institute has been an important centre of research, where students of many nationalities have carried out investigations under her supervision.

Mme. Curie was a careful and accurate experimenter, and showed marked power of critical judgment in interpreting scientific facts. She retained an enthusiastic interest in her science throughout her life, and was a regular attendant at international conferences, taking an active and valuable part in scientific discussions. She also had a deep interest in the application of radium for therapeutic work both in France and abroad.

A FAIRLY good demand for bronze powders exists in Italy, especially for use in making varnishes and printing inks. Germany is the chief source of supply but is finding competition from two domestic manufacturers, namely, the Fabbriche Riunite de Metalli in Foglie in Polvere, Abbiategrasso (Milano), and the Compagnia Italiana Bronzi Speciali, Torino. Total imports of metal powders into Italy aggregated 185,680 lb. compared with 185,900 lb. for 1932.



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The Chemical Age Lawn Tennis Tournament

Second Round Results: Third Round Draw

THE second round matches in the fourth annual CHEMICAL AGE Lawn Tennis Tournament were completed last week-end, and the results are given below. F. G. Hawley and J. Haines (Anglo-Persian Oil Co., Ltd.), holders of the doubles cup, and C. G. Copp (Doulton and Co., Ltd.), holder of the singles cup have survived the second round, the former by a decisive win of 6-1, 6-1 and the latter by 6-3, 6-4. W. Speakman and S. E. Chaloner (Monsanto Chemical Works, Ltd., Ruabon), who won the doubles cup in 1932, are also through to the third round, their second round match being unfortunately scratched. Particulars of the third round draw are printed below. In the case of the singles there will be a fourth round before the semi-finals, and for the convenience of players who may be arranging their holidays, the draw for the fourth round has been made simultaneously so that no time may be lost in fixing the later matches.

All the matches in the following list must be completed by Bank Holiday, August 6, and the results (signed by all players, winners and losers) must reach the Editor of THE CHEMICAL AGE, Bouverie House, 154 Fleet Street, London, E.C.4, not later than first post on August 7. As far as practicable, the third round engagements in the singles should be finished by about July 23, to allow time for the fourth round. In all cases we should be glad if players would forward results immediately after their matches so that they may be published in THE CHEMICAL AGE at the end of the same week. Having found their position in the draw, all that the players now have to do is to write or telephone each other, decide on a suitable date, time and ground, play their matches and forward the results to us in accordance with the rules.

The finals have been fixed for Saturday, September 15. As announced in THE CHEMICAL AGE of June 23, we have accepted a cordial invitation from the Anglo-Persian Oil Co., Ltd., to arrange for them to be played at the Britannic House Club, Lower Sydenham; further details and invitations will be issued later. Thomas Hill-Jones, Ltd., of Invicta Works, Bow Common Lane, E.3, have kindly promised to present "Invicta" silver statuettes to be awarded outright to the winners of the doubles and the singles, and Mr. W. Lloyd-Willey, director of the same company, is presenting silver statuettes of similar pattern, to be known as the "Lloyd-Willey" statuettes, for each of the three runners-up. The winners of the doubles and singles respectively will hold, jointly with the firms they represent, THE CHEMICAL AGE silver challenge cups for twelve months.

Second Round Results

DOUBLES.

W. Speakman and S. E. Chaloner (Monsanto Chemical Works, Ltd.), walk-over. W. M. Harper and H. P. Gold (I.C.I. Ltd., Birmingham) scratched.

V. J. Prosser and A. Baxter (John Haig and Co., Ltd.) beat F. R. O. Allen and R. A. J. Bennett (Nobel Chemical Finishes, Ltd.), 6-2, 7-9, 6-1.

C. G. Copp and R. D. Hayman (Doulton and Co., Ltd.) beat A. G. R. Clarke and E. C. Browne (G. A. Harvey and Co. (London), Ltd.), 6-3, 6-2

A. E. C. Willshere and L. F. Grape (Borax Consolidated, Ltd.) beat A. Collins and H. Sibley (British Oxygen Co., Ltd.), 6-3, 4-6, 6-3

A. S. Marcar and G. H. Trigg (Bovril, Ltd.) beat Leonard Jones and Alan V. Rhead (Chance and Hunt, Ltd., Birmingham), 6-0, 6-4.

E. H. M. Badger and R. N. B. D. Bruce (Gas Light and Coke Co., Ltd.) beat R. A. Nottingham and F. Pritchard (Le Grand Sutcliffe and Gell, Ltd.), 6-3, 6-0.

E. Thomsett and R. Welsh (British Oxygen Co., Ltd.) beat G. Stanford and J. Shirreff (Johnson, Matthey and Co., Ltd.), 6-3, 6-3.

F. G. Hawley and J. Haines (Anglo-Persian Oil Co., Ltd.) beat P. Smith and B. T. Francis (Bakelite, Ltd.), 6-1, 6-1.

SINGLES.

R. Welsh (British Oxygen Co.) beat A. Tickner (British Celanese, Ltd.), 6-3, 3-6, 7-5

A. Collins (British Oxygen Co.) beat F. H. Choppin (London), 6-2, 6-0.

A. S. Marcar (Bovril, Ltd.) beat E. Thomsett (British Oxygen Co.), 4-6, 6-2, 6-3.

C. G. Copp (Doulton and Co., Ltd.) beat G. H. Trigg (Bovril, Ltd.), 6-3, 6-4.

H. R. Whittaker (Williams (Hounslow), Ltd.) beat L. A. Maronge (Bakelite, Ltd.), 6-8, 6-3, 6-2.

L. F. Grape (Borax Consolidated, Ltd.) beat John Window (Spencer Chapman and Messel, Ltd.), 6-3, 6-1.

W. L. Alldis (Brandhurst Co., Ltd.) beat J. S. Wilson (British Celanese, Ltd.), 6-4, 6-2.

H. A. Hare (Grindley and Co., Ltd.) beat I. R. Peake (R. W. Greeff and Co., Ltd.), 6-0, 6-0.

Albert Baxter (United Yeast Co., Ltd.) beat Rupert Law (Howards and Sons, Ltd.) 6-4, 6-1.

Ronald F. Porter (Howards and Sons, Ltd.), walk-over. F. Pritchard (Le Grand Sutcliff and Gell, Ltd.) scratched.

R. N. B. D. Bruce (Gas Light and Coke Co.) beat Chas. English (S. H. Johnson and Co.), 7-5, 8-6.

L. Giltrow (Williams (Hounslow), Ltd.) beat E. D. Lacy (Murex Welding Processes, Ltd.), 4-6, 6-2, 6-4.

G. F. Hammond (Williams (Hounslow), Ltd.) beat P. Smith (Bakelite, Ltd.), 6-2, 6-1.

S. E. Chaloner (Monsanto Chemical Works, Ltd.), walk-over. Leonard Jones (Chance and Hunt, Ltd.) scratched.

P. A. Tunstall (Salt Union, Ltd.) beat W. Speakman (Monsanto Chemical Works, Ltd.), 6-2, 6-3

I. Williams (Monsanto Chemical Works, Ltd.) beat Edwin Whittaker (A. C. Wells and Co., Ltd.), 6-1, 6-2.

Details of the draw for the next round are as follows:—

Doubles

THIRD ROUND.

Hawley, F. G., & Haines, J. Anglo-Persian Oil Co., Ltd., Britannic House, Finsbury Circus, London, E.C.2. (National 1212.)	*v*	**Willshere, A. E. C., & Grape, L. F.** Borax Consolidated, Ltd., Regis House, King William Street, London. (Mansion House 8332.)
Prosser, V. J., & Baxter, A. John Haig & Co., Ltd., Kinnaird House, 2, Pall Mall East, London. (Whitehall 1040.)	*v*	**Badger, E. H. M., & Bruce, R. N. B. D.** Gas Light and Coke Co., No. 1 Laboratory, Fulham. (Fulham 5531.)
Thomsett E., & Welsh, R. British Oxygen Co., Ltd., Angel Road, Edmonton. (Tottenham 2488.)	*v*	**Marcar, A. S., & Trigg, G. H.** Bovril, Ltd., 148-166, Old Street, London, E.C.1. (Clerkenwell 1202.)
Copp, C. G., & Hayman, R. D. Doulton & Co., Ltd., Lambeth, S.E.1. (Reliance 1241.)	*v*	**Speakman, W., & Chaloner, S. E.** Monsanto Chemical Works, Ltd., Ruabon, North Wales. (Ruabon 3.)

Singles

THIRD ROUND.

Whittaker, H. R.
Williams (Hounslow), Ltd., Hounslow, Middlesex. (Hounslow 1166, Ext. 7.)

versus

Collins, A.
The British Oxygen Co., Ltd., Angel Road, Upper Edmonton, London. (Tottenham 2647.)

Hare, H. A.
Grindley & Co., Ltd., Upper North Street, Poplar, London, E.14. (East 0058.)

versus

Bruce, R. N. B. D.
Gas Light & Coke Co., No. 1 Laboratory, Kings Road, Fulham, S.W.6. (Fulham 5531.)

FOURTH ROUND.

Whittaker or **Collins**

v

Hare or **Bruce**

Alldis, W. L.
Brandhurst Co., Ltd., Vintry House, Queen Street Place, London, E.C.4. (Central 1411.)

versus

Marcar, A. S.
Bovril, Ltd., 148-166, Old Street, London. (Clerkenwell 1202.)

Alldis or **Marcar**

v

Baxter, Albert.
United Yeast Co., Ltd., 238, City Road, London, E.C.1. (Clerkenwell 0303.)

versus

Hammond, G. F.
Williams (Hounslow), Ltd., Hounslow, Middlesex. (Hounslow 1166.)

Baxter or **Hammond**

Grape, L. F.
Borax Consolidated, Ltd., Regis House, King William Street, London. (Mansion House, 8332.)

versus

Welsh, R.
British Oxygen Co., Angel Road, Edmonton. (Tottenham 2488.)

Grape or **Welsh**

v

Copp, C. G.
Doulton & Co., Ltd., Lambeth, London, S.E.1. (Reliance 1241.)

versus

Giltrow, L.
Williams (Hounslow), Ltd., Hounslow. (Hounslow 2929.)

Copp or **Giltrow**

Williams, I.
Monsanto Chemical Works, Ltd., Ruabon, North Wales. (Ruabon 3.)

versus

Tunstall, P. A.
Salt Union, Ltd., 20, Water Street, Liverpool. (Central 4370.)

Williams or **Tunstall**

v

Porter, Ronald F.
Howards & Sons, Ltd., Uphall Works, Ilford. (Ilford 1113.)

versus

Chaloner, S. E.
Monsanto Chemical Works, Ltd., Ruabon, North Wales. (Ruabon 3.)

Porter or **Chaloner**

Honours at Birmingham University

Sir Harry McGowan becomes Doctor of Laws

AT Birmingham University on June 30 there were ten recipients of the honorary degree of Doctor of Laws, three of whom are well-known to the chemical industry. They were presented at the Degree Congregation by the public orator, Professor R. L. G. Ritchie, who outlined the public services of each in a series of short orations which are printed below. A photograph of the recipients is given on page 7 of this issue of THE CHEMICAL AGE.

Sir Harry McGowan.—The story of Sir Harry McGowan's career reads like a romance; but it is the romance of industry. He foresaw the bright future of chemical research directed to practical ends, and out of his vision came the reality of Imperial Chemical Industries, Ltd., founded by him in 1926, with the late Lord Melchett. In his remarkable career he has reconciled romance with reality, and practical achievement with vision.

Professor G. T. Morgan.—He held the Chair of Chemistry in Ireland, and was Professor Frankland's successor in the Mason Chair at Birmingham University. Afterwards he became Director of the Chemical Research Laboratory at Teddington. His fellow chemists have now done him the supreme honour and elected him President of the Chemical Society.

Sir John Cadman.—He was appointed to the Chair of Mining at Birmingham University at the age of thirty-one, an achievement of which the University is justly proud. During twelve years' tenure of that chair he built up the splendid Mining Department. Outside the University, also, he won for himself golden opinions and, for her, golden guineas, one hundred thousand of them, to endow the new School of Oil Engineering. He became adviser to the Anglo-Persian Oil Co., and later chairman.

Steel Industry Research

New Laboratories Opened near Sheffield

LORD RUTHERFORD, chairman of the Advisory Committee of the Department of Scientific and Industrial Research, was the guest of the United Steel Companies, Ltd., at a lunch in Sheffield on June 29, when he opened the new research department which has been built at Stocksbridge, not far from the works of Samuel Fox and Co., Ltd., where much of the company's high-grade steel is produced.

The new department has been designed for abnormal researches of a kind which could not easily be undertaken in the existing research departments of the eleven constituent parts of the company. In these laboratories much routine work has to be done, and it was felt to be necessary to create a department which could originate research, could undertake investigations requiring much time, and special investigations, as into the creep strength of metals and into methods of chemical analysis, and could also digest and publish technical information and data. Dr. T. Swinden, the director of the new laboratories, is already faced with a long programme of work.

Mr. W. Benton Jones, chairman of the company, who presided at lunch, said there was a new co-operative spirit in British industry. Not long ago they regarded their works as homes of secrets to be guarded closely and jealously from friend and foe. Now they felt they were objects of interest to everybody. They opened their works one to another.

No Laboratory is Self-Sufficing

Lord Rutherford spoke of these aims in the course of his speech at lunch, and added to them a particular plea for the generous treatment of the scientific men employed. Because men clocked in and clocked out it did not necessarily mean, he said, that they were doing what was most required. He said he knew of nothing more deadening to original ideas than "to keep a man's nose firmly fixed on the grindstone." Even directors needed a change, and he would plead that the young men should have opportunities of meeting other young men in other parts of the country. Ideas were more likely to come from such meetings of colleagues than from holding them down to some work from which there might be no progress at all. No laboratory to-day was self-sufficing.

After lunch the party went to the new department, which has been designed by Mr. George H. Shipley in collaboration with the staff, the cost involved being about £60,000. Wherever possible the products of the firm have been used and an unusual method of building in reinforced concrete has been employed. The roof rests upon vertical tiers of concrete carried out from walls of ordinary building construction, supported by special fender beams strengthened by tie-rods. This allows good lighting and plenty of wall space. The walls in the chemical and corrosion test laboratories are lined with glass, the floors and benches are of teak, and much care has been taken to ensure that the rooms are insulated against sound. The building has complete equipment, both scientific and clerical, and has its own conference room.

The visitors also spent some time examining the new plant of Samuel Fox and Co. During his speech at lunch Mr. Benton Jones described this plant as unique, in composing a bigger installation of high-frequency steel-melting units than existed elsewhere in this country. The steel was first melted in open-hearth furnaces and then refined in electric furnaces. Their aim in this shop, he said, had been to make it as clean as the places in which one lived. Cleanliness was the basis of economy, and such steel as was there produced could only be made in shops absolutely clean.

AFTER having been closed down last year because of the contraction in lithium sales, the Hans-Heinrich Lithium Smelter at Langelsheim, near Goslar, in Hannover, Prussia, has resumed operations and has taken on 30 workers. The main buyer of lithium metal is the Reich Railway, which utilises it in the form of an alloy, called "Railway Metal." The related zinc plant has also resumed operations.

Society of Glass Technology

Variation in the Strength of Glass

THE last meeting of the Society of Glass Technology for the session 1933/34 was held in Sheffield on June 20, the president, Mr. G. V. Evers, being in the chair. The death was reported of a former treasurer of the Society, Alderman Joseph Connolly, of Salford.

Implications of the known variation in the strength of glass were discussed by Mr. W. M. Hampton, Ph.D., B.Sc., F.Inst.P., and Mr. C. E. Gould, of Chance Brothers and Co., Ltd. The authors pointed out that the physical properties of glass could be divided into two main groups. In the first group were those properties (such as the refractive index, density and coefficient of expansion) which did not vary between one specimen and another made from the same batch, by more than the error of the determination. The other type of property was one which varied over a range of values, however accurately the determination might be made. Instances were (a) impact strength, (b) tensile strength, and (c) thermal endurance. In these cases the variation of the property was as definite as the existence of the property itself. It was shown that the variations in these three physical properties could be reduced to a variation in tensile strength. As a result of many measurements on thermal endurance it had been found that the standard deviation of thermal endurance was always about 10 per cent.

A brief survey of published investigations on the breaking strength of sheet glass was given by Mr. A. J. Holland, M.Sc., and Professor W. E. S. Turner. The authors described measurements made on the breaking strength of strips 10 cm. long by 0.6 to 1.4 cm. wide cut from flat drawn 26 oz. sheet glass. The strips were broken by placing them on two knife edges separated by a distance of 7.6 cm. and loading them by pouring lead shot into a tin suspended from a third knife edge resting on the specimen midway between the supports. Lantern slides of typical breaks and of the fractured surfaces were shown. The effect of the diamond cut edge of the specimen was also discussed.

Bursting Strength of Glass Bottles

A third paper dealt with the bursting pressure of glass bottles, the joint authors being Mr. B. Longmuir, B.Eng., and Professor W. E. S. Turner. It was largely as a result of the increased extent to which beer was pasteurised in this country that work had been done to ascertain the effect of temperature, method of application, rate of application, and time of application of pressure, on the resulting bursting pressure of quart screw cork amber glass beer bottles. After examination as to the state of annealing, bottles were subjected to internal pressure and the breaking pressures were determined. Several batches of bottles were burst at different temperatures, namely, at 15°, 25°, 40°, 50°, 60°, 75°, 90° and 150° C. It was found that the bursting pressures required at 150° were distinctly lower than those required at 15°. Apparatus for a study of the rate of application of pressure had been constructed, and work on this aspect of the problem was in progress. From results already obtained, however, there seemed to be some connection between the rate at which pressure was applied and the time of application. A study of the tests in which bottles were held at constant pressure revealed the fact that the specimens lasted longer at lower constant pressures.

World Potash Production

PRELIMINARY figures for 1933 indicate a substantial recovery in world potash commerce over the low level reached in 1932. The total world consumption during 1933 can be roughly estimated at about 23 per cent. less than the peaks attained in 1929 and 1930, and approach closely the average for the five-year period ended 1928. While production in the United States during 1933 was 4½ times that of the average for 1924-1928, the supply available for consumption (domestic output plus imports) was actually less, because of the fall in imports. The 1933 supply totalled 304,000 short tons (K_2O) in contrast with an average of 324,000 tons for 1924-1928.

Lord Leverhulme and Simple Words

Back to More Lofty Times

LORD LEVERHULME touched the right note when at the Mansion House the other day he urged young people to write legibly and to choose simple words. He held out the hope that we may get back to those more lofty times when, in simple words, we could express more meaning than now attaches to fashionable polysyllabic phraseology. A sore throat did not perhaps bring such snobbish satisfaction to the sufferer as can now be obtained from the more modern tonsilitis, but the description did mean to those who used it a great deal more than can be got out of the latter term. Whether we shall ever again reach the lost heights when common sense appealed to and helped us, before we descended into the flabby and inferiority-promoting regions of psychology, is perhaps more in doubt, but Lord Leverhulme set us on the right lines. He was, himself, doubtful about the legible writing. We are so busy developing the infant ego, that pothooks and hangers have long ceased to help in the formation of our sturdy characters. Later in life the typewriting machine has robbed us of a calligraphic quality which had, in its time, some little effect upon our characters. If, however, we can make a beginning by getting back to the use of simple words we could reach heights of thought undreamed of by the intelligentsia. Such nonsensical twaddle as "the ownership and control of the instruments and means of production" is incapable of expression in words which have any meaning, and as the habit of simplicity in words develops the utter vacuity of most of the Socialist phraseology would become apparent to us.—"The Independent," of June 30.

Dyeing Trade Wages

Employers Reject Workers Proposals

AMENDED proposals affecting 80,000 operatives in Yorkshire, Lancashire, Cheshire, Derbyshire and Scotland were discussed in Manchester on July 2, at a joint conference between the Federation of Unions in the Bleaching, Dyeing, Finishing, and Calico Printing Trade, and the committee of the Allied Association of Bleachers, Dyers, Printers and Finishers. The proposals, put forward by the unions, were that the men's basic rate be increased from 30s. 3d. to 34s. per week of 48 hours, and the women's basic rate be increased from 18s. to 21s., cost of living additions to be made in accordance with the index figures of the Ministry of Labour. It was also proposed that piece workers' rates should be subject to an addition of ten per cent., plus the existing cost of living percentage (80 per cent. of that for time workers).

The conference lasted two and a half hours, and at the end it was announced by Mr. A. Shaw, for the unions, that they had finally put two questions to the employers. The first question was: "Is the Allied Trades Association prepared to make any variation in the existing wage agreement?" The reply was that the association was unable to accede to any request for increased wages which would involve increased cost of production. The second question was: "Is the Allied Association prepared to enter into an agreement with the trade unions with the object of regulating hours?" The employers' reply was: "We have previously made proposals, which still stand, dealing with the question of hours, and have received no response. We have no authority to reply to your question other than in the negative, but we are prepared to place the matter before the Allied Association again."

It was explained that there is no definite agreement which regulates hours. Sectional agreements operated until about 1931, when they were dropped. The employers' proposals include an offer to investigate any specific cases of alleged overtime which the operatives brought forward. Some time ago wages proposals submitted by the operatives were rejected by the employers.

SHIPMENTS of butyl alcohol from the United States in the first quarter of 1934, totalling 759,133 lb., went to seventeen world markets. The foreign demand has materially increased in recent years, while imports have practically disappeared.

News from the Allied Industries

Whale Oil

ARRANGEMENTS FOR OPERATING A WHALE OIL REFINERY in England are being made by a concern financed by British, French and Swiss interests, according to a report in the "Norges Handels and Sjofartstidende." Financiers are reported to be working in co-operation with a Norwegian whaling group.

Bleaching

ADDRESSING the thirty-fourth ordinary general meeting of the Bleachers' Association, Ltd., held in Manchester on June 27, Sir Alan J. Sykes said that the causes of unsatisfactory trading during the past year included lower prices for bleaching, which had brought no increase in business; diminished purchasing power in foreign markets as a result of the decline in commodity prices, and especially the "disequilibrium" caused by the relatively greater decline in the prices of primary products; restrictions on international trade; and increased competition both at home and abroad. Between 1929 and last year the value of world trade had declined by approximately 65 per cent., and it was not surprising that this decline—five-sixths of which could be attributed to the fall in prices—should be reflected in a reduced demand for British cotton goods.

Non-Ferrous Metals

TWO REPRESENTATIVES OF THE INTERNATIONAL NICKEL CO., Mr. E. Pam and Mr. Lindell, are expected to arrive at Helsingfors from Canada during this month, with other experts, to work out a preliminary project for the first year's investigation work under the contract in which the Finnish Government gives the Mond Nickel Co. the right to prospect for and exploit nickel findings in Petsamo. Preliminary operations, which must start before May, 1935, will last for three years, with an extension of another two years for research, if necessary. The concession is for forty years, to take effect from the expiration of this three (or five) year period. During the first year not more than 1,000 tons may be extracted, the amount rising to 1,500 tons in the second and third years, and to 2,000 tons a year thereafter. A royalty of 5 per cent., calculated on the current price of nickel, is to be paid to the Finnish Government. It is expected that the British company will spend about £100,000 during the first three years on research.

Beet Sugar

SIR JAMES MARTIN, presiding at the annual meeting of the Ely Beet Sugar Factory, Ltd., on June 22, said they had paid to their growers for their beets the total of £494,285 in respect of their crop for the year under review, as compared with £400,650 for the previous year. The 1933 season was the last governed by the British Sugar (Subsidy) Act, 1925. As, however, the Government had decided to investigate the whole question of the future of the sugar industry, the subsidy had been extended so as to cover the coming manufacturing season of 1934. They had, therefore, been enabled to offer to their growers a co-operative contract for a further year, and the ecreege contracted for was again sufficient to enable the factory to be worked at full capacity during the coming season. They could only await patiently the findings of the committee of inquiry, upon which would depend largely the Government's policy in the future.

THE BRITISH SUGAR (SUBSIDY) BILL was read a third time without a division in the House of Commons on June 29. Sir H. Samuel renewed his protest against the continuance of the scheme, which, he said, penalised the general public for the benefit of one particular interest. The sums now being voted by the House would bring the total expenditure on the beet sugar experiment, from the subsidy and the rebate of taxation, to a sum of £40,000,000. Mr. Walter Elliot (Minister of Agriculture) said the Bill was purely a temporary measure, which would have eventually to be replaced by a long-term policy.

Dyeing and Cleaning

THE SHAREHOLDERS' PROTECTION ASSOCIATION has issued a circular to shareholders of Associated Dyers and Cleaners, Ltd., saying that the association has very carefully considered the company's report and accounts and advisory committee's report. The association considers the proposal to appoint a committee of investigation, independent of the board, "very proper and welcome," and urges shareholders to give it their support.

Artificial Silk

CONSTERNATION HAS BEEN CAUSED throughout the rayon textile industry by the reduction in rayon yarn prices of 6d. per lb., recently announced by all the leading rayon producers. This step has been necessary following the reduction in the excise duty from 1s. to 6d. per lb., which came into operation last Monday. The decreased duty is the outcome of the trade agreement between the United Kingdom and France.

Seed Crushing

IT IS FEARED that unless the representations which are being made to the Imports Duties Advisory Committee for a revision of the import duty on foreign oil coming into Britain are successful, many of the seed-crushing mills at Hull will suspend operations. Imports of foreign oil are coming into the country in increasing quantities despite the duty of £3 10s. per ton. The crushers contend that the duty is not enough and the price of home manufactured oil is out of all proportion to the cost of the raw material. The buying of seed is not an easy matter, because American competition is keen, and, with rather adverse crop reports prices have gone up considerably, both for Indian and Plate linseed. Meantime some of the near Continental markets are closed to this country, so that there is difficulty in disposing of oil stocks.

Continental Chemical Notes

THE MANUFACTURE OF CARBON DIOXIDE in gaseous, liquid and solid form by the Burger process is to be undertaken in Austria by the newly-formed concern, Nussdorfer Kohlensäure-Erzeugung Burger and Co.

* * *

THE DEUTSCHE HYDRIERWERKE (associated with Henkel A.-G.) have announced a net profit of over 600,000 marks for the year ending December 31, 1933. A dividend of 6 per cent. absorbs 240,000 marks. Business is developing favourably in the present year.

* * *

THE HEYDEN CONCERN, of Dresden, reports for 1933 a slightly increased gross turnover of 6,000,000 marks (against 5,800,000) and a net profit of 246,568 marks (against 89,595). Dividend payment is now resumed, after several years' break, with a 3 per cent. distribution. Although the export trade shows no decline in bulk, the depreciation of the dollar led to 8½ per cent. decline in value.

* * *

RUBBER IN POWDERED FORM can be incorporated with asphalt with advantage to the latter ("Kolloid-Zeitschrift," 1934, p. 219). When incorporated with powdered rubber at 140° C., asphalt undergoes considerable increase in body. The improvement is less marked when the operation is conducted at higher temperatures and is entirely absent above 245° C.

* * *

THE POISONING OF SILICA-LEAD-VANADIUM CATALYSTS during gaseous reactions has been investigated by Kharmandarian and Brodovitch, who state that arsenic trichloride and carbon monoxide are the most active poisons ("J. Khim. Prom.," 1933, No. 9, p. 35). A small proportion of carbon dioxide in the reacting gases appears to suppress the poisoning action of these substances and has the additional advantage of intensifying catalytic activity.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THE tone of the chemical market has been steady during the week and business in industrial products has been fairly satisfactory. The announcement of prices for nitrogen fertilisers for July is expected any day and is eagerly awaited. It is understood that all current business is being transacted at the prices in force for the month of June. The prices of sodium bisulphite powder and sodium phosphate have been advanced by £2 and 10s. per ton respectively. There has been a good demand for acetone, ammonium chloride, formaldehyde, formic acid, and more interest has been shown in acetic acid. There has been little change in the arsenic market. Japanese competition continues and buying interest is limited. Barium chloride and potassium chlorate are also dull items. Business in the coal tar products market has been fairly satisfactory and most prices are well maintained. Creosote oil continues in good demand, and sales of refined tar are on a large scale. There is a steady demand for cresylic acid, and some improvement has been evident in the pitch market. The demand for pharmaceutical chemicals has been somewhat limited but the tone of the market is steady. The best demand has been for aspirin, cream of tartar, citric and tartaric acids. There has been a better demand for menthol. The essential oils market has been fairly active.

Price Changes

General.—SODIUM BISULPHITE POWDER, 60/62%, £18 10s.; SODIUM PHOSPHATE, £13.

Pharmaceutical and Fine Chemicals.—MENTHOL, synthetic detached crystals, 8s. to 12s. per lb.; SAFROL, 1s. 8d. per lb.; VANILLIN, ex clove oil or ex guaiacol, 13s. to 14s. per lb.

Manchester.—SULPHATE OF COPPER, £14 5s. to £14 10s. per ton; CARBOLIC ACID, crystals, 8d. per lb., crude, 2s. to 2s. 1d. per gal.; CREOSOTE, 3½d. to 4¼d. per gal.

All other prices remain unchanged.

LONDON.—Chemical markets maintain the steady conditions which have been noticeable for some time, there being a good average demand for most products with prices practically unchanged. The coal tar products market remains quiet, with no change in prices from last week.

MANCHESTER.—Conditions in the Lancashire cotton textile industry and in the woollen mills of the West Riding have not improved sufficiently to bring about any material expansion in the volume of deliveries of chemical products to the dyeing and allied establishments, though in a number of other directions, allowing for the seasonal lull which is now making its influence felt to some extent, the movement of supplies into consumption has been fairly satisfactory. On the Manchester market this week new business has been on moderate lines in respect of prompt transactions, with a limited number of contract bookings over the next few months also reported. From the point of view of price movements, whilst changes since the last report have been irregular in tendency they have been relatively unimportant both in number and extent and the undertone in most respects remains firm.

SCOTLAND.—The Scottish heavy chemical market is fairly quiet at the present time, the approaching Glasgow Fair holidays having the effect that little or no buying is being done.

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.—9d. per lb. less 5%.

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

ACID, FORMIC.—LONDON: £43 10s. 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, according to district and quality. 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 store. MANCHESTER: £49 to £53 ex store.

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

ACID, TARTARIC.—LONDON: 1s. per lb. SCOTLAND: B.P. crystals, 11d., carriage paid. MANCHESTER: 1s. 0⅜d. to 1s. 0¾d.

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, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. 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.

BARYTES.—£7 to £8 10s. 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. 7d. to 2s. 11d.

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.—3⅞d. to 5d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—£41 to £46 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.

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

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £27 per ton. SCOTLAND: 40%, £28 ex store.

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, £31 10s.

LEAD NITRATE.—£28 per ton.

LEAD, RED.—SCOTLAND: £25 10s. to £28 per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £37 10s.

LITHOPONE.—30%, £17 10s. to £18 per ton.

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

METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 6d. to 2s. 1d. per gal. Pyridinised industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

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

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—8½d. to 9d. per lb. without engagement.

POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £37.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d. LONDON: 5d. per lb. with usual 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: £37 to £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

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

POTASSIUM PERMANGANATE.—LONDON: 9½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: Commercial, 8¾d.; B.P., 9½d. to 9¾d.

POTASSIUM PRUSSIATE.—LONDON: 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot material, 8¼d. ex store. MANCHESTER: Yellow, 8½d.

RUPRON (MINERAL RUBBER).—£16 10s. per ton.

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

SODA ASH.—58% spot, £5 15s. 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. net for spot lots and 4d. per lb. with discounts for contract quantities. 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 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, £15 ex station, 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.

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

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

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

SODIUM PHOSPHATE.—£13 perc ton.

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

SODIUM SILICATE.—140° Tw. Spot £8 per ton d/d station, returnable drums.

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

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 15s. 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.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £14 5s. to £14 10s. per ton f.o.b.

SULPHUR.—£10 15s. per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9; ground American, £10 ex store.

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

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8¼d. to 8¾d. per lb.; crude, 60's, 2s. 1½d. to 2s. 2½d. par gal. MANCHESTER: Crystals, 8d. per lb.; crude, 2s. to 2s. 1d. 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. 6d.; dark, 95/97%, 1s. 3d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

ANTHRACENE OIL.—Strained, 4½d. per gal.

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. 6½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 3¾d. to 4d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3¾d. f.o.r. North; 4d. London. MANCHESTER: 3½d. to 4½d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4½d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d. to 1s. 8d.; 99/%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £9 15s. 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.—LONDON: £3 to £3 1s. per ton f.o.b. East Coast port for next season's delivery.

PYRIDINE.—90/140, 6s. 6d. to 8s. per gal.

TOLUOL.—90%, 2s. 2d. per gal.; pure, 2s. 5d.

XYLOL.—Commercial, 2s. 2d. per gal.; pure, 2s. 4d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb. 100% d/d buyer's works.

BENZIDINE, HCL.—2s. 5d. per lb.

p-CRESOL 34-5° C.—2s. per lb. in ton lots.

m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags; £79 5s. in casks, in 1-ton lots.

α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.

o-NITRANILINE.—3s. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE P.G.—1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—9½d. per lb.

p-TOLUIDINE.—1s. 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Home: £7 5s. per ton delivered in 6-ton lots to farmer's nearest station. Export: Nominal £5 17s. 6d. per ton f.o.b. U.K. ports in single bags.

CYANAMIDE.—£7 5s. per ton carriage paid to any railway station in Great Britain in lots of 4 tons and over.

NITRATE OF SODA.—£7 18s. 6d. per ton delivered in 6-ton lots to farmer's nearest station.

NITRO-CHALK.—£7 5s. per ton delivered in 6-ton lots to farmer's nearest station.

CONCENTRATED COMPLETE FERTILISERS.—£10 15s. to £11 6s. per ton according to percentage of constituents.

NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton according to percentage of constituents.

Latest Oil Prices

LONDON, July 4.—LINSEED OIL was quiet. Spot, £22 5s. (small quantities, 30s. extra); July, £20 14s.; Aug., £21; Sept.-Dec. £21 5s.; Jan.-April, £21 2s. 6d., naked. SOYA BEAN OIL was slow. Oriental (bulk), July-Aug. shipment, £12 15s. per ton. RAPE OIL was easier. Crude, extracted, £27; technical, refined, £28 10s., naked, ex wharf. COTTON OIL was dull. Egyptian, crude, £12 10s.; refined, common, edible, £16; and deodorised, £17 10s., naked, ex mill (small lots, 30s. extra). TURPENTINE was steady. American, spot, 42s. 6d. per cwt.

HULL.—LINSEED OIL, spot, quoted £21 17s. 6d. ton ton; July, Aug., Sept.-Dec., and Jan.-April, £21 5s. naked. COTTON OIL.—Egyptian crude, spot, £13; edible, refined, spot, £15; technical, spot, £15; deodorised, £17, naked. PALM KERNEL OIL, crude, f.m.q., spot, £13 10s., naked. GROUNDNUT OIL, extracted, spot, £19; deodorised, £23. RAPE OIL, extracted, spot, £26; refined, £27 10s. SOYA OIL, extracted, spot, £15; deodorised, £18 per ton. COD OIL, 25s. per cwt. CASTOR OIL, pharmaceutical, 35s. 6d.; first, 30s. 6d.; second, 27s. 6d. per cwt. TURPENTINE, American, spot, 44s. 6d. per cwt.

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.

Complete Specifications Open to Public Inspection

SULPHUR DYESTUFF PREPARATIONS, *manufacture.*—I. G. Farbenindustrie. Dec. 24, 1932. 33176/33.

DYEING LEATHER.—Soc. of Chemical Industry in Basle. Dec. 21, 1932. 34172/33.

CYCLOHEXYLPHENOLS, manufacture.—I. G. Farbenindustrie. Dec. 20, 1932. 35217/33.

TRISAZODYESTUFFS, manufacture.—I. G. Farbenindustrie. Dec. 21, 1932. 35370/33.

PRINTING CELLULOSIC MATERIALS with dyestuffs.—Soc. of Chemical Industry in Basle. Dec. 22, 1932. 35579/33.

COLOURED LACQUERS and coating compositions, manufacture.—J. R. Geigy A.-G. Dec. 19, 1932. 35581/33.

DYESTUFFS of the indanthrone series, manufacture.—E. I. du Pone de Nemours and Co. Dec. 20, 1932. 35634/33.

HALOGENATED PHENYLTHIOGLYCOLLIC ACIDS, manufacture.—Soc. Chemical Industry in Basle. Dec. 23, 1932. 35741/33.

LACQUERS FROM CELLULOSE ESTERS, manufacture and production. I. G. Farbenindustrie. Dec. 21, 1932. 35846/33.

DYESTUFFS of the triarylmethane series, manufacture.—I. G. Farbenindustrie. Dec. 22, 1932. 35884/33.

CASTOR OIL, manufacture of preparations.—Soc. of Chemical Industry in Basle. Dec. 20, 1932. 35891/33.

POLYMERISED DRYING OILS.—Imperial Chemical Industries, Ltd. Dec. 20, 1932. 35895/33.

ALKALI SALTS OF NAPHTHALENE-1-SULPHONIC ACID, manufacture.—J. R. Geigy, A.-G. Dec. 22, 1932. 35960/33.

ORGANIC ARSENIC COMPOUNDS, manufacture of amino-substituted. I. G. Farbenindustrie. Dec. 22, 1932. 35961/33.

COMBATING PLANT DISEASES, process.—I. G. Farbenindustrie. Dec. 22, 1932. 35962/33.

POLYHYDRIC ALCOHOLS, manufacture.—E. I. du Pont de Nemours and Co. Dec. 23, 1932. 35971/33.

NUCLEAR SUBSTITUTED AROMATIC AMINES.—catalytic process for the manufacture.—I. G. Farbenindustrie. Dec. 22, 1932. 35993/33.

STABILISED PREPARATIONS, manufacture.—I. G. Farbenindustrie. Dec. 24, 1932. 35994/33.

SALTS OF HEXAVALENT CHROMIUM and other valuable oxygen compounds, simultaneous production.—Bozel-Maletra Soc. Industrielle de Produits Chimiques. Dec. 24, 1932. 36011/33.

SEPARATION OF ZIRCONIA from zircon and products resulting therefrom.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de Saint-Gobain, Chauny, et Cirey. Dec. 23, 1932. 36022/33.

HYDROABIETYL ALCOHOLS and their manufacture.—E. I. du Pont de Nemours and Co. Dec. 21, 1932. 36051/33.

POLYMERIC VINYL ALCOHOLS, manufacture.—Consortium für Elektro-Chemische Industrie Ges. Dec. 24, 1932. 36130/33.

DIHYDROFOLLICLE HORMONE, manufacture of acyl derivatives.—Schering-Kahlbaum A.-G. Dec. 23, 1932. 36135/33.

AZO COMPOUNDS, manufacture.—I. G. Farbenindustrie. Dec. 24, 1932. 36232/33.

DISAZO DYESTUFFS insoluble in water and rubber products coloured therewith, manufacture.—I. G. Farbenindustrie. Dec. 23, 1932. 36367/33.

EXTRACTIVE SUBSTANCES from animal and vegetable organisms, extraction.—I. G. Farbenindustrie. Dec. 24, 1932. 36368/33.

SACCHAROSONIC ACIDS and their salts, manufacture.—Dr. H. Ohle. Dec. 23, 1932. 36421/33.

Specifications Accepted with Dates of Application

SYNTHETIC RESINS derived from polybasic acids and polyhydric *alcohols and coating compositions containing the same.*—W. W. Triggs (American Cyanamid Co., and T. F. Bradley). Dec. 14, 1932. 412,172.

AQUEOUS SOLUTIONS OF AMINOACRIDINE or aminoacridinium salts, manufacture.—I. G. Farbenindustrie. Dec. 16, 1931. 412,176.

ANAESTHETIC SUBSTANCES, manufacture of stable solutions.—I. G. Farbenindustrie. Dec. 17, 1931. 412,208.

ACTIVATED OR ABSORBENT CARBON or decolourising carbon, preparation.—A. McCulloch and R. E. Hargreaves. Dec. 16, 1932. 412,209.

PHOSPHATIDE PRODUCTS, production.—J. E. Pollak (Hanseitische Mühlenwerke A.-G.). Dec. 19, 1932. 412,224.

TRANSFORMATION PRODUCTS from oils obtained from fatty oxyacids or substances containing the same, preparation.—P. Perucca. Dec. 28, 1931. 412,188.

THIOCYANATES AND FERRO-CYANIDES of the alkali and alkaline earth metals and Prussian blue, production.—E. Hene. March 3, 1932. 412,254.

NEW CONDENSATION PRODUCTS of the anthraquinone series, process for the manufacture.—I. G. Farbenindustrie. Dec. 23, 1931. 412,270.

PLASTIC COMPOSITIONS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Jan. 13, 1933. 412,301.

HIGH MOLECULAR SULPHIDES of the aliphatic series, processes for the manufacture.—Henkel et Cie, Ges. Feb. 19, 1932. 412,305.

DYES AND INTERMEDIATES therefor, and photographic emulsions sensitised therewith, manufacture.—I. G. Farbenindustrie. Jan. 18, 1932. 412,309.

STABLE SOLUTIONS of the sodium salt of diamino-dihydroxy-arseno-benzene methylene-sulphinic acid, method of making.—B. Reuter. Jan. 21, 1933. 412,317.

TREATING ACID TARS from the purification of benzole or other liquid hydrocarbons for the recovery of acid, resinous, and other bodies, method.—G. W. J. Bradley and Woodall-Duckham (1920), Ltd. Feb. 27, 1933. 412,343.

ORGANIC SULPHIDES and plastic compositions therefrom, manufacture.—Dunlop Rubber Co., Ltd., D. F. Twiss and A. E. T. Neale. March 8, 1933. 412,349.

COMPOUNDS CONTAINING HEAVY METALS and sulph-hydryl groups from keratinates, processes for making.—R. Von Wülfing and E. Möller (trading as J. A. Wülfing (firm of)). April 5, 1932. 412,366.

PRODUCING FAST DYEINGS and printing on animal fibres by means of acid mordant dyestuffs, process.—Durand and Huguenin A.-G. May 12, 1932. 412,391.

MAGNESIUM, process and apparatus for the production.—G. Gire and R. Fouquet. July 6, 1933. 412,417.

ASPHALT SOLUTIONS, manufacture.—Dr. A. Wacker Ges. für Elektro-Chemische Industrie Ges. Dec. 9, 1932. 412,495.

DISPERSIONS OF CHLORINATED RUBBER, production.—Chemische Fabrik Buckau. March 11, 1933. 412,525.

Applications for Patents

June 21 to 27 (inclusive).

FERTILISERS, manufacture.—Aktiebolaget Kemiska Patenter. (*Sweden, June 29, '33.*) *19040.* (*Sweden, April 6.*) 19041. (Sweden, April 11.) 19042.

CARBON-SUBSTITUTED, ETC., BARBITURIC ACIDS, producing.—F. Boedecker, H. Gruber, J. D. Riedel-E. de Haën. 18752.

ALCOHOLIC FERMENTATION of sugar-containing liquids.—F. Boinot, Usines de Melle. 19018.

ALKYLAMINES, production.—Boot's Pure Drug Co., Ltd., H. H. L. Levene and F. L. Pyman. 18856.

ORGANIC SALTS OF BISMUTH, production.—Boot's Pure Drug Co., Ltd., A. P. T. Easson and F. L. Pyman. 18857.

EXPLOSIVES, manufacture.—W. M. Burden, C. G. Jackson, J. N. Pring and G. Rotter. 18564.

FLUOROHYDROCARBONS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 18392.

DERIVATIVES OF CELLULOSE, etc.—A. Carpmael (I. G. Farbenindustrie). 18393.

DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 18623.

NITROCELLULOSE, manufacture.—E. I. du Pont de Nemours and Co. (United States, June 21, '33.) 18434.

ALKALI METAL ADDITION PRODUCTS of aromatic hydrocarbons, manufacture.—E. I. du Pont de Nemours and Co. (United States June 29, '33.) 18886.

PHOSPHATES, production of assimilable.—R. Flatt. 18424.

PICKLING STAINLESS STEEL, ETC.—Grasselli Chemical Co. (United States, June 23, '33.) 18553.

PRODUCTS COMPRISING VEGETABLE PHOSPHATIDES, production.—Hanseatische Mühlenwerke. (Germany, Dec. 13, '33.) 18771. (Germany, April 5.) 18772.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, June 23, '33.) 18616.

MANUFACTURE of 4-nitroso-diphenylamine derivatives.—I. G. Farbenindustrie. (Germany, June 24, '33.) 18716.

TETRAZO SALT, manufacture.—I. G. Farbenindustrie. 18717.

VISCOUS SOLUTIONS of salts of anaesthetic substances with hydroxycarboxylic acids, manufacture.—I. G. Farbenindustrie. (Germany, June 28, '33.) 18991.

BENZENE DERIVATIVES, treatment.—Imperial Chemical Industries, Ltd., and N. Bennett. 18554.

From Week to Week

THE LONDON AND SOUTH-EASTERN SECTION of the Institute of Chemistry will hold a dance at the Hotel Russell on October 19.

MR. BORIS DVORKOVITZ has resigned from the board of Motor Fuel Proprietary, Ltd.

MR. SAMUEL PODMORE, of Acock's Green, late chairman and co-founder of the Birmingham Chemical Co., left £2,551 (net personalty £1,211).

THE BRITISH DRUG HOUSES, LTD., has hitherto issued a revised edition of the B.D.H. Catalogue of Fine Chemical Products in July of each year. This year, publication of this catalogue will be deferred until September.

BARBER, WALKER AND CO., LTD., have placed an order with Simon-Carves, Ltd., Manchester, for a battery of 30 of the latest type coke ovens, with all necessary machinery, and a complete by-product plant, coal handling, draining, and blending plant. The new plant is to be built at Harworth Colliery, Bawtry, Yorkshire.

REPRESENTATIVES OF CHILEAN NITRATE INTERESTS and European synthetic nitrate producers held a conference in Paris last week in an attempt to reach an agreement to end the long warfare. The delegates have maintained secrecy about the proceedings, but admit encountering considerable difficulties. This conference is a continuation of the one held last month in Zurich.

MR. J. L. FERGUSON, resident director of Lever Bros., Ltd., Port Sunlight, has been appointed nominee member of the Mersey Docks and Harbour Board by the Minister of Transport, in the room of the late Sir Max Muspratt. Last month Mr. Ferguson succeeded Sir Max Muspratt as chairman of the Liverpool and North-Western branch of the Federation of British Industries.

THE EXPORT DUTIES ADVISORY COMMITTEE has received applications for the addition of magnesium sulphate to the free list and for drawback under Section 9 of the Finance Act, 1932, in respect of nitro-cellulose photographic film base in rolls, used in the manufacture of unexposed sensitised photographic film. Representations should be addressed in writing to the secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, S.W.1, not later than July 23.

AN ORDER VALUED AT ABOUT £135,000 for the equipment of two new sugar cane factories in India has been placed with A. and W. Smith and Co., Ltd., Glasgow. Each of the new factories will be capable of crushing 850 tons of cane per day. The buildings will be constructed in India, but about 3,300 tons of material will be supplied by the Glasgow firm. Other local firms have recently booked good contracts for cane sugar factories in India.

A SPECIAL DEGREE CONGREGATION was held at Sheffield University on June 30, when the honorary degree of Doctor of Science was conferred on Emeritus Professor W. P. Wynne and Professor E. Mellanby. Professor F. H. Shera, public orator, referred to the importance of Professor Wynne's researches into the properties of naphthalene and toluene, and to the fact that Professor Mellanby's world-famous discoveries respecting vitamins had reduced the malady of rickets to the ranks of preventable diseases.

SHAREHOLDERS OF MOTOR FUEL PROPRIETARY, LTD., are informed that the work carried out on the plant at Slough has proved highly successful. The directors are already actively engaged in making the necessary arrangements to commercialise the company's process, and a full statement will be shortly issued, setting out the future policy. The directors have been approached to deal with the foreign rights in several countries, but they do not intend to fix any price for these until the results obtained in this country can enable them to assess these rights at their proper value.

SEVERAL WEARDALE LEAD MINERS have formed themselves into a company and propose to reopen certain spar mines in the district with a view to providing employment. This once prosperous lead mining area has been hard hit by industrial depression. Nearly all the mines have been closed during the last few years, and several hundred miners are idle. For years the spar from which the lead ore was washed was rejected as waste, but it has now a marketable value as roadmaking material. Preparations are being made to reopen the old Redburn Spar mine, and men are already employed rigging up the necessary shafthead gear.

ARISING OUT OF THE DISCOVERY of hundreds of poisoned fish in the River Wear, near Bishop Auckland, the Crook Gas Co. was fined £20 at Bishop Auckland, Durham, on July 2, for allowing ammonia to percolate from a tank and pollute the river. It was stated that the discovery of dead and dazed fish led to investigation by the Wear Fisheries Board, who prosecuted. Poisonous liquid was found to be escaping from a dilapidated tar tank at the Crook Gasworks into the river. Commenting on the pollution which was caused, the chairman of the Bench (Dr. Beresford Kane) declared that it was fortunate that the discovery of the dead fish gave an early warning to the authorities, otherwise domestic water supplies drawn from the river at this point might have been gravely in danger.

THE MANUFACTURE OF PEST KILLER AND FERTILISERS has been started at Middlesbrough by the Cargo Fleet Iron Co., Ltd.

ACETATE PRODUCTS CORPORATION will hold a meeting at Winchester House, London, on August 8, at 12 noon, to receive the account of the liquidator.

OIL HAS BEEN AGAIN STRUCK in the Nienhagen area by the German Vacuum Oil Co., the average daily production on the first few days exceeding 100 tons.

PROFESSOR JAMES KENNER, of the University of Manchester, has been appointed as the representative of the University to the Chemical Engineering Congress (1935).

ANSWERING A QUESTION IN THE HOUSE OF COMMONS on June 28, the Chancellor of the Exchequer said the quantities of power methylated spirits issued during the first three months in each of the years 1932, 1933 and 1934, were respectively 6,045, 26,308, and 148,045 bulk gallons.

MR. ANDREW WHITE COOKSTON, of 38 Grosvenor Gardens, London, S.W.1, and of Crookston Brothers, Glasgow, managing director of the Egyptian Phosphate Company, Ltd., of Safaga, Upper Egypt, left personal property in England and Scotland valued at £257,565.

THE MAHARAJAH OF KOLHAPUR has granted to a British syndicate the monopoly of commercially utilising the mineral deposits of his State, especially bauxite. The syndicate will be formed by the promoters of the scheme and it is said that Sir Basil Blackett will be managing director. An important aluminium industry may come into existence in the State.

LONG SERVICE AWARDS have been presented this year to 645 employees in the various groups of Imperial Chemical Industries, Ltd. The recipients, who completed their respective qualifying periods of service on December 31, 1933, comprise 20 with fifty years' service each (chiming clocks), 130 with forty years' service (gold medals), 194 with thirty-five years' service (gold watches) and 301 with twenty-five years' service (silver watches and medals).

THE GOVERNMENT OF INDIA have decided to establish a central bureau of industrial research which will be attached to the Indian Stores Department in order to give it an essentially practical character and to ensure that it will keep in close contact with industrial markets and current business. The bureau may also serve to indicate what are the needs for further steps in the way of industrial research.

THE "F.B.I. REGISTER OF BRITISH MANUFACTURERS, 1934-35," edited by Ernest A. Nash, A.C.I.S., is now available, price 15s. net, post free. Manufacturers and traders will find this a useful book of reference, as it contains an alphabetical list of companies and firms, with a brief description of their business, and head office, works and telegraphic addresses. Particulars of trade associations are also given. The Register may be obtained from the Federation of British Industries, 21 Tothill Street, London, S.W.1.

INTERNATIONAL COMBUSTION, LTD., Grinding, Screening and Filtering Division, report among recent orders for England, a complete plant for grinding manganese ore comprising 6 ft. × 36 in. Hardinge conical ball mill, double helical single reduction gear unit, rotary and superfine air classifiers, operated under vacuum, dust collecting filter, complete furnace, elevator, bunker, supporting structures, magnetic separator and belt feeder. This represents the latest practice in dustless dry grinding.

THE GERMAN AMMONIA SALES ORGANISATION, of Bochum, which was recently extended until 1940, reports sales by its producers of synthetic nitrate during the year ended June 30, 1933, of 43,357 metric tons of nitrate, compared with 40,484 metric tons in the previous year. The producers of cookery ammonia delivered during the same period only 42,895 metric tons of nitrate, against 77,853 metric tons; only 18,925 metric tons thereof, compared with 30,910 metric tons, were exported. About 60 per cent. of the total sales of the German Nitrate Syndicate consist of sulphuric ammonia.

THE MEDICAL RESEARCH COUNCIL announces that new arrangements for further combined chemical and bacteriological investigations into the conditions which govern the life and multiplication of micro-organisms causing disease have been made possible by the generous co-operation of the Middlesex Hospital Medical School, the trustees of the late Lord Leverhulme and the Sir Halley Stewart Trust. Accommodation and facilities are being provided at Middlesex Hospital in the Bland-Sutton Institute of Pathology and the adjoining Courtauld Institute of Biochemistry. The investigations will be directed by Dr. Paul Fildes, who has been appointed a member of the scientific staff of the Medical Research Council. The other workers are Mr. B. C. J. G. Knight, with a Halley Stewart research Fellowship, and Dr. G. P. Gladstone and Dr. G. Maxwell Richardson, holding Leverhulme research Fellowships. The support given by the co-operating bodies is sufficient for an initial period of five years.

THE TENTH INTERNATIONAL EXHIBITION OF INVENTIONS will be held at the Central Hall, Westminster, London, from October 3 to 13, this year. With the increase of trade throughout the world, and particularly in this country, there is an increasing demand for inventions of commercial utility. The available space is being taken up by exhibitors more rapidly than in previous years, although the prospectus has only recently been circulated. In addition to the general public, the exhibition is visited by a large number of agents from all parts of the world seeking new lines, and also by the principal buyers from the departmental stores.

THE ADVISORY COMMITTEE of the Leverhulme Research Fellowships announces that the number of applications for awards this year was approximately the same as in 1933. The advisory committee has recommended, and the trustees have approved, 12 nominations to Fellowships, tenable for varying periods up to two years. Three Fellowships awarded last year have been extended for a further period of one year. On the recommendation of the advisory committee the trustees have also approved the award of nine grants to research workers to assist the completion of their programmes. These grants are held under the same general conditions as the Fellowships.

A FAULTY STEAM GAUGE was stated to have caused a fatality which was the subject of an inquest at Dudley this week. On June 30, George Thompson (32), Commonside, Pensnett, was removing a manhole cover from a large boiler at the brewery of Julia Hanson and Sons, Ltd., Greystone Street, Dudley, when he was enveloped in steam from the boiler and received severe scalds from which he died three hours later. William Clifton, Himley Road, Dudley, the boiler attendant, said that on Friday night he withdrew the fire and made other preparations for the periodical inspection and overhauling of the boiler. On Saturday morning the steam gauge registered zero, and he instructed Thompson to open the manhole. The Coroner (Mr. R. Marshall) said that absolute reliance was placed upon a gange which turned out to be imperfect. In future other safety measures would have to be taken to ensure that the boiler was free of steam.

MR. JAKOB KLEIN, Doctor of Engineering (Hon.) and Privy Commercial Councillor, who has for many years been general manager and since 1930 chairman of the board of Klein, Schanzlin and Becker, A. G., of Frankenthal (Pfalz), Germany, celebrated his 65th birthday on July 3. His life's work has not only concerned the development of his works, which he took over with 300 workmen and which now employs 1,300 men, after having been temporarily extended as far as 2,000, but his interests also concern the development of the whole German industry, on whose behalf he has worked very successfully both in Germany and abroad. In consideration of his work regarding the development of pumps, compressors and similar business, the Technical High School of Karlsruhe granted him the title of Doctor of Engineering (Hon.). The various organisations of the German industry attach great value to his co-operation and the results of his endeavours with these organisations have proved how correct have been his principles. Dr. Klein has spent many years in business in Manchester.

THE COUNCIL FOR RESEARCH on Housing Construction, of which Lord Dudley is the chairman, has issued a first report on slum clearance and the rehousing of slum and overcrowded populations. The council is a body of individuals acting in their personal capacities and not as representatives of other bodies, and the views in the report are set out as "the results of a conscientious and co-ordinated study by a body of individuals, severally experienced in some part or other of the housing field, and united by a common desire to assist in fulfilling the nation's housing needs." Mr. C. J. Kavanagh is the director of the activities of the council, and its members include Dr. W. H. Coates and Lord Melchett (Imperial Chemical Industries, Ltd.), and Sir David Milne-Watson, governor of the Gas Light and Coke Co. Other representatives of the chemical and allied industries are Major L. J. Barley and Mr. A. R. Gregory (Imperial Chemical Industries, Ltd.), members of the economic and finance committee, and Mr. A. H. Douglas and Major V. Lefebure (Imperial Chemical Industries, Ltd.), Dr. J. H. Paterson (Murex Welding Processes, Ltd.), and Mr. R. F. Stuart (Davey, Paxman and Co., Colchester, Ltd.), members of the various technical panels.

New Companies Registered

C. T. Bowring & Co. (Fish Oils), Ltd., 20 Castle Street, Liverpool.—Registered as a "private" company on June 29. Nominal capital £100,000. The objects are to adopt an agreement with C. T. Bowring & Co., Ltd., and to carry on the business of manufacturers and refiners of and dealers in fish oils, referred to in the said agreement and that of manufacturers of and dealers in oils, tallows, greases and fats, chemists, druggists, etc. Directors: Sir Edgar R. Bowring, Clive Bowring, Frederick C. Bowring, Robert M. Johnston.

Ciba, Ltd., 40 Southwark Street, S.E.1.—Registered as a "private" company on June 22. Nominal capital £50,000 in £1 shares. To acquire and carry on as a going concern the pharmaceutical department of the Clayton Aniline Co., Ltd. (except as mentioned in an agreement with that company) and also to acquire the appointment as sole concessionaires for the sale and the adopting for sale and distribution of pharmaceutical products manufactured by the Society of Chemical Industry in Basle, Switzerland in the United Kingdom of Great Britain and Ireland and the Isle of Man and South Africa, etc. Directors: Jas. Brodbeck, Alfred E. Peak, Thos. Fraser M. Smart, John J. Brodbeck.

The Magnesium Metal Corporation, Ltd., 95 Gresham Street, London, E.C.4.—Registered as a "public" company on June 18. Nominal capital £50,000 in £1 shares. To acquire, produce, manufacture, deal in and turn to account magnesium in all its forms (including compounds and alloys) and in all metals, minerals or substances employed in connection with the manufacture, production or fabrication of magnesium, etc.

Company News

Electrolytic Zinc Co.—An ordinary dividend of 4 per cent. is announced, payable on September 7.

Distillers Co.—The directors have declared a final dividend on the ordinary shares of 12½ per cent., making 20 per cent. for the past year, against 17½ per cent. for 1932-33.

Phoenix Oil Products, Ltd.—The net profit in 1933 amounted to £55,134, against £54,517 in 1932, and after deducting £48,000 in respect of dividends on the preference shares, £10,434 is applied in writing off the remainder of preliminary expenses.

Morgan Crucible Co.—The statutory report states that the total received in respect of shares issued wholly for cash is £1,115,966. The estimate of preliminary expenses amounts to £14,376.

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 the following tenders for supplies required during the period November 1, 1934, to October 31, 1935, tenders due at the Indian Stores Department, Miscellaneous Section, Simla, on the dates mentioned: Alumina ferric and sulphate of alumina (July 24), (Ref. 21218/1934); ammonium chloride and salamoniac (July 17), (Ref. 21217/1934); calcium carbide (July 16), (Ref. 21212/1934); disinfecting fluids (July 10), (Ref. 21211/1934); nitric, hydrochloric and sulphuric acids (July 18), (Ref. 21210/1934).

Jamaica.—A newly-established commission agent in Kingston desires to obtain the representation of United Kingdom manufacturers of epsom salts, glauber salts and petroleum jelly, on a commission basis for Jamaica. (Ref. No. 3.)

Northern Ireland.—A firm of merchants and agents dealing in oils, chemicals, etc., in Belfast, desire to secure the representation of United Kingdom manufacturers of mineral acids. (Ref. No. 11.)

South Africa.—A manufacturers' agent in Cape Town, who covers the whole of South Africa, desires to secure the representation of United Kingdom manufacturers of solid tanning extracts on a basis to be arranged. (Ref. No. 17.)

New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to July 27, 1934.

Chlorotex. 551,102. Class 1. Chemical substances for use as reagents in philosophical research. The British Drug Houses, Ltd., 16 to 30 Graham Street, City Road, London, N.1. May 15, 1934.

Maxoclor. 550,437. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. Imperial Chemical Industries, Ltd., Imperial Chemical House, Millbank, London, S.W.1. April 17, 1934.