The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXII. April 13, 1935 No. 824

Notes and Comments

I.C.I. Progress

THE preliminary announcement a fortnight ago of an increased dividend for shareholders in Imperial Chemical Industries, Ltd., has been followed by the issue of the eighth annual report which confirms the optimistic impressions created by the dividend announcement. Continued improvement in demand is reported by all the manufacturing groups serving the home market, though not in so marked a degree as in the previous year. Most of the export markets were better, though increasing competition from the East added to already difficult conditions. Throughout the report there is evidence of recovery, necessitating considerable plant extensions and an increase of nearly six thousand in the total number of persons employed, bringing the figure to 41,736. A general survey of the overseas activities of the company and its subsidiaries also strikes the same satisfactory note, and the only setback noted throughout the report was in the matter of fertilisers for home consumption, the upward trend of the previous year having been reversed. Better sales, however, are expected during the coming season. Striking progress has been made in various branches of research, and an indication of the progress of the work at Billingham may be gathered from the fact that the first unit for producing petrol by hydrogenation of creosote has been successfully started up.

Some important changes are shown in the balance sheet. Holdings in subsidiary and associated concerns are written down by transfers of £2,610,000 from the central obsolescence and depreciation fund and £107,682 from general reserve. Even so the total interest in subsidiaries is £5,272,632 higher than twelve months ago, principally due to the acquisition of the Broughton Copper Co., Ltd., the formation of Imperial Chemical Industries (Egypt) Société Anonyme and the acquisition of further share in subsidiary companies. On the other hand cash assets show a reduction of £5,010,644, partly due to the erection of the oil-from-coal plant at Billingham.

Simplification of Capital Structure

ACCOMPANYING the annual report of Imperial Industries, Ltd., are detailed statements with regard to the proposals for the simplification of the capital structure of the company which are to be laid before the shareholders at the annual meeting and at an extraordinary general meeting and class meetings of ordinary and defered shareholders to be held on the same day. Stated briefly it is proposed to effect a conversion of the present deferred shares into ordinary shares, each four deferred shares of 10s. each being converted and consolidated into one ordinary share of £1, carrying full dividend rights from the commencement of the current financial year. The case for simplification is explained in detail. Reference is made to the historical fact that the bulk of the deferred shares were issued to shareholders of the companies merged in 1926 as a capitalisation of part of the estimated increase in future profits. In favour of the scheme it is argued that the retention of the company's competitive position demands the maintenance of plant and equipment at the highest efficiency. This means that substantial appropriations for obsolescence and reserves are likely to bear most heavily on the deferred shareholders for some time to come. On the present ordinary distribution of 7 per cent., the proposal would mean that the actual dividend income of the deferred shareholders would be doubled. If however, the distributable earnings should expand the deferred shareholders would fare more favourably under the present arrangement.

If the ordinary shareholders' return is not to be reduced, the company at first, instead of conserving resources, will have to pay out more in dividends than under the present arrangement. The fact that reserves will be augmented by the reduction in the deferred capital means merely a book change which will not affect the liquid resources. The fairest test of the proposal is the relative present and prospective earnings on the ordinary and deferred capital. If the transfer of £1,000,000 to reserve and the increase of £42,312 in the carry-forward are written back, the present percentage earned on the deferred is over 5, compared with 9½ on the ordinary. On this basis the earning power of the present deferred capital would be slightly curtailed by the scheme. Future earnings cannot be predicted, but any improvement would heighten the value of the deferred shares under the existing arrangement. As regards capital, voting rights and bonus issues, the deferred shareholders are adversely affected by the proposals, but the directors have no hesitation in unanimously recommending the whole of the proposals to all classes of shareholders for their acceptance.

Chemical Plant Corrosion

THE resistance of materials of construction to the forces of decay existing in every chemical process is one of the prime concerns of the chemical engineer. Actually the process of decay is two-fold, that of mechanical wear or abrasion and that of corrosion or

"chemical wear." Mechanical wear may arise from quite unusual causes. We recollect examining the interior of a large gas main that had been rifled to the point of holing by conveying warm gases containing tar that had been given a swirling motion, by reason of a deflection due to a too sudden change of direction. Until visual examination was made it appeared equally possible that the damage was due to corrosion. Mechanical wear, in so far as it is preventable, is a matter of design coupled with an intelligent selection of metals.

Corrosion is more insidious and is far less understood than mechanical defect. Whilst the fundamental work of men like Newton Friend, U. R. Evans and Bengough has illuminated the mechanism of corrosion, no great generalisations have yet been discovered that enable principles to be enunciated for the selection of materials resistant to any given type of corrosion. Therefore, it was not surprising to find a large audience assembled at the April meeting of the Society of Chemical Industry to hear what Dr. Harold Moore had to say on the subject of corrosion-resisting non-ferrous alloys. It was interesting to observe how fashions change in scientific theory.

Film Theory of Corrosion

TWO decades ago corrosion was regarded as electrolytic in its origin; to such an extent had that idea taken root, that it was virtually impossible to convince anyone of the bare existence of an oxide film. Now it is the film theory that holds the field. It is held that there is no inherently resistant metal—not even gold and platinum—and that metals are for the most part in a state of unstable equilibrium; they have been won from their natural condition as oxides or sulphides by chemical means and, given the least opportunity, they will revert to the state of nature. At all times the surface of the metal is covered with a film of oxide (or sometimes basic sulphate) and Dr. Bengough even maintains that we have never yet seen a metal surface.

Many of these oxide films are highly resistant to chemical action. On this view resistance to corrosion involves not only a resistant surface film, but also that the film must be immediately self-healing if broken. The theory seems to account for the surprising effect of small impurities in the metal or in the material in contact with it. The relative behaviour of two metals may be completely changed according to whether dissolved oxygen is present or not; the addition of 0.01 per cent. of arsenic prevents the dezincification of brass, and 0.002-0.004 per cent. of copper immensely increases the rate of solution of pure zinc. Non-ferrous metals develop the corrosion-protective coating more readily than iron.

The Cost of Experience

FROM this film conception the generalisation for which chemical engineers and others have been waiting, may ultimately appear. Possibly in work on the composition and properties of the films and on the variations provoked by different sets of conditions will lie the pathway of practical discovery. But that time is not yet. It is remarkable with what frequency all speakers and writers on the subject are driven to make vague statements that at first sight bear the hall-mark of knowledge, but that on examination by those who desire to apply them are found to be full of uncertainties.

Even laboratory experiment, as Dr. Moore significantly remarked, is no safe guide to the suitability of a metal for withstanding any given set of practical conditions; the number of variables is so great, and the possibility of error due to accidental omission of an essential but unsuspected factor is so serious, that the only practical test is that of use on the large scale. Experiment on the large scale, however, is apt to be expensive and the result is generally referred to as "experience." Chemical industry must lose an immense amount of money in gaining experience. We know an industrial magnate whose experience of metal corrosion in one process cost him £500,000. We suggest to Dr. Moore, and to the chemical industry in general, that a central clearing house for information on the behaviour of metals in chemical plant should be set up. To this organisation chemists and engineers alike should communicate their experiences as and when they occur, full investigation being permitted if possible, and that all should be entitled to submit their problems to the central body for guidance where information is available. Collection of information on these lines would enable advice to be given on the use of materials.

It was suggested at the meeting under discussion that many difficulties arose because the user does not give the material proper treatment. What is and what is not a "proper treatment" may be a moot point, but, unless the user is fully instructed by the metallurgist and their combined knowledge is pooled, as much money may be wasted in discovering the meaning of the "proper treatment" as in any other way. An instance was given of pitting of stainless steel pillars outside a shop, due to adhesion of dust particles bearing sulphur oxides derived from the atmosphere. The difficulty could have been avoided if the steel had been washed each day; but how is a shopkeeper to know that "stainless" steel out of doors wants washing unless he is told by the maker?

Letter to the Editor

Congress for Scientific Management

SIR,—The occasion of the Sixth International Congress for Scientific Management, to be held in London from July 15 to 20 this year, under the patronage of the Prince of Wales, will doubtless prove an event of considerable national importance. Management has never previously been the subject of a large conference in this contry and, therefore, I should like to draw special attention to this fact. The Federation of British Industries, whose president I am, took some responsibility in 1933 when it convened together representatives of numerous professional and scientific bodies These representatives undertook the work of arranging the congress. The Federation wishes the congress every success and hopes that several hundreds of companies will be represented thereat.

An excellent and varied series of papers has been secured and these will be printed and made available to members before the congress. The necessary financial help has been given by the broadest range of industrial companies, banks, commercial houses and by professional and scientific bodies, as well as by individuals interested in particular sections of the congress. Very practical results have accrued in the countries in which previous congresses have been held.

The chairman, Sir George Beharrell, on behalf of his Council, extends a cordial invitation to all those interested in any phase of management. I should like to suggest, therefore, to your readers, that they make an early application for programmes and membership forms to the Secretary of the Congress at 21 Tothill Street, S.W.1.—Yours faithfully,

HERBERT SCOTT, President,
Federation of British Industries.

Annual Report of Imperial Chemical Industries, Ltd.

Continued Improvement Throughout 1934

THE directors of Imperial Chemical Industries, Ltd., in their eighth annual report, to be presented at the annual meeting at the Central Hall, Westminster, on May 1, record that in the home market each of the company's manufacturing groups experienced a continuance of the improvement in demand, though not in so marked a degree as in the previous year. Exceptional conditions caused decreased sales of a few products, but for a number of others there was more than a countervailing expansion. Taken as a whole, therefore, the volume of home business showed a pleasing growth. Most of the export markets were better, though increasing competition from the East added to already difficult conditions. In general, there was evidence of moderate recovery.

Sales of alkali products were larger than during the previous year, both in the home trade and, despite increased competition, in export markets. Extensions of plant begun in 1933 to meet growing industrial needs at home and abroad are now in operation. The market for heavy chemicals also was good throughout the year, while there has been a notable increase in the sales of the new products. Acid production was maintained at a level which has called for plant extension. Special attention continued to be concentrated on the manufacture of chemicals not hitherto produced in this country.

The Dyestuffs Group

In the home market sales of dyestuffs have held closely to the level of the previous year, but export markets have recorded a substantial improvement. The production of organic chemicals has shown a satisfactory increase, and the demand for these materials, particularly by the rubber and lacquer trades, has been very encouraging. Developments of specialised products for agricultural requirements have met with success.

Regarding the explosives group, the report states that the new commercial agreements negotiated by the British Government with foreign countries and industrial recovery at home led to some increase in coal output and the home sale of explosives followed this movement. Exports of explosives showed a moderate increase. Consumers' requirements for industrial nitrocellulose are expanding rapidly, and new business has been opened up in highly refined nitrate of potash.

The home consumption of fertilisers suffered a set-back in 1934, reversing the upward trend of the previous year. Better sales are, however, expected as the Government schemes for the restoration of agricultural prosperity gather impetus. The agreement with the more important European producers of synthetic nitrogen fertilisers was extended for another year, ending June 30, 1935, and the adherence of the Chilean producers was secured. An arrangement was also concluded with the Japanese makers. More ordered selling followed in the export markets, but increased production in Japan and the United States led to a decrease in exports to those countries. The erection of the oil from coal plant at Billingham referred to in last year's report proceeded smoothly throughout the year in accordance with the programme. An indication of the progress of the work may be gathered from the fact that the first unit for producing petrol by hydrogenation of creosote has since been successfully started up.

The excellent progress made by the leather cloth group has been well sustained during the year under review, as a consequence of which it has been necessary to make considerable extensions to the plant. In the lime, cement and plaster group, sales of lime, cement, partition block and plaster were in excess of those of 1933. To cope with the demand, fresh lime-burning plant is being erected, and will begin production during the first half of 1935, while a plant for the manufacture of "Pioneer" partition block is now operating successfully on the Thames.

The Metal Group

During 1934 there was a further large increase in sales of non-ferrous metals. At home, business reflected the increased activity in industry generally, and particularly in ship-building, locomotive building, the motor trade and telephone development; abroad, sales increased in all the principal markets, and particularly in India, where trade has continued to benefit by the Ottawa agreements. Steady progress has been made in the modernisation of equipment and in the introduction of new methods, with consequential reductions in production costs and improvements in the quality of the company's non-ferrous metal products. The 1934 game season was satisfactory, and there was a further growth in sales of sporting ammunition.

The majority of the associated home companies recorded an improvement in business. In paints and lacquers especially a notable expansion of sales took place. New products developed met with a favourable market reception. The plastics industry in general had a successful year, and the company's share of the market has expanded satisfactorily. A comprehensive service, both of product and technique, is now at the disposal of the moulding trade.

Overseas Trade

Manufacturing and mining activities in Canada progressed consistently throughout the year, most of the basic industries having made considerable advances over 1933. Canadian Industries, Ltd., has, therefore, had an excellent year, and to meet the growing volume of trade new plants are being erected. Following the continued expansion of the mining industry on the Rand and the Northern Rhodesian copper belt, African Explosives and Industries, Ltd., has had another successful year, the volume of trade and profits having been the highest in the history of the company. Sales of explosives were much larger, and, in order to be in a position to meet any expansion in the mines' requirements, further extension of the capacities of the factories is being made. Sales of fertilisers and pesticides also made good progress. Large quantities of arsenicals were sold to the authorities to fight the locust pest which last year menaced the greater part of the Union.

In Australia, the better conditions of 1933 were continued throughout last year. Imperial Chemical Industries of Australia and New Zealand, Ltd., and its associated companies benefited in particular from greater activity in gold mining and in business generally. The company's branch in Egypt has been converted into an Egyptian company, under the name of Imperial Chemical Industries (Egypt) Société Anonyme.

In the Far Eastern markets Japanese competition has been no less severe than last year, but the merchanting companies, by active steps to combat it, have, in general, succeeded in retaining their business. Sales in India, particularly, were substantially enlarged during the year. Business in the South American countries has improved slightly, although exchange restrictions have added to the difficulties of trading in these markets. A company is being formed in the Argentine Republic to amalgamate the various interests there of the company with those of E. I. du Pont de Nemours, of Wilmington, Delaware, U.S.A. The capital will be held in equal proportions.

Research Activities

The company has continued its policy of prosecuting research in order to improve manufacturing processes, products and sales, and to develop new branches of its industries. Striking progress has been made in many directions, of interest both to the company and its customers. In addition, the company has maintained close touch with the research work carried out by the Universities and by sections of the Department of Scientific and Industrial Research.

Relations between the management and their co-workers and with the trade unions remain cordial. The number of workers employed by the company increased during the year under review to 41,736, an additional 5,000 having been engaged. Of these, 2,600 were temporary appointments in connection with new construction work. Works accident figures showed a continuing improvement.

All factories have been maintained in a state of high efficiency; the necessary provision has been made for depreciation of wasting assets and minor services, and for contin-

gencies, while the subsidiary companies in which Imperial Chemical Industries, Ltd., does not hold the whole of the issued ordinary capital have provided in their own accounts for depreciation on fixed assets. The total cost of these items in 1934 was £3,049,386, which has been charged against the profits for the year. Stocks have been valued at cost of market value, whichever was the lower. Following the normal practice, no credit has been taken for foreign dividends where exchange restrictions prohibited the transfer home of cash representing such dividends. These dividends are, however, unimportant in amount.

Gross and Net Income

The gross income of the company for 1934 amounts to £7,965,038, and, after allocating £1,000,000 for obsolescence and £615,931 for the company's income tax, the net income for the year amounts to £6,349,107, as against £6,001,605, or an increase of £347,502. The year's income contains nothing of an exceptional nature; it relates solely to the year's operations, and includes no sum from profits on the sale of investments. After allocating £1,000,000 to general reserve, the balance for the year is £5,349,107, which, with £566,139 brought forward from 1933, gives a total balance available of £5,915,246. The preference dividends for the year were paid on the due dates. An interim ordinary dividend of 2½ per cent. was paid on November 1, 1934, and the directors recommend a final ordinary dividend of 5½ per cent., making 8 per cent. for the year, and a dividend of 2 per cent. on the deferred shares, leaving a balance of £608,451 to be carried forward.

The authorised capital is unchanged at £95,000,000. The total nominal issued capital amounted to £77,323,476 at December 31, 1934. A small increase of £375 on the amount issued at December 31, 1933, is due to the issue of capital in exchange for further shares in a subsidiary company. The company's interest in its subsidiary companies is to be measured by the aggregate book value of the shares and debentures of the companies, together with the amount of the advances to them for capital expenditure and general development, less debts due to them. The comparative figures at December 31, 1934, and a year earlier are as follows:—

	Book Value in the Balance Sheet at Dec. 31, 1933.	Dec. 31, 1934.	Increase or Decrease.
	£	£	£
Shares and Debentures in Subsidiary Companies in which the Company holds over 50 per cent. of the shares, or control	62,526,732	62,765,839	+ 239,107
Add Advances to them for Capital Expenditure and General Development and for Debenture Redemption	17,443,172	21,625,765	+ 4,182,594
	79,969,904	84,391,605	+ 4,421,701
Deduct Amounts written off	917,683	2,717,682	+ 1,799,999
	79,052,221	81,673,923	+ 2,621,702
Deduct Debts due to them	12,957,624	10,306,694	— 2,650,930
Total Interest in Subsidiary Companies	£66,094,597	£71,367,229	+ £5,272,632

Assets of Subsidiary Companies

The assets of the subsidiary companies have been subjected in detail to the annual review, and it has been decided to apply £2,610,000 of the central obsolescence and depreciation fund and £107,682 of the general reserve to writing down values in the books of the subsidiary companies, a corresponding reduction being made in the book value of the "Shares and Debentures in and Advances to Subsidiary Companies." The increase in the book value of shares and debentures in subsidiary companies is principally due to (*a*) the acquisition of the Broughton Copper Co., Ltd., (*b*) the formation of Imperial Chemical Industries (Egypt) Société Anonyme, and (*c*) the acquisition of further shares in subsidiary companies, less the transfer to "Associated Companies" of holdings in connection with the du Pont/I.C.I. Argentine merger.

An increase of £185,602 in holdings in associated companies arises principally from a transfer of holdings formerly included under "Subsidiary Companies," less a writing off of excess values to the extent of £82,318. The book value of marketable and unquoted investments, excluding Government securities, held both by the company and its home subsidiaries, is £8,995,714, or an increase on last year of £81,131. The increase is mainly due to the acquisition of additional shares in concerns in which the company already had an interest. The market value of the marketable investments, or computed value in the case of unquoted investments, at December 31, 1934, is £8,681,118, being £808,650 higher than a year before. There was still a depreciation on book value of £314,596.

Cash at bankers, in hand and invested in British Government securities at December 31, 1934, amounting to £3,253,358, compares with £8,264,002 at December 31, 1933, being a decrease of £5,010,644. In the main, this decrease arises from the repayment of the outstanding debenture issues of certain subsidiary companies, to an amount of £4,055,714, and the erection of the oil from coal plant at Billingham, both of which have been financed out of the company's resources.

The central obsolescence and depreciation fund has been augmented by the appropriation of £1,000,000 and a further £1,000,000 has been added to the general reserve, both out of the year's profits. The total of the amounts written off, amounting to £2,800,000, has been provided by applying the central obsolescence and depreciation fund to the extent of £2,610,000 and by withdrawing £190,000 from the general reserve. This leaves £3,140,000 in the central obsolescence and depreciation fund, apart from like reserves of subsidiary companies, and £10,560,000 in general reserve at December 31, 1934.

Chemical Notes from South Africa

If the railway rates are reduced, it is not unlikely that Kimberley will give the Union all the chalk it requires for making distempers and plaster of paris. The district is estimated to contain some 500,000,000 tons of whiting, and nearby are supplies of gum suitable for use as a binding material.

In the report of customs tariff amendments for 1935, which the Board of Trade and Industrials has just presented to Parliament, it is recommended that the duty on superphosphates be increased. At the same time it is recommended that the duty on calcium cyanide, silk screen process paste paint, and certain photographic requirements be decreased.

The perfumery business that has been established in South Africa for some years now is still making satisfactory progress, largely as a result of the expensive advertising campaign in which it indulged. Increased attention is being given to the development of the export business in the Far East, but it will probably be some time before any really great advances are recorded in this trade.

During 1934 there was a large increase in the importation of chemicals for industrial purposes, and during the first few months of the present year this demand has hardened. Most of the chemicals for industrial use in South Africa are still being imported. The trade in dyes rarely reaches a value of £30,000 a year, but it is fairly constant. South Africa buys more British dyes than German dyes, but pays a much higher price for the German product. Considering how popular British dyes have become in the Union, there seems to be no reason why the best British dyes should not in due course oust the German product from this market.

Distemper cures, warm specifics, skin ointments, and cattle medicines are now being manufactured in a variety of South African factories, which often are branches of famous British factories. A considerable quantity of British manufactures falling under these categories are still imported and find wide favour in the Union, but the local manufacturers claim that they can meet the imported article competitively. Patents are frequently taken out in the Union for insecticides guaranteed harmless to human beings and not to contain injurious acids, and British products of similar type should be offered in this market.

Rare Earth Metals in the Treatment of Textiles

By A. J. HALL, B.Sc., F.I.C., F.T.I.

JUST as the textile industry is taking into use many of the complex organic substances which a few years ago were just costly laboratory products but are now being produced cheaply in large quantities, so it now appears that salts of the rare earth metals are being investigated with a view to determining their value in textile dyeing and finishing processes. Definite uses have been found for salts of such metals as titanium, zirconium, molybdenum, lanthanum and tungsten, and it would seem to be only a question of time before these substances will be used in large quantities. Such developments would undoubtedly have a very stimulating effect on the production of rare earth metal products. At present, the application of rare earths in the textile industries is mainly for the purpose of delustring rayon, weighting real silk and rayon, mordanting in preparation for the fixation of special dyes, and for increasing the fastness to light and washing of certain dyestuffs. In addition, certain rare earth metal salts, notably those of thallium, have been found efficient preventatives of bacterial and fungoid growths in textile materials.

Weighting of Real Silk

The weighting of real silk is an important textile process. Weighting is effected not merely for the purpose of increasing the weight of the silk but also with a view to giving the silk fibres and threads more covering power. A weighted silk fibre has a larger cross sectional area than one not weighted, so that weighting of a silk fabric gives it a more solid and compact appearance. From very early times tin salts have formed the basis of the most satisfactory weighting processes, but more recently it has been discovered that considerable advantages can be obtained by using, together with the stannic chloride, a certain proportion of salts of such rare earth metals as cerium, thorium and lanthanum. Originally, weighting was carried out for the purpose of regaining the weight lost during the degumming process, which results in a loss of weight of about 20 to 30 per cent. In defining the extent of weighting it is usual to refer to the weight of the silk non-degummed as *par*. When the silk is weighted, say, 20 per cent. above this weight then the weighting is referred to as being 20 per cent. above par. Weighting up to 100 per cent. and more is commonly carried out.

The usual weighting process consists of steeping the silk in a cold solution of stannic chloride of about 53° Tw., then rinsing it with cold water, and further immersing it in a solution of disodium phosphate of about 10° Tw., whereby a considerable proportion of the tin is fixed within the silk in the form of tin phosphate—a white insoluble substance which is strongly retained by the silk without impairing its white colour. These treatments may be repeated until the desired degree of weighting is obtained. It is then usual to treat the silk in a dilute solution (5° Tw.) of sodium silicate whereby better fixation of the tin phosphate is secured whilst a small additional degree of weighting is obtained. The amount of tin fixed in the silk at each treatment with stannic chloride is obviously of importance; the greater the amount, the less cost and labour is involved in repeated treatment to secure the required degree of weighting. It is for this reason that importance is attached to the discovery of F. W. Weber and his collaborators (U.S. Pat. 1,896,381, 1,896,858 and 1,898,105) that the addition of rare earth metal compounds to the stannic chloride bath has the effect of causing an increased fixation of tin. Further, it is found that these additions can cause viscose rayon to become weighted under similar conditions and which are otherwise only moderately effective.

Stannic Chloride Liquors

Weber has recorded that he finds stannic chloride liquors containing additions of rare earth compounds produce a weighting in real silk much greater than with any other liquors yet recommended: 750 c.c. of stannic chloride solution (106° Tw.) are heated with 75 grams of thorium carbonate until a clear liquor is produced, and the solution is then diluted to 64° Tw. The silk fabric is steeped in this liquor for several hours and is then washed with cold water; afterwards the tin present is fixed by passing the fabric through a warm solution of disodium phosphate. Instead of the thorium carbonate it is equally useful to employ 50 grams of the mixed carbonates of lanthanum and didymium. The effect of the rare earth metal carbonates is to increase the basicity of the weighting liquor, and possibly this is influential in securing an increased degree of weighting. Stannic chloride solution prepared by this method remains clear and free from sediment, whereas an increase of its basicity by the addition of an ordinary alkali, such as caustic soda, would have resulted in the formation of a precipitate or yielded an unstable liquor. A notable claim for weighting liquors prepared in this manner is that their composition does not change appreciably during the treatment of three or four lots of silk.

The Use of Tin

Silk weighted with tin alone has a definite affinity for rare earth compounds and it is this fact which explains the increased weighting obtained by the method described above, for it is found that the rare earth metal is present together with the tin in the weighted silk. In the weighting liquor the addition of the rare earth compound, say, lanthanum carbonate, causes the stannic chloride to become more basic as shown in the following equation:

$$3SnCl_4 + La_2(CO_3)_3 + 6H_2O = 3Sn(OH)Cl_3 + 3H_2CO_3 + La_2(OH)_3Cl_3.$$

At the present time quite a considerable amount of mixture material containing both silk and viscose rayon is manufactured. If such a fabric be weighted in the usual manner with stannic chloride it is found that practically all the weighting is on the silk, whilst the rayon is not much affected. It is therefore necessary to modify the composition of the weighting liquor so that a better balance will be obtained between the two fibres. According to U.S. Pat. 1,898,105 the addition of zirconium carbonate to the stannic chloride liquor enables this effect to be obtained, and, in fact, the weighting liquor which results can be used for weighting viscose rayon itself. A suitable weighting liquor for viscose rayon alone or together with real silk can be prepared by dissolving one part of zirconium carbonate in 15 parts of stannic chloride solution of 106° Tw., heated to about 70° C. and then diluting the product to 20 parts by the addition of water. If viscose rayon be steeped in this liquor for two hours, then washed with water and treated with a solution of disodium phosphate, it acquires an increased weight of 30 per cent. After a second and third similar treatment it has increased weights of 50 and 75 per cent. respectively. The composition of such a weighting liquor remains substantially the same after repeated use.

Subdued Lustre

The present almost universal demand for rayon fabrics and garments having a subdued lustre has necessitated the use of opaque white pigments which can be applied to materials manufactured from rayon having a high lustre and also which can be added to rayon spinning solutions; in both cases the immediate aim is to reduce the lustre of the rayon. It is necessary that the pigment shall be as inert as possible to acids, alkalies and other chemicals with which rayon goods may be treated, and that it should preserve its pure white colour and not after-yellow during prolonged storage. Titanium dioxide appears to be the most satisfactory pigment so far discovered, and it is being used in very large quantities for delustring rayon. In order that the particles of titanium dioxide, which are applied to the surface of rayon fibres or which are incorporated actually within the fibres (as when added to the rayon spinning solution), should give the maximum dulling it is essential that they have a high refractive index and be quite small. For this reason the titanium hydroxide (this is the first product obtained in the manufacture of titanium dioxide from titaniferous ores) is carefully calcined so that its refractive index is raised from 1.8 to 2.7. The calcination must also be controlled so that the particles do not become too hard, for such particles in a viscose spinning solution cause excessive wear of the pumps and spinnerets. In order to eliminate large titanium dioxide particles it is usual to grind the product thoroughly before use.

It has been recorded that titanium dioxide is about five times more efficient as a delustring agent than zinc oxide.

Titanium dioxide can be made into fine dispersions by means of various agents and then applied externally to bright rayon woven and knitted materials. Quite a considerable amount of delustring is carried out with such dispersions, but since the titanium dioxide particles are merely dried on the surface of the rayon the effect is largely removed by one or two washings. In contrast, the rayon produced from viscose or cellulose acetate spinning solutions containing an addition of titanium dioxide is permanently dull. Apparently the production of dull viscose rayon, with the aid of titanium dioxide, has not been entirely without difficulty for it has been found that the pigment can accelerate the fading of applied dyestuffs when exposed to light. This effect is noticed particularly when the dyed rayon is exposed to sunlight in a wet condition.

Tungsten Salts

Quite recently, tungsten salts have been found especially serviceable for delustring rayons. Hitherto, delustring has been carried out by precipitating within the rayon (after its manufacture into woven and knitted goods) insoluble barium sulphate. The delustred effect is, however, only moderately fast to washing. It has now been found (E. Pat. 415,822) that a much faster delustring is obtained by first padding the rayon material with a solution of sodium tungstate, then drying, and afterwards treating with a dilute solution of barium chloride. This method can be adapted to printing bright coloured patterns (with fast vat dyes) on a delustred viscose rayon fabric (H. Metzl, " Textilber.," 1934, *34*, 460). Instead of tungsten salts it is also possible to use various molybdenum compounds for the same purpose.

It is well known that basic dyes include the brightest colours which can be applied to textile fibres and that it is impossible to obtain with other dyes such brilliant shades as those of Rhodamine, Methylene Blue and Brilliant Green. Unfortunately, these bright dyes are only of moderate fastness to light, and, furthermore, they have such little affinity for cotton and viscose rayon that they can only be applied after a previous mordanting of these fibres. Hitherto, a tannic acid-tartar emetic mordant has been mainly used for cotton, the textile material being first impregnated with tannic acid and then after-treated with a solution of tartar emetic or other antimony salt (the fluoride of antimony is often used as a substitute for tartar emetic), whereby water-insoluble antimony tannate is precipitated within the fibres. This precipitate has a strong affinity for basic dyes and with them forms an insoluble complex coloured lake. More recently this metallic mordant has been widely replaced by Katanol (I.G.) or similar product which is allied to a colourless sulphur dye and which is mainly a sulphurised phenol. The shades obtained with Katanol and tannic acid-antimony mordants and basic dyes are almost equally bright. It has been further found, however, that a more definite innovation in mordanting can be effected by using complex salts of phosphotungstic or phosphomolybdic acid. It is found that colour lakes resulting from either of these complex substances and basic dyes have quite a superior fastness to light (E. Pat. 1,591). Even faster lakes result when both tungsten and molybdenum are present and this is the case when phosphomolybdotungstic acid is used.

A Possible Development

So far, these fast-to-light lakes (Fanal colours) have been mainly used as pigments for decorative purposes, but there is much more than a remote possibility that they will in the future find application in the colouring of textile materials, particularly cotton. There is a possibility that cotton could be mordanted with an insoluble molybdenum or tungsten compound and then dyed with basic dyes and thus obtain fast-to-light shades. Alternatively, it would appear possible to aftertreat ordinary basic dyeings on a tannic acid-antimony mordant with a solution of a molybdenum or tungsten salt and thus introduce a small proportion of either of these metals and obtain increased light fastness in this indirect method. Further information will be found in E. Pats. 265,032, 292,253, 275,943 and 299,521. Micheels (" Bull. Soc. Ind. Mulhouse," 1928, *94*, 344) has also discussed the fixation of basic dyes on complex mineral salts.

Mildew in sized and finished cotton goods has, in the past, been the cause of large losses in the cotton industry. Most cotton goods contain starchy substances which favour the growth of mildew, and when so attacked the cotton becomes tendered and discoloured. In order to avoid mildew attack it has been customary over a large number of years to add a moderate amount of zinc chloride to the cotton, but this preventative measure has often proved unreliable. The British Cotton Research Association therefore investigated the problem thoroughly and finally discovered a satisfactory antiseptic in Shirlan (the anilide of salicylic acid), but it is interesting to note that thallium carbonate was also found to be very efficient. Thallium carbonate has no adverse effect whatever on dyed or finished cotton, whilst being an efficient antiseptic against fungi growth, but, unfortunately, is difficult to obtain in quantity.

Textile Bleaching

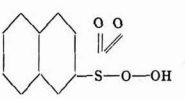
Application of Newly-Discovered Chemicals

THE drift of newly-discovered compounds from the research laboratory to the works plant is, in general, slow, but there are numerous cases where the reverse has been the case and preparations which might appear to be of purely scientific interest have quickly proved to be exceedingly valuable when brought into industry.

Chloramine T, or sodium para-toluene-sulpho-chloramide, $CH_3.C_6H_4.SO_2NClNa$, is a by-product in the manufacture of saccharin, and has proved to be exceedingly useful for bleaching and simultaneously de-sizing textile goods. In aqueous solution it is possessed of greater stability than most oxidising bleaches and even after a two hours' boil it loses no more than 10 per cent. of its available chlorine. Used in conjunction with starch or farina it enables the sizer or finisher to control the fluidity of his paste with great ease and certainty, whilst it possesses great merit as a reagent for removing starch sizing from textiles. From 3 to 4 lb. of Chloramine will simultaneously bleach and de-size 70 to 80 cotton pieces each of length 130 yards or a total weight of one ton.

The di-chlorine substituted compound corresponding to Chloramine T has also found considerable favour amongst textile technologists as a bleaching agent which may be successfully applied to rayons and delicate fibres. Dichloramine is used to the extent of 2 g. per litre of water and the solution brought to 70° C., when the silk may be entered. Heating is continued up to 80° C. and the fabric immersed from 5 to 10 minutes. Bleaching is then accomplished and the goods should be removed, antichlored and rinsed. Another use for Dichloramine is indicated by the report in a German textile journal that the scouring of cotton with alkalis is considerably aided by the addition of this compound. The treated yarn was stated to be as clean as when fat-solvents had been employed and to have increased in tensile strength. These Chloramine compounds are sold by the Chemische Fabrik Pyrgos, G.m.b.H., under the names of " Activin " and " Peraktivin."

A new organic bleaching agent of the peroxide type has been described by W. Gutman (" J. Soc. Dyers and Col.," 1933, *49*, 374). " Biancal," as this compound is called, is a derivative of naphthalene persulphonate having the constitution:



Possessing free available oxygen it has been found a useful auxiliary in the kier-boiling of cotton when it enables a better white to be obtained and the chemical degradation of the cellulose as shown by Clibbens and Gleake cuprammonium viscosity tests is practically nil. In addition to liberating oxygen and having bleaching properties, Biancal is a useful stabiliser for peroxide bleaching mixtures and is said to be more efficient than the usual silicate or pyrophosphate. Farb. und Gerbstoffwerke Carl Flesche, Junr., are the manufacturers of this promising substance.

That the ingenuity of research chemists in finding new organic bleaches is not by any means exhausted is shown by Brit. Pat. 412,014, wherein H. D. Elkington protects the use of Succino-chlorimide $(CH_2\text{-}CO)_2N.Cl$, which is claimed to operate in either acid, neutral or alkaline media. For each volume of the textiles lightly folded 25 to 50 volumes of 3 per cent. succino-chlorimide solution are used. The rate of reaction is stated to be intermediate between that of hypochlorites and peroxides and goods so bleached are not affected in tensile strength.

Physics as Applied to Industry

Institute of Physics Conference at Manchester

A CONFERENCE on physics as applied to industry was held by the Institute of Physics at Manchester on March 28 and 29. The gathering was welcomed to Manchester University by Sir William Clare Lees, a member of the University Council and a spokesman of Lancashire industry. He pointed out that they had come to a district where physics and technology were in hourly association, and he recalled, as a bond of union between the textile industry and the vacuum, that the first artificial silk was produced in 1855 by Swan as a filament for his electric lamps. Professor J. S. B. Stopford, Vice-Chancellor, hoped the coming of the conference would bring to Manchester new ideas and interest, while Sir William Bragg, who presided, endorsed the welcome on behalf of the University, and expressed on behalf of the conference gratitude for the University's hospitality.

The first lecture was by Mr. J. W. Ryde, of the General Electric Co., who, speaking on modern electrical illuminating devices, described the development of the modern method of producing light of varying colours by discharging electricity into gases, such as helium and neon. Among the applications of the use of electricity in gases were the production (with carbon dioxide) of a daylight lamp for certain leather work and the matching of colours in fabrics; neon lighting, for advertisements and aviation beacons; and greatly improved street lighting.

The photo-electric cell was dealt with by Mr. T. C. M. Lance, of Baird Television, Ltd., and Mr. R. C. Walker, of the General Electric Co., the discussion being mainly on the industrial application of the cell.

The session ended with a discussion opened by Mr. L. J. Davies and Mr. A. L. Whiteley, of the British Thomson-Houston Co., Ltd., on recent applications of mercury vapour rectifiers and thyratrons.

The Conference Dinner

The conference dinner was held on March 28 at the College of Technology, the president of the Institute, Sir Henry G. Lyons, presiding. The toast of "The City of Manchester" was submitted by Professor W. L. Bragg, the president of the conference, who recalled great names, Dalton and Joule, and spoke of Lord Rutherford and of Sir J. J. Thomson, of whom he said that one of the great treasures of the University was the possession of "certain note-books" containing an account of experiments set for him as a student.

Professor J. A. CROWTHER, Professor of Physics in the University of Reading, and hon. secretary of the institute, gave the toast of "The University of Manchester."

Professor J. S. B. STOPFORD, replying, said he was glad the university had not been referred to as a "provincial" university.

Lieutenant-Colonel A. G. LEE proposed the toast of "The Institute of Physics." He asked whether the rate of scientific advance was adjusted to the rate of absorption by the economic forces in the world. Were there enough scientists turned out at our universities or too many? To that his answer was he thought there were not enough. The individual scientist, he said, was not, as a rule, adapted for gauging the full effects of these physical discoveries, but he thought a body such as the Institute ought to take the responsibility for the full effects of these discoveries. It ought to awaken the country to the necessity of adjusting physical discoveries to the rate of advance in the economic affairs of the country so that we might enjoy the leisure and wealth that physicists had discovered.

The PRESIDENT, responding, indicated to Colonel Lee that the questions he had raised would be considered. He expressed the thanks of the institute to the Manchester Corporation, the University, and the College of Technology.

The discovery of a substitute for radium, derived from sodium, was announced at the final session of the conference on March 29. It was described as the "most startling communication" yet received by the institute.

Dr. J. D. COCKCROFT, of the Cavendish Laboratory, Cambridge, who made the announcement, said that a radio-active sodium had been produced which was equivalent to radium, and could be used in the same way as radium. The announcement was made in the course of an address on the application of high-tension vacuum tubes to industrial purposes. He said that while several high-tension vacuum tubes had been constructed to withstand voltages of over 1,000,000, it seemed immediately possible to construct tubes to withstand 2,000,000 volts, with the possibility of further extension later. High voltages were finding an increasing application in atomic research. It had been found that hydrogen atoms speeded up by high voltages could produce transmutations of matter on a large scale compared with any attained hitherto. By such transmutations, quite new kinds of atoms appeared, such as a hydrogen atom having three times the normal mass.

There had also been produced unstable radio-active forms of the common elements, such as radio-active nitrogen and oxygen, while by bombarding ordinary sodium with heavy hydrogen a radio-active sodium was created which emitted gamma rays of more than twice the energy of any from the radio-active elements. This radio-active body lost its radio-activity in about half a day. It did appear possible that such radio-active sodium could be produced in large quantities yielding the equivalent in emissions of one gramme of radium.

Professor J. A. CROWTHER, in the discussion, referred to the startling nature of Dr. Cockcroft's announcement. "By the use of these high voltages it may now be possible to produce a substitute for radium in large quantities," he said.

Dr. COCKCROFT, who is 36, spent three years in research work on the staff of Metropolitan-Vickers at Trafford Park before going to Cambridge, where he has done some remarkable work which has made his name famous in the scientific world. He was one of the group of Cambridge scientists who succeeded, a few years ago, in constructing an apparatus for the disintegration of the atom.

In the afternoon, members of the conference paid a visit to the research laboratories and works of Metropolitan-Vickers, Ltd. At night, at the College of Technology, Mr. R A. Watson Watt, of the National Physical Laboratory, gave a public lecture on cathode-ray oscillographs, which the conference discussed on Thursday.

Medium Temperature Carbonisation

Extensive Orders for Koppers Plant

THE Barsinghausen Colliery, near Hanover, belonging to the German State, is undertaking an extensive reconstruction programme with a view to improving its working results, which have for some time been unremunerative. The basis of the improvement is carbonisation, and it is intended to carbonise the coal produced from this mine, and to convert it into a product suitable for the domestic market and for burning either in closed stoves or in open grates. After examination of other types of carbonising plant, the company has now placed a contract for a battery of Koppers medium temperature coke ovens consisting of 29 Koppers combination circulation ovens operating at medium temperature and carbonising 350 tons of coal (dry basis) per 24 hours. The ovens are remarkable in that they will have an average width of only 8½ in., and they are 12 ft. high and 56 ft. long.

Surface equipment to be installed includes a compressed air plant of 7,000,000 cu. ft. per hour, a 2,400 kW turbo-generator and a fan to augment the existing capacity by 50 per cent. The coal will be cleaned by means of the Sophia-Jacoba specific gravity process, and is then suitably prepared for carbonisation in a plant provided by the Koppers Co., which has also obtained the order for the complete by-product recovery plant, including preliminary cooling, tar separating and gas exhausting plant, semi-direct ammonia recovery installation, complete with final gas coolers, benzol scrubbing and distillation plant and pipe still plant for topping the tar.

This order also includes the whole of the coal and coke transportation plant, with coke-quenching installation and coke screening and breaking plant. A high yield of motor fuel is expected, together with a valuable quantity of surplus gas of high calorific value. This is the seventh order for a medium temperature plant received by the Koppers Companies within the last four years.

The Weathering and Corrosion of Glass

Action of Water, Acids and Alkalies

THE surface of glass slowly underwent slight changes even on storage or exposure to the atmosphere, and this process of change was known as "weathering," said Miss V. Dimbleby, M.Sc., of the Department of Glass Technology, Sheffield University, in a paper read before the Midland Section of the Institute of Vitreous Enamellers, on March 25. The change was evidenced by a loss in brilliance, and the appearance of patterns on the surface, sometimes developing into an opaque whitish layer. Under the microscope these deposits on the glass surface were seen to contain numerous crystal forms, and when tested with indicators, such as phenolphthalein, gave a strong alkaline reaction. Some glasses, with high alkali content, completely lost their brilliance and transparency when stored in the tropics where the climatic conditions favoured "weathering." Removal by washing of the weathering products from a glass which had been stored resulted in a more resistant surface.

Glass Grains of Definite Size

Dealing with the attack of glass by water, and the development of laboratory resistance glasses, Miss Dimbleby said the early Kavalier resistance glass was of the alkali-lime-silica type, but, in 1892, following upon his investigations in connection with heat-resisting glasses, Schott produced the first Jena laboratory resistance glass. Schott explored the possibilities of zinc oxide, alumina and boric oxide as constituents of glass, and many of the modern resistance glasses contained these oxides.

The methods devised for testing the resistance of glass to attack by solutions are of two classes: (1) those testing the glass in the form of vessels, etc., as in actual use, and (2) those testing the glass as glass.

The extent of attack of solutions upon glass is measured (a) by the loss in weight per unit area of the glass surface; (b) by evaporation of the resulting solution to dryness in platinum and weighing the residue, returning the result as mg. per unit area of surface attacked; (c) by titration of the resulting solution against standard acid, reporting all alkalies as soda per unit area; (d) complete analysis of the resulting solution and (e) examination of the glass after test. Results from method (d) had shown that water extracted some of all of the constituents from a glass.

In the standard 5-hour boiling test for 4-oz. medicine bottles, specified by the Society of Glass Technology,[1] the well-washed bottles are filled with boiling, boiled-out, distilled water, and then suspended in steam at 100° C. for 5 hours in a specially-designed boiler. The resulting solution is then titrated in a specified way to obtain a measure of the total alkali extracted from each bottle. A limit of 5 mg. Na_2O is imposed for satisfactory bottles, and the bottles are examined after test. Another test used for medicine bottles depends upon the precipitation of a 0.01 per cent. solution of marcotine hydrochloride[2] when alkali was extracted from a glass surface; here glasses of good resistance did not produce any precipitation within an hour at 100° C.

Attack of Glass by Water

In order to eliminate any effects of surface conditions when investigating the behaviour of glasses as chemical substances, resort is made to the use of glass grains of definite size. In the method used extensively in the Department of Glass Technology[3] at Sheffield the glass is ground and sieved so as to yield grains passing sieve No. 20 I.M.M. (aperture 0.635 mm.), but lying on sieve No. 30 I.M.M. (aperture 0.421 mm.). After careful inspection, the grains are washed free from dust in alcohol, dried, and 10 g. is weighed into a cylindrical gauze container of platinum for acid tests, stainless steel for water tests, or silver for alkali tests. After a second washing in alcohol, the glass in the container is reweighed, then suspended in 500 ml. of the boiling solution contained in a beaker of fused silica for water and acid tests, but of silver for alkali tests. A condensing device is fitted on the beaker top, and boiling is continued gently for an hour, after which the container is removed, washed in water, then in alcohol, dried and reweighed. The percentage loss in weight of the glass is recorded, and in the case of water tests the solution is titrated for alkali and, if necessary, boric oxide content. The Duetsche Glastechnische Gesellschaft[4] employs a test using grains slightly smaller than those used at Sheffield.

Fused quartz, although not attacked by water and acids, is corroded by alkaline solutions. An increase in the silica content of soda-silica glasses increases the resistance to acid and sodium carbonate solution as well as to water.

Series of glasses based upon the formula quoted, and replacing Na_2O gradually by BaO, CaO, PbO, MgO, ZnO, Al_2O_3, Fe_2O_3, TiO_2 or ZrO_2 have been prepared and tested at Sheffield. Replacement of soda by any of the other oxides resulted in an increase of resistance to attack by water, the effect being very great for low proportions of the substituted oxides, then falling off to a practically constant value. Comparing on a molecular basis the effects of the various oxides, the order of merit over the whole range tested was, proceeding from most beneficial to least, ZrO_2, Fe_2O_3, Al_2O_3, TiO_2, ZnO, MgO, PbO, CaO and BaO, this also being approximately the same as the order of the solubilities of the individual oxides in water.

In the series of glasses $(80-x)\ SiO_2$, xB_2O_3, $20Na_2O$, substitution of Si_2O by B_2O_3 had resulted in slight improvement in resistance to water attack so long as the B_2O_3 content did not exceed some 8-10 per cent., but beyond this point the durability fell off very rapidly. In the series $(90-x)\ SiO_2$, XB_2O_3, $10Na_2O$, no maximum durability was found. Water attacked these glasses less than did hydrochloric acid or the alkaline solutions. Replacement of silica by zirconia up to 20 per cent. in a soda-zirconia-silica series showed an increase in water resistance, particularly for low values of zirconia.

The relative action of various acids on glass was outlined briefly by Miss Dimbleby. Turner and co-workers showed that "constant boiling" strength (20.24 per cent.) hydrochloric acid was more corrosive than strong nitric or sulphuric acid. Dimbleby and Turner[5] found that, generally, oxides which produced greatest resistance to water attack were also most beneficial for acid resistance, the acidic or feebly basic oxides being again useful. Weberbauer,[6] using 10 per cent. hydrochloric acid, in series of glasses similar to those used by Enss found that replacement of silica by the various oxides increased the durability towards the acid, at first, then decreased it.

The action of 2N sodium carbonate solution upon glass was shown to resemble that of water rather than that of 2N caustic soda solution, or to lie between the two. In the three-component series used by Dimbleby and Turner[7], the glasses containing the most basic oxides, BaO, CaO, MgO and PbO, were more strongly attacked by the carbonate than by the caustic alkali, while the zinc, alumina and titania-containing glasses were more susceptible to attack by the caustic soda, titania being outstanding in its weakness in this respect. Zirconia is remarkable for its beneficial action in endowing resistance to attack by all reagents, including caustic alkali.

[1] J. Soc. Glass Tech., 1931, Proc., 52.
[2] J. Soc. Glass Tech., 1923, *7*, 122.
[3] J. Soc. Glass Tech., 1926, *10*, 307.
[4] Glastech. Ber., 1927, *5*, 449.
[5] J. Soc. Glass Tech., 1926, *10*, 307.
[6] Glastech. Ber., 1932, *10*, 361.
[7] J. Soc. Glass Tech., 1926, *10*, 307.

THE Port of Bordeaux Administration recently constructed a fumigation station for food products in Bordeaux. When the station opened late in December, 1934, the principal fumigant employed was hydrocyanic acid gas, but the Superior Council of Hygiene has banned the use of this gas for fresh fruits and vegetables. A mixture of 7 parts carbon dioxide with 1 part ethylene oxide has been employed for beans, and carbon bisulphide has been used for corn. The first importation of American fruit to arrive after the station opened was a shipment of fresh pears which were fumigated with hydrocyanic acid gas, but the only other shipment to arrive from the United States, consisting of fresh apples, was treated with the ethylene oxide mixture.

Cultivation and Preparation of Raw Rubber

A Review of Recent Research

RESEARCH in the cultivation and preparation of raw rubber was described by Mr. J. Grantham, formerly Director of Research, United States Rubber Plantations, in a paper read before the Royal Society of Arts, on March 25. Professor F. L. Engledow, Professor of Agriculture, Cambridge University, presided.

Mr. Grantham stated that the problems of cultivation research might be divided into four main groups, agricultural methods, exploitation (mainly tapping), selection, and disease. Agricultural methods included methods of clearing, methods of drainage, clean weeding or cover crops, methods of preventing wash, type of material to be planted (seeds, seedlings, or stumps), number of trees per acre, thinning, and manuring.

Experimentation on the tapping system has probably been the most complete of all work on rubber, but the coming into production of the new high-yielding areas of selected material rendered it necessary for much of the work to be done over again, since it was by no means certain, indeed, it was already clear, that much of the knowledge obtained from unselected trees would not apply.

Importance of Selection

Selection was the latest sub-division of the work to be started. The large profits of the early days of rubber planting provided little stimulus to the development of improved strains of *Hevea*. Indeed, the rapid extension of the planted area caused too great a demand for any planting material available, to permit selection being exercised. Before 1917 there were only one or two isolated attempts to select seed from high-yielding trees. While selection of seed from high yielders gave prospects of improvement, they were rather indefinite, owing to the mixed nature of the ordinary rubber tree. Several attempts were made from 1910 onwards to propagate *Hevea* vegetatively, but until successful budgrafting was achieved in Java in 1917 no practical success had been obtained. The Java methods were first published in 1918. The development of a practical method of vegetative reproduction introduced possibilities of much more rapid progress in securing high yielding strains than had previously existed. The next few years saw a considerable progress, at first mainly in the Netherlands Indies. Much attention was paid to the selection of high yielders in the existing plantations, and in some cases this was done over many thousands of acres. Measurement of the latex yield of every individual tree was carried out periodically on many estates for the purpose of securing data for the thinning out of poor yielders, and, on one large estate at least, was continued for over three years. This preliminary selection formed the basis of a second selection for the identification of the really high-yielding trees, which were needed for selection work.

Seed Selection

Seed selection, which started about the same time as budding, and on the same basis of the selection of high-yielding in the old unselected areas, had developed more slowly. It had been carried out along two main lines: mass selection with uncontrolled pollination, and small-scale breeding work with controlled pollination.

Preparation research dealt with all that happened to latex from the time it left the tree until it was shipped to the manufacturer. Its object was to produce economically products with the properties required by the manufacturer and to develop useful new products. Before about 1920 it was almost entirely concerned with the preparation of dry rubber; since that date it had also been concerned with various forms of latex. In contrast to cultivation research, it was almost exclusively work carried out in the chemical or technical laboratory, and found its application in the estate factory.

Early work in Ceylon in 1898 on coagulation of latex with acids formed the basis of the early methods of preparation The early exports of rubber from the East were produced by coagulation of the latex by acetic or other acids in shallow dishes or plates, and the thin round slabs thus obtained were pressed to remove the serum, and dried naturally, forming the so-called "biscuits." The slabs of coagulum obtained were first hand-rolled and later passed through mangles to produce larger and thinner sheets, which were naturally dried. Such sheet was fairly light in colour, but very subject to becoming mouldy and unattractive in appearance. Smoke-drying was introduced, partly to prevent formation of moulds, and partly to secure more rapid drying. This gave a dark brown colour to the sheet, with a more pleasant odour, and not so subject to mould formation. Another method of preparation developed at an early date, the coagulation of latex in larger bulk. The big blocks of soft coagulum thus obtained were broken up on power-driven rollers under a stream of water and built up by passing through successive rollers into a thin crêpe-like continuous sheet which was air-dried in large drying sheds. This gave a pale yellow coloured product, which became known as pale crêpe. Rubber obtained by natural coagulation during the transport of latex, known as lump, coagulated scrap from the trees, and earth rubber, or coagulum from latex which had fallen to the ground, was also washed on power rollers, and manufactured into crêpe of lower grade and darker colour.

Experimental Work in Holland

Work of an experimental nature was carried out by the Dutch at Delft, in Holland, under Government auspices, and it was soon realised that the properties of raw rubber formed little or no indication of its quality after vulcanisation. This resulted in the setting-up of three rubber-testing laboratories, that of the Imperial Institute, that of the Department of Agriculture of the F.M.S. in Juala Lumpu in 1914, and that of the Central Rubber Station in Java in 1916. These laboratories were equipped to vulcanise test-samples of rubber and to test the mechanical properties on a Schopper testing machine which measured the strain with increasing elongation up to the breaking point, using ring samples. These laboratories were equipped to vulcanise test-samples sulphur mixture for vulcanisation in preference to the more complicated mixtures used for most manufactured articles, since the variations which it was desired to investigate were thereby more accentuated. Differences between Fine Hard Para and plantation grades soon became apparent and many factors causing variation in plantation grades were worked out. It was found that Fine Hard Para vulcanised much more rapidly than smoked sheet or crêpe and that smoked sheet vulcanised more rapidly than crêpe. This was connected with the non-rubber substances present in the latex serum. The longer coagulum was kept in wet condition before being made into sheet or crêpe the more rapid was the rate of vulcanisation. This was apparently due to the bacterial decomposition of serum constituents with the formation of accelerating substances. It was also found that the greater the quantity of serum substances retained in the dry rubber, the more rapid was the rate of vulcanisation, a fact which explained the rapid vulcanisation of Fine Hard Para, in which all the serum substances were retained.

Creaming of Latex

Creaming of latex could be brought about by the addition to ammonia-preserved latex of many plant substances such as pectin, gum tragacanth, and ammonium alginate, a product of seaweed. The process had now been developed by a manufacturing company with plantations in Sumatra, to a point where large shipments of creamed latex of 60 per cent. rubber content were being made in bulk steamer tanks. The possibility of centrifuging was known as long ago as 1897, but had only developed as a practical process in recent years, from a patent taken out in 1925 for the concentration of latex in a modified Alpha Laval centrifuge. Shipments of centrifuged latex of 60 per cent. rubber content had been made for some years, and were now being made in bulk. Mr. Grantham concluded by saying that preparation research should undoubtedly be directed in close contact with the manufacturing industry, and increasing co-operation with such organisations as the Research Association of British Rubber Manufacturers appeared to be indicated.

Death of Prof. W. R. Hodgkinson

Long Service in the Chemistry of Explosives

PROFESSOR WILLIAM RICHARD HODGKINSON, formerly professor of chemistry and metallurgy at the Artillery College, Woolwich, died at his home at Shooters Hill, Blackheath, on Monday, at the age of 83 years. Born near Sheffield in 1851 he was educated at King Edward's School, Eccleshall, and took a scholarship at the Royal School of Chemistry and Royal School of Mines. After passing through Würtzburg University he joined the staff of the Royal Military Academy, Woolwich, and finally the Military College of Science. During his studies under Sir Edward Frankland at the Royal School of Mines he contributed to chemical literature papers on organic chemistry, with, among others, the late W. H. Perkin, junior.

After returning to England from Würtzburg, Professor Hodgkinson assisted Professor Sir E. Frankland and Sir T. E. Thorpe at the Royal College of Science, South Kensington, until 1885, when he went for a time to the Royal Military Academy. Until his retirement in 1918 he had been professor of chemistry and metallurgy for 31 years at the Ordnance College, Woolwich, now the Military College of Science. He edited and enlarged a well-known text-book familiar to many generations of students, the Valentin-Hodgkinson "Qualitative Chemical Analysis," which passed through many editions.

Sir Robert Robertson, Government Chemist, in a tribute to Professor Hodgkinson in "The Times" on Wednesday, wrote: Trained at a time before the present specialisation, Hodgkinson had an equal interest in organic, inorganic, and metallurgical chemistry, and after going to Woolwich he became an authority on the chemistry of explosives. Numerous papers which appeared in the chemical journals as a result of his work are characterised by originality of outlook. This was, indeed, one of his chief characteristics, and all who spoke with him on chemical subjects will remember his fertility in ideas. In addition he had a personality which endeared him to all, and the writer can tell of the many occasions on which now senior Artillery officers have spoken with appreciation and pleasure of the time spent under his instruction in the chemistry classes of the Ordnance College. Owing to his acquaintance with explosives—he wrote the Service Treatise on that subject—he was much occupied during the war in advising on and in directing certain manufactures, for which he was made a C.B.E. in 1918.

Duffield Coal Products, Ltd.

Winding-up Petition Dismissed

IN the Winding-up Court, Chancery Division, on Monday, Mr. Justice Bennett had before him a petition by Mr. Charles Kinross, of 36 New Broad Street, E.C., for the compulsory winding-up of Duffield Coal Products, Ltd. The hearing had been adjourned for a report from an independent expert.

Mr. Topham, K.C., appeared for the petitioner, Mr. Evershed, K.C., for the company, and Mr. Wynne Parry for Mr. Duffield.

When the hearing was opened on March 25, Mr. Topham said the object of the company was to acquire certain processes and patents for producing coal products, among them gas and oil from waste slack coal. The company had gone on for over six years and petitioner's case was that on the evidence of the chairman of the company, the processes set out in the prospectus had turned out commercially a complete failure. It was now put forward that Mr. Duffield had discovered new methods and that if the company continued by the preference shareholders putting up 10s. a share, he could make it a great success. One hundred and sixty-seven preference shareholders, holding 35,918 shares, supported the petition and 33 preference shareholders holding 31,552 shares opposed the petition.

Counsel then read an affadavit by Mr. Charles Kinross, who stated that the nominal capital of the company was £300,000, divided into 150,000 preference shares of £1 each, and 3,000,000 ordinary shares of one shilling each. All the preference shares had been issued and 2,660,000 of the ordinary shares. The amount of capital paid up at the end of September last was £207,598. The company had 31 objects in its prospectus. Ten shillings a share had been paid on the preference shares and there had been a further call of 2s. 6d. Mr. Kinross alleged that the company had never made any trading profit or paid any dividend.

Mr. Evershed, K.C., for the company, read an affadavit by the chairman denying that the substratum of the company had gone or that the processes acquired had proved a failure.

Mr. Wynn Parry read an affadavit by Mr. Duffield, who declared that it was entirely untrue that the substratum of the company had gone. He declared that the object of producing gas and oil from waste slack coal remained the main object of the company and was now immediately capable of fulfilment on a commercial scale. The chief reason why the company had not been in a position to proceed to production on a commercial scale hitherto was that it was only within the past few weeks that extensive experiments which he and his technical staff had been conducting had met with final and complete success. The processes employed at the time of the issue of the prospectus were almost entirely out of date, and many patents had been allowed to lapse, but the company had 28 patents and two applications for letters patent in existence. Under these circumstances, as the result of his experiments, lately brought to perfection, the company could now be regarded as being within measurable distance of being placed on a dividend earning basis.

Counsel said in view of this affadavit he asked that the petition should be adjourned for the report of an independent expert to place the possibility of the new process beyond doubt.

After discussion, his lordship said he thought it would be in the interests of everybody if independent opinion should be obtained.

On Monday, Mr. Evershed said the board had taken independent advice, and it confirmed the view they had taken. His lordship would see the report.

The hearing was again adjourned until Tuesday, when his lordship held that the substratum of the company had not gone, and he dismissed the petition.

Personal Notes

MR. J. W. TOWERS, of J. W. Towers and Co., Ltd., attained his 80th year on April 6.

MR. ERNEST HENRY SANITER, of Rotherham, chief metallurgical chemist of the United Steel Companies, Ltd., left £25,272.

MR. G. H. MILLER, of London, and Mr. S. Miller, of Birmingham, have joined the board of directors of Fletcher, Miller, Ltd., engineering chemists, Alma Mills, Dukinfield.

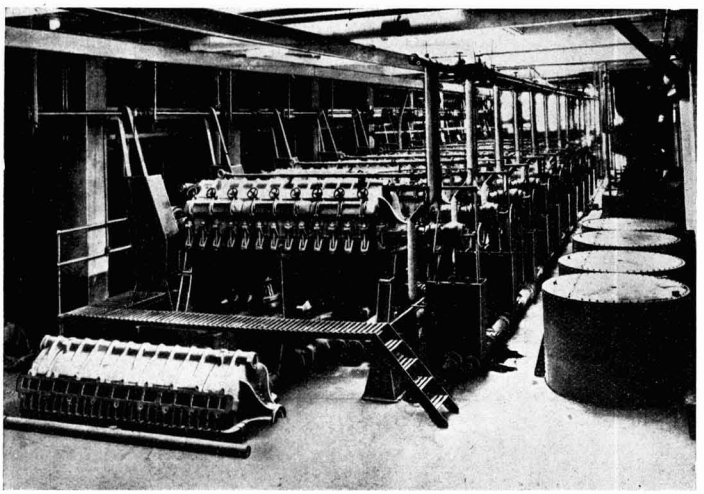
MR. WILLIAM CRAWFORD, who retired in 1920 from the position of manager of the firm of Adam Hamilton and Sons, dyers and bleachers, Blackland Mills, Paisley, died on April 6, at the age of 77.

MR. HAROLD BIRTWISTLE, only son of the late Mr. W. H. Birtwistle, founder of the firm of W. H. Birtwistle and Co., oil and tallow manufacturers, of Ramsbottom, near Bury, Lancs., died this week at the age of 50.

SIR HARRY MCGOWAN opened extensions to the social club at Dog Kennel Lane, Langley, for the employees of Chance and Hunt, Ltd., Oldbury, on April 8. Sir Harry said that the new club and the playing fields were examples of the policy of Imperial Chemical Industries, Ltd., of providing facilities for games and social contact for the employees.

PROFESSOR DR. CARL BOSCH is to be proposed as a new member of the I. G. Farbenindustrie trust board of supervision in order to take over the presidency in the board of supervision and the board of directors in succession to Dr. Carl Duisberg, who died a short time ago.

MR. BERNARD MOORE, a potter who successfully reproduced the wonderful glazes of the old Chinese craftsmen, has died at his home at Drawcott-on-the-Moors, aged 85. His speciality was the production of sang-de-bœuf, rouge flambe and gold flambe wares, which were acclaimed by experts as even more brilliant than the productions of the old Chinese dynasties. Mr. Moore was a past-president and a vice-president of the English Ceramic Society and had read many papers before the society. He was also prominent in research work in the pottery industry.



The substitution of Monel Metal Mesh for canvas filter cloth in Sugar Refineries has greatly reduced maintenance costs. This installation comprises 12 "Valley" filters fitted with Monel Metal cloth.

Factors Influencing the Efficiency of a Corrosion-Resisting Material

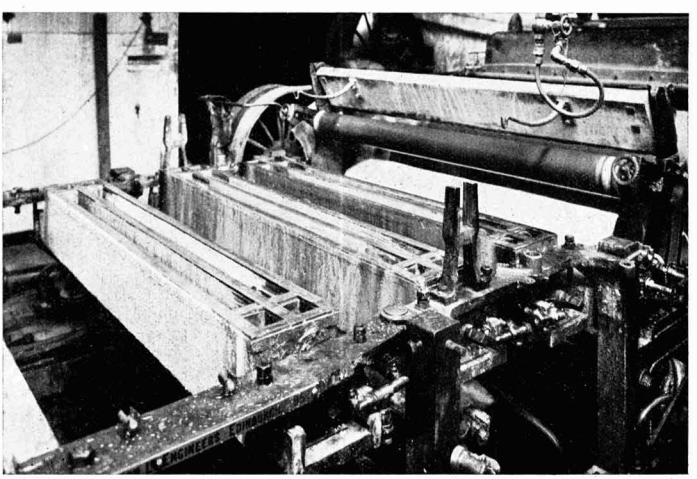
IN selecting a particular metal for corrosion-resisting machinery, several complementary factors must be considered. Of fundamental importance is the rate of attack by the chemicals which are to be handled and in this connection the importance of determining the *true* rate of attack cannot be overemphasised. In making corrosion tests such factors as the rate of agitation, degree of aeration and amount of abrasion must have as accurate control as the temperature and concentration. There are also two effects to be considered in interpreting corrosion tests—first, the rate of wear of the metal as it affects its length of life, and second, the amount of material dissolved by the solvent as it affects the purity or appearance of the product being handled.

Another important property is that of strength. It often happens that the best material from the point of view of corrosion has a strength quite inadequate for the particular equipment in mind. It is therefore necessary to seek a compromise between corrosion-resistance and strength. The tensile strength is of evident importance but the yield point is often more so. Resistance to fatigue and impact must also receive consideration, for a great deal of equipment has to withstand sudden or repeated shocks. The amenability of the metal to working is another factor which must be borne in mind; cheap and rapid repair of equipment handling highly corrosive chemicals may sometimes be more important than original efficiency.

Nickel and various nickel alloys have long been known to chemists as valuable metals for certain purposes in the laboratory and plant. The high strength of these metals, as compared with other corrosion-resisting metals, makes them exceptionally well adapted for chemical equipment. Monel metal has rather greater strength than mild steel.

Nickel owes a great deal of its corrosion resistance to its tendency to become passive under highly corrosive conditions. The effect of nickel in producing passivity is also evident in Monel metal. Thus, as would be expected, Monel metal is very resistant to acid corrosion, because it cannot directly replace hydrogen in combination. It will successfully resist direct acid attack, even when the hydrogen-ion concentration is comparatively large, as in 10 per cent. sulphuric acid. It is only attacked where a considerable hydrogen-ion concentration is accompanied by the presence of another radical which easily decomposes to combine with the metal.

The presence of an unstable, strong oxidising agent in con-



Because of its resistance to corrosion and wear Monel Metal is employed for Suction Box Bars in modern paper mills. This installation is in an English mill.

junction with strong acidity is the chief condition to guard against in the use of Monel metal. It will resist the oxidising agent by itself, as shown by its resistance to the action of liquid chlorine and to alkaline bleach solutions, such as peroxide and chlorine bleach, and will also resist the acid as shown by its extended use in pickling acids, but the combination produces rapid action.

The resistance of Monel metal to erosion was brought out in a test where a number of ⅛ in. nozzles of different makes were inserted in a pipe in an enclosed tank. Opposite each nozzle was arranged a disc of the same material. The pipe was coupled to a direct-acting pump which drew water from the bottom of the tank and supplied it to the pipe at a pressure of 250 lb. per sq. in. Air was admitted to the pump cylinder by a valve to an extent which caused the piston to pump 1 in. of its stroke. The water was maintained at a temperature of 150° F. and analysis gave its quality as follows: calcium chloride, 14 g. per gal.; sodium nitrate, 5 g. per gal.; sodium chloride, 20 g. per gall.; magnesium chloride, 2.5 g. per gal.; gritty matter, 26 g. per gal.—thus representing a bad feed water. The pump was worked for 500 hours and when the specimens—commonly-used brasses and bronzes, stainless steel, mild steel and Monel metal—were examined, Monel metal was found to be the least attacked.

British Association of Chemists

Annual Meeting of the London Section

THE London Section of the British Association of Chemists held its annual meeting at Broad Street Station Restaurant, London, E.C., on Friday, April 5, Mr. J. C. Mellersh, the retiring chairman, presiding. As usual the meeting was followed by a concert.

The committe's report on the past year's work was presented by Miss W. Wright, B.Sc., A.I.C. Reference was made to the efforts to interest students in the activities of the Association, and it was stated that the Association had student members in many colleges and universities. The membership of the Section, which at May, 1933, was 808, has increased by 20.

The report was adopted, as was also the hon. treasurer's report, which showed that the finances were satisfactory.

The CHAIRMAN, in a brief address, said that the past year had been one of steady progress, not only in respect of increased membership, but also by reason of the increasing interest that was evinced in the Association's work throughout the profession. He added that the Association would be celebrating its coming-of-age two or three years hence, and suggested that it would not be impossible to double the membership by that time.

Election of Officers

The following officers were elected for the ensuing year: Chairman, Mr. G. T. Gurr; hon. secretary, Miss W. Wright; hon. treasurer, Mr. W. C. Peck. Added to Section Committee: T. Hedley Barry, W. Ellenberg, A.I.C., W. Littlejohn, and J. C. Mellersh.

Mr. S. R. PRICE (chairman of the Council of the Association) proposed a vote of thanks to Mr. Mellersh for his services as chairman of the Section during the past two years.

The meeting then discussed suggestions made by the Unemployment Special Purposes Committee, which were referred to the sections from the annual general meeting of the Association, and are the subject of a ballot. The three suggestions with respect to which opinions were asked for were (*a*) That the period of benefit be extended beyond 26 weeks for a further 13 weeks, but at half rate of benefit, where a member is still unemployed; (*b*) the possibility of granting a cash payment to the dependents of a member at death; and (*c*) the possibility of making a cash payment to members reaching the age of 65—only those who have drawn no benefit during fifteen years to be eligible.

It was stated that during the last nine months the incidence of unemployment among the Association's members had been comparatively low and that during the past two years the benefits paid to members had fallen by about 50 per cent. The time was not far distant when the finances of the fund would be again reviewed by the Association's actuary, and the committee anticipated that when the reserve necessary to make the fund financially sound had been reckoned, there would be a substantial amount which could form a nucleus of a fund to give effect to the suggestion which was most favoured of the three which were the subjects of the ballot.

In support of suggestion (*a*) it was pointed out that, apart from the desirability of affording further help to unemployed members, the extension of the period of benefit would help the profession as a whole, inasmuch as it would keep up the market value of the chemist. If chemists were prepared to dash into posts at any salary, the result would be to depreciate the salaries offered to the profession generally. In regard to (*c*), it was pointed out that at the age of 65 years there was a distinct likelihood of compulsory retirement, and at that age even a small lump sum payment might be of very great assistance.

In the course of discussion it was suggested that perhaps (*b*) and (*c*) would not be of very much use, unless the amounts payable were quite substantial. On the other hand, if unemployment benefit could be extended, as suggested in (*a*), it seemed that more valuable assistance would be given to members, it would help to keep up the standard of salaries in the profession, and there would be a better chance of increasing the Association's membership and of being able to adopt all three suggestions at a later date. Probably the Special Aid Fund might be used to help cases of hardship resulting from the death of a member, at any rate for the time being.

A point made by several speakers was that the unemployment fund had been contributed to in order to benefit those who had become unemployed, a result of which was to improve the status of chemists and render them less likely to accept low salaries in desperation. Cash payments to the dependents of members at death, or to members on attaining the age of 65, were not within the original purpose of the fund, and members out of employment might receive less benefit than they were entitled to because of these other liabilities. The purpose should be, as far as possible, to increase unemployment benefits; the other matters were matters of benevolence or to be insured against. It was agreed also that legal advice would have to be sought before the unemployment fund could be used for purposes (*b*) and (*c*).

The Legal Aid Fund

Mr. C. B. WOODLEY (general secretary of the Association) referring to the Association's Legal Aid Fund, said that recently two cases had been settled in Scotland without reference to the courts, on a precedent established in the English Courts, concerning the three months' salary payable to chemists on the termination of their engagement. The members concerned were well satisfied with the results. There had been several settlements south of the Border also without recourse to the courts. A number of questions arising where members had been in doubt concerning agreements with employers had also been the subject of legal opinions, and Mr. Woodley assured the members that when they submitted questions of this kind they might be assured of the best possible advice.

During the last few months there had been a very distinct advance, not only in the number of appointments referred to the Association but in the value of those appointments, and the Association's members had obtained several appointments at salaries from £700 per annum upwards. Mr. Woodley emphasised that those appointments had come to the Association and to nobody else, and if employers came to the Association and offered the right salary they secured the right men. In some cases, where the salaries offered were not sufficient having regard to the qualifications necessary, the salaries had been increased.

Suggestions having been made that the Association should consider a sickness insurance scheme, members were asked to give some indication on the ballot papers as to whether they would be interested. No scheme has yet been put forward.

Notes and Reports from the Societies

Cleveland Institution of Engineers

Plastics Displacing Metals

DR. J. L. PEARSON, of Imperial Chemical Industries, Ltd., addressing the Cleveland Institution of Engineers, Middlesbrough, on April 8, said the new plastics industry was displacing metals in this country to the extent of about 100,000 tons a year. In recent years more research work had been carried out in the chemical industry than in the metallurgical industry, which was therefore called upon to face competition in a commercial field hitherto regarded as its own.

Dealing with the rapid growth of the plastics industry, he said the industry, large as it is now, has only just emerged from the embryonic stage, and one may reflect whether the steel age is not to give way to the plastic age. The new industry is challenging with considerable success both the ferrous and non-ferrous branches of the metallurgical industry in certain fields.

The most effective reply of the metallurgical industry was likely to be in the direction of bright annealing, as providing a better and more permanent finish, irrespective of what the finishing process might be.

Institution of Chemical Engineers

Heat Transfer in the Food Industry

THE last meeting of the Institution of Chemical Engineers for the current session will be held jointly with the Food Group of the Society of Chemical Industry, on Wednesday, April 17, in the hall of the Federation of British Industries, 21 Tothill Street, Westminster, S.W.1.

At the afternoon session (3.30 p.m.) the president will be the chairman, and the following papers will be read: "Heat Exchange and Steam Equipment in the Food Industry" (L. H. Lampitt, D.Sc., F.I.C.); "Steam Generation in Factories connected with the Food Industry" (F. H. Preece, A.M.Inst.C.E.); "Water-Conditioning for Steam Generation" (F. R. Jones, M.Sc., A.I.C.).

At the evening session (6 p.m.) Dr. L. H. Lampitt, chairman of the Food Group, will be the chairman, and the following papers will be read: "Fluid Heat Transmission in the Food Industry" (J. Arthur Reavell, M.I.Mech.E.); "Gas Heating in the Food Industry" (Peter Lloyd, B.A., A.I.C.); "The Development of Spray Drying" (T. B. Philip, B.Sc., A.R.C.S., A.I.C.).

Institution of the Rubber Industry

London Section: Strength of Vulcanised Rubber

IN testing samples of vulcanised rubber for strength it is customary to break a number of test pieces and accept the arithmetic mean of the individual results as the correct value, said Mr. W. H. Reece in a paper read before the London Section of the Institution of the Rubber Industry, on April 8. Such methods have been analysed statistically by Wiegand and Braendle and Fric, who were able to show that the results do not strictly obey the law of accidental error, but differ essentially by an excess of low values. This discrepancy is attributed to a certain number of defective test pieces. By superimposing the frequency curves obtained by the respective authors it can be shown that the curves are similar in shape in spite of the differences in experimental technique. As the frequency curve is negatively skewed it is necessary to "weight" the results before taking the arithmetic mean, in order to obtain an approximate model value.

Refined methods of calculating the strength, however, are of little value in comparing the results of one laboratory with another, unless standard testing methods are adopted. Such differences as size and shape of test piece were discussed by Mr. Reece, together with the results obtained from ring and dumb-bell test pieces. In some instances the differences are considered mathematically and methods of adjustment given in order that results may be compared in spite of differing testing technique.

Society of Public Analysts

Election of New Members

A MEETING of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, London, on April 3, Mr. John Evans, president, being in the chair.

Certificates were read in favour of W. Godden and F. Morton. The following were elected members of the Society: F. Bell, J. T. Dobbins and D. J. O'Sullivan.

Commercial ground almonds and their adulteration was the subject of a paper by Mr. G. N. Grinling, F.I.C. A modification of the Bieber test which is capable of detecting the presence of 10 per cent. of apricot kernel oil has been devised. From 10 to 15 per cent. of apricot kernel oil may also be detected by shaking the oil with lime water; almond oil and most other vegetable oils remain clear, whereas apricot kernel oil forms a persistent emulsion. When subjected to these tests, the oil expressed from several commercial samples of ground almonds gave results suggestive of adulteration.

Discussing the detection of Japanese oil in other peppermint oils, Mr. D. C. Garrett, B.Sc., Ph.D., F.I.C., said that furfuraldehyde is a normal constituent of peppermint oil; the amount varies with different types of oil, but is approximately the same in oils of the same type. This has been made the basis of a tentative test for the detection of Japanese oil in other peppermint oils, and a rough quantitative colorimetric method has been developed. The application of the reaction to the detection of certain adulterants in other essential oils has given promising results.

An apparatus for the accurate measurement of nitrogen in micro-Dumas combustions was described by Mr. H. C. Gull, M.Sc. The apparatus is characterised by measurement of the weight instead of the volume of the nitrogen, and avoids some of the practical drawbacks of the present methods, such as the formation of a persistent froth on the surface of the potash solution.

Institute of Fuel

Processing of Hydrocarbons in the Coal, Oil and Gas Industries

SPEAKING at a meeting of the Institute of Fuel, in London, on April 10, Mr. A. Fisher said that in Great Britain efforts were being made to utilise economically the vast amounts of low-grade coals by conversion into oil, while, concurrently with hydrogenation, efforts were being made in carbonising coal at low temperatures to obtain the maximum quantity of liquid hydrocarbons and smokeless domestic fuel.

The production of desirable solid, liquid and gaseous products from both low-grade solid and liquid hydrocarbons is frequently carried out by the Knowles oven process, by which is meant the varied applications of Knowles ovens. The main advantage of these ovens lies in the simplicity of both construction and operation. The oven is a D-shaped oven with flat hearth heated from below. The heating arrangements consist of heating flues running along the entire length of the ovens, while the oven floor is built of carborundum tile or refractory brick, the remaining brickwork being of different qualities of firebrick, to take care of expansion and contraction. In the coking of coal direct on a flat hearth heated from below the gas and vapours, as released, pass to a cooler zone, resulting in the progressive deposition and coking of the resinous matter present in the coal, with a tendency towards the liberation of vapours and gas of primary characteristics.

The Knowles ovens were applied in the oil industry with the object of utilising the heavy residual oils produced when cracking for high yields of motor fuel, and to give a better quality of coke than could be produced in the cracking operation itself.

In this coking operation it is desirable to charge as heavy an oil as possible to the Knowles ovens, the residues produced from the cracking operation being conditioned by flashing the light ends in a flash drum prior to charging the residues to the ovens. The physical differences in the cokes produced by the usual "non-residium" cracking operation and the Knowles oven process are quite marked: coke produced by cracking operations is characterised by comparatively high volatility, low specific gravity and extreme

porosity. Although this coke has been and is being used to a limited extent as a domestic fuel, its 12 to 15 per cent. volatile content is a source of difficulty in its use. In this connection it should be noted that there is a great difference between an oil coke and a coal coke of the same volatility. Whereas an oil coke of 12 per cent. volatile content is a smoky fuel, a coal coke of the same volatility as, for example, a coke from carbonising coal at low temperature is virtually smokeless. Furthermore, the physical structure of the coke produced in oil-cracking operations enhances reactivity and gives rise to local overheating of grates used for its combustion. In addition, it is extremely difficult to obtain a uniform coke by such operations, as there is always the possibility of getting pitchy material mixed with the coke, which gives rise to considerable trouble in its utilisation as a domestic fuel. In comparison with this, oil coke, as produced by Knowles ovens, is consistently of the same quality, having regularly a volatility of below 2 per cent. and being harder and denser.

The Knowles oven process for the gasification of liquids is of particular interest to the gas industry. Knowles ovens present the opportunity of reducing the problem of fluctuation in the prices of by-products as far as tar is concerned.

Society of Chemical Industry

Manchester Section : Annual Meeting

THE annual general meeting of the Manchester Section of the Society of Chemical Industry was held at the Engineers' Club, Manchester, on April 5, Dr. A. Schedler presiding.

The following officers and members of committee were elected: Chairman, Mr. A. McCulloch; vice-chairman, Dr. A. Schedler; hon. secretary and treasurer, Dr. W. H. Brindley; Chemical Engineering Group representative, Mr. H. Cheetham; Plastics Group representative, Dr. W. J. S. Naunton; Food Group representative, Dr. T. K. Walker; committee, Mr. S. A. Brazier, Dr. T. Callan, Mr. S. M. Neale, Dr. E. E. Walker, and Dr. F. C. Wood, in place of Miss Rona Robinson, and Messrs. T. Horner, D. M. Paul, F. Scholefield and C. M. Whittaker the retiring members. Mr. E. N. Marchant and Dr. J. C. Withers were re-elected in accordance with Rule 8. Drs. M. Barash and A Geake were re-elected hon. auditors.

On behalf of the Section, Dr. Schedler made a presentation to Mr. McCulloch to mark the appreciation of the local members of his services as honorary secretary and treasurer during the period 1925-1934.

Organic Acids by Natural Processes

The formation of organic acids by natural processes was the subject of a paper by Dr. T. K. Walker. The author pointed out that acids of simple constitution derived from carbohydrate material metabolised by plants and by micro-organisms may be divided conveniently for purposes of discussion into those of six carbon atoms, four carbon atoms and two carbon atoms respectively. In recent years new technical uses have been found for some of these compounds and, conversely, the study of the conditions governing their formation by certain moulds and bacteria and investigations concerned with the mechanism of the formation of these acids have rendered the utilisation of certain biological agencies for their production on a technical scale an economic possibility. Thus, to-day a most efficient and cheap process has been developed for the production of gluconic acid from glucose by the action of certain species of *Penicillium*. Calcium gluconate has been employed successfully for intravenous injection in cases of lowered calcium content of the blood, and the salt is also finding increased industrial uses, notably in the textile trade.

Last year, 10,000 tons of citric acid were produced in Europe from sugar by the use of mould fungi, and this method for its manufacture now competes strongly with the older processes by which citric acid is obtained from citrus fruits. The production of citric acid by mycological means has the advantage that the product is not contaminated by pectin, the removal of which from the citric acid of lemons is a somewhat troublesome process. Whilst the formation of gluconic acid from sugar is a relatively simple oxidation process, the production of acids containing four carbon atoms is effected by a series of intricate reactions. Briefly, it is now assumed that the sugar is first converted to compounds of three carbon atoms. From the latter, pyruvic acid arises and is transformed into acetic acid. Dehydrogenation of two molecules of the acetic acid gives rise to succinic acid, from which, in turn, by the action of various enzymes, fumaric, *l*-malic and oxalic acids are formed. There is good evidence available for the further assumption that citric acid is produced by the condensation (by the loss of two atoms of hydrogen) of one molecule of malic acid with one on acetic acid.

Ash Composition of Rubber Latex

A note on the ash composition of rubber latex was contributed by Dr. C. Falconer Flint and Mr. Hugh Ramage. Information was sought on the extent to which the ash composition and trace-element content of rubber latex may vary. No published information being available, six samples of unconcentrated ammoniated latex and six samples of concentrated ammoniated latex were obtained in this country and analysed by a quantitative spectrographic method developed by H. Ramage ("Nature," 1929, *123*, 601). Figures show that wide variations in ash composition do, in fact, occur. Rubidium was found to be present in all samples, the figures being of the same magnitude as the sodium and calcium figures. Potassium was the predominating metal; and the other metals estimated were sodium, rubidium, magnesium, calcium, manganese, copper, iron and lead. Traces of tin, silver, nickel and strontium were detected. The average analysis figures for concentrated and unconcentrated latex were shown to indicate that sodium, calcium and copper were associated with the rubber particles (probably as adsorbed ions), while the other metals were present in the serum. It was suggested that rubidium may play an important part in the synthesis and secretion of latex, and that rubidium deficiency may exist in certain rubber soils, adversely affecting the trees.

A New Fibre Refractometer

A new instrument for determining the refractive indices of fibres was described by Mr. J. M. Preston and Mr. K. Freeman. In this instrument the fibres act as minute cylindrical lenses, whose focal lengths depend on their refractive indices relative to the medium in which they are immersed. When their refractive indices are the same, the cylindrical lenses have an infinite focal length. Thus, if a beam of light is passed through a parallel bundle of fibres immersed in a medium, the beam of light will be passed straight through without deviation, or will be spread out fanwise in a plane perpendicular to the fibre axes when the refractive indices of fibres and medium are respectively equal to, or different from, one another. Now it would be possible to make liquid mixtures and to test them one by one on a bundle of fibres through which a narrow beam of light had been passed, the mixture which enabled the beam to pass without deviation being the one whose refractive index equalled that of the fibres. Fortunately, this laborious procedure can be avoided by using the different dispersions of fibres and liquids.

All liquids have greater dispersions than fibres, which means that there can only be one wave-length at which coincidence of refractive indices of fibres and medium can occur. The dispersions of a number of liquids must first be determined by measuring their refractive indices at various wave-lengths over the spectrum. If a small spectrum is now projected through a parallel walled cell filled with one of those liquids and a parallel bundle of fibres is introduced with their axes perpendicular to the slit of the spectrograph, then, if dispersion curves of fibres and liquid cross, that is, if their refractive indices are the same at any wave-length, at that wave-length the projected spectrum will not be deviated, but on either side of this wave-length it will be spread out fanwise in a direction parallel to the spectrograph slit.

The shape of the spectrum projected on a screen at one end of the instrument on introducing the fibre bundle changes from that of a rectangle to that of an hour glass, the waist of which corresponds to the wave-length at which there is coincidence of the dispersion curves. From the data of the dispersion curve of the liquid the refractive index corresponding to this wave-length is found and thus of the fibres at that wave-length. A measurement can be made in a few moments, and by using a range of liquids and finding the coincidences of the dispersion curves of the fibres and each of the liquids, the whole dispersion curve of the fibres can be rapidly plotted and their refractive indices can be interpolated at any desired wave-lengths.

News from the Allied Industries

Iron and Steel

AT MEETINGS IN SHEFFIELD, on April 5, of the ordinary and preference shareholders of Edgar Allen and Co., Ltd., steel manufacturers, the proposals for the reorganisation of the capital were approved, the voting being almost unanimously in favour.

Dyeing and Finishing

IT WAS ANNOUNCED AT BRADFORD on April 8 that the ballot vote of members of the dyeing and finishing trade unions on questions relating to wages and hours had been completed. It was stated that 83 per cent. of the members were in favour of giving three months' notice to terminate the common agreement in the industry, that 76 per cent. were in favour of authorising the joint executive committee to hand in on their behalf at the end of the three months a week's notice to terminate their employment if satisfactory arrangements had not been reached with the employers, and that 80 per cent. were in favour of refusing to work in excess of 48 hours a week if requested by the joint executive committee. The joint executive committee decided to request the employers to reconsider an application made by the unions last June respecting revision of wages rates and the limitation of working hours, and to give three months' notice to end the common agreement.

Paint and Varnish

SHAREHOLDERS and the staff of Pinchin, Johnson and Co. have been invited to subscribe for 300,000 four per cent. cumulative second preference £1 shares at par and for 75,000 ordinary 10s. shares at 28s. a share. The market price of the existing ordinary shares is about 38s. 9d. Renounceable letters of allotment will be posted on April 18, and these may be split up to May 31 in the case of the ordinary shares and up to June 14 in the case of the preference shares. The offer, which has been underwritten at a commission of 1 per cent., will remain open until April 15.

Continental Chemical Notes

Belgium

POSSIBLE LIQUIDATION of the Union Chimique Belge (over 50 per cent. of the capital having been lost) is down for discussion at the extraordinary general meeting called for April 16.

Russia

CARBON-FREE FERRO-MOLYBDENUM is now in regular production at the Czeljubinsk Iron Alloys Works.

AN ALCOHOL-PRODUCING FACTORY utilising cellulose and paper waste products has been erected on the River Sjas, with a daily capacity of 83 hectolitres.

PURE CITRIC ACID CAN BE EXTRACTED from the juice of wild pomegranates, according to investigations reported in "Sa Industrialisaziju." The pomegranate tree grows over a wide area in Transcaucasia.

A THIRD CINEMA FILM FACTORY, with an annual capacity of 600 million feet, is under construction at Kazan and is expected to enter production in July. At present two factories are in operation.

IT HAS BEEN DECIDED TO PROCEED with the erection of a factory near Moscow to produce 45 tons annually of the new anti-malarial, Akrichin. A new preparation, Arsmalz, for treating malarial swamps, is also stated to be in production at the Constantinovka Combinate.

ACHIEVEMENTS OF THE 1934 ANTI-MALARIAL CAMPAIGN were reviewed at a recent Moscow conference. Over 600,000 hectares of marshland were sprayed from aircraft with Schweinfurt Green and about 25,000 hectares flooded with petroleum by the same means. About 7,000 hectares of marshy ground were drained. The Soviet Union is allocating 80 million roubles for fighting malaria in 1935. At the same conference reference was made to the synthetic anti-malarials, Plasmozit and Akrichin.

OVER 4 MILLION TONS OF APATITE ORE have been extracted from the vast deposits (estimated at 2 milliard tons) on the peninsula of Kola in the Arctic Circle, since 1929. Several flotation and concentration plants now stated to be under construction will eventually guarantee a considerable annual tonnage of phosphate fertilisers and titanium and vanadium ores. The Russian Fertiliser Research Institute has developed a process for making a nitrogen-phosphorus fertiliser by nitric acid decomposition of apatite, and also has under investigation a new process to be operated in conjunction with raw iron manufacture for thermal treatment of apatite with formation of a product resembling Thomas slag. Ample fuel resources are available on the peninsula in the shape of peat and shale while the mining and chemical combinates at present being constructed will be supplied with hydro-electric power.

Czecho-Slovakia

A SECOND CARBON BLACK PRODUCER is announced as the firm of A. Fischer, Prague. Among the leading consumers in the country is the Bata concern with an annual consumption of 700 tons.

France

A COAL AND LIGNITE HYDROGENATION PROGRAMME with a view to an output of 300,000 tons benzine is being urged upon the Government by the Mines Commission.

AN AGREEMENT RELATING TO VISCOSE SPONGE MANUFACTURE has been entered into between the Société Française de la Viscose and the Viscose Development Co. A new company designated "Spontex" will be registered.

Bulgaria

THE COPPER SULPHATE INDUSTRY is only working to a fraction of its capacity. The firm of Bratja Asmanowi complains that in face of an average yearly importation of 3,000 tons its own works only produced 650 tons last year although its capacity is 1,500 tons. Notwithstanding this state of affairs, the Agricultural and Co-operative Bank has just accepted a tender for 1,900 tons copper sulphate from the Italian Montecatini concern. This is actually a barter transaction in exchange for Bulgarian poultry.

Germany

PRUSSIAN PETROLEUM OUTPUT in February amounted to 31,000 tons, as compared with a monthly average of 26,000 tons in 1934.

OF THE 300,000 TO 360,000 TONS OF LUBRICATING OIL used annually in Germany, about 20,000 to 30,000 tons are subjected to regenerative treatment. About 35 undertakings now practice oil-regeneration, including shipping companies and electric power stations.

CALCIUM DODECYL SULPHATE is described as an unusually good flotation agent for sulphide and oxide ores. Experiments also revealed its value in coal-grading processes, while tests still in progress indicate its probable value in separating felspar from its accompanying mica and quartz ("Metallbörse," March 30).

THE MILDEW RESISTANCE OF CASEIN PLYWOOD ADHESIVES was found in recent tests by the German Plywood Research Centre to be considerably increased by addition of certain chemicals, notably thymol, copper chlorite and Zylamon T. Another series of tests in progress in the tropics in connection with termite-resistance of plywood shows so far that adhesives on a phenol-formaldehyde resin basis are the most satisfactory ("Chemiker-Zeitung," March 27).

Weekly Prices of British Chemical Products

Review of Current Market Conditions

Price Changes

General Heavy Chemicals.—SODIUM METASILICATE, £14 10s. per ton.

Rubber Chemicals.—ANTIMONY SULPHIDE, golden, 6¾d. to 1s. 3d. per lb.; crimson, 1s. 5½d. to 1s. 7½d.; CADMIUM SULPHIDE, 3s. 2d. to 3s. 6d. per lb.

Wood Distillation Products.—ACETATE OF LIME, brown, £8 10s. to £9 per ton; CHARCOAL, £5 to £10 per ton; METHYL ACETONE 40/50%, £46 to £50 per ton; WOOD NAPHTHA, solvent, 3s. 3d. to 4s. 3d. per gal.

Pharmaceutical and Photographic Chemicals.—ACID, CAMPHORIC, 18s. to 20s. per lb.; MENTHOL, A.B.R., recryst, B.P., 11s. 6d. per lb.

Essential Oils.—ANISE, 2s. per lb.; BERGAMOT, 6s.; BOURBON GERANIUM, 21s.; CAMPHOR, white, 1s. 3d.; CANANGA, Java, 13s.; CASSIA, 80/85%, 5s. 9d.; CITRONELLA, Java, 1s. 9d.; Ceylon, 1s. 6d.; CLOVE, 90/92%, English, 4s. 9d.; LEMON, 6s.; LEMONGRASS, 4s.; ORANGE, SWEET, 7s. 6d.; OTTO OF ROSE, Bulgarian, 45s.; PEPPERMINT, Japanese, 4s.; Wayne County, 14s.; PETITGRAIN, 6s. 3d.

All other prices remain unchanged.

THERE have been advances in the prices of a number of essential oils during the week, and a number of rubber chemicals have also shown an upward tendency. There are no price changes to report in the markets for tar products, perfumery chemicals and intermediates. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—There is very little change to report in the London chemical market and the demand continues steady. The movement of coal tar products is steady. Stocks are not very plentiful but prices remain unchanged.

MANCHESTER.—Values have been steady to firm generally on the Manchester chemical market during the past week, and in rare instances are quotations being shaded. Sellers state that in the aggregate deliveries of chemicals, mainly of the heavy varieties and principally against old commitments, are being maintained on a fairly satisfactory scale, though new business so far as local consumption is concerned remains only moderate. A quietly steady business on shipment account is being transacted. From now until after the Easter holidays business generally is expected to show signs of tapering off, but the prospects afterwards, unless something unforeseen occurs, are regarded as reasonably promising. Among the by-products this week the tail-end of the shipping season approaches with prices on an easy basis; in other sections prices are about maintained, with carbolic acid and creosote oil fairly active, but the light materials mostly quiet.

SCOTLAND.—There has been considerable improvement in buying in the Scottish heavy chemical market during the past week.

General Chemicals

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

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

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

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

ACID, CITRIC.—11¾d. per lb. less 15%. MANCHESTER: 11¾d.

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

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

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

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

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £24 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. MANCHESTER: 1s. 0¾d. per lb.

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

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

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

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

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

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

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

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

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

ANTIMONY SULPHIDE.—Golden, 6¾d. to 1s. 3d. per lb.; crimson, 1s. 5½d. to 1s. 7½d. 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 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

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

CADMIUM SULPHIDE.—3s. 2d. to 3s. 6d.

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 4¼d. per lb. LONDON: 4¼d. to 5d.

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

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

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

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

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £4 2s. less 2½%.

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

DIPHENYLGUANIDINE.—2s. 2d. per lb.

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

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

LAMPBLACK.—£45 to £48 per ton.

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

LEAD NITRATE.—£27 10s. per ton.

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

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

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

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

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

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

NICKEL SULPHATE.—£49 per ton d/d.
PHENOL.—7¼d. to 8¼d. per lb. for delivery up to December 31.
POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38 to £40.
POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5% d/d U.K. Discount according to quantity. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.
POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.
POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.
POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.
POTASSIUM NIRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.
POTASSIUM PERMANGANATE.—LONDON: 10½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10¾d.
POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¼d.
SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.
SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r in bags.
SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. 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: £22. SCOTLAND: £20.
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 lot less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. 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, £14 10s.
SODIUM META SILICATE.—£14 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.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.
SULPHATE OF COPPER.—MANCHESTER: £14 10s. to £14 15s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 4s. 5d. to 4s. 7d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—11d. to 1s. per lb.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.
BENZIDINE HCL.—2s. 5d. per lb.
p CRESOL 34-5° C.—2s. per lb. in ton lots.
m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITRCTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
o-NITRANILINE.—3ss. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.: 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0¼d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—9½d. to 11d. per lb.
p-TOLUIDINE.—1s. 11d. per lb.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 10s. to £9. Grey, £12 to £14. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £11; grey, £13 10s.
ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.
CHARCOAL.—£5 to £10 per ton.
WOOD CREOSOTE.—Unrefined, 3d. to 1s. 6d. per gal.
WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 3d. to 4s. 3d. per gal.
WOOD TAR.—£2 to £4 per ton.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 7¾d. to 8¼d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¾d. per lb.; crude, 2s. 1d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 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, 8½d. to 9d. per gal.; standard motor, 1s. 2d. to 1s. 2½d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 6½d. to 1s. 7d. LONDON: Motor, 1s. 5½d. SCOTLAND: Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 5½d. to 5¾d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 4¾d. to 5½d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4¾d.; light, 4½d.; heavy, 4½d. to 4¾d.
NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 2½d. to 1s. 3½d.; heavy, 11d. to 1s. 0¼d. 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.—Medium soft, 42s. to 45s. per ton. LONDON: 45s. per ton, f.o.b. East Coast port.
PYRIDINE.—90/140, 6s. to 8s. 6d. per gal.; 90/180, 2s. 3d.
TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 1d. to 2s. 2d.
XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—£7 5s. per ton; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.
CYANAMIDE.—£7 5s. per ton delivered in 4-ton lots to farmer's nearest station.
NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935, in 6-ton lots, carriage paid to farmer's nearest station for material basis 15.5% or 16% nitrogen.
NITRO-CHALK.—£7 5s. per ton to June, 1935, in 6-ton lots carriage paid for material basis 15.5% nitrogen.
CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents, for delivery up to June, 1935, in 6-ton lots carriage paid.
NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton.

Latest Oil Prices

LONDON, April 10.—LINSEED OIL was barely steady. Spot, £22 15s. (small quantities); April, £20 2s. 6d.; May-Aug., £20 12s. 6d.; Sept.-Dec., £21 5s., naked. SOYA BEAN OIL was steady. Oriental (bulk), April-May shipment, £22 15s. per ton. RAPE OIL was quiet. Crude, extracted, £32; technical refined, £33 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £24 10s.; refined common edible, £28 10s.; and deodorised, £30 10s., naked, ex 'mill (small lots, 30s. extra). TURPENTINE was firm. American, spot, 47s. 3d. per cwt.

HULL.—LINSEED OIL, spot, quoted £21 2s. 6d. per ton; April, £20 15s.; May-Aug., £21; Sept.-Dec. £21 5s. COTTON OIL.—Egyptian, crude, spot, £24 10s.; edible, refined, spot, £27; technical, spot, £27; deodorised. £29, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £19 10s., naked. GROUNDNUT OIL, extracted, spot, £32; deodorised, £35. RAPE OIL, extracted, spot, £31; refined, £32 10s. SOYA OIL, extracted, spot, £25 10s.; deodorised, £28 10s. per ton. CASTOR OIL.—Pharmaceutical, 40s. 6d. per cwt.; first, 35s. 6d.; second, 32s. 6d. COD OIL, f.o.r. or f.a.s., 25s. per cwt., in barrels. TURPENTINE, American, spot, 49s. 3d. per cwt.

Inventions in the Chemical Industry

Patent Specifications and Applications

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

Complete Specifications open to Public Inspection

OIL COMPOSITIONS suitable for use as softeners for cellulose derivatives, production.—E. I. du Pont de Nemours and Co. Sept. 26, 1933. 25034/34.

3 : 4 : 6-TRIAMINOQUINOLINES, manufacture.—I. G. Farbenindustrie. Sept. 28, 1933. 25895/34.

DESTRUCTIVE HYDROGENATION of solid carbonaceous materials. International Hydrogenation Patents Co., Ltd. Sept. 29, 1933. 26046/34.

THERAPEUTICALLY-ACTIVE HYDANTOIN DERIVATIVES, manufacture. Soc. of Chemical Industry in Basle. Sept. 30, 1933. 26433/34.

DETERGENTS.—L. H. Flett. Sept. 26, 1933. 26555/34.

REDUCTION OF ZINC ORES.—O. Dony. Sept. 27, 1933. 27262/34.

SYNTHETIC BALSAM by condensation of phenols with aldehydes, manufacture.—Brick Trust, Ltd. Sept. 30, 1933. 27480/34.

THICK COATINGS OF NITRO DERIVATIVES of cellulose on metal foils, production.—Aluminium-Walzwerke Singen Dr. Lauber, Neher and Co., Ges. Sept. 30, 1933. 27657/34.

DEWAXING MINERAL OILS, method.—Aktiebolaget Separator Nobel. Sept. 29, 1933. 27717/34.

AZO DYESTUFFS CONTAINING CHROMIUM, manufacture.—I. G. Farbenindustrie. Sept. 27, 1933. 27724/34.

TAR PRODUCTS, particularly for road construction, manufacture. J. R. Geigy A.-G. Sept. 27, 1933. 27725/34.

DYEING WOOL.—I. G. Farbenindustrie. Sept. 30, 1933. 27728/34.

SACCHARIFICATION OF CELLULOSE.—H. Scholler. Sept. 27, 1933. 27750/34.

ACTIVATED CARBON, preparation and regeneration.—Soc. per L'Industria Articoli di Caoutchouc E per Materiali Protettivi E Anti-Gas. Sept. 28, 1933. 27834/34.

ALKALI METAL ADDITION PRODUCTS of aromatic hydrocarbons, manufacture.—E. I. du Pont de Nemours and Co. Sept. 29, 1933. 28042/34.

AZO DYESTUFFS CONTAINING CHROMIUM, manufacture.—I. G. Farbenindustrie. Sept. 29, 1933. 28049/34.

FORMIC ACID, concentrating.—R. Koepp and Co. Chemische Fabrik A-G. Sept. 30, 1933. 28086/34.

ESTERS OF DICARBOCYLIC ACID and compositions containing these esters.—Kodak, Ltd. Sept. 10, 1932. 9638/35.

Specifications Accepted with date of Application

SYNTHETIC RESINS, production of articles from.—H. D. Elkington (A. Nowack A.-G., and Dr. R. Hessen). Aug. 17, 1934. 425,871.

CONVERTING HYDROCARBON COMPOUNDS in the vapour phase by heating, process.—Naamlooze Vennootschap Nieuwe Octrooi Maatschappij. Aug. 26, 1933. 425,874.

VINYL FORMATE, manufacture.—Consortium für Elektro-Chemische Industrie Ges. Sept. 1, 1933. 425,673.

IODONAPHTHOLDISULPHONIC ACIDS, manufacture.—Chemische Fabrik vorm. Sandoz. Oct. 4, 1933. 425,752.

CRACKING HYDROCARBON OILS.—Naamlooze Vennootschap Nieuwe Octrooi Maatschappij. Oct. 27, 1933. 425,953.

OLEO-EMULSION OF GRAPHITE, process for producing.—E. Rabetrano. Nov. 16, 1933. 425,884.

ELECTROLYTIC PRODUCTION OF FLUORINE.—E. I. du Pont de Nemours and Co. Oct. 31, 1932. 425,979.

AZO DYESTUFFS CONTAINING COPPER, process for manufacture.—I. G. Farbenindustrie. Sept. 23, 1932. 425,990.

INSECTICIDAL, FUNGICIDAL, AND LIKE MATERIALS, manufacture.—E. I. du Pont de Nemours and Co. Sept. 24, 1932. 426,051.

VITAMIN PREPARATION, process for manufacture.—I. G. Farbenindustrie. Sept. 27, 1932. 425,998.

AMINO ALCOHOLS, manufacture.—E. I. du Pont de Nemours and Co. Sept. 27, 1932. 426,062.

SYNTHETIC TANNING AGENTS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Oct. 7, 1933. 426,006.

DYEINGS AND PRINTINGS by means of ester salts of leuco-vat-dyestuffs, production.—Durand and Huguenin A.-G. Dec. 12, 1932. 426,073.

CELLULOSE DERIVATIVES, manufacture of photographic supports. I. G. Farbenindustrie. March 4, 1933. 426,023.

PREPARATIONS HAVING AN ANTI-EMETIC ACTION, manufacture.—Chemische Fabrik von Heyden A.-G. March 8, 1933. 426,290. March 29, 1933. 426,291.

VARNISHES.—F. F. Schwartz. April 28, 1933. 426,154.

SILICIOUS PRODUCTS, calcination.—P. C. Fassotte. May 3, 1934. 426,157.

INSECTICIDAL, FUNGICIDAL, AND LIKE MATERIALS, manufacture.—E. I. du Pont de Nemours and Co. Sept. 24, 1932. 426,102.

PRODUCING SULPHUR by means of reduction of sulphur dioxide, process.—A. R. Lindblad. Sept. 6, 1933. 426,165.

HORMONE OF CORPUS LUTEUM, process for obtaining.—Soc. of Chemical Industry in Basle. June 14, 1933. 426,166.

DELIVERING LIQUEFIED GASES, method.—Ruhrchemie A.-G. July 17, 1933. 426,031.

MIXED CARBONYL SALICYLIC ETHER-ANHYDRIDE of salicylocarbonic acid and homologues thereof, manufacture.—L. A. Dupont. July 11, 1933. 426,243.

ADHERENT PATINA UPON COPPER or its alloys, production.—J. S. Withers (Battelle Memorial Institute). Aug. 17, 1934. 426,115.

SEPARATION OF PARA-CRESOL from liquid phenolic mixtures containing it.—Monsanto Chemical Co. Nov. 25, 1933. 426,175.

POTASSIUM SULPHATE, process for making.—Borax Consolidated, Ltd. Aug. 29, 1934. 426,305.

OIL-SOLUBLE HARDENING PHENOL-ALDEHYDE RESINS, preparation. Dr. H. Honel and J. Ehrenfeld and O. Reichhold (trading as Beck, Koller & Co.). Aug. 26, 1933. 426,249.

Applications for Patents

(March 21 to 27 inclusive.)

SULPHURISING ORGANIC COMPOUNDS, process.—Dr. Alexander and Posnansky and C. Sandvoss. (Germany, March 26, '34.) 8788.

HEAT-TREATABLE ALUMINIUM BASE ALLOYS.—Aluminium, Ltd. (United States, Aug. 15, '34.) 9305.

CASTING ALUMINIUM MAGNESIUM ALLOYS.—Aluminium, Ltd. (United States, Nov. 20, '34.) 9306.

CYANINE, ETC., DYES, manufacture.—B. Beilenson, Kodak, Ltd., and F. M. Hamer. 8922.

STEROL COMPOUNDS, manufacture.—A. Carpmael. 9577.

ISOLATION, ETC., of carbonyl-containing oxidation products of sterols.—A. Carpmael. 9423.

ESTERS, production.—Celluloid Corporation. (United States, March 31, '34.) 9545.

ANTHRAQUINONE DYESTUFFS.—Chemical Works, formerly Sandoz. (Germany, March 21, '34.) 8909.

ACETYLATED CELLULOSE THREADS, manufacture.—Courtaulds, Ltd., and R. L. Wormall. 9013.

ANHYDROUS CALCIUM SULPHATE, production.—J. S. Dunn, Imperial Chemical Industries, Ltd., and F. R. Himsworth. 9302.

NITRIC ACID, production.—E. I. du Pont de Nemours and Co. (Feb. 5, '34.) (United States, Feb. 24, '33.) 9300.

COLUMBIUM ALLOYS, producing.—Electro Metallurgical Co. (United States, April 11, '34.) 9358.

CYANINE, ETC., DYES, manufacture.—N. I. Fisher, F. M. Hamer and Kodak, Ltd. 8921.

DYEING.—W. W. Groves. 9251.

DYESTUFF-SULPHONIC ACIDS, manufacture.—W. W. Groves. 9253, 9405.

SALTS OF ACRIDINIUM BASES, manufacture.—W. W. Groves. 9403.

ANTHRAQUINONE COMPOUNDS CONTAINING NITROGEN, manufacture. W. W. Groves. 9407.

DISAZO DYESTUFFS, manufacture.—W. W. Groves. 9411.

POLYAZO DYESTUFFS, manufacture.—W. W. Groves. 9597.

AQUEOUS SOLUTIONS of addition compounds of alkylacridinium salts, etc., manufacture.—W. W. Groves. 9598.

SULPHONATION PRODUCTS of acylated amines, manufacture.—I. G. Farbenindustrie. (Germany, March 22, '34.) 8878.

OXAZOLE DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, March 24, '34.) 9293.

ANHYDROUS MAGNESIUM CARBONATE, production.—I. G. Farbenindustrie. (Germany, May 19, '34.) 9584.

ESSENTIAL OILS, manufacture.—Imperial Chemical Industries, Ltd. 9436.

DYESTUFFS, production.—J. D. Kendall. (Oct. 3, '33.) 9067.

METALLIC MAGNESIUM, manufacture.—Oesterreichisch Amerikanische Magnesit A.-G. (Austria, May 4, '34.) 9064.

REFINING OILS, ETC.—Planktokoll Chemische Fabrik Ges. 9374.

MAKING ASPHALT.—Planktokoll Chemische Fabrik Ges. 9464.

HYDROCARBON PROUCTS, production.—H. E. Potts (International Hydrogenation Patents Co.). 9357.

DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, March 22, '34.) 9040, 9041, 9042. (Switzerland, March 24, '34.) 9294, 9295.

NAPHTHALENE, ETC., hydrogenation.—Yorkshire Tar Distillers, Ltd. 9334.

DYESTUFFS, manufacture.—W. W. Groves. 9010, 9595.

From Week to Week

LOSS ESTIMATED AT £500 has been caused by fire at the Cartvale Chemical Works, Paisley, involving three vats of oil.

DAVID MOSELEY AND SONS, LTD., rubber manufacturers, of Ardwick, Manchester, will give their employees a day's holiday with pay at the celebration of the King's Jubilee.

AN EXTRAORDINARY GENERAL MEETING of shareholders of the Cheshire United Salt Co., Ltd., will be held at Winchester House, London, on April 30, for the purpose of considering resolutions for the reduction of the capital and the creation of a new class of preferred ordinary shares.

SOUTHALL BROS. AND BARCLAY, LTD., manufacturing, wholesale and retail chemists and druggists, of Birmingham, have changed their name to Southalls (Birmingham), Ltd. A new company (Southall Bros. & Barclay (1935), Ltd.), was registered on April 2, with a capital of £100 in £1 shares.

MR. J. B. M. HERBERT, lecturer in physical chemistry at Manchester University, and Professor M. Polanyi, also of Manchester University, have succeeded in isolating heavy oxygen water. This is believed to be the first time that it has been produced in this country.

THE IMPORT DUTIES (EXEMPTIONS) (No.8) ORDER, 1935, issued by the Treasury on the recommendation of the Import Duties Advisory Committee, provides for the addition to the Free List as from April 12 of certain waste and scrap rubber.

DANIEL ADAMSON AND CO., LTD., of Dukinfield, announce that they have recently acquired the services of Mr. D. T. Sloan, to assist their managing director, Mr. Percy A. W. Parkyn, in dealing with the ever-increasing ramifications of the company. Mr. Sloan has had wide experience in mechanical engineering and has served as a director of Joseph Foster and Sons, Ltd., and Yates and Thom, of Preston and Blackburn.

SPEECH DAY at the Royal Commercial Travellers' Schools is fixed for Saturday, July 27, when Sir Ernest Benn, president of the 1935 Appeal, will address the children, and Lady Benn, J.P., will distribute the prizes. The annual festival dinner will take place (by permission of the Drapers' Company) at Drapers' Hall, on December 13.

THE CUSTOMS DUTY on tubes of all sections manufactured wholly of copper or of alloys containing more than 50 per cent. by weight of copper, has been raised from 10 per cent. to 20 per cent. as from April 5. A large proportion of the imports of such tubes consist of copper water-service tubes for buildings, offered for sale at prices against which British manufacturers find it impossible to compete.

THE STEAMSHIP "OTTERHOUND" sailed from the River Tees on Tuesday, with the first shipment of petrol made in the district. She was bound for Ellesmere Port, near Birkenhead. The petrol, totalling 300,000 gallons, was produced from the hydrogenation of creosote at the Billingham plant of Imperial Chemical Industries, Ltd. It is being delivered to the Shell Mex B.P. Co., who, with Anglo-American Oil Co., are undertaking distribution.

THE SCHRODER EXECUTOR AND TRUSTEE CO. states that after providing for costs, it has sufficient to make a final payment equivalent to 5s. 10d. per £100 bond in respect of interest unpaid on the prior secured 7 per cent. sterling bonds of the Compania de Salitre de Chile (Cosach). This includes bonds exchanged for debentures of the Corporation de Ventas de Salitre y Yodo de Chile (Sales Corporation).

THE SECRETARY FOR MINES announces that Afror Tyne powder sheathed with powdered sodium bicarbonate as manufactured by the Miners Safety Explosive Company, Ltd., at Penrhyndeudraeth, Merionethshire, has been added to the list of permitted explosives for general use in mines to which Part II of the Explosives in Coalmines Order applies. Denaby powder and "Kentite," as manufactured by Roburite and Ammonal, Ltd., near Wigan, have also been added to the list of permitted explosives for general use in mines to which Part II of the order applies.

THE IMPORT DUTIES ADVISORY COMMITTEE has received an application for the addition to the free list of the following essential oils and floral concretes:—Essential oils: Cananga, cassia, chenopodii, spike lavender, mandarin, neroli, petitgrain. Floral concretes: Jasmin, lavender, mimosa (cassia), mousse de chène, orange flowers, rose, violet leaf (vert de violet), attar (otto) of rose. Representations should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than May 2.

JOSEPH BENTLEY, LTD., manufacturing chemists, of Barrow-on-Humber, Lincs., have increased their nominal capital by the addition of £7,000 beyond the registered capital of £18,000.

AN ACCIDENT in the yard of Thomas Ovens and Sons, Ltd., Chemical Works, Bo'ness, last week, resulted in a workman, John McNaughton, being conveyed to Edinburgh Royal Infirmary suffering from severe crushing injuries about the shoulders.

GLASGOW CORPORATION GAS COMMITTEE has further considered the desirability of installing a benzol recovery plant at the Provan gasworks and has inspected similar plant in operation in the Leeds gasworks. The committee now recommends that offers be invited from several firms for the erection of the plant at Provan works.

TWO REPRESENTATIVES of the Chinese Government visited the low-temperature carbonisation works at Askern, near Doncaster, on April 9, where they saw the process of extracting motor spirit from coal. They have been sent to England with authority to select a low-temperature carbonisation process for adoption in China.

THE COLOURING OF THE FIRM'S PETROL with a green dye by an employee of Wigglesworth, Ltd., manufacturing chemists, of Peel Mill, Westhoughton, near Bolton, enabled the police to trace the person who was stealing it, with the result that Richard Higham (54), lorry driver, was fined £10 and 22s. costs by the Bolton county magistrates on April 4.

MR. J. ALBERT THOMSON, who, as announced in THE CHEMICAL AGE, April 6, has given £10,000 to establish a commercial laboratory in Edinburgh University, is the managing director of Thomson and Brown Bros., motor accessories manufacturers, of Edinburgh, and not of Brown Bros. and Co., Rosebank Ironworks, Edinburgh.

THREE REMINDERS

BRITISH SUMMER TIME commences at 2 a.m. on Sunday. All clocks should be put forward one hour to-night (Saturday).

EASTER HOLIDAYS.—Owing to the publication of THE CHEMICAL AGE a day earlier than usual next week, all matter for publication must be received by Wednesday morning at the latest.

LAWN TENNIS.—Entries for the fifth annual CHEMICAL AGE lawn tennis tournament close on Monday, April 29.

THE IRISH FREE STATE GOVERNMENT has decreed that between May 1 and October 31, 1935, the maximum quantity of superphosphates, ground mineral phosphates and compound manures which may be imported into that country is 7,000 tons. Importers must open licences from the Department for Industry and Commerce to import any quantity of these fertilisers.

TWELVE PERSONS WERE KILLED on April 7 in an explosion at a firework factory in the Worli quarter of Bombay. The explosion occurred while chemicals were being mixed preparatory to the making of fireworks. Suddenly there was a great flare and a terrific report. Huts adjoining the works were razed to the ground, and cracks appeared in neighbouring buildings.

COURTAULDS, LTD., announce that they have recently acquired an interest in Morton Sundour Fabrics, Ltd., and that the two companies are also collaborating, by means of a private company in which each is interested, in the development of certain new processes connected with textiles, which were originated by Morton Sundour Fabrics.

THE NEW RESEARCH LABORATORIES built by United Dairies, Ltd., in Wood Lane, Shepherd's Bush, were opened on April 5, by Mr. Geoffrey Shakespeare. The laboratories are contained in a building 200 ft. long and lighted on all sides. Four laboratories are set aside exclusively for research, and in six further laboratories, devoted to what is called routine control, samples submitted by public authorities are analysed, glass bottles tested, and many other branches of investigation are carried on.

A NEW DRUG to combat heart disease, described as the most powerful drug known for stimulation of the heart and several times more potent than digitalis, was described on April 5, at a meeting in New York, of New York Cardiological Society. The drug, which has been named thevetin, has been isolated in crystalline form from the be-still or yellow oleander nut. It has been in experimental use, under the supervision of Dr. Albert S. Hyman, for six months at the Beth David Hospital. The drug is administered by injection and is stated to be an effective aid against dropsy and other maladies.

THE I. G. FARBENINDUSTRIE reports a further increase of business in 1934, owing to the growth of domestic sales and its activity in the production of substitute raw materials. Net profit amounts to Rm.50,981,071, compared with Rm.49,143,347 for 1933, out of which an unchanged dividend of 7 per cent. is distributed. The balance of Rm.4,779,941, compared with Rm.2,078,863, is carried forward. Sales of dyes registered an increase as to values and quantities, in spite of a slight reduction of exports. The agreements with the Imperial Chemical Industries and other leading European competitors have turned out satisfactorily.

Forthcoming Events

LONDON

Apr. 15.—Royal Society of Arts. "The Part Played by Rubber in Transport." Colin Macbeth. 8 p.m. John Street, Adelphi, London.

Apr. 17.—Society of Chemical Industry (Food Group). Joint meeting with the Institution of Chemical Engineers. 3.30 p.m. "Heat Exchange and Steam Equipment in the Food Industry," Dr. L. H. Lampitt. "Steam Generation in Factories connected with the Food Industry," F. H. Preece. "Water Conditioning for Steam Generation," F. R. Jones. 5.30 p.m. Interval and Tea. 6 p.m. "Gas Heating in the Food Industry," P. Lloyd. "Fluid Heat Transmission in the Food Industry," J. Arthur Reavell. "Development of Spray Drying," T. B. Philip. 21 Tothill Street, London.

GLASGOW

Apr. 19.—British Association of Chemists (Scottish Section). Annual general meeting. 7.30 p.m. Central Halls, Bath Street, Glasgow.

MANCHESTER

Apr. 15.—Institution of the Rubber Industry. Annual general meeting and smoking concert. Engineers' Club, Albert Square, Manchester.

Company News

I. G. Farbenindustrie.—A 7 per cent. dividend is announced for 1934. This is the same as for each of the three previous years.

British Tar Products.—The payment of 6¼ per cent., less tax, is announced on the ordinary and preferred ordinary shares.

Bede Metal and Chemical Co.—The report for 1934 shows net profit, after tax and depreciation, £3,153; add £8,454 brought in, making £11,607; dividend, 3d. per share, or 3⅛ per cent.; £1,000 to reserve for replacements; leaving to go forward £8,427.

Briton Ferry Chemical and Manure Co.—The report for 1934 states that there was a trading loss of £5,671; after charging £1,020 to depreciation, the debit balance was £9,913, which with the debit brought in makes a total debit of £14,063 to go forward.

Tarmac, Ltd.—A net profit of £41,477, is shown for 1934, against £39,613 for 1933. The ordinary dividend is repeated at 5 per cent., and a further allocation of £5,000 made to reserve, leaving the carry-forward slightly higher at £30,046.

A. and F. Pears.—For the year 1934 the profit was £49,898, against £50,747 in the previous year, plus £26,577 brought in. The dividend on the 6 per cent. cumulative preference shares absorbs £12,000, and on the 12 per cent. cumulative preferred ordinary shares £38,400, leaving to be carried forward £26,075.

British Drug Houses, Ltd.—A trading profit of £57,875 is shown for 1934, against £56,780 in the previous year; from this is deducted £15,821 for depreciation, tax, etc., leaving £42,054, add £10,218 brought in, making £52,272; dividend 5 per cent. on ordinary shares, £10,000 to reserve, leaving £10,172 to be carried forward.

Murex, Ltd.—An interim dividend of 2s., less tax, or 10 per cent., is to be paid for 1934-35 on the ordinary shares. For the previous year an interim dividend of 15 per cent. was paid on the 373,034 old ordinary 10s. shares and 11¼ per cent. on the 76,966 new shares issued in October, 1933. The final dividend was 20 per cent. on the old shares and 15 per cent. on the new shares.

Associated Dyers and Cleaners.—A loss is reported for 1934, after all expenses, and including income from investments, etc., of £1,656, compared with £37,008 a year ago. This is increased to £35,387 by fees, £30,107 written off for depreciation, and £3,605 Acton works reorganisation expenditure during 1933 written off. After including £1,120, income-tax recoverable and fees, there is a loss for the year of £34,164, against £65,539. This has been dealt with by transferring it against the general reserve, which, after further deduction of the payment made to the late managing director, will then amount to £2,123.

Aluminium Corporation.—The report for 1934 shows profit, after depreciation, etc., of £26,120, against £20,767, after payment of debenture interest, etc., and fees, £4,496 remains. The debit £21,120 brought in is reduced to £16,624.

Timothy Whites and Taylors.—The directors have declared an interim dividend of 7½ per cent., less tax, on the ordinary shares on account of the year ending September 30, 1935, payable on April 10. This is the first distribution since the merger with the Taylor group of companies which received sanction late last year. The company was formerly known as Timothy Whites, Ltd. The capital was then substantially increased and certain alterations made in the general structure. For 1933-34 the deferred ordinary (now ordinary) shares received an interim of 5 per cent. and a final payment of 12½ per cent.

Doulton and Co.—The report for 1934 shows a loss for the year after depreciation, etc., of £22,433, to which is added fees, £2,165, special depreciation of buildings, £5,355, and plant, £9,318, and loss on trade investment, £5,164, making a total loss of £44,435; transfer from old credits reserve not now required, £2,500, £5,000 tax reserve not now required, and £50,000 from general reserve; add £5,491 brought in, leaving a credit balance of £18,556. The payment of the preference dividend for 1933 is to be made, leaving dividend in arrears for 1934. The last dividend on the ordinary shares was 5 per cent. for 1930.

Tariff Changes

Goods Prohibited for Export

APPENDED is a list of goods the export of which from the United Kingdom is prohibited save under licence. These drugs are also prohibited to be imported. It should be noted, however, that three open general export licences have been issued authorising the exportation *without separate licences* of some of the goods to certain destinations. Applications for licences to export dangerous drugs should be addressed to the Under-Secretary of State, Home Office, Whitehall, S.W.1.

Acetyldihydrocodeinone and its salts and any preparation, admixture, extract or other substance containing any proportion of acetyldihydrocodeinone.

Cocaine (including synthetic cocaine) and the salts thereof, and any substance containing not less than 0.1 per cent. of cocaine.

Coca leaves.

Diacetyl-morphine (commonly known as diamorphine or heroin) and the salts thereof, and any substance containing any proportion of diacetyl-morphine.

Diamorphine (see diacetyl-morphine).

Dihydro-morphinone, its salts, and any preparation, admixture, extract or other substance containing dihydro-morphinone.

Dihydro-oxycodeinone and the salts thereof, and any substance containing any proportion of dihydro-oxycodeinone.

Dihydro-codeinone and the salts thereof, and any substance containing any proportion of dihydro-codeinone.

Ecgonine and salts thereof, and any substance containing not less than 0.1 per cent. of ecgonine.

Esters of morphine, their respective salts, and any preparation, admixture and extract containing any of the said esters (except diacetyl-morphine, see above), *are absolutely prohibited.*

Heroin (see diacetyl-morphine).

Indian hemp (except the resin thereof) as defined by the Dangerous Drugs Act, 1925, and any extract or tincture of Indian hemp. Note: The exportation of the resin of Indian hemp (which is known under the names, amongst others, of Hashish or Charas) *is absolutely prohibited.*

Morphine and salts thereof, and any substance containing not less than 0.2 per cent. of morphine. Note: The exportation of Benzoyl-morphine *is absolutely prohibited.* (See also esters of morphine.)

Opium (raw opium and medicinal opium). Note: The exportation or opium prepared for smoking *is absolutely prohibited.*