The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXI. November 24, 1934 No. 804

Notes and Comments

An Unqualified Success

SIR RICHARD REDMAYNE'S impartial investigation into the experimental working of the five-day week established, without reduction of wages, by Boots Pure Drug Co., Ltd., in the company's offices and works at Nottingham, has confirmed the advantages of the system which has been in operation in the offices of THE CHEMICAL AGE from the inception of this journal. We have always had the benefit of the five-day week at Bouverie House, and we are glad to find that the 5,000 to 6,000 employees of Boots Pure Drug Co., Ltd., at Nottingham are to enjoy similar privileges indefinitely, if not altogether permanently. The investigation upon which Sir Richard Redmayne has reported was carried out under the direction of the Ministry of Labour, at the request of Lord Trent. In the main works at Nottingham and Beeston the hours of work were reduced from 47½ to 42½ (five days of 8½ hours each); in the offices the hours of work were made 38⅓ instead of 42 5-6. In the shop-fitting department (employing 458 men and eight females, where the workmen were receiving 1½d. an hour above the standard rates of the district) hours of work were reduced from 44 to 42½; in the warehouse departments with 170 workpeople and the printing department with 630 workpeople, the reduction of working time was 2½ hours a week. Sir Richard Redmayne refers to the scheme of rationalisation completed by the company in 1932, when a new factory was opened at Beeston, and says that by the spring of this year the improvement in production was so marked that three courses had to be considered—(1) reduction of staff; (2) immediate enhancement of sales; (3) reduction of working hours. The first course was felt to be undesirable, the second impracticable, and the third was chosen. Sir Richard Redmayne draws attention to the nature of the company's business, which is largely self-contained inasmuch as it makes and distributes its own produce, and to the comparatively small percentage that labour cost bears to total cost of production.

In his conclusions Sir Richard Redmayne says that the working of the five-day week has proved an unqualified success both from the business point of view and from that of the employees. Cost in the aggregate has not been enhanced, and a higher efficiency on the part of the employees has been attained. The effects in regard to enhancement of health and contentment, regularity of attendance at work, and diminution of absenteeism have been very marked. 'Had the working hours not been reduced it would have been necessary to have dispensed with a number of workers. Sir Richard Redmayne adds that it is difficult to say how far the experiment is capable of being applied to other industrial concerns, because the firm of Boots has the advantage of being distributors of the commodities they produce. His opinion is that the experiment might be applied at many works—a large printing works, for instance; and certainly at works where production and distribution are vested in the same concern and where wages do not constitute a high proportion of the selling price. But each case would have to be considered on its merits.

Overseas Chemical Trade

IMPORTS of chemicals, drugs, dyes and colours into Great Britain are increasing more rapidly than exports. That, in short, is the conclusion to be derived from a perusal of the Board of Trade returns for October, summarised in page 473 of this issue. The returns show an increase of a little over 8 per cent. in exports in the chemical group over the corresponding month of 1933 (a total of £1,798,007 against £1,661,670), and an increase of over 10 per cent. in imports for the same period (a total of £1,056,300 against £957,895). Re-exports, at £51,912, showed an increase of a little over 7 per cent. over the £48,270 of the corresponding month of last year.

Taking a longer view of the situation and comparing the aggregates for the ten months ended October 31, 1934, with the corresponding period of the two preceding years, we find the same tendency of imports to overtake exports. Exports are up by 6½ per cent. on 1933, and by 5½ per cent. on 1932 (£16,273,824 in 1934; £15,291,300 in 1933; and £15,430,065 in 1932). Imports showed an increase of just under 18 per cent. on the 1933 figures, and a fraction over 18 per cent. cent. increase on the imports for the ten months to October, 1932 (£9,495,545 in 1934; £8,049,195 in 1933; and £8,045,555 in 1932). Thus the margin between the total exports and total imports is getting less each year. Total exports to date in 1934, at £16,273,824, compare with total imports of £9,495,545, a difference of £6,778,279. Twelve months ago the relative figures were: Exports, £15,291,300; imports, £8,049,195; difference between exports and imports, £7,242,105. In the previous year (ten months to October) the figures were: Exports, £15,430,065; imports, £8,045,555; difference between exports and imports, £7,384,510. These latter calculations do not take into account the

re-exports, which vary considerably not only from month to month, but from year to year. Thus the total re-exports to date this year amount to £734,503, or something over 32 per cent. less than the ten months' total of £1,089,579 for 1933. Compared with two years ago there is an increase of 51 per cent., the re-exports for the ten months ended October, 1932, having reached only £483,867.

Bogus Degrees

THE Association of Scientific Workers is said to be desirous of promoting another Bill this session to stop the spurious degree ramp. Many there are who question the value of a degree. It is true that the employee is judged by his work and not by his paper qualifications, but at least to prospective employees the possession of a genuine degree is equivalent to a testimonial of real value since it is a guarantee to the employer that the candidate has followed a prescribed course of training and has shown sufficient intelligence to answer an examination paper of some difficulty upon the subject-matter of his course. Whether the knowledge has " stuck " is another matter. There are many University graduates in middle age who would find it difficult to pass even the intermediate examination without prior study. That is the common failing of many of us, but at least the degree man may be expected to know what knowledge exists and where he may find it, and may be expected to have training and intelligence. A degree, and particularly a Doctorate, is of inestimable value to a consultant as it is a guarantee that he is fitted to advise, whereas the non-degree man may be a complete ignoramus on the subject.

There is, of course, a contrary view, as is shown by some exceptions to the position just stated. Nevertheless, the fact is that a University degree carries weight, and that that weight is lost if unqualified persons are allowed to assume degrees for which they have no title. It happens that certain foreign " Universities " assume to themselves the right to present Doctorates on payment of a fee and without examination. In some of the less reputable bodies Doctorates are thickly plastered—for the most part quite genuine so far as paper qualifications are concerned, but of absolutely no justification as a criterion of real qualifications. It is a difficult matter to stop this bogus doctorate business, but the Association of Scientific Workers is doing its best. The Bill promoted last year to this end passed the second reading in the House of Lords, but was withdrawn owing to the failure to arrive at complete agreement with the Standing Committee of University Vice-Chancellors and Principals. That body has not, as expected, brought forward a Bill itself and the Association, feeling that the interests of graduates cannot wait indefinitely, may attack the problem from a more limited angle. It is to be hoped that the two bodies will arrive at an agreement because the bogus degree ramp is quite serious.

Economic Nationalism in Germany

IT is evident from the formation of the Lignite Petrol Company in Germany, to which we made reference in these columns last week, that the powers that be have decided that the country is to be made independent of the outside world for motor spirit, and are pressing on with their scheme for hydrogenation of brown coal. Since home production of petrol by this means is no more economic in Germany than in this country a subsidy is to be paid, with consequent inflated home prices. Under certain circumstances this would be excusable; but the dangerous part of the proceeding lies in the means adopted to put the scheme into effect. This is nothing less than the autocractic commandeering of an industry under conditions such that the Government directs and orders the business, which is under the sole control of a Government official with no previous experience either of brown coal mining or the chemical industry, whilst any losses that may be made as the result of normal occurrences or of the Government director's errors, or for any cause whatever, must be borne by the unfortunate shareholders. A commissioner with sole power over any industry in a capitalist country wherein no other industry is similarly controlled is a novelty, described by the Berlin correspondent of " The Times " as " the most serious threat to the independence of the German industrialist that the regime has yet ventured on."

That the politicians can obtain in any country sufficient power to coerce the men who understand industry to operate their businesses in such a way as to bring them to ruin under ordinary conditions, sets a dangerous precedent that is liable to be followed by irresponsible politicians in other countries. It is a new and disquieting phase of the exaggerating policy of economic nationalism. The cause for these measures is clear from the fact that the petrol-from-coal factories are to be situated in Central Germany, the choice of the site being influenced by the same considerations as those which are making leading firms in the heavy industry set up branch factories in regions such as Central Saxony—*i.e.*, the strategical reasons of war. The signs of the times are full of troubles and difficulties but the difficulties are not insurmountable to those who make a conscious effort.

The Works Nurse

THE direct cost of ill-health due to accidents, industrial diseases, and incapacitating sickness amongst the insured population of Great Britain is said to amount to about £18,000,000 annually. Simultaneously there is a loss of working time which exceeds 500,000 man-years. In industry, however, it is not fully recognised that a large proportion of this ill-health can be prevented by the services of an efficient works nurse, although in cases where the number of employees exceeds 500 the law definitely calls for a qualified nurse to be placed in charge of the ambulance room. Such a nurse should treat all injuries, however slight, and she may find herself fully occupied in attending to many minor ailments as well as accidents. She may also carry out dressings and massage under the directions of the home doctor, and so shorten the period of convalescence for employees. In addition to expert medical advice, she should have direct access to the works manager, who should instruct all departmental heads to support her authority. Where she is adopted, she must be properly equipped or the results of her work will never be fully realised. Even on the lowest grounds of industrial economy a nurse is very essential for a large factory and she proves to be a valuable asset to many smaller works where accidents and ill-health are likely to occur.

Innovations in Cellulose Cooking

By Dipl. Ing. O. Kreiszler and Dipl. Ing. G. Soltau*
Lurgi Gesellschaft für Chemie und Hüttenwesen m.b.H., Frankfort-on-Main

THE cellulose digesting department is generally considered the most important department of a cellulose factory; and with reason, for not only are the most expensive components of the cellulose manufacturing plant, the digesters, housed there but more important still is the process that is carried on there—namely, the sulphite cellulose digestion process proper, which nowadays is carried out in many different ways. Each particular method has its special characteristics. It is well known that no two cellulose factories work on exactly the same lines. The whole of the digestion process is not yet completely understood in its chemical and physical aspects, the reason for this being the fact that neither the actual nature of the structurally complex cellulose fibres, which must be separated from the wood, as far as possible in their primitive form, nor of the lignine to be dissolved out of them, is as yet completely understood. Added to these two constituents, and still further complicating the conception of this organic system, are the accompanying substances which, according to the use to which the cellulose is to be put, are usable or undesirable. It is therefore evident that in the development and introduction of new processes in this field many difficulties have to be overcome and unusual care has to be exercised, but in spite of these complications, the Lurgi Gesellschaft für Chemie und Hüttenwesen m.b.H., with the assistance of the extensive laboratories of its holding company, the Metallgesellschaft A.-G., has evolved a number of promising processes in this particular field.

Mechanical Filling

Mechanical filling of the digesters is, at the present time, very economical. When the first filling apparatus was designed some nine years ago the principal consideration was to make use of the increase in the filling capacity, which amounted to 20-30 per cent., by increasing the production and in so doing avoid the necessity for further outlay on the costly digesters. In more ways than one, the use of mechanical filling systems led to a saving in the production costs of cellulose, since the consumption of steam and sulphur is smaller. This saving is decisive to-day, since the digesters are, in the majority of cases, not working at full capacity, and it is by itself large enough to balance the original outlay on a filling apparatus in less than a year.

The following table shows the saving in steam referred to the quantity of pulp produced, according to the increase in the density of the charge as compared with ordinary, non-mechanical filling.

Increase in Density of the Charge in %.	*Saving in Steam in %.*
10	11.6
15	15.5
20	19.6
25	23.5
30	27.3
35	30.6

An average cellulose factory with an annual output of 20,000 metric tons and a steam consumption of 2.8 metric tons steam per ton of pulp would accordingly save some 40.000 RM (=0.235 × 2.8 × 3 × 20,000) with an increased charge of 25 per cent., putting the price of steam at 3.00 RM per metric ton. In addition to this, there would be a saving in sulphur which, using pyrites, would be some RM 8,000.—, provided that the increased density of the charge is the same.

The Fresk Apparatus

Soon after the Swedish engineer Fresk, who was the first to develop a new method of filling the digesters quite different from the previous practice, by using a powerful current of air to introduce the chips into the digester, there came on the scene another Swede, Svensson, with his steam filling method.

The Fresk apparatus (Figs. 4, 5 and 7), which was gradually improved, is characterised by very uniform distribution, which is indispensable for the production of high-grade cellulose. The increase in density of the charge of the Fresk process as compared with the ordinary methods of filling the digesters is 24-30 per cent. The distribution in the Fresk apparatus is so uniform that in the digesters filled with the aid of this apparatus, pulp is produced, even without forced circulation, which satisfies in all respects the requirements of high-grade cellulose. The power consumption of the Fresk apparatus, frequently the score of objections, amounts annually to some 100,000 kWh for an output of 20,000 metric tons. This costs, at RM 0.032 per kWh, RM 3,200—a sum which is negligible alongside the RM 48,000 saved.

In the beginning, the Svensson apparatus (Fig. 6), which uses steam, did not come up to the output of the Fresk apparatus, but recent designs embody considerable improvements so that the present-day type reaches increased charges of from 30 to 35 per cent. as compared with ordinary non-mechanical hand filling. If forced circulation is employed, digesters filled to this extent by the Svensson apparatus likewise yield a good class pulp, but unless this aid is employed the high density of the charge interferes with the natural circulation of the liquor, so that the pulp produced is unequal.

More recently, the two kinds of mechanical feeders described have been succeeded by the Huntemüller apparatus (Fig. 1). This works not only with a gaseous medium such as air or steam, but possesses a cast steel propeller which hurls the chips downward into the digester. The propeller also sucks in air sideways, thus increasing its centrifugal effect. In this way the apparatus gives remarkably good results.

These three filling processes are to-day considered as the best throughout the world. All three types of plant are sold by the Lurgi Gesellschaft für Chemie und Hüttenwesen m.b.H., Frankfort-on-Main.

Start of the Cooking Process

The filling of the digesters with chips and digesting liquor is followed by the cooking process. This is started by impregnating the chips with liquor. Though little attention was first paid to this operation, the impregnation is nevertheless an important process, which in the past could only be carried out in a more or less satisfactory manner by sacrificing a comparatively long time. Since chemical decomposition practically begins at 105° C. only, the contents of the digester are gradually heated in such a way that the impregnation of the chips is completed at 105° C. This takes from four to eight hours.

The Lurgi Gesellschaft für Chemie und Hüttenwesen m.b.H. have greatly improved this process. In their method of impregnation the digester, filled with the chips and liquor, is as usual tightly closed at the top. The liquor is then drawn off again from the bottom by a pump: as soon as a few cubic metres of liquor are withdrawn, a vacuum of 400-450 mm. Hg is produced in the digester (*i.e.*, a vacuum of 0.5-0.6 kg. per sq. cm.). The air in the pores and capillaries of the chips, which with normal humidity of 18 per cent. consist of 25 per cent. lignine, 66 per cent. air or similar gases and some 9 per cent. moisture, expands due to this vacuum and escapes from the chips, rising through the liquor to the surface. Contrary to the expectation that the expansion of the air would hinder the penetration of the liquor, it proved, surprisingly enough, that the liquor rapidly penetrated into the chips while the vacuum was produced, so that after a short time they became heavier than water, indicating that at least 80 per cent. of the capillaries was filled with liquor.

The liquor can be withdrawn in most cases by the same pumps which filled the digesters with liquor. The vacuum also has the effect of liberating a quantity of SO_2 gases from the liquor into the gas space, and these are eagerly taken up

* Reprinted from the "Periodic Review" of the Metallgesellschaft A.-G., September, 1934.

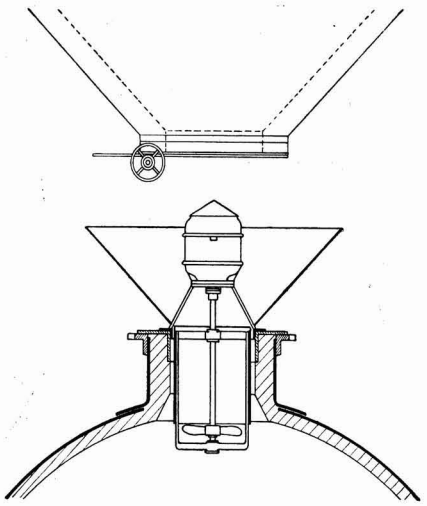


Fig. 1. Digester Filling Apparatus, Huntemuller Type.

by the chips. During the withdrawal of the liquor from the digesters, it is forced through a jet blower into which it sucks the air which collects in the digester above the liquor through a pipe designed for the purpose. This air, which likewise contains SO_2 gases, is conducted from the liquor to the liquor storage vessel, where the SO_2 gases are returned to the liquor, while the air escapes. When all the liquor is withdrawn from the digester, by reversing the pumps the digesters are refilled with the same or else with preheated liquor. The SO_2 gases present in the gas space and further quantities of liquor penetrate into the chips.

In the majority of cases, it proves best in the second filling with liquor to admit 10-15 per cent. less than was otherwise ordinarily necessary, partly because a certain quantity of liquor has already penetrated into the chips, and also partly because it is no longer so dangerous if a few chips remain above the surface of the liquor, as they are already impregnated with liquor. Apart from this, the wood content of the digester has, during heating, settled to such an extent on account of its weight that all the chips are below the surface

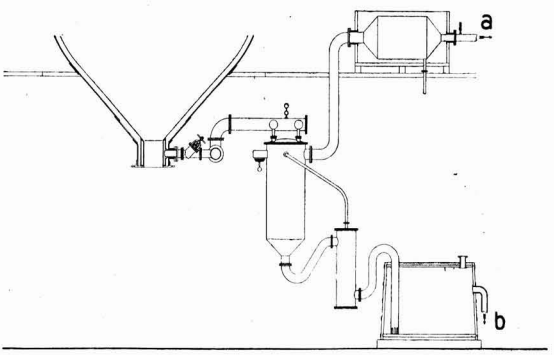


Fig. 2. Degasification of the Waste Liquor. (a) Cooling and Absorption; (b) Degasified Waste Liquor.

when decomposition proper commences. By reducing the quantity of liquor fed, digestion steam and sulphur are economised.

By the time the digester is filled, the chips are completely impregnated. The cooking can now be carried out in the shortest time. Not only can the period of initial cooking up to 105° C. be reduced to about one hour by this impregnation but also the stoppage usually occurring at 105° C. can be avoided, and the rise to the maximum temperature of 130-140° C. can be brought about as rapidly as the boiler plant and the cross-section of the steam pipes will permit. In one Finnish cellulose factory a large number of cookings have been carried out in digesters of 225 cu. m. and the temperature was raised to 135° C. within 3 hours, while without the process it takes about nine hours to reach this temperature: not a sign of black or brown wood was evidenced, which showed that the impregnation was good.

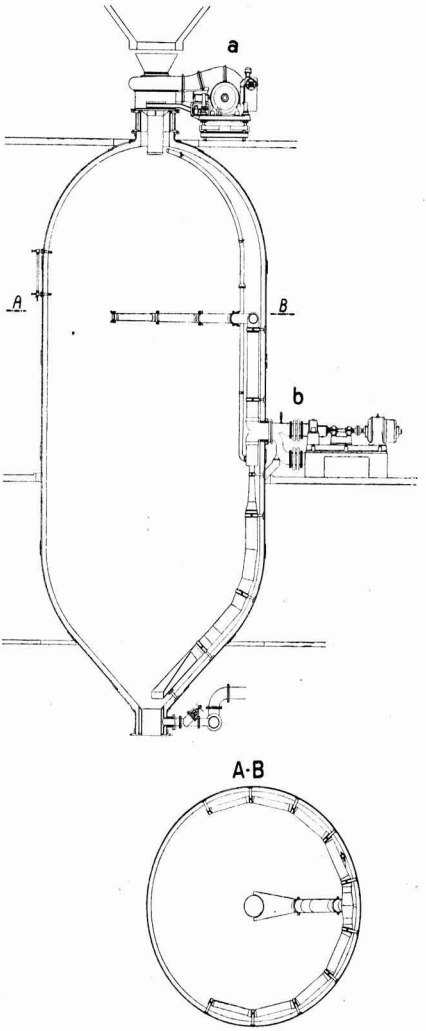


Fig. 3. Digester with Lurgi Equipments. (a) Fresk Digester Filling System; (b) Lurgi Liquor and Gas Circulation Plant.

The principal advantage lies less in the shortening of the cooking period by some 4-6 hours than in the production of an excellent and uniform pulp with an extraordinarily good resistance. With the former cooking processes, only the external fibres of the chips are decomposed at first, while the interior fibres are attacked later after they have gradually become impregnated. This means that the exterior fibres are too strongly attacked and weakened before the interior

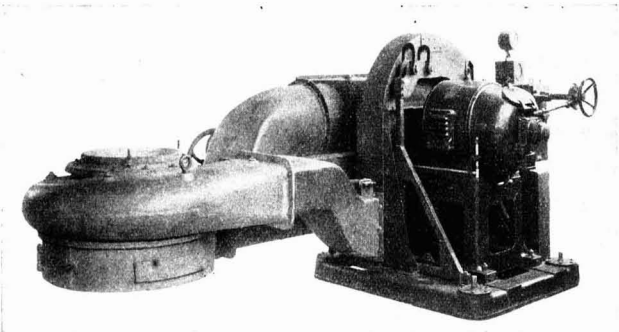


Fig. 4. Fresk Apparatus, Side View.

recent years. The problem was tackled anew from various sides and, after a number of years' research, three processes were evolved: the Brobeck process, the Schauffelberger process, and, finally, the Lurgi cellulose cooking process.

The first two of these processes work with the indirect heating method using a heater. By degrees, the causes of the objectionable crust formation in heaters have been fathomed, so that it is possible to prevent crust formation to some extent, but naturally operations are subject to accidental factors, and, here and there, crusts still form on the heating pipes, giving rise to the necessity for cleaning these and by so doing interrupting the even tenor of working.

The Lurgi Gesellschaft für Chemie und Hüttenwesen m.b.H. therefore set to work to evolve a process which would make it possible to produce pulp of the highest quality simultaneously preserving the initial structure of the fibres and the

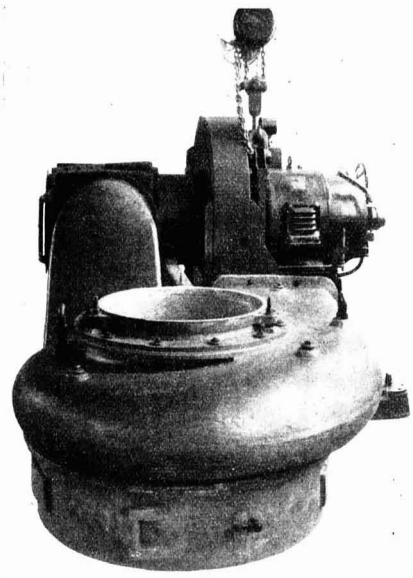


Fig. 5. Fresk Apparatus, Front View.

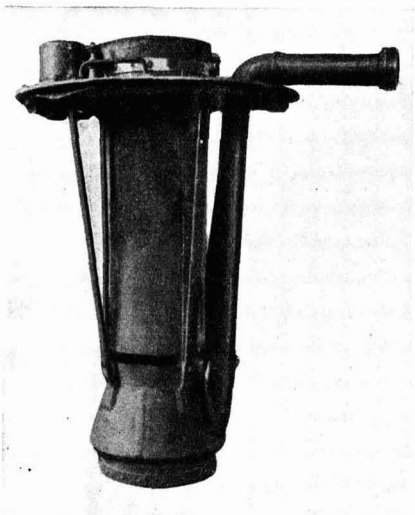


Fig. 6. Svensson Apparatus.

fibres are completely decomposed. On an average the mills obtained pulp consisting of strong and weak fibres with a poor strength.

With the new impregnation process both the interior and exterior fibres are attacked simultaneously and the cooking process is completed for all the fibres at the same time, while their original properties are preserved. This process, which is equally applicable to vertical or horizontal digesters, is protected by patents in all important countries.

A further device which is extensively used in the cellulose industry at the present time is the liquor circulation. The Norwegian, Morterud, interested himself in this problem as far back as twenty years ago. In the sulphate cellulose industry he met with success, but in the sulphate cellulose production he failed owing to the question of materials. This has been solved within

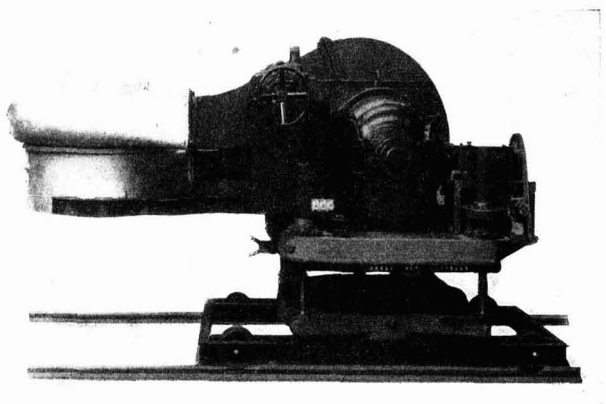


Fig. 7. Fresk Apparatus on Rails.

good yield of wood by the indirect cooking method without employing a heater, that is to say, by means of direct cooking. Their efforts were completely rewarded. Even the first plants have borne out this: the pulp produced by the Lurgi cellulose cooking process by plants in actual use is now recognised as having superior qualities in respect of uniformity, of strength and of colour.

Fig. 3 illustrates the way in which the process operates. An ejector is built into the pressure piping of a liquor-circulating plant embodying the latest improvements such as insulated piping to prevent heat losses in the digester, pumps of sufficient size arranged outside the digester for better accessibility. This ejector by means of the liquor sucks up the gases which collect in the uppermost part of the digester and introduces them into the liquor which is forced into the lower part of the digester. The gases formerly withdrawn from the digester after having escaped from the liquor now enrich the latter continuously, so that the dilution which the latter undergoes due to the condensate is not only done away with, but the liquor is strengthened up even beyond its original concentration. This method gives quite as good results as the indirect cooking where the liquor is not diluted by condensed steam. All parts of the digester are continually fed with excess SO_2 gas. Uniform heat distribution is provided for by the circulation of the liquor. By this means the digestion process can be carried out at all places and times in such a way as to ensure the uniform improved conditions necessary to the desirable results referred to above.

The Lurgi Process

The Lurgi process permits the cooking in presence of a high lime content, for deposits of calcium compounds are not to be feared, as in the other cooking processes, since no heater is used and since also the continuous high concentration of SO_2 in the liquor prevents the formation of calcium deposits and, therefore, their precipitation. The favourable effect of a high lime content on the properties of the material is well known.

It should be emphasised also that the plant for the Lurgi cellulose cooking process is less expensive than that for the other processes since the very costly heater is unnecessary. Of course, if steam of 2-3 kg. per sq. cm. is all that is available, the indirect cooking method cannot be dispensed with. Where this is the case, the Lurgi Gesellschaft für Chemie und Hüttenwesen m.b.H. also supplies heaters.

The waste liquors from the cooking process contain, in addition to the substances eliminated from the wood and fixed in various forms and combinations, 0.5-1.0 per cent. free SO_2 according to the cooking process so long as they are still contained in the digester under a pressure of about 2 kg. per sq. cm. In the majority of cases these quantities of SO_2 are lost: the waste liquors are run off from the digester whereby the SO_2 gases escape, unless the waste liquor is brought into contact with cold water. For every ton of cellulose some 5 cubic metres of waste liquor are produced. If only 0.5 per cent. SO_2 can be recovered from this waste liquor, an average cellulose works with an annual output of 30,000 metric tons economises 750 metric tons SO_2 which corresponds to 375 metric tons of sulphur, or about 10 per cent. of its former consumption of sulphur.

The Lurgi Gesellschaft für Chemie und Hüttenwesen m.b.H. possesses the sole rights of a process by means of which the free SO_2 is eliminated from the waste liquor with a view to re-using it for preparing fresh liquor.

Degasifying the Waste Liquor

A small, compactly designed degasifier receives the waste liquor as it flows under pressure from the digester, as shown in Fig. 2. The liquor is atomised through suitable tuyeres and runs over a sort of cascade in order to separate by continuous dispersion the greatest possible quantity of free sulphur dioxide. These cascades are so arranged that the gases once freed from the liquor cannot come again into contact with it. The gases and vapours are collected in the outer jacket of the degasifier, whence they are discharged. The degasifier waste liquors are passed into a storage tank where they are allowed to stand, the last traces of SO_2 gas being led to the degasifier by a pipe system. The liquor ultimately goes to the distilleries or to the sewer. The mixture of gas and steam is led from the degasifiers into a separator where the greater part of the steam is condensed by controlled cooling and is then discharged. The gases which are left behind are fed to a cooler and are then either mixed with the tower liquor or fed into the liquor tower.

The gas expeller is manufactured in acid-resisting V$_4$A-steel; the other parts such as the separator, cooler and storage tank can be made by the pulp manufacturers themselves. By virtue of this, this very efficient plant is so cheap that its cost can be written off by the saving in sulphur in 8 to 12 months.

The advantages of the processes described gain in importance when they are combined, for each individual process creates the best working conditions for the other or supplements it in some way. The digester space is only fully utilised if it is mechanically filled and if the Lurgi cellulose cooking process is employed. The impregnation method substantially aids the work of the liquor and gas circulation and by combining these two processes special advantages are gained. On the other hand, the enrichment of the liquor due to the liquor and gas circulation entails an intensive degasifying of the waste liquors.

New German Technical Books

Reviewed by Dr. Felix Singer

"Glass and Ceramic Filters in the Laboratory for Filtration, Gas Distribution, Dialysis and Extraction." Glas- und keramische Filter im Laboratorium für Filtration, Gasverteilung, Dialyse, Extraktion), by Dr. Paul H. Prausnitz. Published by the Akademische Vertaggesellschaft m.b.H., Leipzig, 1933.

From an expert on filtration, gas distribution, dialysis and extraction, of the standing and undisputed reputation of Dr. Prausnitz, one would expect something interesting and valuable from the title of this book. Prausnitz has fulfilled these expectations, and has given us a monograph on all questions of laboratory filtration, apart from the use of paper and collodion filters. How extremely important this is for all those interested can be seen from the amount of literature on the subject reviewed by Dr. Prausnitz. Hundreds of scientific and technical publications are referred to and a unified work is made from their critical estimation. The most essential parts of the book are (1) the principles of filtration in the laboratory, (2) description and characteristics of ceramic and glass filters, (3) methods of work in filtration, separation of the phases liquid-solid, (4) methods of work with glass and quartz filters in the treatment of gases, (5) glass filters as diaphragms in liquids, (6) glass filters for extraction. A complementary bibliography, a complete register of names and subjects and a specially interesting list of patents completes this valuable volume. The book is a notable one and can be strongly recommended to every chemist who has to do with filtration questions.

* * *

"Manual of Inorganic Chemistry" (Lehrbuch der Anorganischen Chemie). Professor Dr. Ernst H. Riesenfeld. Published by S. Hirzel, Leipzig, 1934. Price RM.15.

Whilst most manuals of inorganic chemistry (with few exceptions) choose the same arrangement of the material which Thomas Graham used in his "Elements of Chemistry," of about 100 years ago, Dr. Riesenfeld consciously sets himself above this and uses the periodic system of the elements as the basis for the construction of his manual, whilst this was formerly the culminating point. The author begins with water and its elements, and goes on immediately to a discussion of the periodic system of the elements. The weight is laid on comprehensive views. Therefore a comparative survey of their properties is placed before every group of elements. As he does not discuss chemical-technological processes at all and only deals with analytical questions comparatively shortly, the author is enabled to consider specially just the fields in which the greatest progress has been made in late years, and which offer the very best starting points for new investigations. Special attention is given to atomic chemistry, the theory of isomorphism and the relations between atomic structure and chemical linkage. The manual is principally for students. It also, however, will serve the chemist and technician who, on account of their work, have little time to follow regularly the progress of inorganic chemistry as an indication to the present state of science.

Accountancy for the Small Manufacturer

System to Facilitate the Determination of Manufacturing Costs and Selling Prices

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

THE growth in the demand for chemical products, side by side with recent developments in engineering, calls for the institution and maintenance of accounting methods which will enable the small manufacturer to prepare reliable trading accounts, profit and loss accounts, and balance sheets, and to arrive at manufacturing costs and selling prices. The success of any manufacturing business depends to a large extent on the efficiency of the accounting and costing system set up, and it cannot be too strongly emphasised that the chemical manufacturer who refrains from adopting suitable methods of internal check and control, by reason of the expense involved, will sooner or later find himself at a serious disadvantage in relation to competitors who are in a position to compile proper accounts and statistics.

The Order Book

Demands for chemical products of both standard and special design are reflected in the manufacturer's order book, and consequently the creation of a sustained demand is a problem calling for constant and scientific treatment. In these days of competition the manufacturer should adopt only those methods of advertising and publicity which have proved to be consistent business pullers, and in this connection it cannot be disputed that the reiterated message designed to meet the eye of the customer and the potential buyer, brings definite and more permanent results. A special book should be kept for recording the orders received, and each entry should give the date, the customer's name and address, a detailed description of the products required, and the rate or price of each kind. Columns or sections should also be provided for the insertion of the date of supply or despatch, and for any remarks or special observations, while it is advisable to reserve space for showing the sales book or day book folio. When an order has been completed the transaction will automatically pass into the category of sales, and if the buyer has been allowed a period of credit an entry will have to be made in the sales book from where the selling price will be posted direct to the personal account opened in the sales or customers' ledger. If no analysis of the sales is considered necessary or desirable, the monthly or other periodical totals of the sales book may be transferred to the credit side of a general sales account kept in the impersonal ledger, but if the manufacturer wishes to ascertain the amount of gross profit realised under two or more headings it will be much more convenient to use an analytical sales book which has been provided by the printers with a sufficient number of extra money columns to enable each transaction to be properly classified at the time of making the original entry.

Cash and Discount

Amounts of cash received from credit customers will be entered on the debit side of the manufacturer's general cash book, giving the date and the name of the sender, and will be posted direct to the credit side of the respective personal accounts. If any discount has been allowed the amount deducted should be recorded in a "discount" column specially ruled on the debit or receipts side of the cash book. Both cash and discount must be credited to the personal account, while the monthly totals of the "discount" column of the cash book will be transferred to the debit side of a discount account, the final balance of which will be transferred to profit and loss. Debtors' accounts should be constantly examined, and should not be permitted to run on month after month, but should be collected as rapidly as possible to avoid locking up an excessive amount of working capital in the form of book debts. Generally speaking, an effective control can be exercised by making out a list of sales ledger balances at the close of each month's work, and by comparing the various items with those outstanding at the end of the previous month.

The arrival of raw materials, stores, and other trade purchases, should be booked in the receiving department, the details enumerated on the advice notes being carefully compared and ticked off with the original specifications, as shown on the carbon copies of the orders retained. Directly the materials have been transferred to their allotted places, and the invoices have been checked and passed for payment, the transactions can be recorded in the purchases journal, or bought day book, each entry giving the date, the rotation number of the invoice or other debiting document, and the name of the supplier or purchasing agent. By using a book ruled with several cash columns, the purchases may be classified under specific heads, the monthly totals of each column being debited to a separate goods or stock account, while the invoiced prices are credited to the personal accounts kept in the purchases or bought ledger. Materials returned by the manufacturer, including all allowances made by suppliers in lieu of actual returns, may be entered at the end of the purchases book, where a few pages can usually be reserved for that purpose, the amount shown on each credit note being debited against the particular personal account, and the monthly totals either credited to the different goods or stock accounts, or deducted from the corresponding monthly totals of the purchases before the latter are debited in the ledger. Items of cash paid by the manufacturer in settlement or part settlement of creditors' accounts will be shown on the credit side of the general cash book, or in a cash payments book, from where they should be posted to the debit side of the personal ledger, all discounts obtained being enumerated in a "discount" column of the cash book.

Prime Cost

The cost of any job, contract, or manufacturing operation will consist of the outlay in the form of a variety of materials and stores, the wages paid to engineers, chemists, charge hands, and technical and other assistants, and all the expenses and business charges incurred in production, all of which will have to be covered before any real profit can be made. The term "prime cost" has reference to the cost of materials, labour, and such direct expenses as foremen's wages, the salaries paid out to inspectors and superintendents, the rent of the workshops, depreciation of machinery, plant, and other profit-earning equipment, and the expenditure involved in the maintenance of tools and trade appliances. In order to maintain continuity in the workshops, the stocks of materials and essential stores should always be in excess of the minimum quantities which experience has proved to be advisable to carry under each heading, and this can be ensured by keeping a stock order book in which the essential information will be recorded. These records should include the date, the name of the engineer, manager, or department requiring the stock, a description of the goods needed at the moment, and the name of the person authorising the order, while columns could also be provided for the insertion of the date on which each order was actually placed, particulars of the stock ordered, including the quantity, weight or number, the order number, the date of arrival, and a reference to the general condition of the stock upon arrival. Directly an order has been sanctioned, the official order form will be made out and forwarded to the supplier or agent, and it is a good practice to use a manifold order book for this purpose, each order being made out in triplicate. The person in charge of the stores should be provided with stock cards to be attached to the different drawers, shelves, boxes, etc., thereby facilitating the recording of everything received and issued, and the determination of the quantities on hand. All material required for the execution of an order should be requisitioned on forms stating the product to be manufactured, the customer's name, the cost, and in some instances the parts, accessories, or components, or the drawing and pattern numbers.

As the largest item in the cost statistics will probably fall under the heading of labour, it is necessary that a good system should be set up for organising, controlling and recording wages paid out. Broadly speaking, the wages may be divided into day-work wages and piece-work wages, these two kinds of operations being subjected to a different internal control. Workers paid on the basis of a straight hourly rate should be provided with cards on which to enter details of the operations performed on each day of the week, these cards being initialled by the foreman or charge hand, whose records will be passed on to the office for purposes of comparison before the wages sheets are prepared. The particulars to be shown on the wages sheets will consist of the number and name of each worker, the hours worked each day, the total hours worked during the week, the rate of pay, the gross wages, the various stoppages and deductions, and the sum payable, and these particulars should correspond with the time sheets kept by the foreman, charge hand, or works clerk. Workers paid at a straight piece rate should register the time at which they commenced and ceased work each day, preferably by means of a time clock or recorder, and the cards on which these records are made should be quite distinct from those used by day workers. Piece workers' cards will have to be passed on to the progress office in order that the items may be properly allocated against the different jobs, operations and contracts, and when this analytical work has been independently checked, the wages sheets can be prepared, and the details entered in the wages book. If the amounts payable to the workpeople are entered in a simple wages book, a summary should be made out every week, showing the totals paid out under the different headings, so that suitable cost accounts can be compiled, and to avoid the need for re-writing the names and numbers every week, the other columns should be repeated to cover as long a period as the size of the book will allow.

In order to ascertain the total cost of any contract, the fixed charges, or "on-cost," will have to be added to the prime cost, including all office expenses, selling expenses, travelling expenses, commissions paid to representatives and agents, etc., the salaries of sales engineers, draughtsmen, counter salesmen, storekeepers, and assistants engaged in research work. Provision for on-cost is usually made in the costs by means of a percentage addition to the prime cost, the percentage being determined by reference to the figures shown in the last trading or profit and loss account.

Before the final accounts and balance sheet can be drawn up, it will be necessary to assess the value of the stock on hand and work in progress as at the balancing date, and to compute the depreciation to be written off the book values of the productive equipment. The stocktaking work should be apportioned by allocating one person to call out the quantities and descriptions of the materials and stores in each workshop, room, or store, these particulars being set down on suitably ruled and printed stock sheets by another person. Responsibility for accurate pricing out of the numerous items will be on the shoulders of the buyer or manager, and all calculations, additions and extensions should be independently checked by persons who have taken no part in the actual count. The work performed by each person should be signed for, the sheets as a whole being signed by the proprietor, the partners, or the directors, as the case may be. Care must be exercised to ensure that the credit side of the trading account

---

Trial Balance, September 30, 1934.

	Debit.	Credit.
Capital		3,000 . .
Drawings	260 . .	
Machinery and Plant	1,750 . .	
Fixtures and Fittings	500 . .	
Loose Tools and Appliances	325 . .	
Goodwill	500 . .	
Stock, as at September 30, 1933	871 17 6	
Bank		555 7 .
Cash in Hand	56 19 4	
Bills Payable		150 . .
Purchases, less Returns, etc.	5,113 11 8	
Sales, less Returns, etc.		7,612 12 2
Wages—Productive	1,175 10 6	
do. —Unproductive	318 19 9	
Carriage Inwards	42 8 3	
do. Outwards	66 16 8	
Discounts		179 5 1
Salaries and Office Expenses	315 10 .	
Bad Debts	4 7 9	
Rent, Rates and Taxes	183 11 2	
Gas, Water and Electricity	96 17 3	
Advertising and Insurances	105 12 6	
Postages and Stationery	21 8 11	
Travelling Expenses and Commission	77 7 5	
Income from Investments		196 15 3
Sundry Trade Expenses	33 3 7	
Sales Ledger Balances	365 19 5	
Purchases Ledger Balances		491 2 2
	£12,185 1 8	£12,185 1 8

Accrued Expenses, September 30, 1934.

Wages—Unproductive	£5 16 8
Carriage Outwards	1 16 6
Salaries and Office Expenses	11 7 2
Gas, Water and Electricity	9 16 3
Travelling Expenses	8 8 0
Sundry Trade Expenses	13 7 8
Total	£50 12 3

Advance Payments, September 30, 1934.

Rates	£21 5 9
Insurances	5 5 0
Total	£26 10 9

Trading and Profit and Loss Account.

Year ended September 30, 1934.

Debit.		Credit	
To Stock, as at September 30, 1933	871 17 6	By Sales during Year, less returns and allowances	7,612 12 2
„ Purchases during Year, less returns and allowances	5,113 11 8	„ Stock, as at September 30, 1934	1,023 4 5
„ Productive Wages	1,175 10 6		
„ Carriage Inwards	42 8 3		
„ Balance carried down	1,432 8 8		
	£8,635 16 7		£8,635 16 7
To Wages—Unproductive	324 16 5	By Balance brought down	1,432 8 8
„ Carriage Outwards	68 13 2	„ Discounts	179 5 1
„ Salaries and Office Expenses	326 17 2	„ Income from Investments	196 15 3
„ Bad Debts	4 7 9		
„ Rent, Rates and Taxes	162 5 5		
„ Gas, Water and Electricity	106 13 6		
„ Advertising and Insurances	100 7 6		
„ Postages and Stationery	21 8 11		
„ Travelling Expenses and Commission	85 15 5		
„ Depreciation, viz.:— Machinery and Plant £175 0 0 Fixtures and Fittings 75 0 0	250 . .		
„ Sundry Trade Expenses	46 11 3		
„ Balance, being Net Profit for Year	310 12 6		
	£1,808 9 .		£1,808 9 .

Balance Sheet, September 30, 1934.

Liabilities.		Assets.	
Amount due to Bankers	555 7 .	Cash in hand	56 19 4
Bills Payable	150 . .	Stock	1,023 4 5
Sundry Creditors	491 2 2	Sundry Debtors	365 19 5
Accrued Expenses	50 12 3	Machinery and Plant, less depreciation written off	1,575 . .
Capital, viz.:— Balance as at Sept. 30, 1933 £3,000 0 0 Less Drawings 260 0 0		Fixtures and Fittings, less depreciation written off	425 . .
£2,740 0 0		Loose Tools and Appliances	325 . .
Add Net Profit for Year 310 12 6		Goodwill	500 . .
	3,050 12 6	Advance Payments	26 10
	£4,297 13 11		£4,297 13 11

is not inflated, as would be the case if any assets—such as filters, pumps, mixers, or chemical and scientific apparatus, etc.—are included in the stock. Chemical products which have actually been sold and entered in the day book during the period under review, but which are still on the manufacturer's premises at the time of taking stock, should be excluded from the sheets.

In the matter of depreciation of wasting assets, the essential requirement is that an adequate sum should be written off each year, and included in the manufacturing costs, to cover shrinkage in value arising from wear and tear, obsolescence, or effluxion of time. There are, however, several methods whereby this can be effected. For example, an equal proportion of the first or original capital cost of requisition and installation may be written off each year and charged against the profits, so that at the termination of a definite period—known or estimated to represent the service or useful life—the asset account will show a balance roughly equivalent to the realisable or break-up value.

By carrying out the essential principle of modern double-entry book-keeping, *viz.*, that for every entry made on the debit side of one book or account there exists a corresponding entry on the credit side of another book or account, it is not difficult to verify the clerical accuracy of the entire records at the close of the year or half-year. All outstanding debit and credit balances in the complete set of books can be summarised in the form of a trial balance which will form the basis for the preparation of the final accounts and balance sheet exhibiting a true and correct view of the manufacturer's financial position in relation to the business and to the outside world. Providing no errors have been made in postings or additions, the debit and credit totals of the trial balance will correspond with each other, and after making provision for any accrued expenses, and for payments made in advance, or which cover a period extending beyond the stocktaking date, the amount of net profit actually realised can be ascertained. To arrive at the balance of gross profit does not necessitate the drawing up of a trial balance, this figure being found by adding the net invoiced cost price of all the trade purchases to the opening stock figure, and by deducting this total from the net sales plus closing stocks, and for purposes of comparison and control it is advisible to show the percentage relation of each item to the turnover. Percentages should also be inserted against the items appearing in the periodical profit and loss account, all material variations being subjected to careful investigation for the purpose of effecting economies, where this is possible without disturbing the customary efficiency of production, sales or servicing.

To indicate the correct methods of drafting the final accounts, a specimen trial balance, or summary of outstanding ledger balances is given in the preceding page, together with a list of accrued expenses and advance payments as apportioned at the stocktaking date. The value of the stocks and work in progress at the end of the year has been assessed at £1,023 4s. 5d. (all figures are purely hypothetical for purposes of illustration only), and it has been assumed that after subjecting the machinery and plant to a 10 per cent. deduction to cover depreciation, and the fixtures and fittings to a deduction of 15 per cent., the balance of net profit is to be added to the manufacturer's capital and retained in the business. The final accounts would be drafted in the manner indicated in the right-hand column in the preceding page.

Low Lustre Finishes on Rayon Fabrics

The Necessity for Improved Methods

ABOUT two years ago it was suggested by fashion experts that the public had begun to tire of dull rayon and that in the near future there would be a return to the use of high lustre rayon in fabric and dress materials. There was little truth in this suggestion, for at the present time the public appears to be more satisfied than ever with textile materials which have a lustreless matt appearance. There is thus an increased demand for dull rayon yarn as produced by the manufacturer, and an increased pressure upon the dyer and finisher to improve his methods for reducing the lustre of rayon goods made from bright yarns.

It is by no means an easy task to "dull finish" bright rayon fabrics satisfactorily, and it might be anticipated that most finishers regard the use of dull rayon yarns (delustring of the resulting fabric is then unnecessary) as being the best solution of this difficult problem. Unfortunately, however, the low-lustre yarns now available are not so amenable to dyeing and finishing processes as the bright yarns, and one has met rayon garment manufacturers who assert that fabric made from dull rayon yarn is less durable than that made from bright yarn and afterwards dulled. It is therefore quite evident that there is a need for improved methods of producing rayon dress materials having a dull appearance.

Formerly, dull rayon yarns were made by the addition to the viscose of a hydrocarbon having a high boiling point, water-white high viscosity paraffin oil being useful for this purpose. Owing to the intimate dispersion of the oil within the cellulose constituting the resulting viscose rayon this oil could not be removed by repeated washing so that the yarn had a permanent low lustre. Dulesco was a type of rayon made after this manner. But by use of oil alone it was impossible to secure satisfactorily a yarn having so small a degree of lustre as that now in demand and for this reason attention was drawn to the possibility of incorporating white inorganic pigments in the rayon and thus obtaining a full matt appearance. To-day, matt yarns of both viscose and cellulose acetate are being produced such that their low lustre is due to a small content of titanium oxide (TiO_2). By using these matt rayon yarns it is possible to knit or weave fabrics having but a very small amount of lustre, but, unfortunately, it is found in the wet processing of such fabric that it is particularly susceptible to creasing. Many woven fabrics and nearly all knitted fabrics must be dyed in rope form, and with the dull rayon yarn materials there is a definite tendency for the rope creases to become permanently "set" so that they cannot be removed in the subsequent finishing; they must therefore remain as a defect in the finished fabric. Bright rayon yarn materials are not so liable to this defect.

As an alternative to the use of these creasable dull rayon yarns it may be left to the dyer and finisher to reduce the lustre of bright rayon fabrics. Many methods have been tried but of these only two have been found really serviceable. In the first, the rayon material is impregnated with a barium salt and then treated with a solution of sulphuric acid or Glaubers salt whereby opaque insoluble barium sulphate is precipitated within the rayon fibres. Lately it has been suggested that better results can be obtained by using barium tungstate instead of sulphate. The second dulling method consists of impregnating the rayon material with an emulsion or suspension of a finely divided china clay or similar white inert pigment. The china clay may also be mixed with titanium oxide (this has a high refractive index) for the purpose of increasing its effectiveness. The barium sulphate method does not lend itself easily to the production of even delustring and the presence of barium sulphate crystals within the rayon decreases its durability. The china clay method is easy to carry out but the rayon material regains its original high lustre as soon as it is washed for there is nothing to fix the clay within the fabric. It is thus evident that neither of these delustring processes is quite satisfactory.

It is not forgotten that cellulose acetate rayon fabrics can be fully delustred by simple boiling in a strong soap liquor containing a swelling agent such as phenol, but there is a disadvantage in this, since the lustre of the fabric is readily restored by hot ironing or pressing. In reviewing all the facts connected with the production of matt woven and knitted rayon materials it appears that there is no immediate likelihood of discovering improved methods by which the dyer or finisher can delustre bright rayon goods. The conclusion reached is that further progress must be made by the rayon manufacturer. He should modify his dulling methods so that the yarn no longer has a high susceptibility to creasing.

The Manufacture of Emulsions

A Study of the Principal Factors Involved

A STUDY of emulsions, from the point of view of the technician who may be called upon to manufacture products in that form, was presented in a paper which Mr. F. A. Cooper read before the Graduates and Students Section of the Institution of Chemical Engineers on November 7.

An emulsion is defined as a system containing two liquid phases, one of which is dispersed as globules in the other. It is usual to speak of the phase which is broken up as the disperse or internal phase, and the other liquid as the continuous or external phase. This definition, however, does not cover all the systems commonly spoken of as emulsions. By mixing two emulsions, it is possible to obtain a system containing two liquid phases broken up in a third; this is usually referred to as a three-phase emulsion. The size of the globules may vary from colloidal dimensions to those easily visible by the naked eye. Most artificially-prepared emulsions contain globules of the order of 0.1 to 50 micra.

By dissolving a third substance of a colloidal nature in one of the two phases, it is possible to prepare emulsions of almost any concentration. Such concentrated emulsions may consist of oil dispersed in water, or water in oil; these are known as the two emulsion types, and the change from one type to the other is known as inversion.

Emulsifying Agents

The type of a stable emulsion seems to depend in the first place on the emulsifying agent used. Those commonly used for the preparation of oil-in-water emulsions are soaps of monovalent metals, casein and other proteins, glues, gelatin, egg-yolk, saponin, gums and milk-powder. Industrially, on account of their low cost, rosin and other soaps, casein and glue are the most used. Finely-divided solids which have been used experimentally are the basic sulphates of iron, copper, nickel, zinc and aluminium, lead arsenate, kieselguhr and colloidal clays. Water-in-oil emulsions can be made, using the soaps of di- or trivalent metals or finely-divided carbon black; powdered zinc hydroxide, aluminium hydroxide and lead oxide have also been used.

If two emulsifying agents be used, each of which promotes one type of emulsion, by varying the ratio of their concentrations, it is often possible to obtain either type of emulsion or no emulsion at all. The same effect may be observed when, to an existing emulsion, an electrolyte which promotes the opposite type is added in different concentrations. Indeed, Parsons and Wilson, when adding magnesium or ferrous salts to an emulsion stabilised with sodium oleate, found that the important factor was the ratio of the equivalents of magnesium or iron to the equivalents of sodium present. When this ratio exceeded unity, inversion took place.

In commercial practice a watch must be kept on the stability of the emulsifying agent itself. It must not be liable to decomposition through bacterial action or the presence of hard water.

Action of Finely Divided Solids

To sum up our ideas of the action of colloidal emulsifying agents we may say that they stabilise the emulsion by lowering the interfacial-tension by the formation of a plastic or very viscous film round the globules and, possibly, by imparting an electric charge to the globules. The type of emulsion formed depends on the relative wettability of the emulsifying agent by the two phases and on the nature of the ions adsorbed.

The theory of the action of finely-divided solids as emulsifying agents is rather different. It also takes account of the relative wettability of the solid by the two liquids. If the solid is wetted by either liquid to the complete exclusion of the other, it will not be adsorbed at the interface, and will not act as an emulsifier at all. If, however, it is wetted simultaneously, though not to the same extent, by the two liquids, it will go to the interface and promote the formation of an emulsion. The liquid which wets it the more will become the external phase.

A characteristic of any emulsion which has an important bearing on its stability and physical properties is the distribution of particle-size. This can be determined by taking a photomicrograph, showing clearly a large number of globules, and each of these globules is then measured and classified according to its diameter. Each class must consist of an equal range of diameters, such as 0-1μ, 1-2μ, 2-3μ, and so on. The total number of particles in each class is now counted, and the totals, expressed as percentages of the grand total, can be plotted against the average diameter of each size-class. The result is a curve showing the size-frequency distribution; and the shape, as well as the position of this curve, in relation to the axes, is very important.

If n be the number of particles in each class, and d the average diameter of that class, then the first, second and third moments of the distribution are given by

$$\frac{\Sigma\, nd}{\Sigma\, n}, \quad \frac{\Sigma\, nd^2}{\Sigma\, n} \text{ and } \frac{\Sigma\, nd^3}{\Sigma\, n}$$

Let Δ be the diameter of the particle of mean surface area, and let D be the diameter of the particle of mean volume.

$$\text{Then } D^3 = \frac{\Sigma\, nd^3}{\Sigma\, n} = \text{the third moment,}$$

$$\text{and } \Delta^2 = \frac{\Sigma\, nd^2}{\Sigma\, n} = \text{the second moment.}$$

The specific number, or number of globules per gram of oil dispersed, is inversely proportional to D^3, or the third moment; and the specific area, or surface per gram of oil, is directly proportional to $\frac{\Delta^2}{D^3}$, or the second moment over the third, the density being constant.

Mean Particle-Size

Since it is possible to have any number of curves all having the same first moments but differing in their second and third moments, it follows that it is possible to have any number of emulsions all having the same mean particle-size, but differing in specific area, or specific number. Consequently, calculations of specific area must be based on determinations of the whole distribution, and not on determinations of the average particle size. It should also be noted that the mean particle-size is different from the mean diameter.

In order to describe an emulsion completely it is necessary to give either the three moments of the distribution or the mean diameter of the particles, together with the specific area and specific number per c.c. or gram of oil. The latter method conveys the more information.

Emulsions are used when it is desired to distribute one liquid very finely and evenly either over a surface or throughout the bulk of another liquid, with which it is immiscible. The principle is the same as that of mixing a small quantity of finely-ground active material with a large quantity of inert filler in order to obtain even distribution in use. The same result can often be achieved by dissolving the active principle in a volatile solvent, which is afterwards evaporated; but emulsification is usually the cheaper method. In roadmaking, bitumen is emulsified for thin film distribution; as the moisture evaporates the emulsion breaks. The same principle applies to insecticides.

In all types of apparatus for the mechanical preparation of emulsions the two liquids are agitated together more or less violently, although, in many cases, it is claimed that the action is due to hydraulic shearing. In many of the types the action takes place in a passage or tube of microscopic dimensions, but the velocities involved are so enormous that it is extremely probable that the flow is turbulent. The types of apparatus available fall into three main classes: (a) mechanical agitators, (b) colloid mills, (c) pressure or jet emulsifiers. The first class is suitable for emulsions which are easily made, and almost any type of mixer may be used. Very concentrated emulsions can be produced by starting with

the whole of the continuous phase and adding the disperse phase, agitating continuously. A device which is satisfactory for easily-made emulsions consists of a centrifugal pump, attached to a mixing tank so that the material circulates from the tank to the pump and back again. The disperse phase is added slowly to the bulk in the tank, while the incoming stream from the pump keeps the mass in circulation, and the pump itself subjects it periodically to intense agitation.

Colloid mills may be divided into three main types: smooth-faced mills, grooved-faced mills and so-called impact mills, examples of which are, respectively, the Hurrell and the Premier mills, and the Charlotte mill, and the Plausen and Kek mills. Pressure emulsifiers or homogenisers are now made of many different patterns, the principle of all of which is the same. The choice of machine depends on the composition, concentration and degree of dispersion required, laboratory experiment giving the lead. Stability and the viscosity required must also be taken into account. Colloid mills consume a great deal of power, and have a slight heating effect on the material treated, unless a water-jacket is used. Another factor which must be watched is the inclusion of air in the emulsions.

New Technical Books

A Laboratory Manual of Inorganic Chemistry. By John B. Ekeley, Ph.D., Sc.D. Fourth Edition. pp. 293. Chapman and Hall, Ltd. 12s. 6d. net.

This book is specially written and arranged as a laboratory manual to accompany Professor Holleman's "Text-Book of Inorganic Chemistry." In addition to the text of the third edition, the present edition contains an introduction to qualitative analysis. Blank pages are inserted between the text for the use of students in answering the questions which are set. It is wisely pointed out in a note to the student that "he should train himself in the art of making *useful* notes, notes which he will later find of great value for purpose of reference in recalling his knowledge gained from *his own experimental work*."

A Practical Chemistry for Higher School Certificate and Intermediate Students. By G. P. McHugh, M.Sc., Ph.D. (Lond.). pp. 117. Longmans, Green and Co. 2s. 9d.

This book is written for use in the laboratory and has been framed to encourage students to use their own initiative. In an attempt to obviate a mechanical application of analytical tables in qualitative work, the author has so placed the tables and explanations that they face each other. To meet the needs of certain examinations an adequate scheme of quantitative analysis, with a fully worked example for each determination, has been included. In addition, there is a section that has been devoted to inorganic and organic preparations, reactions and gravimetric exercises. The price of the book is an important feature in that it places it within reach of all classes of students.

The Solid Products of the Carbonisation of Coal. pp. 123. Published by the South Metropolitan Gas Co.

It is essential for the success of a chemist's work that from time to time he should discuss with his colleagues his experimental findings as well as his ideas. This discussion tends to promote healthy criticism, the destruction of unsound conclusions, and the development of nebulous ideas into useful working hypotheses. Collaboration of this nature proceeds daily in an industrial laboratory, and in the laboratories of the South Metropolitan Gas Co. it is specially encouraged with the object of attacking problems by a team of workers. The various members of the laboratory staff, by training and experience, become adept in different specialist branches of their science, yielding, for example, the physical chemist, the organic chemist, and the chemist with a flair for work on the technical scale. Experience has also shown that a problem is solved more quickly and more satisfactorily by the combined efforts of several individuals each having a different outlook than by the sole endeavours of any one of them. During a prolonged investigation ideas are contributed from many members of the laboratory staff, and although the general progress of the work may be directed by one or two individuals, it is not equitable that the privilege of publication should be enjoyed by these individuals alone. For these and other reasons it has been decided to publish the work of the Chemical Department of the South Metropolitan Gas Co. in the name of the department, and not in the names of individuals. The present volume gives information on the solid products of coal carbonisation which has been accumulated by the Department during investigations extending over a period of several years.

Tautomerism. By John William Baker, D.Sc., Ph.D. (Lond.), A.R.C.S., F.I.C. pp. 332. George Routledge and Sons, Ltd. 25s. net.

The recent development of electronic theory in its application to the reactions of organic chemistry has permitted the correlation of such reactions on a much more fundamental basis than was hitherto possible. This book makes an attempt to trace the historical development of such ideas in their relation to the phenomenon of tautomeric change, and to present a broad survey of this field in the light of modern theoretical conceptions. The author also deals with the mobility and equilibrium of cationotropic systems, and draws some general conclusions concerning the effects of structural and polar factors. There is also a chapter on ring-chain tautomerism and an appendix by Professor C. K. Ingold, D.Sc., F.R.S., on the significance of tautomerism and the reactions of aromatic compounds in the electronic theory of organic reactions.

The Electronic Theory of Chemistry. By Robert Fergus Hunter, D.Sc., Ph.D., D.I.C., A.R.C.S. With a foreword by C. K. Ingold, D.Sc., F.R.S. pp. 125. Edward Arnold and Co. 8s. 6d. net.

The last ten or twelve years have witnessed enormous developments in the electronic theory of valency, the effects of which are to be seen not only in investigations of the problems of valency and molecular structure as such, but in the broadening of our outlook on many of the major problems of organic chemistry such as those of the directive effect of substituents in aromatic substitution, tautomerism, and the addition of hydrogen and bromine to conjugated systems. This book contains, in more extended form, the substance of the course of lectures on this subject which were delivered at Aligarh in April, 1931, and is primarily intended for honours degree students in chemistry. The range of phenomena surveyed is very wide, and it is clearly the main theme of the book that a single constituent theory can illuminate many different fields of inorganic and organic chemistry.

The Electronic Structure and Properties of Matter. By C. H. Douglas Clark, M.Sc., A.R.C.S., D.I.C. Volume I. pp. 374. Chapman and Hall, Ltd. 21s.

This volume is one of a series which gives an introductory study of certain properties of matter in the light of atomic numbers. The progress of atomic and molecular theory in recent times has proved remarkably rapid and extensive. The subject has advanced along many different lines more or less independently, and the research worker in a specialised branch often encounters no little difficulty in keeping in touch with developments not in his immediate sphere of thought. It has therefore become increasingly difficult, though surely not less important, to correlate work carried out in different branches, and it is in the hope that these diverse researches may be enabled to be considered more readily in inter-relation with each other and in respect of the effect of each contribution to the whole that the present task was essayed. The volume under review contains a general introduction to the subject, a description of atomic and electronic quantum numbers, and the commencement of a detailed account of the properties of matter in relation to electronic structure—melting and boiling points, atomic and molecular volumes, electrical conductivity, magnetic susceptibility, cohesional and other properties.

Chemical Problems in Agriculture

Sir John Russell describes a number of Rothamsted Experiments

SIR JOHN RUSSELL, director of the Rothamsted Experimental Station, opened a discussion on "Chemical Problems in Agricultural Science," at a meeting of the Chemical Society in London on November 15. The classical problems in crop production, he said, centre round the feeding of plants. It was in 1840 that Liebig by chemical reasoning and Lawes by empirical trials applied in practice the knowledge gained by plant physiologists about the nutrition of plants. Up to that time many agriculturists had assumed that plants feed on the organic matter in the soil, knowing nothing about the scientific evidence to the contrary. Liebig showed them that this was not so; he pieced together the scientific knowledge and gave a convincing picture of the plant deriving the great bulk of its food from the air in the form of carbon dioxide and oxygen and the remainder from the soil: the water, and simple compounds of nitrogen, phosphorus, sulphur, potassium, calcium, magnesium, iron, and a number of other elements. These are then built up into the complex carbohydrates, proteins and other substances which finally form the plant tissues. Liebig argued that the soil resources could be increased by the addition of the appropriate chemical compounds, and Lawes showed how to do it. He set up experimental fields at Rothamsted and a factory in London and started the artificial fertiliser industry. This has grown to such enormous dimensions that some 35 or 40 million tons are made annually in the world.

Spacious Days for the Farmer

The problems were for many years mainly the purely technical ones of showing how to fit the fertilisers into everyday farm use. They were spacious days for the farmer; prices were high and costs low and there was no need for stinginess in applying fertiliser. It was put on in adequate amounts and a good response fully repaid the cost. The chemist came into the problem by seeking to find how much of the various fertilisers needed to be added to soils to serve for a particular crop. Average crops were analysed so as to discover what amounts of phosphorus, potassium, nitrogen, etc., they contained. The soils were analysed to find what amounts per acre of these elements they contained in suitable form for plant nutrition, and a simple subtraction sum showed how much, if any, artificial fertiliser need be supplied.

The purpose of modern work is to discover the factors that govern the growth and composition of plants, and, having done that, to find the simplest and most economical method of bringing them under control. The study of soil fertility thus resolves itself into two parellel sets of investigations: plant physiological work to discover what the plant needs in order to attain its maximum growth; more precisely, how growth is affected by variations in the conditions, especially in the supplies of nutrients, water, air supply to the root, reaction of the medium, etc.; then studies by the soil investigator to discover how far a particular soil is likely to satisfy the conditions for full plant growth, and how it can be made to do so better than it naturally would.

Variation in Composition

Variation in composition due to increases in nitrogen supply are much less than the increases in yield given by the increased nitrogen supply. The first increments give considerable increments of crop: later ones give less. So the percentage of nitrogen is first unchanged or even falls, but with later increments it rises steeply. Over a fairly wide range the nitrogen content is more affected by the water supply than by the nitrogen supply. This is what happens in normal fertility conditions; it holds not only for nitrogen but for the other elements that increase plant growth. The fertiliser causes the plant to grow more but does not much affect its composition or its quality. Getting away from the normal fertility range to the extremes of deficiencies or excess some remarkable results are obtained. The form of the plant changes, in extreme cases considerably.

The composition of the crop naturally affects its value as food, especially as animal food. This is particularly so for grass, which forms a large part, sometimes indeed the whole, of the food of the animal. Extreme cases are not common in this country but they occur elsewhere. Pronounced deficiencies sometimes occur in soil, leading to equally pronounced deficiencies in composition of the vegetation, and these lead to marked nutritional troubles with the animals. These are remedied by supplying the missing element as "licks" or as fertiliser. Usually, however, the differences in composition are much smaller than this and as part of the reaction their effects are correspondingly less marked.

A complex case arises when several plants are growing together, especially the mixture of leguminous and non-leguminous plants grown for silage or fodder purposes or naturally occurring in grass land. Leguminous plants are associated with bacteria that fix nitrogen from the air so that they are independent of nitrogenous fertiliser. The non-leguminous plants, on the other hand, are much favoured by nitrogenous fertiliser. Phosphates favour the leguminous plants, so that they increase when phosphatic fertiliser is supplied. This accounts for the remarkable improvements effected by basic slag on pasture land. The position in regard to these principal elements of plant nutrition is that more and better field experiments are essential to provide the facts.

Study of Ingredients

Boron has been much studied at Rothamsted. It is claimed in central Europe that sugar beet requires minute traces of boron. In its absence a certain disease appears. Manganese has been studied at the Waite Institute, Adelaide. In its absence plants fail to grow and oats are liable to a grey fleck disease. Allison, in Florida, has shown that minute traces of copper are essential to plant growth. Soils have not yet been found in this country that respond to copper salts. Lithium is stated by Sir Rowland Biffin to confer resistance to mildew and yellow rust on wheat grown in pots. Molybdenum injected into plants has been found by Miss Sheffield to induce a trailing habit of growth and also to simulate the symptoms of virus disease in Solanum. Roach shows that the roots of fruit trees vary in their power of assimilating molybdenum from the soil; some can do it and others cannot.

Some of these substances are organic. Owing to the difficulty of working with them it has not always been possible to distinguish them from the inorganic, and some of the supposed "auximone" effects are probably attributable to iron. But these are cases where the active agent is probably an organic substance, though owing to difficulties of working it is not possible to be quite sure. H. G. Thornton shows that the invasion of the root hairs of leguminous plants by the nitrogen fixing bacteria is preceded by an excretion from the roots, which causes the bacteria in the soil to multiply, and then to excrete something which causes the root hairs to multiply and to curl. On the inner bend of the curl the bacteria enter.

Plant Changes

The plant is not a fixed unchanged entity but varies within limits according to the conditions in which it is grown. It has another direction of variation: according to its stage or phase of growth. In a general way one can distinguish three phases. In the first the plant is assimilating material from the soil; it becomes rich in mineral matter and in protein. It is at this stage that grass has its highest nutritive value. In the second phase it is working up the assimilated material: building up organic compounds and constructing a solid framework of cellulose. The third phase is the production of seed. Material is shifted from the plant to the seed. Some of it is used for making the embryo and some for the store of food for the young plant. So far as present knowledge goes, the stream of material flowing to the growing seed does not much change in composition once the process has begun and the composition of the seed is fairly well settled long before it is finally ripe.

Letters to the Editor

Chemical Education

SIR,—A series of discussions as to the place of chemistry in the school curriculum occurred recently in the Council of the Institute of Chemistry. The participants, being mainly educationalists, had to begin by assuming that the present curriculum was a good and proper basis which might not include chemistry; but there are many outside the scholastic profession who view the matter from a very different angle. Briefly, they ask themselves whether, in view of the importance of chemistry and the difficulty of accommodating it within the present syllabus, the existing school curriculum is really the best that could be devised to meet modern needs and present-day conditions.

If the purpose of education is to fit men to live, can it truthfully be said that the present system is best adapted to that end? It has come down to us from the old-fashioned classical education plus various additions which have been made—very grudgingly—from time to time. The basis is strictly literary and historical, and it is time we asked whether such a basis is really of value in view of the fact that life in general has developed upon technical and not upon philosophic lines. Children of the present day commence their schooling with a mental development equal to that attained two or three years later at the time when the first Education Act was passed. Moreover, books instead of being rare and costly as in former days are now cheap and available in public libraries, so that half the reason for studying them in school time no longer appertains. Once a child can read and write, let its attention be directed to good literature and not to the intensive study of it in the way that prevails to-day. In short, the general scheme of education should have a scientific basis and the study of literature and history should be regarded as specialisation, just the opposite of what exists at present. We read pathetic letters in "The Times" asking why the Minister of Health makes use of such terms as calorie or protein (sic) which nobody understands, and yet children continue to learn about Canute and the tide, or Chaucer. Men obtain positions as managers, chief chemists or engineers on the strength of their technical knowledge just as they formerly became cabinet ministers on their Latinity.

The prime need of the new education is to teach us to think by teaching us to do, so that we may observe, learn and know. We must go back to the simple countryman who, from the education he does not get in the school, knows every leaf, plant and bird. So we too must become more familiar with the essential things around us, our own bodies and their care for a start. Besides this there is scarcely any type of employment or leisure occupation to-day where a knowledge of materials and mechanism cannot be applied with advantage, hence the reason for making this type of knowledge the basis of *all* education. Chemistry is the common meeting ground of all the sciences and of all common objects, therefore it should be taught at the first possible moment. Not in the form of the Periodic Classification or Qualitative Tables, but introduced perhaps on its romantic side as a history of the alchemists. Children will gladly listen to a story and the tale can be continued till it reaches sufficiently to deal with the common elements around us, whence it is just a logical step to show how these may be detected and to introduce simple experiments on these lines. But to wait till the poor souls are sixteen and then try and cram in the whole of modern chemistry in four years and add research and specialisation as well, is to make of them "chemical sponges" incapable of doing more than swallow book learning and repeat stereotyped experiments. Moreover, as chemistry (or all other sciences) extends its boundaries year by year, it becomes more and more impossible to pump in all the necessary knowledge in the time allotted to the college course, so the only hope is therefore to commence the teaching at an earlier age.

The demands of the other sciences are as insistent, in fact, once a child can read, write and count, then chemistry, physics and mathematics with some form of mechanical training for hand and eye should form the backbone of its teaching. History should be the scientific development of the earth and of mankind, geography the incidence of the stable products of life and their conversion into the finished articles of use. Naturally, the development of self-expression must find a place, but who can deny that the principles of the internal combustion engine are as important as "Paradise Lost."

There is another reason behind all this. Unless our system of civilisation is to break down completely, we must have a better understanding of the elements that go to make it up. We must, in fact, breed the sceptical, the inquiring mind, and get as far away as we can from "the God that ye took from a printed book" or from a nation that takes its opinions, social, moral and political, from the daily paper that happens to give the best racing tips or largest insurances. In the present age it would seem that "Whate'er is loudest advertised is best" and it may be that by training the common mind to inquire and to test, newspaper or poster publicity will not be the sole qualification for success. The idea of inverting the present basis of education may come as a shock to some minds, but in view of the meagre results produced by sixty years of elementary education, reconsideration of the methods adopted would seem to be well worthy of consideration.—Yours faithfully,

"SCEPTICAL."

Rubber in Industry

An Exhibition at the Science Museum

THE Rubber Growers' Association, in collaboration with the Rubber Research Institute of Malaya, the Research Association of British Rubber Manufacturers, the London Advisory Committee for Rubber Research (Ceylon and Malaya), rubber manufacturers, and suppliers of scientific equipment and machinery, have arranged a Rubber Exhibition at the Science Museum, South Kensington, London.

This exhibition, which will remain open until the end of April, 1935, demonstrates the story of the rubber industry from the growth of the rubber tree to the many applications of the product. The plantation section covers all operations from the opening of land to be planted with rubber to the shipping of plantation grades and of latex. Large photographic exhibits are shown indicating the various operations. Tree trunk specimens illustrate present methods of tapping, and representative cases showing good and bad tapping and the subsequent ill-effects of the latter. There is also a model of an up-to-date layout for a sheeting factory and the operations concerned with the production of crepe are fully illustrated by photographs.

So that visitors may gain some idea of the processes which rubber undergoes in the rubber factory examples of standard machinery are installed at the exhibition. They include a two-roll mill, Banbury mixer, extruder, and vulcanisers of various types. Most of this machinery is in operation at specified times, and small rubber articles are being prepared for visitors to take away as souvenirs of the exhibition. Where it is not possible to include machinery owing to its size, illuminated transparencies and charts have been prepared.

The scientific section comprises exhibits dealing with the physical and chemical properties of latex, vulcanised rubber, gutta percha and balata, as well as the various types and samples of wild rubber and a series of plantation curiosities. Microscopic demonstrations are staged to show the size and motion of rubber particles and the movement of the latex in an electric field. Micro-manipulators similar to those used

by Dr. Hauser and his colleagues in their experimental dissections of the rubber globule are also on view. An interesting new tintometer is shown whereby the colour of the latex can be expressed numerically.

The operations of compounding and vulcanisation of rubber compositions is treated comprehensively, while examples of rubber vulcanised with selenium, benzoyl-peroxide and nitro-compounds are also shown. There is also an interesting range of pure-gum stocks cured with increasing proportions of sulphur from 0 to 50 parts per 100 parts of rubber. The physical effects of inert and reinforcing fillers is emphasised by means of simple apparatus, and there is a comprehensive exhibit of rubber pigments and organic colours, together with specimens showing their effect in rubber. Accelerators and antioxidants also receive considerable attention, while the apparatus for demonstrating the fluorescence of rubber fillers in ultra-violet light proves an attraction.

A small section dealing with the hard-rubber reaction and the characteristics of ebonite is on view, as well as an interesting display illustrating the properties peculiar to gutta percha and balata. Arrangements have also been made for showing examples of the various types of synthetic rubber and rubber-like products developed since Tilden's classical work, and finally there is a series of chemical derivatives of rubber, some of which are of industrial interest.

As it would have been impossible to exhibit all the known uses of rubber in the space available, those applications have been selected which demonstrate the versatility of the product, and wherever possible an educational exhibit illustrating the manufacture of the particular article is staged. Visitors to the exhibition are able to follow the constructional details of such well-known items as golf and tennis balls, pneumatic tyres, rubber printing plates, rubber Wellington boots, and hot-water bottles both of the hand-made and moulded types. Sections have also been devoted to the uses of rubber in automobile and railway rolling stock construction.

To demonstrate the numerous applications of the domestic uses of rubber a series of rooms has been erected to form an appropriate setting for rubber flooring, rubber upholstery, ebonite lavatory seats and toilet fittings, mats, rubber brushes, rubber shod pails, baths, coal scuttles, etc.

Horticultural Sprays

Utilisation of Petroleum Products

THE employment of petroleum oils as spray insecticides was discussed by Dr. Hubert Martin, F.I.C., of the Long Ashton Agricultural and Horticultural Research Station, Bristol, in a paper read before the Institution of Petroleum Technologists, on November 13. An example was given of the methods used for the correlation of insecticidal activity and the chemical and physical characteristics of the oil. The results of critical laboratory and field trials were quoted in support of the conclusion that the ovicidal and insecticidal properties of petroleum oil sprays applied to dorman trees are independent of the base of the oil, of its viscosity over the range 126 secs.-870 secs. Redwood I. at 70° F., of its degree of refinement over the range represented by unsulphonated residues of 60 to 100 per cent. by volume, and of the type of emulsification.

The petroleum oils suitable for application to foliage are limited to the highly refined oils of a viscosity high enough to ensure satisfactory insecticidal porperties. Evidence was given that the insecticidal properties of oil sprays applied to foliage decreases as the stability of the emulsifier is increased. The selection of suitable emulsifiers for the preparation of oil sprays to be used in combined sprays was also discussed. The action of petroleum oils in increasing the efficiency of companion insecticides and fungicides in combined sprays was described in connection with the properties of oils as " stickers " and " spreaders."

Concerning the possible utilisation of certain petroleum products as soap substitutes, the naphthenic acids are shown to be unsatisfactory. The sulphonic acids produced during acid refinement include (i) the gamma-acids, of which the calcium salts are water soluble and are promising spray materials, and (ii) the beta-acids, of which the calcium salts are insoluble but of which the acids and sodium salts are relatively oil-soluble and of possible use as emulsifiers.

Calcium Soap on Textiles

Investigations at Mellon Institute

DR. BERNARD H. GILMORE, of Mellon Institute of Industrial Research, who recently concluded an investigation of the determination of calcium soap on textile fibres, presented a report of this study before the Northern New England Section of the American Association of Textile Chemists and Colorists, in Boston, on November 16.

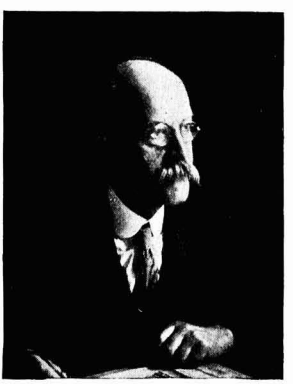
A critical survey of the literature of the subject coupled with the results of his experimental work showed that the common solvents for calcium soaps were not selective in differentiating between alkali soaps and alkaline-earth soaps. He then described a method that is based upon the complete extraction of the total soap by the appropriate solvent, followed by the actual determination of the calcium content of the soap extract. Benzene and carbon tetrachloride were found by him to be equally efficacious for the extraction of calcium oleate; he learned, however, that these solvents were not efficient for calcium stearate. A mixture of benzene and absolute alcohol (advocated by Marcusson) was proved to be the most effective solvent for the extraction of the calcium soaps of the saturated fatty acids and hence most suitable for general purposes.

Dr. Gilmore ascertained that, unless unusual precautions are taken to ensure anhydrous conditions when alcohol is used as the extracting solvent, erroneous results will be obtained, owing to the interaction between the alcohol and the soap.

Death of Mr. Henry P. Benn

Last Survivor of the Original Benn Brothers

WE regret to announce that Mr. Henry Pringuer Benn died early on Sunday at his home at Muswell Hill at the age of seventy-two years. He was the last survivor of the four brothers who gave their name to Benn Brothers, Ltd., who publish THE CHEMICAL AGE and other journals. He was intimately associated with the " Cabinet Maker," which his eldest brother, who afterwards became Sir John Benn, founded in 1880. Mr. H. P. Benn was in at the beginning of that venture, and he continued to give editorial service to the " Cabinet Maker " for nearly fifty years. He specialised on the art and design sides of the trade and was a recognised authority on furniture styles. He attended international exhibitions in Brussels and Paris and produced illustrations of furniture which were remarkable for exact observation. Similar work at the annual exhibitions of the Royal Academy will be long remembered. He had already outlived his three brothers when he retired in 1926.



The late Mr. H. P. Benn.

The youngest of the four brothers, Mr. Robert Davis Benn, suceeded to the editorship of the " Cabinet Maker " when Sir John Benn became chairman of the London County Council in 1906. He died in 1911. Mr. Julius Taylor Benn, who managed the business side, died in 1921. Sir John Benn, who had been successively created knight and baronet for distinguished public services, died in 1922. Mr. H. P. Benn survived his brothers for more than a decade to see one nephew, Sir Ernest Benn, establish Benn Brothers, Ltd., on a sound and expanding basis, and another, Mr. Wedgwood Benn, become Secretary of State for India in the last Government. He leaves a widow and one daughter. The funeral was at Golders Green Crematorium on Thursday.

British Overseas Chemical Trade in October

Exports and Imports Increase

THE Board of Trade returns for the month ended October 31 show that exports of chemicals, drugs, dyes and colours were valued at £1,798,007, as compared with £1,661,670 for October, 1933, an increase of £136,337. Imports were valued at £1,056,309, as compared with £957,895; re-exports were £51,912.

Imports

	Quantities. October 1933.	Quantities. October 1934.	Value. October 1933. £	Value. October 1934. £
Acids—				
Acetic .. .. cwt.	13,458	19,990	21,663	31,964
Boric (boracic) .. ,,	1,608	2,516	1,485	2,539
Citric .. .. ,,	91	550	289	1,557
Tartaric .. .. ,,	1,430	976	5,329	4,214
All other sorts .. value	—	—	9,372	10,326
Calcium carbide .. cwt.	80,854	131,279	44,703	72,064
Potassium compounds—				
Caustic and lyes cwt.	10,318	12,484	13,967	15,104
Chloride (muriate) ,,	83,465	215,302	33,699	61,256
Kainite and other mineral potassium fertiliser salts, not elsewhere specified cwt.	305,003	292,433	60,558	49,345
Nitrate (saltpetre) ,,	22,547	1,629	8,989	1,753
Sulphate .. .. ,,	118,048	126,942	49,058	44,224
All other compounds ,,	8,336	10,279	12,877	18,184
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	13,695	162	4,426	121
Chromate and bichromate .. .. cwt.	1,497	2,511	2,218	3,696
Cyanide .. .. ,,	—	805	—	1,918
Nitrate .. .. ,,	—	80,198	—	15,636
All other compounds ,,	22,963	19,836	17,851	12,424
Other chemical manufactures .. .. value	—	—	246,670	234,181
Drugs, medicines, etc.—				
Quinine and quinine salts oz.	33,979	82,761	2,837	6,983
Medicinal oils .. cwt.	859	3,695	2,102	10,716
Ointments and liniments cwt.	18	8	704	220
Proprietary medicines value	—	—	22,957	43,991
All other sorts .. ,,	—	—	38,438	25,741
Raw or simply prepared value	—	—	63,884	43,739
Finished dyestuffs (coal-tar) .. .. cwt.	4,744	5,303	116,247	131,474
Extracts for tanning—				
Chestnut .. cwt.	34,684	31,675	24,566	21,516
Quebracho .. ,,	27,801	33,508	17,499	18,747
All other sorts .. ,,	15,423	51,886	13,180	34,672
All other dyes and dyestuffs, etc. .. cwt.	5,232	5,458	13,265	23,877
Painters' colours and materials—				
White lead, basic carbonate .. .. cwt.	6,407	7,932	7,693	9,252
Lithopone .. ,,	17,641	16,482	12,757	10,433
Ochres and earth colours cwt.	32,684	35,258	13,086	11,385
Bronze powders ,,	5,014	1,487	18,212	10,253
Carbon blacks .. ,,	28,255	19,094	28,963	30,743
Other pigments and extenders, dry .. cwt.	23,253	30,528	6,079	9,160
All other descriptions ,,	8,901	17,890	22,272	32,901
Total .. .. value	—	—	957,895	1,056,309

Exports

	Quantities. October 1933.	Quantities. October 1934.	Value. October 1933. £	Value. October 1934. £
Acids—				
Citric .. .. cwt.	1,892	2,856	6,876	10,242
All other sorts .. value	—	—	19,769	19,618
Aluminium compounds tons	1,920	6,151	19,073	62,990
Ammonium compounds—				
Sulphate .. tons	36,300	32,917	230,443	195,063
All other sorts .. ,,	1,179	2,019	17,879	25,904
Bleaching powder (chloride of lime) .. .. cwt.	52,070	66,162	17,262	16,758
Coal tar products—				
Tar oil, creosote oil gal.	454,683	1,341,830	10,421	27,188
All other sorts .. value	—	—	30,903	22,988
Copper, sulphate of tons	400	1,843	6,675	25,337
Disinfectants, insecticides cwt.	31,985	39,108	71,995	84,143
Glycerine .. .. ,,	21,339	19,326	44,326	46,007
Lead compounds .. ,,	14,020	14,130	17,847	16,873
Magnesium compounds tons	512	505	10,290	11,765
Potassium compounds cwt.	8,913	6,610	19,636	14,844
Salt (sodium chloride) tons	26,796	35,722	68,646	95,477
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	237,544	255,436	70,635	71,118
Caustic .. .. ,,	146,512	155,501	99,469	91,318
All other sorts .. ,,	213,378	105,535	96,781	85,268
Zinc oxide .. tons	794	940	16,517	17,855
All other descriptions value	—	—	198,781	224,635
Drugs, medicines—				
Quinine and quinine salts oz.	102,245	105,122	11,186	13,074
Proprietary medicines value	—	—	98,807	101,573
All other descriptions ,,	—	—	124,023	145,895
Dyes and dyestuffs—				
Finished dyestuffs (coal tar)—				
Alizarine and indigo (synthetic) .. cwt.	585	978	4,257	7,016
Other sorts .. ,,	7,101	7,092	90,794	86,638
All other descriptions ,,	23,352	17,336	26,805	23,680
Painters' colours and materials—				
Ochres and earth colours cwt.	13,928	17,184	14,496	15,752
Other pigments and extenders, dry .. cwt.	14,792	18,655	20,063	26,126
White lead .. ,,	4,300	6,051	8,183	11,292
Paints and painters' enamels, prepared cwt.	32,468	39,952	90,254	104,523
Varnish and lacquer gal.	72,724	64,128	27,880	26,490
All other descriptions cwt.	35,962	34,735	70,698	70,557
Total .. .. value	—	—	1,661,670	1,798,007

Re-Exports

	Quantities. October 1933.	Quantities. October 1934.	Value. October 1933. £	Value. October 1934. £
Chemical manufactures and products .. value	—	—	21,564	18,087
Drugs, medicines and medicinal preparations—				
Manufactured or prepared .. .. value	—	—	13,037	10,600
Raw or simply prepared value	—	—	11,632	21,340
Dyes and dyestuffs cwt.	217	496	762	809
Painters' colours and materials .. .. cwt.	737	626	1,275	1,076
Total .. .. value	—	—	48,270	51,912

Notes and Reports from the Societies

Institute of Chemistry

Leeds Section : Annual Meeting

THE annual general meeting of the Leeds Section of the Institute of Chemistry will be held on Monday, November 26, at 7.30 p.m., in the Chemistry Lecture Theatre, The University, Leeds, to elect two auditors and four members of committee (nominations received: A. L. Roberts, Ph.D., A.I.C., and H. A. Steinmann, A.I.C.).

Professor I. M. Heilbron, D.Sc., F.R.S., will lecture on "Modern Alchemy—Post-War Advances in the Chemistry of Natural Products."

Society of Chemical Industry

Bristol Section : Spectrum Analysis

A JOINT meeting of the Bristol Section of the Society of Chemical Industry and the Chemical Society was held at Bristol on November 1, when Dr. S. Judd Lewis read a paper on "Spectrum Analysis."

After defining emission spectra and absorption spectra and describing the principal apparatus, Dr. Judd Lewis stressed consideration of the word "modern" as applicable to nearly all apparatus in use at the present time. Even when he commenced his practice of the applied science twenty-two years ago, few apparatus existed in the form familiar to-day, while many of the most useful were not even invented. This applies, for example, to the earliest model among the many sector photometers now in common use for determining the absorption curve of an organic substance, and to any suitable comparator so essential for convenience and accuracy in the study of emission spectra.

Brief reference was made to the main qualitative applications of spectroscopy in industry, namely, (1) the detection of minute quantities of impurity in any material (for example, the strontium in water, lead, tin, chromium, etc., in a food material, manganese or silver in biological material, boron, say 1 part in 1,000,000, as a determining factor in the quality of a leguminous crop), and (2) the complete analysis of a very small specimen (for example, the whole of the dozen components in a single milligram of an alloy or ore; the chief saline ingredients of a single drop of London tap water, although the total solids amount to only 0.02 mgm.; the mordants in a textile, together with all the elements native to the fabric).

It was then explained that the chief difference between the present lecture and that given before the same Society in 1916 lay in the progress made in quantitative spectroscopy. Twenty years ago he (Dr. Judd Lewis) stated "No accurate method of determination has yet been devised"; to-day, there is no type of material which may not be analysed quantitatively with a fair approach to accuracy by spectrographic technique, while most alloys and certain non-metallic substances may be analysed quite conveniently, and often with great rapidity, so accurately and so reliably as to make control by chemical means un-called for. This is so in the metallurgical world, especially where half-a-dozen well-recognised methods are in constant use. Quantitative spectroscopy is of special value in determining components present in only small proportion, say less than one per cent., for in this the degree of precision is often much greater than that attainable by chemical means, especially where the issue is complicated by the concurrence of other elements exhibiting similar chemical or colorimetric reactions.

It was also shown that the ratio quantitative system, as described in "Spectroscopy in Science and Industry" (Blackie), is capable of yielding reliable results with all types of material, whether metallurgical, textile, biological or food. The direction and speed of flow in the tank process of glass manufacture may be studied more satisfactorily by the adoption of spectrum analysis, than by any convenient chemical means. Glass is amenable to spectroscopic investigation also with regard to its general analysis, as also for colouring and decolorising elements, the light and heat absorbing properties, and to many of the purposes for which it may be used.

Society of Public Analysts

Forthcoming Papers

THE next meeting of the Society of Public Analysts will be held on Wednesday, December 5, at the Chemical Society's Rooms, Burlington House, Piccadilly, London, at 8 p.m., when following papers will be read:—"The Question of Tannin in Maté," by W. A. Woodard and A. N. Cowland; "A Specification for Enamelled Hollow-ware," by J. H. Coste, F.I.C., and D. C. Garratt, B.Sc., Ph.D., F.I.C.; "Antimony Compounds extracted from Enamel-ware by Citric Acid Solutions," by R. H. Burns, B.Sc., A.I.C.; "Chemical Examination of the Seeds of *Santalum album* of Mysore," by Y. V. S. Iyer.

Oil and Colour Chemists

Manchester Section : Annual Dinner

THE tenth annual dinner and dance of the Manchester Section of the Oil and Colour Chemists Association was held at "The Manchester," Ltd., Restaurant, Royal Exchange, Manchester, on November 16, when about 170 guests were present.

The toast of "The Manchester Section of the Oil and Colour Chemists' Association" should have been proposed by Mr. A. P. Bevan, president-elect of the National Federation of Associated Paint, Colour and Varnish Manufacturers, but Dr. V. G. Jolly announced that Mr. Bevan was unable to be present by reason of a chill. Professor Hilditch had therefore very kindly consented to step into the breach to propose that toast.

Professor Hilditch said he found it a great pleasure to be present that evening and to have the honour of proposing the toast of the Manchester Section. The thing that appealed to one perhaps most of all about the Oil and Colour Chemists' Association was the catholicity of its tastes—phenolic resins and oil varnishes; present-day painting materials; properties of pigments; fastness to light; annual dinner and annual smoker.

The Chairman announced that a telegram had been received from Mr. Whittaker, who had been largely responsible for the inauguration of the new Scottish Section of the Association. It had been hoped that Mr. Whittaker would have been present that evening but he was unable to attend.

The President of the Association, Mr. G. A. Campbell, M.Sc., responding to the toast, said that it was a pleasant thing in this world—where carping criticism, and, what was worse, uninterested apathy, were more common than pleasant words—it was a pleasure to have words of encouragement and good cheer, and good wishes for the future of the Manchester Section, and of the Association, from someone such as Professor Hilditch. Professor Hilditch, as the head of a very famous School of Research in Oils in Liverpool University, represented a great educational institution. They of the Oil and Colour Chemists' Association held that their institution also was a great educational institution by reason of the opportunities it gave its members of meeting to discuss the problems of the trade, and to listen to papers, and to meet one another socially. That was a great work, and definitely improved the standard of works practice, and the general and technical knowledge throughout the trade.

Dr. Jolly, proposing the toast of "Our Guests," said that in addition to Professor Hilditch, they had also as their guest Mr. B. Mouat Jones, principal of the Manchester College of Technology. It was particularly happy that Captain Wornum should come to the dinner, because he had accepted a new post in the Association, that of research and development correspondent, and that particular post demanded the closest co-operation between them and Captain Wornum. He had a difficult job before him but he asked that the Manchester Section should give him all the support it possibly could. Another gentleman he saw in the offing was a past-president, Mr. Noel Heaton, whom they were glad to welcome once again to the Manchester Section dinner.

Mr. B. Mouat Jones, M.A., responding, referred to the good fellowship and good cheer which had been important features of the gathering.

Society of Dyers and Colourists

Manchester Section : Dutch and English Practice

A MEETING of the Manchester Section of the Society of Dyers and Colourists was held in the Lecture Hall of the Manchester Literary and Philosophical Society on November 16, when Dr. Straatman read a paper on "The Comparison between Dutch and English Dyeing and Finishing Industries."

The lecturer stated that in Holland, as in England, the cotton industry developed in rural districts where the peasants were used to hand-spinning and weaving, and around the towns where the merchants centred. In both countries the cotton industry was stimulated by an influx of foreign merchants and technicians, an influx which came to both because these foreigners could find freedom to work and absence of political and religious oppression. In the case of both countries the cotton industry found a tremendous outlet in their respective colonial possessions, at any rate, until quite recent times.

Cotton was for Holland nearly as important as it was for England. Taking as a basis the official figures of the International Federation of Master Cotton Spinners' Associations for 1933, it was found that England headed the list with about 1 loom for every 100 of population, but Holland was a good second with 1 for 125. While in England only 3.2 per cent. of the looms were either fully or half automatic, the percentage was 7 for Holland. The number of cotton looms in Holland was increasing and in England decreasing. The consumption of raw cotton in Holland was increasing at the rate of about 12 per cent. per year, and remained constant in England. If these figures were compared with those for other countries, there emerged the rather astonishing fact that the total consumption of raw cotton in Holland was at present growing faster than in any other country in the world, not excepting Japan.

Contrasts in Development

The structure of the cotton industry in Holland was quite different from that in England. Lancashire had developed its industry largely on horizontal lines; the industry was divided into horizontal sections of spinners, raw cotton bleachers or dyers, yarn bleachers and dyers, weavers, piece bleachers, dyers or printers, shippers and merchants, and, as a rule, if there was combination or amalgamation it was in a horizontal form. This system had impressed a certain stamp on the textile industry of England, and had had far-reaching consequences for the development of its dyeing and finishing industry. In Holland exactly the opposite was found.

The Dutch cotton industry had developed, and was still developing, in a vertical direction, into vertical units and not combines. The ultimate aim of the cotton firms in Holland was to do their own spinning, weaving, dyeing, bleaching, printing, finishing, even making-up and marketing, if possible, down to the retail trade. It would therefore be apparent that the dyeing and finishing sections in Holland developed along quite different lines, and had to adopt processes that were not unknown, but unusual, in Lancashire.

In Holland the units were self-contained up to a certain point. They possessed their own spinning mills, which spun only those counts which the weaving shed used in big amounts; all other counts were bought from Lancashire, etc. The weaving shed would weave many different styles of cloth but the unit would very often buy grey cloth, say printers, on 'change, if the weaving shed was too occupied to make them, while the unit had a market for the finished cloth. The unit would bleach, dye, or print several types of cloth itself, but would still send out several styles, as a rule, because its machinery for dyeing, etc., was only adapted for the bulk lines which it handled and not for some specialities. Comparing Lancashire with Holland in this respect, the lecturer stated that he was probably not very far out when he estimated that in Lancashire 80 per cent. of the bleaching, dyeing and printing of yarns and piece-goods was done by specialists, while in Holland 80 per cent. was done by the vertical unit itself. Such a Dutch vertical unit would have a chemical manager, who supervised and was in charge of all sorts of technical processes, dyeing and bleaching of raw cotton, sliver and yarn, sizing, bleaching, dyeing and printing and finishing of piece-goods.

Institute of Physics

Discussion on Thermostats

AN informal discussion on thermostats was held by the Institute of Physics on November 13 at the Science Museum. About 150 members and guests were present and the opening speakers were Professor A. V. Hill on "Precision thermostats," Mr. L. G. Carpenter on "Thermostats for use at moderate temperatures" and Dr. J. L. Haughton on "Thermostats for use at high temperatures." Sir Henry Lyons, president of the Institute, was in the chair. This meeting was the first of its kind to be organised by the Institute and its success makes it probable that similar informal discussions will be held from time to time, with a view to providing opportunities for the interchange of ideas among those working on industrial and other applications of physics.

Necessary Postal Reforms

Federation of British Industries' Suggestions

THE Federation of British Industries has this week addressed a letter to the Postmaster-General expressing appreciation of recent reforms and urging the restoration of the penny letter post. This need not, in the view of the Federation, necessarily be accompanied immediately by any corresponding reduction in the rate of postage on postcards. It recognises that this reform cannot be effected without costs to the Exchequer, but it believes that much of the gross cost may be recouped, because many postal users who now take advantage of the printed paper rate would be prepared to make use of a penny rate though they are not willing to pay three halfpence. The Federation feels that this is highly desirable, in view of the irritation now caused by the limitations and restrictions which are placed upon the use of the printed paper rate.

If it is not practicable at the moment for penny postage to be reintroduced, the Federation asks that these limitations and restrictions should be reconsidered. Users of the inland printed paper rate find difficulty in appreciating why, for instance, they cannot take advantage of this rate if advertising material is accompanied by a calendar, or is printed on blotting paper, while the delays which occur in the delivery of communications sent at the halfpenny rate are often a matter of serious inconvenience. A further point upon which the Federation asks that there may be some relaxation in the regulations is in regard to parcels post, where the limitation upon the size of parcels is felt to be irksome. One of the standard sizes approved by the British Standards Institution for plans and drawings is 40 in., and where the necessary allowance for margin and packing has been added, such packages become just too long to be admitted to the parcel post. A slight relaxation in the regulations would make these packages admissible, to the great advantage of the trades that make use of these plans.

Chemical Notes from Japan

THE SHOWA HIRJO K.K. is embarking upon the manufacture of synthetic nitric acid (daily output 10 tons) and ammonium nitrate.

CARBON TETRACHLORIDE to the extent of 60,000 lb. annually is expected from the new factory at Tosa, now under construction by the Nankai Sarashiko K.K.

ACTIVE CARBON WILL BE MANUFACTURED by the newly-formed Dainippon Kasseitan K.K. (500,000 yen capital). It will take over the plant of the Edogawa Seiyakusho, well known for the production of gas masks.

JAPANESE INTERESTS HAVE PURCHASED a whaling fleet comprising five whalers and a ship equipped for the extraction of blubber. It is intended to operate in the South West African coastal waters ("Chemische Industrie").

THE SYNTHETIC ACETIC ACID INDUSTRY is turning its attention to the export market, notably the rubber producing countries. With a monthly production of 1,000 tons, the home demand is more than covered. Production is divided between the Nippon Gosli Kagaku (600 tons) and the Nippon Chisso K.K. (400 tons).

Personal Notes

MRS. CHARLES GARDNER, wife of the chairman of William Gardner and Sons, Ltd., of Gloucester, died on November 18.

PROFESSOR KARL VON LINDE, inventor of the ammonia refrigerator, died on November 16 at Munich at the age of ninety-two.

MR. T. E. H. HAMPTON, B.Sc. (London), has been appointed demonstrator in chemical engineering in the Faculty of Technology of the University of Manchester.

DR. L. H. LAMPITT, chief chemist to J. Lyons and Co., Ltd., and chairman of the Food Group of the Society of Chemical Industry, has been appointed to a seat on the Food Investigation Board. The appointment is for four years.

MR. GEORGE SPENCER, of Lethbridge House, 2 Lethbridge Road, Southport, late director of the Clayton Rubber Co., Ltd., and chairman and managing director of the Monarch Rubber Co., Ltd., left estate "so far as at present can be ascertained" of £14,142, with net personalty £7,385.

MR. EMILE AUGUSTE FOURNEAX, D.Sc., has died at Kenyston, Whitehall Road, Colwyn Bay. Mr. Fourneax, who was 70 years of age, was formerly a research chemist with the Calico Printers' Association, Manchester, retiring to Colwyn Bay ten years ago.

MR. J. H. S. DICKENSON, a special director at Vickers' River Don works, Sheffield, and metallurgist-in-chief of the English Steel Corporation, died on November 16 at his home, Sharrow Vale House, Sheffield. Mr. Dickenson was at one time with Beyer, Peacock and Co., at Gorton. He was later appointed research metallurgist on the staff of Vickers, Sons and Maxim.

PROFESSOR HAROLD C. UREY, of Columbia University, New York, has been awarded the 1934 Nobel Prize for Chemistry for his discovery of heavy water. The physics prize is not awarded. The different results obtained for the mass of the hydrogen atom when determined by two different methods led investigators to suspect that, in addition to the ordinary form of hydrogen, there was another form with an atom twice as heavy. This heavy "isotope" of hydrogen was discovered by Professor Urey, working in association with Dr. G. M. Murphy and Dr. F. G. Brickwedde, in November, 1931.

DR. JOHN WALTER LEATHER, who died at his residence, Ridgeway House, Malvern, on November 14, at the age of 73, was a pioneer of the application of scientific research and experiment to Indian agricultural problems. After completing his education at the University of Bonn he became senior assistant to Dr. J. A. Voelcker, consulting chemist to Royal Agricultural Society. In 1889 Dr. Voelcker was sent to India to advise upon the best course to be adopted to apply the teachings of agricultural chemistry to Indian agriculture and to effect improvements in it. A conference recommended the appointment of a really first-class man as agricultural chemist to the Government of India for the conduct of investigations, and an assistant for purposes of instruction in scientific agriculture. Dr. Leather was selected for the senior post, and he held it from the end of 1892 to 1916, with valuable results.

SIR ANDREW DUNCAN has been appointed independent chairman of the executive committee of the British Iron and Steel Federation, for which provision was made in the constitution adopted at the general meeting of the federation in April last. Sir Andrew, who is an Ayrshire man, born at Irvine in 1884, has been chairman of the Central Electricity Board since it was set up in 1926, having resigned the positions of secretary and vice-president of the Shipbuilding Employers' Federation to take up the post. He has also been Coal Controller, chairman of the Advisory Committee of the Coal Mines Department, a member of the Economic Advisory Council and of the Industrial Development Committee, joint secretary of the Admiralty Shipbuilding Council, and chairman of the Sea Fish Commission. He relinquishes the chairmanship of the Central Electricity Board after having seen the board successfully through the construction stage of its task and fully launched upon general trading operations. In 1935 the board will be trading throughout the whole of the country covered by the national grid scheme, except the small area of North-East England.

DR. J. L. WILTSHIRE, of the chemical division of the Rubber Research Institute, was killed in a motor accident in Malaya on November 14.

MR. H. L. BARKER, who retired several years ago from the post of works manager at Maxwell's Chemical Works, has died at Silloth (Cumberland). He leaves a widow, two sons and a daughter. He had been married twice.

COUNCILLOR R. H. HUME, chairman of the Birmingham Gas Committee, has been elected an alderman of the City Council. He is a director of Cuxson, Gerrard and Co., Ltd., manufacturing chemists, Oldbury. He has been a member of the Birmingham City Council since November, 1920.

DR. WILLIAM PALMER WYNNE, Emeritus Professor of Chemistry in the University of Sheffield, has had conferred upon him the degree of Master of Arts honoris causa by the Senate of the University of Cambridge. Dr. Wynne is now resident in Cambridge and engaged upon research at the Chemical Laboratory.

MR. JOHN BRYAN HALL, who for many years was manager of the "Mobiloil" department of the Vacuum Oil Co., and has just completed thirty years with the company, has retired on pension. On the occasion of his retirement he was presented by Mr. W. Cross, chairman of the company, with an antique grandfather clock and a set of cocktail glasses from the directors and Mr. Hall's own colleagues on the staff. Mr. Hall joined the company in 1904, and in the course of his work for it visited practically every town and village in the United Kingdom. In the early days of the motoring industry, of which he saw the beginnings, he travelled the country in a single-cylinder 9 h.p. Sizaire-Naudin car, and, working in all weathers, covered up to 18,000 miles a year in it. He held executive positions on behalf of the company in many parts of the country, and was latterly one of the outside special representatives.

Phosphorous in Coal and Coke

A New British Standard

THE British Standards Institution has just issued a British standard method for the determination of phosphorus in coal and coke. The matter has been under consideration by a committee of the Institution since 1928 and it was not found possible to include any satisfactory method for the determination of phosphorus in the British Standard Methods for the Sampling and Analysis of Coal for Inland Purposes, issued in 1931 (B.S.S. No. 420). Since that date the matter has been under close investigation and the proposed standard method is based on a comprehensive survey of different methods applied to a large number of cokes from different localities carried out by the Northern Coke Research Committee. Nine methods were selected as being representative of twenty different methods in use among the coke producers and users of Great Britain. In practically every case the phosphorus content of the coke was calculated from the known ash content of the coke and the determined phosphorus content of the ash. Most of the methods involved a preliminary fusion of the coke ash with sodium carbonate or fusion mixture and a subsequent extraction of the melt with either water or acid, to obtain the phosphorus of the ash in solution. In the remaining methods, the phosphorus was obtained in solution usually by extraction of the ash with mineral acid, with or without admixed hydrofluoric acid.

The nine representative methods were applied to the determination of phosphorus in a large number of cokes obtained from Cumberland, Durham, Scotland, South Wales, Westphalia and Yorkshire. It was found that seven of the methods gave low results shown to be attributable to loss of phosphorus in the residues normally rejected during the course of a determination, for example, during the elimination of titanium, or to incomplete extraction of the phosphorus from the ash. The method selected as the standard is one of the two found to give consistent results, and of these two, is the more simple and economical in time. Copies of this method (No. 568-1934) may be obtained from the Institution at 28 Victoria Street, London, S.W.1, price 2s. 2d. post free.

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

RECOVERY OF SULPHUR DIOXIDE from gases containing same.—Metallges. A.-G. May 6, 1933. 8112/34.

SULPHURIC ACID DERIVATIVES of organic acid amides, manufacture.—Henkel et Cie, Ges. May 12, 1933. 8446/34.

TREATMENT OF WASTE SULPHURIC ACID, and manufacture of sulphates and of absorptive carbon therefrom.—N. A. Sargent. May 10, 1933. 8999/34.

HYDROLYSIS OF ALKYL SULPHATE ESTERS for the production of alcohols and ethers.—N. A. Sargent. May 12, 1933. 9170/34.

CONVERTING UNSATURATED ALCOHOLS into their corresponding unsaturated carbonyl compounds.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. May 8, 1933. 12360/34.

MIXED FERTILISERS CONTAINING LIME, manufacture and production.—I. G. Farbenindustrie. May 10, 1933. 12971/34.

PLASTIC ELASTIC COMPOSITIONS, production.—S. Perez. May 9, 1933. 13361/34.

STARCH PRODUCTS, manufacture.—Duintjer Wilkens Meihuizen and Co. Naamlooze Vennootschap. May 6, 1933. 13423/34.

VAT DYEINGS, production.—I. G. Farbenindustrie. May 6, 1933. 13523/34.

ESTERS OF 2-ETHYL-BUTANOL-1.—Carbide and Carbon Chemicals Corporation.—May 12, 1933. 13536/34.

PHENOL, production.—Rütgerswerke A.-G., and L. Kahl. May 10, 1933. 13567/34.

EMULSIONS OF ASPHALTIC MATERIALS.—E. I. du Pont de Nemours and Co. May 6, 1933. 13595/34.

DICHLOROALKYL ETHERS, making.—Carbide and Carbon Chemicals Corporation. May 11, 1933. 13730/34.

TREATMENT OF SOLIDS.—Imperial Chemical Industries, Ltd. May 9, 1933. 13809/34.

VERY ACTIVE ABSORBENT CARBON, production.—Chemical and Biological Products Co., Ltd. May 8, 1933. 13931/34.

ORTHO-OXYAZO-DYESTUFFS, manufacture.—I. G. Farbenindustrie. May 10, 1933. 14147/34.

WATER-INSOLUBLE AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. May 10, 1933. 14191/34.

DYESTUFFS ON CELLULOSIC FIBRES, manufacture.—I. G. Farbenindustrie. May 10, 1933. 14192/34.

POLYVINYL ESTERS, manufacture.—I. G. Farbenindustrie. May 12, 1933. 14281/34.

ACID DYESTUFFS, manufacture.—I. G. Farbenindustrie. May 11, 1933. 14282/34.

COUMARIN, manufacture.—L. Givaudan et Cie Soc. Anon. May 12, 1933. 14348/34.

INDURATED FIBRE, manufacture.—Soc. of Chemical Industry in Basle. May 12, 1933. 14561/34.

HIGH-MOLECULAR ACETALS, process for making.—Farb- und Gerbstoffwerke C. Flesch Jr. May 12, 1933. 14577/34.

DYESTUFF COMPOSITIONS.—E. I. du Pont de Nemours and Co. May 12, 1933. 14588/34.

Specifications Accepted with Dates of Application

POLYMERISATION OF ORGANIC COMPOUNDS.—Triplex Safety Glass Co., Ltd., L. V. D. Scorah and J. Wilson. March 2, 1933. 419,357.

CONDENSATION PRODUCTS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). March 31, 1933. 419,062.

AQUEOUS EMULSIONS OF BITUMEN, pitch, or tar, production.—E. Rouault. April 5, 1932. 419,358.

STARCH FROM MAIZE, manufacture.—International Patents Development Co. April 22, 1932. 419,286.

CYANINE DYES and their use in photography, manufacture.—Kodak, Ltd., and Dr. F. M. Hamer. May 2, 1933. 419,361.

RESINOUS PRODUCTS, manufacture.—E. I. du Pont de Nemours and Co. May 3, 1932. 419,293.

RECOVERY OF SULPHUR DIOXIDE from gas mixtures.—A. M. Clark and Imperial Chemical Industries, Ltd. May 3, 1933. 419,068.

WETTING PREPARATIONS, manufacture and use.—Imperial Chemical Industries, Ltd., C. Dunbar and S. H. Oakeshott. May 5, 1933. 419,154.

SILICON CARBIDE REFRACTORIES and products thereof, processes of manufacture.—Carborundum Co., Ltd. June 30, 1932. 419,214.

WETTING, penetrating, dispersing, foaming, and cleansing agents used in the textile industry.—Chemische Fabrik Stockhausen et Cie. May 9, 1932. 419,308.

DYEINGS AND PRINTINGS on fibrous materials, production.—Soc. of Chemical Industry in Basle. May 10, 1932. 419,366.

TREATING CARBONACEOUS MATERIAL for the recovery of volatile constituents and smokeless fuel, method and apparatus.—H. T. Wright. May 11, 1933. 419,370.

CALCIUM SULPHATE PLASTERS.—S. Barratt. May 15, 1933. 419,081.

TREATMENT OF HYDROCARBON MATERIAL for the purpose of removing carbon bisulphide therefrom.—Yorkshire Tar Distillers, Ltd., S. Billbrough and J. S. Belford. May 22, 1933. 419,312.

ALKALI METAL AND AMMONIUM NITRATES, production.—J. Y. Johnson (I. G. Farbenindustrie). Aug. 30, 1933. 419,232.

RESINOUS PRODUCTS, manufacture.—E. I. du Pont de Nemours and Co. May 16, 1932. 419,373.

DERIVATIVES OF THE ANTHRAQUINONE SERIES, manufacture.—I. G. Farbenindustrie. May 11, 1932. 419,374.

Applications for Patents

(November 8 to 14 inclusive).

SYNTHETIC RESINS, manufacture.—B. A. Adams and E. L. Holmes. 32634.

AZO DYESTUFFS, manufacture.—M. J. G. Bader. (Dec. 12, '33.) 32334.

EVAPORATORS.—D. A. Blair and Blairs, Ltd. 32265.

ESTERS OF POLYNUCLEAR OXYKETONES, manufacture.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 32782.

SEPARATING DUST FROM GASES, apparatus.—Buell Combustion Co., Ltd. 32370.

COPPER OXYCHLORIDE, manufacture.—A. Carpmael (Duisburger Kupferhütte and I. G. Farbenindustrie). 32437.

SULPHATES OF COPPER, ETC., manufacture.—A. Carpmael (Duisburger Kupferhütte and I. G. Farbenindustrie). 32686.

ARTIFICIAL SILK DYESTUFFS.—P. G. Carter, Imperial Chemical Industries, Ltd., R. H. Sennett and C. Shaw. 32587.

SULPHUR DIOXIDE from acid sludge, production.—Chemical Construction Corporation. (United States, Dec. 2, '33.) 32787, 32788.

GLYOXAL SULPHATE, manufacture.—E. I. du Pont de Nemours and Co. (United States, Nov. 10, '33.) 32589.

DIMINISHING BRITTLENESS of polymerisation products of vinyl chloride.—Dynamit A.-G. vorm A. Nobel and Co. (Germany, Nov. 14, '33.) 32554.

HYDROPHYLLIC FATTY SUBSTANCES, etc., making.—Emulsol Corporation. (United States, Nov. 10, '33.) 32449.

SEPARATING SOLIDS FROM GASES, apparatus.—Goodlass Wall and Lead Industries, Ltd. 32431.

AZO DYESTUFFS on the fibre, manufacture.—W. W. Groves (I. G. Farbenindustrie). 32783.

MERCURY COMPOUNDS of arethane series, manufacture.—W. W. Groves (Soc. of Chemical Industry in Basle). 32301.

ANTHRAQUINONE DYESTUFFS.—N. H. Haddock, Imperial Chemical Industries, Ltd., F. Lodge, and C. H. Lumsden. 32825, 32826, 32827, 32828, 32830.

TRIPHENYLMETHANE DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Nov. 11, '33.) 32350.

WETTING, ETC., AGENTS, manufacture.—Imperial Chemical Industries, Ltd. 32588.

DYESTUFF INTERMEDIATES, manufacture.—Imperial Chemical Industries, Ltd., and W. A. Sexton. 32831.

REFRIGERATED CHAMBER EQUIPMENT.—Pulsometer Engineering Co., Ltd. 32306.

ACYL OCTAHYDRO FOLLICLE HORMONES, manufacture.—Schering-Kahlbaum. (Germany, Nov. 9, '33.) 32347. (Germany, May 24.) 32348, 32349.

FERMENTATION PROCESSES.—C. Weizmann. 32811.

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 December 7, 1934.

Stanopac. 554,667. Class 1. Tin oxide. The Union Oxide and Chemical Co., Ltd., 1 and 2 Pepys Street, Seething Lane, London, E.C.3. October 11, 1934.

Brassisan. 554,601. Class 2. Chemical substances used for agricultural, horticultural, veterinary, and sanitary purposes. Bayer Products, Ltd., 31 to 34 Basinghall Street, London, E.C.2. October 9, 1934.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

APART from minor adjustments, there have been no changes in the prices of general chemical products during the week. Unless otherwise stated, the prices given below cover fair quantities, net and naked at sellers' works.

LONDON.—The market continues firm with no change to report from last week. There are several small inquiries in the coal tar products market. Business appears to be improving and prices are firm.

MANCHESTER.—In one or two directions during the past week a little more activity has been reported on the Manchester chemical market. This has been attributed largely to the approach of the end of the year and has been reflected in an expansion of interest shown by some of the larger users of chemicals in connection with contracts for delivery over the early part of next year. Inquiry has been on an improved scale and there has been some increase, also, in the actual weight of business placed. In addition, a moderate trade has been reported to cover prompt and early needs. From the point of view of consumption, there has been little contraction in this compared with the experience of the past month or so and specifications so far this month have been about up to the October level. The chemical market, as a whole, maintains a steady front with little sign of weakness.

SCOTLAND.—Business generally in the Scottish heavy chemical market is mostly concerned with contract prices for the year 1935.

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.—10½d. per lb. less 5%. MANCHESTER : 10½d.

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

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

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

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

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

ACID, OXALIC.—LONDON : £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND : 98/100%, £48 to £50 ex store. MANCHESTER : £49 to £54 ex store.

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

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. SCOTLAND : 11¾d. to 11¼d., less 5% delivered Glasgow. MANCHESTER : 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. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r mines. SCOTLAND : White powdered, £23 ex wharf. MANCHESTER : White powdered Cornish, £22, ex store.

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

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

BARYTES.—£6 10s. to £8 per ton.

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

BLEACHING POWDER.—Spot, 35/37%, £7 10s. 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. 5d. to 2s. 9d.

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

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

CARBON BLACK.—3¾d. to 5d. per lb. LONDON : 4½d. to 5d.

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

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

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

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

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

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

DIPHENYLGUANIDINE.—2s. 2d. per lb.

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

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

LAMPBLACK.—£45 to £48 per ton.

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

LEAD, NITRATE.—£27 10s. per ton.

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

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

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

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

METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 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.—8¼d. to 8¾d. per lb. without engagement.

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

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5¼d. 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 : £38.

POTASSIUM CHROMATE.—6¾d. per lb. d/d U.K.

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

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

POTASSIUM PERMANGANATE.—LONDON : 9¾d. per lb. SCOTLAND : B.P. crystals, 9d. MANCHESTER : B.P., 10d.

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

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

SODA ASH.—58% spot, £5 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 10s. per ton.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

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

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

SODIUM IODIDE.—B.P., 6s. per lb.

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

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

SODIUM PHOSPHATE.—£13 per ton.

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

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

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

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

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 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 2s. 6d.

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. per ton f.o.b.

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

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8½d. to 8¾d. per lb.; crude, 60's, to 2s. 2½d. per gal. MANCHESTER: Crystals, 7½d. per lb.; crude, 1s. 11d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

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

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

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

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d.; 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, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—LONDON: 50s. per ton f.o.b. East Coast port.

PYRIDINE.—90/140, 7s. to 8s. 6d. per gal.; 90/180, 2s. 3d.

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

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

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Nov., £6 19s.; Dec., £7 0s. 6d.; Jan., 1935, £7 2s.; Feb., £7 3s. 6d.; Mar./June, £7 5s.; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CYANAMIDE.—Nov., £6 18s. 9d.; Dec., £7; Jan., 1935, £7 1s. 3d.; Feb., £7 2s. 6d.; Mar., £7 3s. 9d.; Apr./June, £7 5s.; delivered in 4-ton lots to farmer's nearest station.

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

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

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

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

Latest Oil Prices

LONDON, Nov. 21.—LINSEED OIL was firmer. Spot, £19 5s. (small quantities 30s. extra); Dec., £17 15s.; Jan.-April, £18; May-Aug., £18 7s. 6d.; Sept.-Dec., £18 15s., naked. SOYA BEAN OIL was firm. Oriental (bulk), Nov.-Dec. shipment, £14 5s. per ton. RAPE OIL was steady. Crude, extracted, £27 10s.; technical refined, £29, naked, ex wharf. COTTON OIL was dearer. Egyptian crude, £17 10s., refined common edible, £20 10s.; and deodorised, £22, naked, ex mill (small lots 30s. extra). TURPENTINE was easier. American, spot, 44s. per cwt.

HULL.—LINSEED OIL, spot, quoted £18 5s. per ton; Nov.-Dec. and Jan.-April, £18 2s. 6d.; May-Aug., £18 7s. 6d., naked. COTTON OIL.—Egyptian crude, spot, £17 10s.; edible refined, spot, £19 10s.; technical, spot, £19 10s.; deodorised, £21 10s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £13 10s., naked. GROUNDNUT OIL.—Extracted, spot, £23; deodorised, £27. RAPE OIL.—Extracted, spot, £26 10s.; refined, £28. SOYA OIL.—Extracted, spot, £16; deodorised, £19, per ton. COD OIL (industrial), 25s. per cwt. CASTOR OIL (pharmaceutical), 36s. 6d.; first, 31s. 6d.; second, 28s. 6d. per cwt. TURPENTINE.—American, spot, 45s. 3d. per cwt.

Forthcoming Events

LONDON

Nov. 26.—Institution of the Rubber Industry (London Section). "Special Properties of Latex." F. H. Cotton. 7.30 p.m. Institution of Mechanical Engineers, Storey's Gate, London.

Nov. 28.—Institute of Fuel. "Nature of the Processes of Oil Cracking, Water Gas Carburetting and Hydrogenation." Professor M. W. Travers. 6 p.m. Burlington House, London.

Nov. 28.—Society of Chemical Industry (Road and Building Materials Group). "Problems Arising in the Use of Porous Building Materials." B. H. Wilsdon. "The Mechanism of Wood Decay." Dr. E. A. Rudge, London.

Nov. 28.—Institution of Chemical Engineers (Graduates and Students Section). "Oil-Gas Fuel in Tinplate Manufacture." W. N. Hoyte. London.

Nov. 29.—Institute of Vitreous Enamellers (Southern Section). "Costing for Vitreous Enamelling." J. H. Coupe. 8 p.m. British Industries House, Marble Arch, London.

Nov. 30.—Institute of Metals (London Section). Supper-Dance. 7.30 p.m. Thames House, Millbank, London.

BANGOR (North Wales)

Nov. 26.—The Chemical Society. "A General Review of Polysaccharide Structure." Professor W. N. Haworth. Chemistry Lecture Theatre, University College, Bangor.

BELFAST

Nov. 30.—Institute of Chemistry (Belfast and District Section). Annual Dinner. Grand Central Hotel, Belfast.

BIRMINGHAM

Nov. 28.—Institute of Vitreous Enamellers (Midland Section). "Costing for Vitreous Enamelling." W. Todd. 7.30 p.m. Chamber of Commerce, New Street, Birmingham.

Nov. 29.—Midland Metallurgical Societies. "Directionality in some Annealed Non-Ferrous Alloys." R. G. Johnston. 7 p.m. James Watt Memorial Institute, Birmingham.

EDINBURGH

Nov. 27.—Institution of the Rubber Industry (Scottish Section). "Development in Modern Rubber Machinery." F. Siddall. 25 Charlotte Square, Edinburgh.

GLASGOW

Nov. 30.—Society of Dyers and Colourists (Scottish Section). "Recent Chemical Developments in Wool Research." Dr. H. Phillips. 7.15 p.m. George Hotel, Buchanan Street, Glasgow.

Nov. 30.—Institute of Chemistry, Society of Chemical Industry, Institute of British Foundrymen (Scottish Sections). "Recent Development in Silicate Enamels and a Study of their Industrial Uses." E. E. Geisinger. 7.30 p.m. Royal Technical College, Glasgow.

HULL

Nov. 27.—Hull Chemical and Engineering Society. "Producer Gas as a Factory Service." "Some Notes on Inflammability." E. C. Craven. 7.45 p.m. Municipal Technical College, Park Street, Hull.

LEEDS

Nov. 26.—Institute of Chemistry (Leeds Area Section). Annual general meeting. "Modern Alchemy—Post-War Advances in the Chemistry of Natural Products." Professor I. M. Heilbron. 7.30 p.m. University, Leeds.

MANCHESTER

Nov. 30.—Manchester Literary and Philosophical Society (Chemistry Section). "Chemical Aspects of Linoleum Manufacture." Dr. James Allan. 36 George Street, Manchester.

From Week to Week

MR. F. W. PATERSON, of 35 Great Tower Street, E.C.3, was appointed receiver of the Argonaut Varnish Co., Ltd., on November 8, under powers contained in debenture dated September 29, 1928.

THE LIQUIDATOR of J. M. Newton Vitreo-Colloid (1928), Ltd., gave notice in the "London Gazette," of November 20, of a return to contributories of 1d. per share as a first payment to be made on December 10, at 9 York Place, Edinburgh.

NOTICE OF AN INTENDED DIVIDEND by Metafilters (1929), Ltd., was given in the "London Gazette," of November 20. The liquidator is Mr. J. Pelham, of 59 Woodstock Avenue, N.W.11, and the last day for receiving proofs, December 7.

THE RESEARCH DEPARTMENT at Pease and Partners' Bankfoot Works, Crook, is understood to be closing. Their research department was opened four years ago, when Dr. W. T. K. Braunholtz was appointed chief of the laboratories.

THE BUSINESS OF BLEACH MANUFACTURERS and oil blenders, carried on by Alexander Whitby and Co., at St. Mungo Street, Bishopbriggs, Glasgow, has been dissolved by the death of Miss A. Blackwood, one of the partners. The business will now be carried on by Mr. Alex. Whitby, under the same name.

THE PARTNERSHIP between Harold Bamford, Patrick Joseph Finn, Marcus Schleifer and Joel Woolfe, carrying on business as manufacturing chemists at Brookhouse Laboratories, Blackburn, as Bamford Finn and Co., has been dissolved. The business will be carried on by Mr. Bamford and Mr. Finn on their own account.

SADLER AND CO. (GLASGOW), LTD., have decided to extend their Dalmarnock soap and oil works by taking over a factory in the Bridgeton district. The works at Dalmarnock are not to be closed. The new premises are required to cope with expanding business. They were formerly used by the Barrowfield Oil Works, and have been used of late as an employment exchange.

DETAILS ARE NOW AVAILABLE of an issue by Motor Fuel Proprietary, Ltd., of 300,000 shares of 5s. each at 15s. per share. The issue is being made to shareholders in the proportion of three new shares for every four now held, the lists remaining open until November 27. The new capital is required for the purpose of acquiring a site to erect thereon a plant capable of treating 500 tons of coal per day and to provide working capital.

THE UNIVERSITY OF BIRMINGHAM METALLURGICAL SOCIETY held its 19th annual dinner in the Union, Edgbaston, on November 17. Among the guests were Dr. H. Moore (President of the Institute of Metals), Mr. D. J. MacNaughton (Director of the International Tin Research Association), Mr. W. L. Chance (Warden of the Guild of Undergraduates), and Mr. E. W. Bache (ex-President of the Birmingham Chamber of Commerce).

THE RUBBER GROWERS' ASSOCIATION has just published an interesting book on "Rubber and Agriculture," which is one of a series of books dealing with rubber in industry. This book (64 pp.) is fully illustrated and contains sections devoted to the use of rubber equipment for tractors, pneumatic tyres for farm vehicles, rubber for cowstalls and in the dairy, rubber footwear and clothing, rubber belting and hose, rubber in the farm house and the miscellaneous applications of rubber in the various items of equipment used in farming operations. Copies of the book are available free of charge on application to the Secretary of the Rubber Growers' Association, 2-4 Idol Lane, Eastcheap, London, E.C.3.

THE DISTILLERS CO. announces that, as the parties have been unable to arrive at an agreement, the negotiations between the company and the National Distillers Products Corporation of Virginia have come to an end. It was on June 21 that an announcement was made to the effect that the Distillers Co. had contracted to buy 337,000 shares of no par value in National Distillers at $25 per share. With the proceeds of this issue, and of a similar issue to stockholders, National Distillers was to purchase a 40 per cent. interest in a new company, Distillers Co. of Delaware. The remaining 60 per cent. interest in the new company was to be owned by Distillers Co., which was to transfer to it exclusive rights of manufacture and sale in the United States of all its brands.

THE FIRST REPORT of the Rubber Regenerating Co. since its conversion into a public company contains interesting references to the outlook for the manufacture of reclaimed rubber. The directors state that the volume of business has doubled during the past six months and that the company has at present more than double the amount of forward business booked at the same date last year. In addition to the increased volume, contracts are now on a more favourable price basis. The directors consider that a price of around 6d. for raw rubber is satisfactory from the point of view of the company. The slump in raw rubber prices in 1929 and succeeding years, however, proved that reclaim rubber has now taken its place as a compounding ingredient in rubber manufacture on its own merits. The recent rise in the price of raw rubber is regarded as being only one of the factors leading to an extended use of reclaim rubber.

MR. E. J. BELL, of 23 King Street, Cheapside, E.C., was appointed receiver and manager of Central Polish and Varnish Works, Ltd., on November 7, under powers contained in debenture dated March 6, 1928.

NOTICE WAS GIVEN in the "London Gazette" of November 13 of the voluntary winding-up of Pollopas, Ltd., and the appointment of Mr. T. G. Foster, of 1 Oxford Street, Nottingham, as liquidator.

PAYMENTS HAVE BEEN MADE by the Second Anglo-Scottish Beet Sugar Corporation to growers all over Scotland in settlement of beets delivered to the Cupar factory in October to the value of £26,000. A total of 80,000 tons of beet will be delivered to the Cupar factory, where 450 men are employed.

THREE NON-EUROPEAN WORKERS were killed and two Europeans and fifteen non-Europeans were injured in a fire in the cracking plant of the Anglo-Persian Oil Co.'s refinery at Abadan on November 18. The fire was quickly got under control and the material damage was slight.

IT IS PROPOSED TO HOLD at the London School of Hygiene and Tropical Medicine an annual conference, lasting for two days, in order that medical officers in industry who are on leave from the tropics, may be able to meet their colleagues and discuss their problems. The main subject for discussion will be the prevention of disease, *e.g.*, control of malaria and epidemic diseases in the tropics; water supplies; sewage and refuse disposal; housing; the keeping of records, and hygiene generally.

THE I. G. FARBENINDUSTRIE reports that in the third quarter of 1934 business as a whole developed satisfactorily despite increased export difficulties. Dye exports were at the level of the previous year. The turnover in chemicals improved, especially in respect of home sales, but the position in regard to foreign sales of pharmaceutical products was difficult. Home sales of rayon developed well, and the new "Vistra" is also said to have achieved "further development successes."

LORD TRENT, chairman of Boots Pure Drug Co., Ltd., unveiled a bronze bust to the memory of his father in front of Nottingham University College buildings, on November 15. It is the gift of Nottingham Corporation. The pedestal bears the inscription:—"Our great citizen, Jesse Boot, Lord Trent. Before him lies the monument of his industry; behind an everlasting monument of his benevolence." The college was erected and endowed by the late Lord Trent, who spent £500,000 on it and a still larger sum on the surrounding park and other amenities. The bust has been executed by Mr. C. L. Doman.

BRITISH TAR PRODUCTS, LTD., give notice that at an extraordinary meeting to be held on November 26, proposals will be submitted for sub-dividing the existing £1 preferred ordinary and ordinary shares into 5s. shares. Further, preferred ordinary shareholders may by notice in writing, left, together with the share certificate, at the company's office, 11 and 12 Pall Mall, S.W.1, not later than December 10, or such later date as the directors may agree, elect to convert their shares into ordinary shares. Issued capital amounts to £326,245 in £1 shares, of which £32,952 is in 8 per cent. non-cumulative preferred ordinaries and the balance in ordinary shares.

THE LIGHTING OF THE NEW BATTERY OF COKE OVENS at the Cargo Fleet Ironworks of the South Durham Steel and Iron Co., Ltd., has inaugurated the most up-to-date silica coke oven plant in the country. This latest extension completes an entirely new coking plant within the past two years and will provide a coke output of over 5,000 tons per week. The ovens are of the "Kogag" type, built with the Goldschmidt flue for an increased yield of benzol, and are the first to be built in this country on this principle. The ovens can be heated by either coke oven or blast furnace gas. An extended and re-modelled by-product recovery plant installed in connection with the new ovens will produce tar, sulphate of ammonia, benzol, toluol, naphthalene, solvent naphtha, and other products.

THE ADMIRALTY AND AIR FORCE of France have kept in close touch with the working of the first low temperature carbonisation plant which was started up at Lens in July, and it is now announced that two works are about to be set up at Lievin and Bethune for the production of oil and petrol from coal. The result of the Lens works has been completely satisfactory, yielding products from various French coals of the best quality and fully up to the estimated figures. Colonel W. A. Bristow, chairman of Low Temperature Carbonisation, Ltd., was invited by the French Society of Industrial Chemistry to lecture in Paris upon the whole process, and the discussion and debate was largely attended by Government and official representatives of the fuel oil and chemical industry of France. The new plans for Lievin and Bethune have been approved by the Minister of Labour and by the municipalities in these areas and work on the enterprise is about to begin at a cost of 40,000,000 francs. Active negotiations are in progress for three further works in different parts of the Continent.

Company News

Joseph Nathan and Co.—In a circular to shareholders it is stated that the preliminary figures show a profit for the year to September 30 last, after providing for contingencies, of £55,230, compared with £39,521 for the previous twelve months.

Sudan Salt.—It is announced that the next accounts will be for a period of 21 months ending December 31, 1934; meanwhile, in order to comply with the Companies Act, the ordinary general meeting was held on November 21, and was adjourned until the spring, when the accounts for the period ending December 31 next will be presented.

Eastern Chemical Co.—The report for the year ended March 31, 1934, states that the result of the year's working, after writing off £4,014 for depreciation, is a loss of £5,056, the trading loss being the difference, viz.: £1,042, which is £2,091 less than the trading loss of the previous year. The annual meeting will be held at 13 Fenchurch Avenue, London, E.C.3, on November 28, at 3 p.m.

Weardale Lead Co.—The report for the year ended September 30, 1934, states that the profit and loss shows a loss of £151, but after bringing into account income from investments, etc., there remains a credit balance for the year of £621, which, added to previous year's credit balance of £881, makes £1,503 to be carried forward. No allowance for depreciation on property, plant and machinery has been provided. The company's investments appreciated further in value to £28,375. The annual meeting will be held at the Central Station Hotel, Newcastle-on-Tyne, on November 27, at 12 noon.

Lewis Berger and Sons.—The report for the year to July 31 last shows that the net profits amounted to £102,460. This is stated to be the highest level reached since 1929-30, and compares with £74,405 in the previous year. Larger dividends from subsidiary companies (all of which operated at a profit) account for £15,560 of the total profit increase of £28,056. The ordinary dividend is raised from 7½ per cent. to 10 per cent., less tax, and the carry forward of £75,069 compares with £53,337 brought in. The annual meeting will be held at the Great Eastern Hotel, Bishopsgate, London, E.C.2, on November 27, at 12 noon.

British Cyanides Co.—It is reported that the gross profits for the fifteen months to September 30, 1934 were £73,847, compared with £47,507 for the previous twelve months. After providing £11,067 for research expenditure, patents, etc., writing £4,000 off cost of plant at Birmingham Gas Works, writing down obsolete plant by £1,848 and £701 written off investment in Cotton Treating Syndicate, there is a net profit of £26,257. This compares with a figure of £15,907 for the previous year adjusted to fifteen months. A final dividend of 5 per cent., less tax, is to be paid, making 9 per cent., compared with 3 per cent. for the previous twelve months. The carry-forward is £2,288. The annual meeting will be held at Southern House, on November 28, at 12 noon.

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).

India and Burma.—A firm of manufacturers' representatives and commission agents in Bombay is desirous of obtaining agencies for pharmaceutical products, paints and varnishes, on either a commission or consignment basis, for India and Burma. (Ref. No. 454.)

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Department of Public Health is calling for tenders, to be presented in Cairo by February 2, 1935, for the supply of 110 metric tons of disinfectant fluid for general purposes and 12,600 kilos of disinfectant for medical purposes. (Ref. F.Y. 2169.)

Voluntary Liquidation

Marylebone Laboratories, Ltd.

THE statutory meeting of the creditors of Marylebone Laboratories, Ltd., 294/300 Regent Street, London, W.1, was held recently when Mr. M. M. Turner, the principal shareholder, presided. A statement of affairs was submitted which showed ranking liabilities of £2,214, of which £1,320 was due to the trade. The assets comprised, cash in the hands of Sproull, Goddard and Co., £100; book debts £99; estimated to realise £50; and cash at bank £21; making a total of £171, from which had to be deducted £19 for preferential claims, leaving net assets of £152, or a deficiency, so far as the creditors were concerned, of £2,062. The issued capital was £500, all of which was subscribed for in cash, and the deficiency, as regarded the shareholders, was £2,562. The company was incorporated on May 13, 1933. The company also had a branch at Bristol, but that was closed down after a very short time. It was stated that a meeting of the creditors was held in August last, when a moratorium was agreed upon. The premises were held on a lease for seven years at a rental of £375 per annum. The landlord had distrained. For the year ending May 12, 1932, the turnover was £3,918, and there was a net loss on the trading of £1,069. From that date up to November 7 last, the turnover was £3,112, and there had been a net trading loss of £1,092. The shareholders had previously nominated Mr. Donald Currie as liquidator, and it was decided to confirm that appointment. A committee was also appointed consisting of the representatives of Dawson and Son, Ltd., Edsall Engineering Co., Ltd., and Telegraph Condenser Co., Ltd.

BOX NO. 1630. Will the numerous applicants who received no direct communication accept the thanks of the Advertiser and this intimation that the position advertised has been filled.

BUSINESS OPPORTUNITIES

(1s. per line; minimum charge 8s.)

NEW GLAZING AND ENAMELLING PROCESSES FOR SALE.

FOR England, Colonies, Dominions and several other countries. Swiss Company wish to sell the sole manufacturing rights of their outstanding new COLD ENAMEL VARNISH PROCESSES (PORCELAIN-LIKE GLAZE). Applicable in the cold on nearly any surface, every metal, on building material of any kind. Even seamless glazing of walls possible. Applicable even on paper, cardboard, artificial leather, wire, cables, etc. RESISTS WATER, ACIDS and SCRATCHING. Small costs for installation. Great business possibilities. Suitable for formation of a new Company. Only principals having some capital are invited to inspect large sample exhibit at the Director of "Agipa," c/o Turner's Hotel, Guilford Street, London, W.C.1 (Daily 10-1, 3-6 o'clock).

FOR SALE

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

CHARCOAL, ANIMAL and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill-Jones, Bochurch, London." Telephone: 3633 East.

FILTER PRESS, Dehne, 17 C.I. Plates 24 in. x 24 in. and Frames, with Pump 2½ in. plunger, nearly new condition. C. F. DAVIS, LTD., Hatcham Road, Old Kent Road, S.E.15. New Cross 1147.

HYDRAULIC PRESSES AND PUMPS. Large stock in London. Price quoted for adapting and erecting.—THOMPSON AND SON, Maria Street, Millwall.

WANTED

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

GRINDING of every description of chemical and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London E. Telegrams: "Hill-Jones, Bochurch, London." Telephone: 3633 East.

EDWARD RUSHTON, SON AND KENYON (Established 1855).
Auctioneers' Valuers and Fire Loss Assessors of CHEMICAL WORKS, PLANT AND MACHINERY.
York House, 12 York Street, Manchester.
Telephone: 2517 and 2518 Central, Manchester.
Telegrams: "Russonken, Manchester."
And Bardon Chambers, 13 Infirmary Street, Leeds 1.
Telephone: 26154.

OFFICIAL NOTICE

(1s. per line; minimum charge 8s.)

THE INSTITUTION OF CHEMICAL ENGINEERS. EXAMINATION, 1935.

Application forms (returnable 20th December, 1934) and particulars of the Associate-Membership Examination for 1935, together with the Memorandum on "The Training of a Chemical Engineer," may be obtained from the Hon. Registrar, Institution of Chemical Engineers, Abbey House, Westminster, London, S.W.1.

PATENTS & TRADE MARKS

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

KINGS PATENT AGENCY, LTD. (B. T. King, C.I.M.E., Regd. Patent Agent, G.B., U.S.A., and Can.). Advice, Handbook, and Cons. free. 49 yrs. refs. 146a Queen Victoria Street, London, E.C.4. 'Phone: City 6161.

PATENTS obtained, trade marks and designs registered, at home and abroad.—GEE AND CO. (Patent and Trade Mark advisers to THE CHEMICAL AGE), 51-52 Chancery Lane, London. W.C.2. Telephone: Holborn 1525. Established 1905.

REGINALD W. BARKER & CO. (Estab. 1886.) Patent and Trade Mark Agents, 56 Ludgate Hill, London, E.C.4. Booklets sent gratis. Phone: City 5140.

WORKING NOTICES

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

THE Proprietor of British Patent No. 194,454, dated January 6, 1922, relating to "Improvements in Materials for Polishing and Cleansing," is desirous of entering into arrangements by way of a licence or otherwise on reasonable terms for the purpose of exploiting the above patent and ensuring its practical working in Great Britain. Inquiries to B. Singer, Steger Building, Chicago, Illinois.