The Chemical Age

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Notes and Comments

Overseas Chemical Trade

UNMISTAKABLE evidence of a steady recovery in the chemical industry is afforded by the Board of Trade returns relating to overseas trade issued last week-end. A month ago we reported a substantial increase in exports of chemicals, drugs, dyes and colours during January, and a no less satisfactory decrease in imports. The figures just issued enable a comparison to be made with the first two months of 1934 and 1933, and they indicate a decided improvement in every direction. Exports of chemical products for January and February this year totalled £3,354,147, against £2,843,550 for the same period of 1934, a welcome increase of £510,597, or just under 18 per cent. Compared with the figures for the first two months of 1933, there was an increase of £542,510, or 19.2 per cent. Chemical imports for the two months amounted to £1,827,333, against £1,891,181 for the same period of 1934, a decrease of £63,848, or 3.3 per cent. The 1935 figure, however, is still £446,397 (or over 32 per cent.) more than the total imports of £1,380,936 recorded in the first two months of 1933. Re-exports at £94,641 were £13,076 higher than in the corresponding period of 1934 and £30,068 higher than in 1933. Details under the various headings are given on page 274.

The improvement in the trade balance is not confined to the chemical group. Under the heading of oils, fats and resins, manufactured, the exports for the two months totalled £1,094,732, against £737,974 in 1934 (an increase of £356,758) and against £860,862 in 1933 (an increase of £233,870). Imports in this group totalled £5,011,919 in the first two months of this year, against £5,217,412 in 1934 (a decrease of £205,493) and against £5,011,928 in 1933 (a decrease of £9).

The Discovery of Insulin

THE discovery of insulin as a specific for diabetes, which was first announced in 1922, is recalled by the death of Professor J. J. R. Macleod, F.R.S., Regius Professor of Physiology at Aberdeen, which occurred on March 16 at the comparatively early age of 58. At the time of the announcement Professor Macleod was Professor of Physiology, and Sir Frederick Banting was (and still is) Professor of Medical Research at Toronto University. Macleod was always anxious to share the credit with his younger colleague, and as the value of insulin became more and more apparent on further investigation the two men were together awarded the Nobel prize for medicine in October, 1923, each receiving about £4,000. Macleod divided his share with Dr. J. B. Collip, then Professor at Alberta University, and now Professor of Biochemistry at McGill, and F.R.S., while Banting divided his with Dr. Best, who, he declared, had played an important part in the discovery, and to whom he felt that proper credit had not been accorded. This action gave to the four men who worked on the insulin experiments an equal division of the prize-money; as Macleod said, it was only teamwork that made insulin possible. Both Macleod and Banting received the honorary degree of D.Sc. from Toronto University in November, 1923, and were afterwards the guests of honour at a banquet given by the Governors of the University and attended by 400 representatives of the medical profession and the Universities of Canada, and Johns Hopkins, Chicago, and other American Universities. In the same year Macleod was elected a Fellow of the Royal Society and was Cameron prizeman of Edinburgh University.

Professor Macleod was born at Cluny, near Dunkeld, in Scotland, on September 6, 1876, the son of the Rev. Robert Macleod. He was educated at the Grammar School and Marischal College, Aberdeen, where he was Anderson scholar, and at Leipzig. He graduated M.B., Ch.B. at Aberdeen, and took the diploma in public health at Cambridge in 1902. From 1899 to 1902 he was demonstrator of physiology at the London Hospital, and lecturer in biochemistry in 1902. He was elected Mackinnon research scholar of the Royal Society in 1901, and held the scholarship till 1903, when he was appointed Professor of Physiology at the Western Reserve University, Cleveland, Ohio. He remained there till 1918, when he went to Toronto as Professor of Physiology and Associate Dean of the Faculty of Medicine. In 1928 he returned to his first University of Aberdeen as Professor of Physiology. Professor Macleod was a member of the Medical Research Council, 1929-33; president of the American Physiological Society, 1922, and of the Royal Canadian Institute, 1925; a Fellow of the Royal College of Physicians; a member of the American Physiological Society, the Society of Experimental Biologists, the Society of Biological Chemistry, the Association of American Physicians, the American Association for the Advancement of Science, the London Physiological Society, and the Biochemical Society; a Fellow of the Royal Society of Canada and the Royal Society of Edinburgh; an honorary Fellow of the Academy of Medicine, Toronto; a foreign Associate Fellow of the

College of Physicians of Philadelphia; a corresponding member of the Medical and Chirurgical Society of Bologna; and a corresponding member of the Kaiserliche Deutsche Akademie der Naturforscher zu Halle. He was also an honorary doctor of Aberdeen, Pennsylvania, Jefferson Medical College, and the Western Reserve University.

The Industrial Chemist as a Citizen

IT is well that the industrial chemist should be reminded from time to time of his opportunities of useful service in public life in addition to his professional duties to those with whom he associates in the commercial and individualistic atmosphere of the manufacturing works. The training of the chemist occupies so prominent a place in the literature of the various professional organisations that the wider outlook is apt to be ignored. We are therefore especially interested in an editorial article in the latest issue of the Journal of the Institute of Chemistry setting out some of the lines along which the industrial chemist may render himself a more useful member of society.

The newly qualified chemist who has proceeded from the university to the analytical or the research department of a big modern works, before being drafted to the larger sphere of direct contact with manufacture, should, says the writer, have little difficulty in realising his professional status. He must be loyal to his employers, and ordinarily has no reason to be otherwise. Occasionally, however, he may find himself in a quandary. For example, he may find himself associated with a concern where adulteration of food or other products is practised; or he may be expected to sign reports which are not in accord with the results of his work; or he may find that those in charge of operations persistently neglect or evade legal requirements for which he is held responsible. He is faced with the problem of deciding whether to give up his employment or be disloyal to his conscience and to his profession. In such circumstances, he must resist and protest against breaking or neglecting to carry out the law and, if those in charge are unscrupulous and insist on his compliance, he may have to bring the facts to the notice of the directors and possibly of the appropriate authorities. Most probably he will be compelled to seek another appointment, in which event the Institute of Chemistry will help him in his search, but to be a professional man he must first be a good citizen.

Outside Contacts

THE chemist in industry must be loyal to his colleagues and, where several chemists are employed, must play for the team and not only for himself; be ready to give credit where it is due, and be tactful in his criticism of others. He must have no thought of taking an unfair advantage of the ideas disclosed by his fellow-workers, but be ready to reciprocate in a frank expression of opinion and a free exchange of ideas for the common benefit. The high degree of esteem in which the profession of chemistry is held has been established by the standard which has been adopted by its members, among whom there exists a strong sense of mutual responsibility in the services they render to the community. At the same time, unless outside contacts are cultivated, there is danger of professional segregation, leading to degeneration. It is of first importance that the chemist should maintain close touch with his professional brethren by attending meetings and contributing to the activities of a chemical society where available. Here, as the article in the Institute Journal points out, he may derive advantage from the local sections of the Institute of Chemistry, which make it possible for members in all parts of the kingdom to meet together, and to make their views on professional matters known to each other.

The industrial chemist should associate also with men of other professions and interests, learning thereby that in no one profession or calling is concentrated the realisation of the purpose of study and mental effort through all the ages. Outside contacts, however, should not end with those of a professional nature. Social contacts of a right type should be cultivated in order to preserve a proper sense of balance and proportion in the chemist as a professional man, and, moreover, if he has a flair for public work, he may be doing a service to his profession as well as to the community by taking part, so far as he is able, in the administration of local affairs.

I.C.I. and Armaments

MR. H. J. MITCHELL, a director of Imperial Chemical Industries, Ltd., addressed the employees of the company at Northwich, on March 15, and vigorously denied the allegations made against Imperial Chemical Industries, Ltd., at the American Arms inquiry, declaring that he welcomed the coming investigation by the Royal Commission on Armaments. "I want to touch on a matter," he said, "about which many of you have probably been concerned. I refer to the documents tabled in the American Commission concerning the so-called 'sordid business' of Imperial Chemical Industries, Ltd. First of all, you must remember that this Commission in America was purely political, and therefore you did not get the truth. I want to give the lie direct to all those statements. I have been closely and personally associated with the Nobel's section, to which all this refers, for forty years. We welcome the Royal Commission and we want it. We want to be able to tell the world that we art not what people have tried to prove we are. We have never, to my knowledge, entered into any business of which we can be ashamed."

Mr. Mitchell expects to be the principal witness before the Royal Commission, and he hopes that such evidence as he will be able to give will be published to the world. He looks forward to it with the greatest possible pleasure, and he has assured the employees of the company that they may, with confidence, feel that they have no reason to be ashamed of those with whom they are associating.

THE Chemical Engineering Group has just issued its tenth data sheet, which deals with "The Correlation of Hydrometer Scales." This sheet has been prepared by Mr. W. Preston, under the direction of a special committee consisting of Mr. J. Arthur Reavell (convener), Mr. E. A. Alliott and Mr. H. W. Cremer. Copies are obtainable at the price of 2s. 6d. in paper covers or 3s. 6d. bound in limp cloth. Complete conversion tables for sp. gr., Twaddell, Baumé, Brix and Beck scales are given. In addition, tables are given showing (1) the relation between the Barkometer, Brix, Balling and Cartier scales and specific gravity; (2) that between the "New," Rational, Dutch and American Baumé scales; (3) the various "proof" degrees (for alcohol) compared with specific gravity; and (4) the specific gravity of sulphuric acid solutions.

The Evolution of the Public Lecturer

ON March 6 the seal of finality was set by Sir Frederick Keeble on the second series of Research and Development Lectures delivered under the joint patronage of the Royal Institution and the British Science Guild. The use made of the Royal Institution in these lectures is both new and peculiar: the invitations have been issued jointly by the president of the Institution and the president of the British Science Guild. The admission card carried the tag: Reception at 10 p.m. After the lecture a few congregated in the *foyer;* most became democratically jammed together in the tea-room. At the first lecture the big-wigs were soon translated to superior regions: theirs not to consort with common clay. Prowling about, as we did, we saw no sign of any formal reception. Neither host took us by the paw and said: "Vurry pleased to meet you, Mr. Cheshire Puss. I'm glad you've come off from the slates to m-i-a-o-u in our support." We can fancy how startling, what joy to some would have been the effect of being graciously received not merely by one but by two real, live noble lords, of course in full war-paint for the occasion.

The Writing on the Wall

The Royal Institution to-day needs a very active president able to compound cocktails by shaking up human material and weld the membership together in an atmosphere of cordial, scientific understanding. London is small enough for one such meeting-place. Some anti-social virus is in the air. Even the Royal Society is gone out of social action in recent years. By continued refusal to organise its forces and take the lead, the Society is selling the pass scientific in a way that will soon be past recall: strange to say, reputed biologists are the leaders of an abiotic policy. Formerly, its soirées were the resort of most attractive beings, bearing bright stars and broad bands of colour across their manly bosoms: it now consorts mainly with schoolmasters, creatures without a grain of imagination and in no way helpful or entertaining. Only the brave deserve the fair; yet scientific workers make no attempt even to assert their equality. Let them beware, lest they entirely sacrifice social position and influence. The Royal Society needs a General Smuts as its president during a few years, a statesman to give it back a public sense and secure for it full rights as the guardian of a freedom which is fast being sacrificed. The writing on the wall is only too clear. Myopic officials are throwing its public efficiency to the winds.

In starting the new combined course at the Royal Institution, the tactful blunder was made of telling members they had better stay away—to make room for the specially-invited *hoi polloi,* who were to be "researchingly and developmentally" converted to a true faith. Ladies were banned. As a result, after the first lecture the attendance was inadequate and speakers have lectured to papered houses. Discussion after the lecture was suggested on the invitation card to the first but nothing came of the suggestion. The Prime Minister, who was in the chair, might well have led off: to have learnt how far he had been "developmented" would have been interesting. The chairman at the last lecture, the Minister of Agriculture, was equally mum: at least, he might have said that he hoped to make milk Milk, not an unholy skim, in the course of his term of office—alone task enough for a National Government. A great opportunity of breaking loose from convention and putting life into the dry bones of knowledge born of experimental inquiry has been lost. The frigid formality of the Royal Institution has prevailed throughout. The result of such *laissez faire* is seen in the unrepresentative attendance on the front benches of recent years.

A Guild of Wisdom

Lack of salesmanship was peculiarly striking at the White City recently—everywhere the inquiring visitor seemed to be regarded with suspicion; no "Come, walk into my garden, said the spider to the fly" spirit was apparent anywhere. We doubt if the attendants knew that they had gardens; contrariwise, if they did, what grew in them and how. So it has been at the R.I. The old question may be asked: "What went ye out for to see?" Scarce a reed has been shaken by the wind of these lectures. The British Science Guild is a body that has long wandered in the wilderness of publicity but hitherto without a leader with a convincing war cry. The much-misused term "Science" is proved to be no "Excelsior." The Guild has sought, apparently, by these lectures, to bring home to the public the extent of scientific achievement. Actually, they have been given to an audience scarcely needing such enlightenment. At least, it is to be hoped that the well-known members of the firm to which the president of the British Science Guild is attached, who were present, are fairly well informed already; we imagine they were really there out of kindness of heart, to make a house and act as *claque.*

The Guild has not sufficiently considered what the public really needs. Sir Richard Gregory, who is its main pillar, having inherited the charge from his former leader, Sir Norman Lockyer, who was an addict to "Science" without ever being "scientific," has constantly insisted of late upon the importance of securing publicity for this our modern conceit. He uses the entirely ambiguous word "Science" almost *ad nauseam.*

A Crying Demand

If the truth be told, it probably is that the public regards the Guild as a body of self-centred freaks. If only Sir Richard would recognise the futility of ever flinging mere knowledge at the public, natural knowledge, in particular—an an antidote to the supernal ignorance of the Church especially. The vast majority is satiated with the proof of what scientific effort has done—mostly to harm the world by creating commercial strife. The ultraterrestrial extravagances of an Eddington and a Jeans may have tickled the palates of a few seeking relief from the debased literature of the day; they cut no ice in worldly life. Every boy knows the innards of his B.B.C. box. Every fool in the country knows something of motor. mechanism—what he doesn't know is something of his wonderful self—what he can't do is to use his eyes and think with intelligence, find out things for himself—be judicial in short. Lessons in this art—the art underlying scientific discovery and invention—are a crying demand of the day. We are sufficiently commercialised to be in no need of the Guild telling us of the money value of this and that advance in knowledge: that we may leave to the Uesanians, who appear to have no other outlook.

What Sir Richard has always at the back of his mind is the method underlying scientific discovery when he talks of "science." Let him send "science" and "scientist" to the dustbin and substitute the equivalent of the really significant teutonism· *Wissenschaft,* our perfect English word Wisdom. Let his Guild do what the leopard cannot do, shed its ungainly spot and boldly re-register as the British Guild of Wisdom. Wisdom being an unknown quantity in our constitution, the wise in search of a real war cry would all rush to join—the Guild would have found its mission and its *mètier.* Sir Thomas Browne has defined this in saying:—

> The wisdom of God receives small honour from those vulgar heads that rudely stare about and with a gross rusticity admire His works. Those highly magnify Him, whose judicious inquiry into His acts and deliberate research into His creatures return the duty of a devout and learned admiration. Therefore:
>
> Search while thou wilt and let thy reason go,
> To ransom truth, e'en to th' abyss below.

The office of the Guild should be to evolve a select body of lecturers competent to develop not mere knowledge but wisdom in the minds of their hearers. Let it begin at the beginning: seek to make the schools places of rational instruction: cover the country with posters on Beer-Bovril lines: "neonise" against certificates and cram and all school sham.

What Lord Melchett and other members of I.C.I. attending the R.I. lectures have needed has been some stimulus to their immortal souls, if such can exist in a modern business organisation. Sir Frederick Keeble's lecture on "The Green Plant as Agricultural Engineer" was an attempt to put the

Health and Fertility of the Earth
The Immune Cow

fear of wonder into such men. His lecture to the Mechanicals (THE CHEMICAL AGE, November 3, 1934, pages 398-9) was carefully prepared in advance and delivered from type: a complete literary *tour de force,* it suffered a little from over-restraint in delivery. Sir Frederick, in early days a very lion, has been more and more carried away, with the efflux of time, by the melodic beauty of rhythmic delivery, so now truly roars only as the sucking dove. At Storey's Gate he was relieved from the strain of thinking and acted a prepared part in uninterrupted, dulcet tones: the effect was that of a Lener String Quartette in pianissimo, strange to his rough "mechanical" surroundings. His Albemarle St. performance was a dress rehearsal. He spoke without notes, almost sotto voce, in a trance of thought, slowly seeking to polish every facet of the jewels he was casting before ——. The harmonies in the soil, elicited by scientific discovery, which he sought to reveal, will have been made clear to some. The occasion, however, demanded rougher treatment. He should have borrowed George Robey's eyebrows and played the fool. After all, it was Falstaff who said:

The world is mine oyster which I with sword will open.

The fool's sword to-day is the scientific plough-share. Sir Frederick should have cast hard loaves of germless bread at his audience; poured skim milk upon their heads; rubbed rickets-carrying margarine upon their faces—to bring home the urgency of using the knowledge we have of the emptiness, if not worthlessness, of our public diet. These are the things that need crying from the house-tops: that he should speak so gently as he did was a cruel disappointment.

An Assured Supply of Nitrogen

Less than a century ago, views on the fertility of the earth were highly mechanical. Liebig held that, to maintain fertility, all the mineral matters carried away in farm produce must be restored: if this were done all was well. Nitrogen could be obtained from the air. Came one John Lawes, who showed that to raise an economic crop it was essential to apply nitrogen in some form. For a time, the gasworks and coking plants, together with Chili saltpetre, supplied this. In recent times, the great synthetic ammonia industry has been brought into being and we seem to have an assured supply, so that the anxiety voiced by a Crookes is no longer felt. Lime, silica, magnesia, are everywhere for us to use. Potash and phosphate give cause for thought: the sources are very local. To these grosser needs, modern inquiry has added an increasing number of minor. Iron, manganese, copper, sulphur, fluorine, iodine and even boric acid are certainly all required. Salt, of course. Because of the special value of iodine, we have cause to regret the disappearance of villainous Chili saltpetre from the market, owing to the development of the ammonia industry. This contained a good deal of iodine. The industry should be recovered at the earliest possible moment. We could well do without much South American meat—we cannot do without its iodine, unless we make use of seaweed as manure universal.

Mineral manures, however, are no sufficient sustenance for the plant: the value of farmyard manure is recognised the world over. It is a grave question to what extent fertility is now being affected by the disease motor-car-itis from which civilisation is suffering so severely—the internal combustion engine makes no useful contribution of waste.

To the ordinary eye the plant lives above ground, though some recognise that it has roots. The trained eye alone can see that, apart from the root growth of the plant, a vast growth of microscopic underground life is also in ebb and flow, following climatic and soil variations. Upon this the plant is inseparably dependent. Seer and prophet, Keeble views with apprehension the possible, maybe sudden, failure of the fertility of the earth through changes affecting the well-being of these vast underground populations.

Boron to the Rescue

Only this last week a striking illustration of the possible imminence of this danger is given in a letter to "Nature." Sugar beet is known to suffer from a disease termed Crown Rot, which a Dutch observer has attributed to absence of boron from the soil. Messrs. Murphy and Hughes, two Irish workers, have confirmed the diagnosis by contrasting the growth of sugar beet seedlings in culture solutions free from boric acid with those of similar plants in solutions also containing a minute proportion of the acid. The disease soon appeared in the absence of the acid: it disappeared from affected plants when these were transferred to the solution containing it. The disease is rife in certain districts in Leinster but occurs locally. Why is this? Is the supply of boron in sea spray insufficient or in any way made locally inoperative? In New Zealand, sheep suffer from disease owing to the absence of iodine, in a district across which there is no current from the sea. The Swiss valleys and those of the Dauphiné, where goitre is endemic, are also remote from such refreshment.

Only during the past twenty years at most have we been made acquainted with the existence in our foods in minute proportions of a variety of substances affecting our healthy growth. We now know that it is useless for us to feed ourselves, however liberally, upon fatty and starchy foods and meat, unless we secure a proportionate supply of these activating and controlling agents. They vary in amount in plants, climatically, seasonally and also according to the conditions under which the plants are grown. Sir Frederick spoke specially of the changes in grass and of the use to be made of grass cut and immediately dried in summer as winter food for cattle, making possible in a measure their maintenance under summer conditions.

An Immune Milk

A still more refined issue was raised in his reference to proof that has been obtained that cows are being so fed that their milk seems in large measure "protected" against more than slight bacterial growth. The future is full of hope. Miracles will be wrought with milk, when once intelligence is applied to its production. If only we can learn what is proper food for plants and animals and produce it, the incidence of disease, both upon plants and ourselves and the animals we (don't) care for, should be greatly diminished; the physicians left to heal themselves.

Truly, we had listened to a development lecture. Yet it is an unholy fact that a man who probably is the one comprehensive, intensive and original thinker in the field of plant biology—the rest are just time servers and the slaves of a narrow professionalism—should no longer be in active direction of inquiry in this field. It is to our national dishonour that he should not be so employed: industry will make no progress unless it retain leaders. Verily are we in need of some display of Wisdom. Even of a true display of salesmanship! To know how, when and where to buy talent—most of all, how to use it.

The Future of Agriculture

It never rains but it pours. The Royal Institution was turned in March into a grazing ground for hares. We were scarce awakened from a Wednesday night's dream of a prospective benign fertility of the earth when, on the Friday, the well-known gay young earth-wanderer, Sir John Russell, came smiling along to give us, in rapid resonant tones, an outline of "The Future of Agriculture." The address was a clever, characteristically broad but superficial survey, largely statistical, of present conditions.

Horrible and forbidding pictures of two colossal wheat-mining machines at work upon the Canadian prairie were cast upon the screen—the one of a multiple ploughing and grain-casting monster, fed upon oil fuel; the other, a great combined reaper, thresher and bag-filling contraption. Each of these is engineered once a year, in due season, across the land: how a civilised world can regard this as Agriculture is difficult to understand—or how the farmer is to compete against it. Yet these are the means by which vast stretches of North and South America and also of Australia, probably soon, of Russian farm land, are being rapidly exhausted of the precious treasure accumulated during long ages past. Not the slightest attempt to preserve, let alone increase, fertility is being made. The practice is nothing short of criminal, open robbery of the generations to come. To call the practice farming is impossible; utterly unscientific both in aim and effect, civilisation must soon demand some less cruel treatment of the soil. Peasant Europe is helpless in face of such monstrous development of mechanism.

The evil goes further, as the wheat is ground into a germless flour, from which the essential elements of nutrition are lacking. Made attractive by bleaching, this is fed to the masses, to their undoubted detriment. Commercial interests have such grip upon our society that the injury that is done is allowed to pass unnoticed—although the authorities must be aware of its operation. At the moment, efforts are being made, by extended advertisement, to increase the incidence

of the evil. Sir John had nothing to say of these shady sides of modern Agriculture.

He thinks that British farming, in the future, is likely to remain much as it is. Methods will be improved. Ewes will be trained to drop two lambs instead of one. More machinery will be used. As the Ford tractor makes no fertilising sacrifice to the soil, the wheat field of the future will present an even surface, without any of the deeper green, more fertile oases of equine origin to which we are accustomed.

Quality of Produce

The picture drawn was a very sorry one. Sir John Russell is without vision. He had no word to say of the importance of quality in agricultural produce—gave no hint of the changes in practice that may be needed when this is recognised. At present, we grow not much above 40 per cent. of our food. Apart from appearance, we pay practically no attention to quality. Yield per acre is the criterion. Maybe the inferior yield is at times superior in quality; this is certainly often true, if the test be that of flavour. All these are matters calling for immediate, profound study.

Ere long the farmer will be called upon and therefore trained to attend to the quality, in terms of nutritive value, of his crops. The public will no longer be allowed to be misled by advertisement. Should it appear that we are able to grow food crops superior in food value to those coming to us from abroad, if wisdom in any way prevail, the public will insist on by far the chief proportion of our foodstuffs being grown at home. We shall decline to admit materials of inferior value. If so, farming may have a great spurt. The hitherto unfulfilled adage, "charity begins at home," will have some meaning. Moneylenders alone will not be allowed to control our policy. The machine will be put into its proper place of due subordination to man's nobility. All this, if only wisdom prevail—perhaps a sufficiently remote possibility.

We are reverting to Nebuchadnezzar, if not to Genesis. The most heartening of recent meetings was the Grassland Conference, held at Dauntsey School, near Devizes, at the instance of the Wilts authority. The meeting was attended by over 400 farmers, many of them young men, who listened with absolute attention and appreciation. Professor Stapledon, of Aberystwith, who laid down rules for pasture in a most fascinating way, was most enthusiastically received, his hearers recognising that they were in the presence of an artist and original thinker—a strange spectacle in farming. He was followed by Professor Ling, of Bristol, who had much to say of interest on the variation in food value of pasture throughout the year and also of the special nutritive value of weeds. Professor Stapledon has observed that the daisy has a special power of accumulating calcium. Someday it will be accounted a criminal practice to grow milk on land not freshly limed.

In the afternoon, representatives of I.C.I. filled the stage, first with a valuable account of the control of the character of grass herbage by regulated feeding of sheep; then by a survey of the work done on silage and on improving grass by special fertilisation and the conservation of such grass by quick artificial drying. Unfortunately, the promises held out for the material have not been fulfilled; there has been an unwarranted delay, apparently owing to slackness on the engineering side. That mechanism should be in default is strange.

We construct machine boxes in the form of ironclads, costing a mere six millions apiece, allowing them quietly to rust out of date, yet cannot make a simple, quick-acting, drying plant, which will make summer grass available to us in the winter, in the form of a milk fit for women with child, babies, all children and old people. All grants should be withdrawn from so-called research until at least this small public service has been rendered by industry. It is useless to bring down nitrogen from the heavens and then take no proper action to use it with effect. Delay in using the wisdom is insufferable.

CHESHIRE CAT.

A Choice of Plasticisers

Dr. T. H. Durrans Discusses Some Outstanding Properties

THE number of substances proposed for use as plasticisers is prodigious, said Dr. T. H. Durrans, in a paper read before the Manchester Section of the Oil and Colour Chemists Association on March 8. One very significant fact is that the consumption of the well-known plasticisers, tricresyl phosphate, ethyl, butyl and amyl phthalates and triacetin is increasing to such an extent that one is bound to assume that very few of the new plasticisers are finding extensive general use in spite of much biassed propaganda in their favour.

There is general agreement that the most important ingredients of a cellulose lacquer are the cellulosic substances and the plasticiser; it seems impossible to make a satisfactory lacquer without a plasticiser. On the plasticiser depends very largely the permanence of the film in the widest sense. The immense importance of the effect of the retention of traces of volatile solvent by the film does not seem to have been appreciated until quite recently. The tenacity with which traces of such volatile solvents as acetone are held by cellulose ester films is remarkable and the effect is greatly aggravated when the higher-boiling solvents are employed. The plasticity of a film may sometimes for a considerable period depend more on retaining solvent than on the plasticiser. To obtain permanence in a film it is therefore highly desirable to use the most highly volatile solvent permissible in relation to the other desired characteristics of a lacquer, and to rely entirely on the plasticer for the plasticising effects. The effect of the presence of small amounts of residual solvent on the tensile strength of a cellulose nitrate film is of considerable importance; traces of acetone always weaken a film, but it is interesting to note that 2 or 3 per cent. of water actually increases the tensile strength.

The tensile strength of a film varies with the solvent from which it has been deposited, but it is not clear whether this variation is due to residual solvent or to the structure of the resultant film. The diminution of tensile strength follows in the same order as the increase of evaporation rate.

It has been shown by Jones and Miles that plasticisers may roughly be divided into three classes. Castor oil has no solvent action on cellulose nitrate, even up to temperatures at which cellulose nitrate decomposes, and films containing 60 per cent. of castor oil are oily to the touch and exude oil on pressure The tensile strength of a cellulose nitrate film falls immediately with the addition of castor oil and as the proportion of oil increases the tensile strength falls rapidly. Ester gum causes similar reductions in tensile strength, but the fall with increasing proportions is not so rapid and, indeed, ester gum seems to diminish the rate of fall induced by most plasticisers.

The second class of plasticisers consists of such products as dibutyl phthalate and tricresyl phosphate, which are dissolved by the cellulose ester. When plasticisers of this class are added to cellulose nitrate there is sometimes initially an increase of tensile strength, followed by a steady fall, as the proportion of plasticiser increases until a maximum proportion is reached at which the film fails suddenly under stress. The third class of plasticiser is somewhat more difficult to define; to this class belong camphor and butyl glycol acetate. These plasticisers may actually cause an increase of tensile strength or, at least, not cause a diminution over quite a long range of proportions.

There is fairly conclusive evidence that plasticisers of Class 2 and 3 are in actual combination with the cellulose ester forming so-called "addition complexes." Plasticisers of Class 2 or 3 confer distinctly different properties to films from those of Class 1. Plasticisers of Class 1 may be considered to be held in a film in a manner similar to that in which water is held by a sponge. Up to a point, the flexibility of the sponge is greatly increased and the tensile strength diminished—thereafter pressure on the sponge causes the exudation of water. The volatility of a plasticiser in its free state is obviously no sure guide to its behaviour in a film. In exactly the same way volatile solvents are held by cellulose nitrate in some form of addition complex which entirely alters the evaporation rates, slowing them up

enormously; the effect is much less pronounced with solutions of resins, such as ester gum, where, apparently, addition complexes are not formed. A small increase in the cellulose-ester content of a lacquer greatly increases the viscosity, but the addition of gum has relatively little effect.

Generally, the proportion of plasticiser used with a cellulose ester is of the order of 30 to 50 parts by weight for each 100 parts of cellulose ester; occasionally the proportion may rise as high as equal parts. Plasticisers, when added in excessive proportions, yield either an oily film, a cloudy film or an excessively soft or fluid film. The oily film is produced by plasticisers of Class 1. The cloudy film may arise with plasticisers for which the cellulose ester has but limited solvent power or where the critical solution temperature is above the atmospheric temperature. The unduly soft or fluid film occurs when the solubility of the plasticiser in the cellulose ester is very high. These are the phenomena which govern the maximum proportions in which plasticisers can be used. Some figures recently obtained by A. E. Lain for the dilution ratios of certain plasticisers throw some light on this aspect.

A Point of Economic Importance

The results suggest that a given degree of plasticity can be obtained with a smaller proportion of butyl or amyl tartrate than of the others, and alternatively that for a given proportion of plasticiser butyl and amyl tartrates will give the less viscous films; further, these films will be able to hold in solution a larger proportion of ester gum than will films made with the other plasticisers. A point of economic importance which arises is that with lacquers which are deficient in active solvents for cellulose nitrate where there is, in consequence, danger of precipitation during application through the accumulation of diluent, butyl and amyl tartrates will tend more efficiently to prevent such precipitation than will the other plasticisers. Here one is tempted to inquire if the high degree of solubility possessed by amyl and butyl tartrates is really a desirable characteristic. On the other hand, the mere dilution of cellulose nitrate by a plasticiser would seem to confer no advantage other than reduction of cost and may indeed be detrimental by reason of the reduced tensile strength of the film.

It is now well recognised that lacquers containing the more usual plasticisers do not give entirely satisfactory results when applied to leather. For this reason castor oil still finds wide application for this class of work in spite of its unpleasant smell, its lack of true plasticising power, its tendency to sweat out if used in excessive proportions, and other defects. Frequently, mixtures of castor oil with other plasticisers are used, but ethyl and butyl acetyl ricinoleates have the lubricating and softening properties of castor oil, while, at the same time, being more readily compatible with cellulose nitrate. These substances cannot be distilled at ordinary pressure without decomposition as their boiling points are well over 350° C. They can be used in proportions up to 50 per cent. in cellulose nitrate films without sweating out.

The Phthalic Esters

The phthalic esters have provided a fruitful field for the inventor, as, in general, phthalic esters are substances which are stable to light and moisture and relatively easy to make by direct methods. One ester which cannot be made by classical esterification methods is diphenyl phthalate; as the interaction of phenol and phthalic anhydride gives rise to phenol phthaleine resource has to be had to phthalyl chloride and this introduces troublesome manufacturing problems. The ester has, however, created considerable interest as it is said to impart more permanent gloss to cellulose nitrate films, but, on the other hand, it diminishes tensile strength, so, on the whole, it does not seem to be really a good plasticiser.

The phthalic esters of higher secondary alcohols are available, but seem to possess but limited compatibilities for cellulose nitrate and none at all for cellulose acetate. The phthalates of octyl and higher alcohols up to cetyl and lauryl suffer from the same defects, although the two latter are said to form solid solutions with cellulose esters and ethers. Cetyl phthalate is a waxy solid—m.p. about 35°; it imparts water resistance and high gloss to cellulose-ester films. Mixed alkyl aromatic phthalates, such as butyl benzyl phthalate, have been known for some time and possess the advantage over the dialkyl phthalates of lower volatility which, however, is offset by lower compatability.

The glycol ether phthalates have also been known and highly appreciated for some time, but the manufacture of these on a large scale presents difficulties by reason of the tendency of the glycol ethers to decompose with explosive violence during esterification. The plasticisers themselves also tend slowly to decompose on storage, aldehydes and other substances being formed. A more complex phthalate plasticiser is di-(β-phenoxy ethyl) phthalate. This substance is a solid which is said to be readily compatible in large proportions with cellulose nitrate. A still more complex plasticiser is di-(β-butoxy ethyl) glycol di-phthalate: it is said to be a good plasticiser for various resins. It is questionable, however, if there is any virtue in such complex materials—the large molecules, while imparting unnecessarily high non-volatility also tend to impart non-compatability.

The development of the hydrogenated phthalates continues but slowly; they can be used in limited proportions with cellulose esters, but appear to be of greatest interest for plasticising glyptals, bakelites and shellac.

Phosphoric esters have always been of interest for plasticising cellulose nitrate on account of their fire-proofing properties. Among the newly described substances are the phosphates of methyl, ethyl and butyl glycol ethers, which, unlike the phenyl and alkyl phosphates are good plasticisers for cellulose acetate, but the lower homologues have the unexpected property of being soluble in water. Both properties diminish sharply as the molecular weight of the alkyl group increases. Some adjustment of these properties of water solubility and solvent power for cellulose acetate is brought about by making the mixed esters such as mono-butyl di-ethoxy ethyl phosphate, but to manufacture such substances in a state of purity is immensely difficult.

Esters of glycollic acid have come in for attention during the last few years, but more success has been had with di-glycollic acid. This dibasic acid when esterified with butyl alcohol and glycol mono-butyl ether gives a mixed ester which is said to have excellent gelatinising properties for cellulose nitrate and great fastness to light.

Ideal Home Exhibition

The King's House and "Jubilee City"

THE first great popular event introducing the Empire celebration of the King's Silver Jubilee will be the opening on Tuesday, March 26, of the nineteenth "Daily Mail" Ideal Home Exhibition at Olympia, London, W. The dominant feature will be "Jubilee City" the impressive decorative scheme of which will be a series of mural paintings extending along more than 1,000 ft. of canvas and presenting a graphic review of world progress during the King's reign, from the Coronation and the early days of the Suffragist campaign to the building of Sydney Harbour Bridge and the launch of the "Queen Mary" Attention will be captured, too, by "The King's House," a full-sized replica of which the exhibition is privileged to include. The King, it will be recalled, recently personally selected the design for the new house which is the Jubilee presentation to His Majesty from the Royal Warrant Holders' Association.

For three weeks, from March 26 to April 18, Jubilee City will transform the Grand Hall of Olympia into a festive rendezvous for friends at home and from overseas who will meet in London at the onset of the royal season. Nearly 500 leading British manufacturers and retailers will co-operate in presenting a magnificent and varied array of products for the home. A £50,000 installation of the latest types of British-made canning machinery, weighing nearly 40 tons, will demonstrate the strides made by this new home industry and the purity and delicacy of its products. Apples, cranberries, and other seasonable fruit as it comes fresh from tree and bush will be turned out cooked and canned. A wealth of features will serve to make the exhibition fully representative of a quarter of a century of progress. Twenty-five years of progress in things engineering and scientific will be found on the second floor of the Empire Hall—the development of electric lighting, telephones, aviation, travel, transport, sound-recording, reproduction and radio. The strides made by Staybrite steel will be seen in the Staybrite Way to Staybrite Street beneath the walls of Windsor Castle in Jubilee City.

"In Quest of Colour"

Jubilee Memorial Lecture of the Society of Chemical Industry

Mr. C. J. T. Cronshaw, Jubilee Memorial Lecturer, 1935.

THE Jubilee Memorial lecture of the Society of Chemical Industry was given at Nottingham on March 14, Mr. C. J. T. Cronshaw, managing director of the British Dyestuffs Corporation (which is now the Dyestuffs Group of Imperial Chemical Industries) being the lecturer.

Mr. Cronshaw said that by common consent the modern dyestuffs industry began with Perkin's discovery of Mauve. Not content with discovering, he also manufactured and developed the use of his dye, and should be included among the great pioneers of the world. His adventure prospered from the start, attracting the attention of others to a new field of industrial enterprise. In 1859 Magenta was discovered by Verguin; then came Violet Imperial and Blue de Lyon, by two Frenchmen. Improvements by Nicholson resulted in the first of the Soluble Blues—by which time the industry resembled the Klondike gold rush. The classic work of Peter Griess and Nicholson opened up the vast range of Azo colours. Simultaneously the first of the basic oranges was produced by Simpson, Maule and Nicholson.

What was the effect of these rapid discoveries on the old dyeing trades based largely on vegetable products and using Logwood for black or navy, Indigo from the East for blues, Madder from France for red? Despite the brilliance, beauty and range of the new synthetic dyes, for some years the two products continued to be used side by side. Instead of hostility, the dyeing trade received the new technique well, declaring in 1875 that the results so far achieved were most hopeful. The first citadel to fall to the synthetic attack was the huge madder trade, the total yearly growth of which was in 1870 estimated at 47,000 tons, with a value of £2,150,000, of which the United Kingdom took half. Perkin and Sons began the manufacture of Alizarine in 1869, Graebe and Libermann in 1871. In 1878, 9,500 tons of Alizarine were produced, and Madder had fallen from 45s. to 15s. per cwt.

Industry Captured by Germany

By this date the manufacture of coal tar colours was worth over three million sterling annually, of which Germany had two-thirds and the United Kingdom less than half a million sterling. In other words, the decline in this British pioneer industry had by 1879 already taken place, although no one protested until 1881, when Professor Roscoe complained that "Germany had driven England out of the field." From then on till 1914 the subject was constantly under discussion, notably by Meldola, by Green in 1901 and Bloxam in 1910.

The textile industries were peculiarly ripe for Perkin's new tool. Cotton, calico printing and wool were all on the threshold of expansion. The moment was equally propitious from the point of view of raw materials, Mansfield having only just shown how benzene could be obtained from coal tar. Perkin was fortunate also in his country—a great and wealthy country—the almost unlimited coalfields of which provided him with his raw material on his doorstep.

British Pioneers Left to Early

Unlike most industries, dyestuffs had not to pass through long years of drudgery and inadequate reward, but prospered from the outset. The pioneers left it too early. Perkin retired a rich man in 1874, Nicholson in 1868 also wealthy. Greville Williams left in 1877. At these dates Perkin was 36, Nicholson 41, Williams 48.

It is beyond dispute that the industry languished because the pioneer spirit and the creative instinct which brought it into being abandoned it too early, little knowing that what they had accomplished was the merest scratch on the surface. From 1879 onwards the industry fell into an anaemic state for which we should admit the fault was largely in ourselves.

To return to the early days, the old vegetable and the new synthetic dyes were living together in harmony, and so far as wool dyeing was concerned, the trade was almost equally divided between the two. Greens and blues were more the province of the new synthetic dyes, violets and prunes were exclusively synthetic, just as black was exclusively vegetable. The other colours were derived from both classes. The same was true of cotton. The dyer still had a foot in both camps.

Triumph of the Synthetic Weapon

The discovery of Congo Red by Böttinger in 1884 gave an immense stimulus to the synthetic product, and by 1890 there had been made available a range of direct cotton dyes of every shade of the spectrum. A still further development took place in 1900, when it was discovered that dyestuffs derived from a particular amino naphthol sulphonic acid had also cotton affinity. No natural colouring matter could now stand up against the onslaught, and with the one exception of natural Indigo, synthetic dyes were the only ones considered for cotton dyeing.

There was not at first the same success with wool, the dyeing of which depended largely on the "azo tool." But Nietzki in 1878 and afterwards Casella opened up a large range of colours which soon obtained an enormous sale. There remained the Naboth's Vineyard of natural Indigo, and it was not until 1890 that Huemann showed that Indigo could be obtained from phenylglycin and later that glycin could be obtained from anthranilic acid instead of aniline. Yet methodic progress was only made when a lucky accident, the breaking of a mercury thermometer, showed that mercury was the catalyst required for obtaining anthranilic acid from phthalic anhydride. Other difficulties, bewildering in their complexity, were eventually overcome, until at last the Indigo synthesis was complete, and the dyestuffs industry added an annual three million pounds to its turnover.

Complexity of Dyestuffs Demand

Having overcome and ousted the natural colouring matters, the synthetic products began to compete with themselves, the struggle centreing around the processes of "finishing" which follow the actual dyeing operation. In these processes, cotton and wool differed very much. In wool, the dyeing itself was only one of the many operations involved. Wool was dyed at various stages of its manfacture, and the problem of dyeing it was in itself a large one. Materials woven from a mixture of cotton and wool introduced further complexities into the dyer's technique. Moreover, there were the varying needs of the customer to be considered, such as fastness to perspiration, light and washing. To this complexity the industry accommodated itself, and raked organic chemistry from end to end in the endeavour to cater for the prodigious needs.

A naval overcoat, said Mr. Cronshaw, had to undergo drastic treatment for almost ten hours so that it should be wind- and rain-proof. The wool had to be dyed before it was woven or milled, and done with a dyestuff which would suffer little or no change in the hot soap and soda solution. With woollen hosiery, the important requirements were that

the sock should retain its knitted texture and its appearance and feel unimpaired. The dyeing processes which gave the fastest shades were usually lengthy, involving risks of shrinking and felting. For hosiery, therefore, dyestuffs had to be used which required short processing and still had a good fastness to washing.

Cotton and wool both enjoyed a second hereafter, cotton in the form of rags as a raw material for paper, wool as shoddy after its colour had been stripped. Obviously the colour was never stripped down to a pure white, so that the dyer had a dark coloured material to begin upon. As the only possible shade was often navy blue, the dyer had to have at his command extraordinarily bright colours to reach this shade, which was usually obtained by the use of bright violets. In carpets, it was not only the shade of the outside thread that mattered, but of the cross section.

Viscose and Acetate Silk

The greatest complexity of all was the calico printer, who was himself dyer, printer and artist—a dyer with his hands tied behind his back because his dyeing had to be done under very rigorous and narrowly-confined conditions. He not only required dyestuffs to dye, but to be able to strip them off when he chose as part of his artistic plan. He demanded a very wide selection of colours, some of which he only used in very small quantities.

A further complication for the dyer, calico printer and dyestuffs manufacturer arose with the discovery and development of viscose silk, which added another fibre to be dyed either by itself or in combination with other fibres of textiles. Then came the problem of acetate silk. Previously, fibres had been either vegetable, like cotton, or animal, like wool and silk. The new fibre was entirely synthetic, entirely devoid of affinity with dyestuffs as usually understood. In its early history the use of acetate silk was sadly impeded by the difficulty of dyeing it, and it was most appropriate that the most valuable discoveries in this field had been made in England. They were due to Green and Saunders, Baddiley and Shepherdson. The needs of the dyer and finisher, whether in cotton, wool, real or artificial silks, were enormously complicated when to them were added the great and constantly-changing needs of the ultimate user.

Users' Varied Requirements

Carpets, for example, were part of the decoration of a room, therefore beauty of shade and pattern was essential. They were exposed to light for years, therefore dyes must have great fastness. On the other hand, the delicate material for ladies' evening gowns had but a short existence and relied for its attractiveness upon beauty of shade; fastness to light mattered not at all, but fastness to perspiration did. Shirts, stockings, etc., required fastness to washing, ironing, and hot pressing. The story was by no means finished yet. There were other materials to be dyed and coloured—silk, paper, leather, rubber, printing inks, paint, wallpaper, sweets, soap, polishes. Each called for some special suitability. No wonder then that the dyestuffs business was so complicated, so multifarious, wholesale and retail, specific and general.

The industry could only have triumphed as it had done, because it had kept a closer alliance with science than any other. It had remained happily married to the science of organic chemistry, and especially to the carbon atom, which was the most neighbourly thing in science.

Science of the Carbon Atom

Dyestuffs chemistry was in a sense a game, but not an easy one, for rules had to be observed, and although the rules were very numerous they were neither so certain nor so rigid as they might be. He mentioned nitroso dyes, which were almost entirely greens and had a limited application, chiefly in calico printing: the nitro dyes, usually yellow, and as might be imagined, sometimes explosive and poisonous and nearly always fugitive to light: the azo dyes, which were by far the most comprehensive both in colour and fastness, providing dyes for both wool and cotton: the triphenylmethane dyes which were the most brilliant in shade and the most fugitive to light. They were derivatives of a colourless hydrocarbon. Sulphur dyes had a direct affinity for cotton, were fairly fast to light and were cheap.

Lastly, there were the vat dyes, the most modern chapter in the dyestuffs book. They were insoluble, but on reduction gave soluble products which could again be oxidised to the original dyestuffs. There were two broad divisions of these products, the Indigo class, having a chemical parentage to Indigo, and those whose parentage was traced to anthraquinone. The former varied among themselves.

Synthetic "Tyrian Purple"

The bromine compounds were all blues, one of which was the identical colour, Tyrian Purple, which the Romans used for their Imperial Murex and which they extracted from a mollusc found on the shores of the Mediterranean. The reds, pinks and oranges were derivatives of indigo, containing an atom of sulphur in place of nitrogen. It was curious that the derivatives of indigo itself varied very little in colour and were always the same shade of blue, while the derivatives of indigo with the nitrogen exchanged for sulphur varied enormously in shade and covered the whole range of the spectrum. Indanthrene blue was the first anthraquinone vat dyestuff.

The manner of putting dyestuffs into use varied enormously, and much patience and skill was expended, once the dyestuff was discovered, in finding a practicable manufacturing route. To this end the dyestuff chemist depended upon his theories of colour and dyeing, and also upon a profound knowledge of organic chemical reactions as well as an ever-widening experience of the influence of chemical constitution, both molecular and spatial, on the various physical properties.

A Sickly Industry in 1914

Describing the changes that had come over the industry since 1914, when in this country there were less than a dozen manufacturing companies, Mr. Cronshaw said that most of their raw materials came from overseas and the dyestuffs were merely, so to speak, assembled in England. There was little or no creative spirit, little or no research, little or no novelty. It was an anxious existence, of which many had spoken but none with full frankness. The threadbareness of the British dyestuffs industry was completely revealed by the war. When the imported stocks were depleted, the awful truth was everywhere apparent.

Out of step with time, tragically little in the way of experience to help, with few leaders of the right spirit and few followers, the units of the British industry set about the terrible business of catching up with time. The industry was to a unique degree a German one, in the hands of three great firms, and almost secret in character. The most complete literature was the patent specifications, of which the German ones alone totalled about 30,000. Without this guide we might even in the 20th century have found ourselves with a lost science, for dyestuffs were sold under trade names, and there was no means of identifying them except by chemical analysis, which was exceedingly intricate even to one with considerable experience. The industry had to try and decide upon the names of dyestuffs which the country's industry required, but, fortunately, the war was a period principally of khakis and navy blues. The Board of Trade helped by compiling a census, the results of which were published in 1918.

Triumph over Difficulties

Difficult though the task was, the British industry was not slow to appreciate its opportunity. Its first need was the recruitment of a technical staff, which had in the early years to be carried out in the worst possible circumstances. At every turn the German monopoly of dyestuffs manufacture was apparent. Manufacturers' plant had also come from Germany, enamel pans particularly; even raw materials, potash salts and fuming sulphuric acid. All things became scarce in war time. Scarcer still were the materials the dyestuffs industry needed—sulphuric acid, nitric acid, potash salts, lead, copper and platinum.

Before the industry could catch up with time it had to pass long years of re-conquest, patient copying and imitation. A creative spirit was a necessity in any industry; more so in the dyestuffs industry than any other. During recent years five outstanding world developments in dyestuffs chemistry had taken place: Naphthol Ice colours, Caledon Jade Green, Duranol colours, Indigosol products, and Soledon colours. Of these, three were British discoveries covered by British patents.

Industrial Fumes and Their Control

The Operation of the Alkali, etc., Works Regulation Acts

THE industrial revolution of the past century, with the resultant tendency for people to herd together in vast communities, has brought the problem of atmospheric pollution by smoke and offensive gases into great prominence, said Dr. W. A. Damon in a paper on "Industrial Fumes and their Control," read before the Lancastrian Frankland Society, at Lancaster, on March 15. The smoke nuisance, he pointed out, has been largely brought under control by the Public Health Acts of 1875 and 1926, by which local authorities are empowered to take legal proceedings against the owner of an industrial fireplace or furnace the emissions of which, whether of grit, soot or ash, constitute a nuisance. Local authorities also have a control over the so-called "offensive trades," in that their permission has to be obtained before such a trade may be established in any urban district.

Early Days of the Chemical Industry

It was in the early days of chemical industry that atmospheric conditions became very bad. The process causing the chief offence was the Leblanc soda process, the first stage of which is the decomposition of common salt by sulphuric acid. The sodium sulphate so formed is required in the next stage of the process, but the muriatic acid gas evolved, being at that time of no commercial value, was allowed to escape to atmosphere. This emission of huge quantities of muriatic acid gas naturally caused great damage in the surrounding district, killing both cattle and vegetation. In return, the manufacturers were constantly harassed by farmers and landowners with claims for compensation. The general public, were, however, left with no means of redress.

Some improvement in conditions obtained when, in 1863, Gossage patented the wash tower which bears his name. The gases were passed up a coke-filled tower, down which water was allowed to trickle. By this means a solution of the acid gas in water was obtained; this solution had a limited market under the name of "spirits of salts." Gradually Gossage towers came into universal use, but they were by no means efficient enough, for whereas it was calculated that in the year 1862 one thousand tons per week of HCl gas were being emitted to atmosphere, corresponding to only 60 to 85 per cent. condensation of the total HCl evolved, an inquiry of the same date showed that, with proper working, it was possible to get a condensation efficiency of 95 per cent. Any improvement in conditions which was obtained by the use of Gossage towers was, however, outweighed by the rapid rate of growth of the industry. Moreover, owing to the very limited demand for their acid, the manufacturers were faced with the problem of disposal of surplus acid obtained from the towers, which problem they solved by pouring it into the nearest water-course, with fatal results to the fish therein. It is no wonder then, that complaints and claims for damages continued.

The Act of 1863

It became obvious that some effort had to be made to control what had, by this time, become a serious public nuisance, and in 1863 Lord Derby introduced the first Alkali Works Regulation Act. This Act related to alkali works only and these were defined as works for the manufacture of sulphate of soda or potash in which muriatic acid gas is evolved. In this Act two important departures from established legal practice were made. Hitherto the method adopted in the case of an admitted evil had been one of repression, but in this Act it was recognised that in certain cases the emission of noxious gases was unavoidable. Consequently, instead of putting a stop to the works on account of the injury they were liable to cause, steps were taken to limit that injury and to oblige the manufacturer to reduce the evil to the lowest possible limit; *i.e.*, to secure a minimum condensation of 95 per cent. of the HCl evolved. Further, the administration of the Act was placed in the hands of inspectors appointed by the central authority instead of in those of the local authorities. The Act was to have continued in force for five years but when this time had expired it was felt that so much good had been done and that there had been so little friction between the inspectors and the alkali works owners that the Act was made perpetual.

By a series of amending and consolidating Acts in 1874, 1881, 1892 and 1906, the original Alkali Works Act has become the Alkali, etc., Works Regulation Act.

Under the Act of 1906 there have now to be registered annually alkali, cement, smelting, sulphuric acid, chemical manure, gas liquor, nitric acid, ammonium sulphate, chlorine, muriatic acid, sulphide, arsenic, nitrate and chloride of iron, bisulphide of carbon, sulphocyanide, picric acid, paraffin oil, bisulphite, tar, zinc, benzene, pyridine, bromine, hydrofluoric acid and a few other works. The list has been extended by Orders of 1928 and 1935, made by the Minister of Health under the power given him by the Public Health (Smoke Abatement) Act, 1926.

Protecting the General Public

Broadly speaking the Alkali Act is intended to protect the general public from injury or damage arising from the emission of noxious or offensive gases. The duty imposed on a manufacturer carrying out one of the above processes is that annual application must be made for a certificate of registration for which a stamp duty of £6 is charged. In the case of an alkali works this stamp duty is £10. A certificate is granted to a new works only when the inspector is satisfied that it is furnished with the best practicable means for preventing escape of noxious gases. Once registered, the works is visited at intervals by the inspector, who satisfies himself that the means provided are used and maintained in a state of efficiency, and also that the process from which the noxious gas is evolved is properly supervised. The manufacturer also has to comply with the following provisions relating to escape of injurious and noxious gases to atmosphere:—

1. Alkali and muriatic acid works: escape not exceeding 1/5 grain per cubic foot.
2. Alkali work: 95 per cent. condensation of HCl.
3. Lead chamber process: escape not exceeding 4 grains total acidity (as SO_3) per cubic foot.
4. Sulphuric acid concentration: escape not exceeding 1½ grains total acidity (as SO_3) per cubic foot.
5. All scheduled works: the provision, use and maintenance of the best practicable means for preventing the escape of noxious gases into the atmosphere or for rendering them harmless and inoffensive.

Finally, various penalties are prescribed in the Act for infraction of its provisions: these are only necessary as a last resort in dealing with an unduly stubborn delinquent.

For the purposes of the administration of the Act England and Wales are divided into six districts, each in the charge of an inspector who is responsible to the chief inspector for the conduct of his district. Scotland is independent and has its own inspector who is responsible to the Department of Health for Scotland. The inspectors themselves are university-trained men, recruited from industry, who have both a theoretical and practical working knowledge of the processes they have to inspect. To this is very largely due the successful handing down of the tradition, set by the first Chief Inspector, Dr. Angus Smith, of friendliness and mutual co-operation between the inspectorate and the industry. Again, this co-operation on the part of the manufacturers makes recourse to prosecution under the Act almost entirely unnecessary.

Methods of dealing with noxious gases must vary according to local circumstances. The methods may, however, be divided roughly into four classes: (1) Methods of absorption or adsorption, with or without subsequent recovery; (2) chemical treatment whereby a chemical compound is formed which may or may not be marketable; (3) combustion methods; and (4) dilution methods. The ideal method is, of course, a recovery method whereby some marketable commodity is produced. Although such a method may be adopted originally only to improve conditions locally, yet it has repeatedly happened that subsequent developments have made it self-supporting, if not a source of actual profit.

A type of industry with which it is difficult to deal satisfactorily is that which, by reason of the nature of its raw materials, cannot operate without some local smell. The definitely noxious and offensive emissions are treated as required under the Alkali Acts but for the process smell remaining there appears, as yet, to be no absolute cure. Another industry possessing its own particular problem is the cement industry. The question here is mainly one of dust and not of noxious gases. The trouble arises from the intermediate drying of the cement slurry, whereby it is converted to a fine dust, before the hot blast converts it to the semi-molten cement in which form it is emitted from the kiln. Some of this dust is picked up by the blast travelling up the kiln and is carried up the chimney, being eventually deposited on the surrounding land and houses. Up to two or three years ago conditions were by no means good, but recently the matter has received considerable attention and gratifying results are forthcoming. The great difficulty in legislating for the control of processes that are liable to be offensive is that the chemical industry is, and must always be, in a state of flux. It therefore follows that any legal enactment is apt rapidly to become out of date, and there must be periods when new processes are operating and possibly polluting the atmosphere without any legal control. An account of the proceedings of the alkali inspectors is given in the annual report of the Chief Inspector of Alkali, etc., Works, published by the Ministry of Health. Included in the report is also an account of any research work that has been carried out in the Chief Inspector's laboratory during the preceding year. These investigations are of a preliminary character only and are intended to stimulate others to carry out further work, rather than to be of an exhaustive nature themselves.

Action Against Solignum, Ltd.

Alleged Misrepresentation in the Sale of Wash

IN the King's Bench Division last week, Mr. Justice MacKinnon commenced the hearing of an action by Mr. Albert Bruff, horticultural specialist, of Pershore, Worcester, against Solignum, Ltd., of Norfolk Street, Strand, London, who manufacture chemical washes for fruit trees, to recover damages for alleged misrepresentations.

Mr. Van den Berg, K.C., and Mr. Godson appeared for the plaintiffs, and Mr. Willinck, K.C., and Mr. Slade for the defendants.

Mr. Van den Berg, in opening the case, stated that there was another company connected with the defendant company, Major and Co. Mr. Major was chairman of both. About July, 1929, Mr. Bruff, whose business was to procure washes and then pass them on to fruit growers for use, entered into a contract in writing with defendants, the substance of which was that they should supply him with washes for five years at a certain price, and that he would sell them at a fair price and take the difference as his profit. If, said counsel, the wash had been as represented, there was no doubt there would have been a large market for it.

Plaintiff was supplied with Long Ashton one solution wash, and plaintiff's case was that the wash supplied was contrary to the representations made and was of such a nature that it did a great deal of damage to the trees of the grower to whom it was supplied. The result was that plaintiff, acting in all innocence and relying on the defendants' representations, suffered immense damage and lost very nearly the whole of the prosperous business he had. It was alleged that defendants broke their representations and warranties and that in giving them they gave them recklessly and regardless whether they were true or false. Counsel said he should sue for substantial damages.

Plaintiff's case was that Mr. Howard, manager of defendants' agricultural department, represented to plaintiff that they could, in Long Ashton one solution wash, reproduce a winter wash for destroying capsid, bugs, etc., in fruit trees.

Results of Trials

Mr. Bruff gave evidence in support of his case and said the trials given to an I.C.I. wash were successful. Witness was under the impression that the defendants were selling him a " definite copy " of the I.C.I. wash, but he came to the conclusion that it was not a copy of it. The two washes were entirely different. Defendants' wash failed to control the pests that it was sold to control. When complaints began to arrive plaintiff went about " smoothing " matters and making excuses. There did not appear to be much " kick " in defendants' wash. When plaintiff received complaints defendants' representative came down and went with plaintiff to growers, and told plaintiff that they had had no complaints from anywhere else. In the end plaintiff wrote a letter renouncing the contract.

Mr. Willinck: Do you appreciate that this is a matter of some importance to charge a company like Solignum with fraud?—It is a serious thing for me. I made the charge on July 10, 1931, to Mr. Hall, their representative, and I said that they must settle fairly with me or I should take the case to court. I told him he was selling under false pretences. I meant that they had undertaken to deliver me a definite article and they had not done so under the contract. They did not fulfil their contract with me.

Further cross-examined, plaintiff said he had a guarantee given him by the defendants and that guarantee he passed on to his growers. He was selling to growers and he was selling, he thought, an identical article with the I.C.I. No. 1 solution, but his case was that he was not getting it from the defendants. Plaintiff gave trials of the solution to growers and he sold defendants' solution as a replica of what was used at the trials. He had no documentary evidence to show that he had passed on the guarantee. The reason he guaranteed this solution was that he was told it was identical with the trial solution. Witness said he had to deal with "under crop scorch " resulting from the wash used on trees. Witness agreed that he took 1,800 barrels of solution in one year, and some were good, some were bad.

Allegations Denied

Mr. Willinck said defendants denied the whole of the plaintiff's allegations. They denied that they supplied a standard wash which failed to emulsify properly and said they were willing to replace any supplied. They denied that plaintiff had suffered damages. They set up a counter-claim. Plaintiff was under contract to them for five years, and they alleged that he had broken his contract by selling other products. They had therefore suffered damage. Defendants also said the plaintiff owed them £344 balance of account. Defendants had settled with all the claims made by the growers.

Plaintiff put his loss of profits at £5,000.

On Tuesday the parties, after a long conference, arrived at a settlement.

Mr. Willinck, K.C., for the defendants, said he was happy to say that the parties had arrived at terms of settlement. The plaintiff had made charges of fraud and breaches of contract against the defendants. As to the charges of fraud he was glad to say that the plaintiff had withdrawn all those charges, they having been due to a misunderstanding. So far as plaintiff's renunciation of the contract went, defendants agreed that the plaintiff had just cause of complaint in regard to some of the deliveries. Under these circumstances the defendants had offered and the plaintiff had accepted £2,500 in settlement of all issues in the action on the claim and counter-claim, and all accounts and all matters between the parties. That sum would indemnify plaintiff, in regard to costs, and leave him a reasonable sum by way of compensation for breaches of contract.

Mr. Godson, for the plaintiff, said all charges of fraud against defendants were withdrawn and they arose from a misunderstanding between the parties. He concurred in the settlement.

His lordship was glad the parties had settled the case. He approved the settlement. There would be a judgment order if necessary.

Metallic Coatings as Protective Media

Some Physical and Chemical Aspects Examined

ALTHOUGH much has been written regarding metal coatings, and even more in regard to theories of corrosion, very little has appeared in convenient form to summarise the physical and chemical assets and liabilities of such coatings as they affect the chemical engineer, according to a paper by Mr. S. Robson, M.Sc., D.I.C., M.I.Chem.E., and Mr. P. S. Lewis, Ph.D., B.Sc., F.I.C., read at a joint meeting of the Chemical Engineering Group and the Bristol Section of the Society of Chemical Industry, on February 7.

Metallic coatings are employed to resist special forms of corrosion to which a metal having otherwise advantageous structural properties may be subject. Atmospheres differ very widely; in a pure atmosphere, iron and steel need no other protection than the film of oxide which forms on the surface and itself considerably retards further attack. In neutral, non-saturated atmospheres, the corrosion of all metals is slow, the actual rate varying with the type of corrosion product formed. Thus, copper and aluminium form corrosion films which protect them from further attack, while zinc, which forms a granular and porous deposit, continues to corrode regularly if slowly. Against a damp, urban atmosphere, iron is very vulnerable, forming corrosion products which are often delinquescent and never self-protecting.

The Value of Zinc

Regarding the value of zinc as a cathodic protector against the rusting of iron, complete protection in running water is afforded by zinc only when the current flowing exceeds 0.23 amps. per sq. ft.; when the rate of attack of the water on the zinc is insufficient to produce this current density on the iron surface, rusting will occur, which explains why relatively non-corrosive water may cause protected iron to rust. Soil corrosion is caused to a large extent by localised electro-chemical action set up on the surface of buried metal by oxygen concentration cells, or by the presence of mill scale, differences in soil contacts, etc.; in addition, it has been suggested that there are galvanic currents, present along pipe lines, due to the line passing through different soils.

The chief characteristics of zinc metal, from the point of view of protection against corrosion, are (1) it readily alloys with iron or steel and copper or brass and thus forms firmly adherent coatings; (2) the intermetallic compounds formed with iron, $FeZn_3$, $FeZn_7$, $FeZn_{10}$, are hard and brittle, and consequently coatings involving their presence are very resistant to wear, but do not well withstand severe deformation; (3) as used commercially as a protective metal, it is readily attacked by acids and should therefore never be used for storage of materials of even low acidity, or which may generate acid by fermentation or other means; (4) zinc withstands the attack of acetylene, anhydrous alcohol, dry chlorine, ether soluble di-chlormethyl-arsine, formaldehyde pure liquid hydrocyanic acid, sulphuryl and thionyl chlorides; (5) it can be applied in more ways than any other metal save cadmium, comprising: hot dip galvanising, electro-deposition, cementation (sherardising), metallic spray, and dust paint, all of which are commercially available.

Protection of the Surface

Zinc is inert to petrol, paraffin, oil and grease. It is quite inert to anhydrous alcohol but is oxidised by mixtures of alcohol and water. Distillation from lime removed the trouble. It is, however, conceivable that the zinc surfaces have a catalytic effect on the oxidation of the alcohols present. If a suitably cleaned zinc surface be corroded by an acid whose zinc salt is insoluble, and preferably of large molecular weight, then under appropriate conditions of concentration and temperature, a colloidal corrosion deposit is formed, which dries hard and is firmly adherent, affording a considerable measure of protection to the zinc surface.

The corrosion-resisting properties of aluminium are (1) it is highly resistant to attack by organic and mineral acids with the exception of hydrochloric and hydrofluoric acids; (2) it is highly resistant to sulphur and sulphur compounds; (3) the protective oxide film is highly refractory, and (4) it offers little resistance to the attack of alkalis which inhibit the formation of the protective oxide film.

Lead coatings are most commonly applied by hot dipping, and since lead does not adhere directly to iron, the latter must be "tinned," alloying metals thus used include tin, antimony, cadmium, zinc and arsenic, and may be added to the bath or applied by a prior dip or, more rarely, by electro-deposition. When using antimony as bonding agent the material, after pickling, is dipped in antimony chloride, giving a superficial film of antimony, but excellently coated sheets have been obtained using galvanised sheet or commercial tinplate as the base.

Lead is mainly used for handling sulphuric acid up to 77 per cent. strength, either in manufacture or storage, its resistance being due to the deposition of an insoluble protective sulphate film. It is equally resistant to sulphur dioxide and sulphur trioxide. Nitric acid attack on lead decreases with increasing concentration, and at 70 per cent. or over, closely adherent crystals are deposited on the metal surface, and further attack is extremely slow. Eighty per cent. or stronger acid may be handled in lead, if the nitrate deposit is not removed by abrasion or broken by creep. Mixed nitric and sulphuric acids may be nitrated in lead vessels, provided the water present does not exceed 25 per cent. Attack by hydrochloric acid increases with increasing concentration, due to the rising solubility of the chloride.

Characteristics of Cadmium

The chief characteristics of cadmium as a protective agent are (1) it offers sacrificial protection to iron and copper; (2) it is more resistant than zinc to attack of oxygen and to corrosion in unsaturated atmospheres; (3) it is more resistant than zinc to moist saline atmospheres; (4) it is less resistant than zinc to moist acid attack; (5) it does not itself bond well to iron and steel, but its alloys with zinc do so; (6) it is resistant to corrosion at moderate temperatures, forming a straw-coloured oxide film at about 250° C. which affords protection from further attack.

The value of a nickel coating lies in its resistance to chemical attack. Nickel is but slowly soluble in hydrochloric and sulphuric acids, but readily so in nitric acid. Resistance to alkaline attack is remarkable, even against fused alkali melts. The metal nickel is readily attacked by sulphur, in consequence of which, at temperatures of 400° C. and above, intercrystalline corrosion occurs, with deposition of the sulphide along the grain boundaries, and resultant brittleness. In caustic soda manufacture, nickel is used for concentration of the liquor, the product containing less than 2 parts per million of nickel. The sulphite paper pulp and cellulose acetate artificial silk industries give examples where alkaline liquors are handled in nickel-clad equipment.

Sprayed Coatings

The main application of sprayed zinc coatings is as a resistant to atmospheric corrosion. The total surface coated with zinc by the wire gun in 1933 amounted to 1,200,000 sq. ft. Since the coating can be applied to cold objects, highly tempered articles, such as valve springs, can be thus protected without damage. Advantage is taken, as in calorising, of the heat resistant properties of an aluminium oxide film in the aluminising process. In this process, articles to be coated are sprayed with aluminium, covered with a coat usually of bitumen to prevent initial oxidation, and then heated for a few minutes at 700° C. to cause bonding between the coating and the steel base. By this means, surfaces having the high heat-resisting properties of calorised coatings are obtained. Aluminised nickel surfaces resist the attack of sulphurising gases. Sprayed aluminium coatings are also used without heat treatment. Due to the non-sacrificial nature of tin, sprayed coatings of this metal are always thick, and coatings up to 1-64 in. are common. Tin spraying finds particular use in the rapid renewal of tin coatings in the dairy industry, where thick coatings can compete with nickel. Sprayed lead coatings are used for battery boxes and for rotors and pumps for chemical plant. Nickel coatings should be 1-100 in. thick and polished if possible; they are used in the paper and silk industries for the coating of large cast iron rolls, which could not be plated.

International Nickel Co. of Canada, Ltd.

A Record Demand for Nickel in 1934

THE report of the International Nickel Co. of Canada, Ltd., for the year ended December 31, 1934, shows a net profit of $18,487,478 after all charges, including provision of $5,321,131 for depreciation, mine depletion and other reserves. After disbursement of $1,933,898 in preferred dividends, there remained $16,553,580, equal to $1.13 per share on the common stock. This compares with 53 cents per share in 1933 and with a net loss of $135,344 in 1932. Net operating income was $23,808,610 as compared with $14,381,327 in the previous year; and as the result of this improvement, earned surplus rose from $22,767,570 as at the close of 1933 to $30,990,016 as at December 31, 1934. Cash and securities increased from $15,616,011 at the end of 1933 to $20,555,118 at the close of 1934.

The annual report also gives the figures for the fourth quarter of 1934. These show a net profit of $4,469,670 as compared with $4,005,165 in the third quarter. After provision for the preferred dividend, the fourth quarter's operations showed 27 cents per share on the common stock, as compared with 24 cents per share in the third quarter.

Dividends Resumed

In 1934 dividends were resumed on the common shares after a lapse since December 31, 1931. Payments were at the rate of 10 cents per share in each of the first two quarters and 15 cents per share in each of the last two, making a total of 50 cents per share for the year. A dividend of 15 cents per share has been declared for payment on March 30. Dividends on the preferred stock have been paid without intermission for the past twenty-nine years. The consolidated balance sheet and statement of consolidated profit and loss have been prepared on the same basis as in previous years, but certain changes in classification and explanatory statements have been made to comply with the requirements of the Companies Act, 1934, of the Dominion of Canada.

Important financial operations during the year included further purchase of the capital stock of the Ontario Refining Co., Ltd., and retirement of the balance of 5 per cent. debenture stock of the Mond Nickel Co., Ltd., and of the 6½ per cent. debenture stock of Henry Wiggin and Co., Ltd. A total of $5,361,138 was involved in these operations which give International Nickel a 90 per cent. stock ownership of the refinery at which its blister copper is refined electrolytically, and which eliminate all mortgage indebtedness except a balance of £1,089,908 in 5½ per cent. mortgage debenture stock of the Mond Nickel Co., Ltd.

Capital expenditure for 1934 totalled $2,395,257 in the company's mines and plants in Canada, Great Britain and the United States. This compares with $448,624 spent in 1933 and with an estimated total of $2,500,000 planned for 1935. The largest single development now in process is the sinking of a new shaft to mine economically the lower levels in the Creighton mine. All capital expenditures have been made out of earnings.

Agreement with Finland

During 1934 the Mond Nickel Co., Ltd., entered into an agreement with the Government of Finland, by which that company has secured the sole right to prospect for, mine and treat nickel-bearing ore which may occur in a defined territory in Finland. "Your management," the report continues, "prior to making this agreement, verified the existence of nickel-bearing ore and, although it is too early to determine the commercial value of the deposit, is of the opinion that the concession is advantageous."

Mr. R. C. Stanley, president, who signs the report, points out the broad basis on which the company developed its business in 1934. "The improvement in your company's business, mentioned in the annual report for 1933, continued through 1934," he writes, "with the result that the present report is the most satisfactory since that for 1929 which was the peak year in the history of the nickel industry. Sales of nickel, copper, rolling-mill products and precious metals substantially increased. Quoted prices for nickel, with the exception of a lower sterling price, remain unchanged. However, though still low, the average price received for copper was five per cent. in excess of that obtained in 1933.

"Operations throughout the year, conducted on an increased scale and at a uniform rate, afforded the management opportunity to cut costs of production to the lowest figures obtaining since the plants were reconstructed and the Frood mine fully developed. The expanded operations called for additions to pay rolls and decreased unemployment in the various localities in which operations are conducted. The year 1934 witnessed a further increase in world nickel consumption, the deliveries in all forms being about 122,000,000 pounds as compared with 96,000,000 pounds in 1933.

As heretofore the use of nickel was well distributed among different nickel-consuming countries as well as within various nickel-consuming industries. Although the increased pace of nickel consumption everywhere was well maintained, those industrial centres whose economic recovery has been most rapid have naturally registered the most prominent gains."

English Consumption at Peak

The demand for nickel in the United Kingdom reached an all-time peak in 1934 and required about 25 per cent. more nickel than in any previous year. Nickel deliveries were about equally divided between America (the United States and Canada) and the rest of the world. Copper sales increased from 113,682,312 pounds to 194,870,682 pounds, or 71 per cent. Sales of Monel metal increased 18 per cent. to a total of 10,763,821 pounds and this business is expanding rapidly in the United Kingdom. Sales of pure rolled nickel were up 19 per cent. to 7,469,914 pounds. Gold sales were 74,375 ounces compared with 21,355 ounces in 1933.

For the first time the report records sales of selenium and tellurium, which are now recovering from the tank residues in the Ontario copper refinery. Sales of selenium amounted to 73,516 pounds; it is used largely in the glass industry as a decoloriser and as a base for various colours. Tellurium, which is used as a hardening and strengthening agent in lead and its alloys, was sold to the amount of 1,110 pounds.

Employees at the end of the year totalled 9,154, an increase of 10 per cent. over the number at the beginning of the year. They were distributed as follows: Canada, 5,474; Great Britain, 2,507; United States, 1,122; other countries, 51. At the close of the year there were 10,190 preferred shareholders and 83,054 common shareholders, representing decreases of one per cent. and seven per cent. respectively, from the figures for December 31, 1933. The report includes a tribute to the late Mr. W. E. Corey, who served as a director continuously from 1915 until his death on May 11, 1934. Mr. R. H. McMaster, of Montreal, president of the Canadian Steel Co., Ltd., has been elected to that vacancy, and Mr. D. P. D. Merica, assistant to the president of International Nickel, has been elected a director in place of Mr. W. J. Hutchinson, resigned.

Outlook for 1935

In closing his report, Mr. Stanley writes: "A programme of mine development, plant construction and rehabilitation, begun in 1926 and concluded in 1929, entailed expenditures in excess of $50,000,000. Coincident with the completion of this extensive work the current world trade collapse started and has lasted with varying severity since that time. It is, however, gratifying to report that your company's business apparently turned the corner of depression during the spring of 1932 and since then has improved gradually to such an extent that the net profits in 1934 are, with one exception, the greatest in your company's history. Furthermore, it should be noted that 1934 was the first period in which your modernised plants were operated at a rate of capacity sufficient to demonstrate the economies which the large capital expenditures have made possible. The year closed with all your properties in first-class condition and with your sales and technical departments thoroughly organised and staffed to manage efficiently a growing business. Hence, barring major disturbances, 1935 should continue to show improvement in quality of output, lower costs of production, and from present indications increasing sales of your company's diversified products."

Foundations of Social Well-Being

The Influence of Insurance upon Public Affairs

SIR ERNEST J. P. BENN, who last year succeeded the late Lord Revelstoke as chairman of the United Kingdom Provident Institution, presided at the 94th annual meeting of the Institution at Southern House, London, on Wednesday. In moving the adoption of the report and accounts, Sir Ernest said that for 94 years the members of the institution had been offered at its annual meeting some helpful comments upon public affairs. Instead of saying anything about the influence of public affairs upon insurance, he proposed to take rather safer ground and offer a few observations on the influence of insurance upon public affairs. The disturbed condition of the world was not alone due to mistakes in public administration, but also, and perhaps more, to a very general forgetfulness of the economic and even the ethical and moral foundations upon which social well-being depended. In repairing that forgetfulness the world might do worse than examine the principles upon which institutions like their own were founded, for they were closely related to the essential principles of the good life, using "good" in the widest sense of the term. Insurance thoughts were long-distance thoughts and had a better perspective than the hand-to-mouth opportunism which tended to absorb so much attention in public affairs.

Sacrifice Before Benefit

Insurance recognised that sacrifice must come before benefit, and denied the wisdom of a policy of something for nothing. That was a thought which might with great advantage be more widely applied. He was not arguing for or against State assistance in one direction or another, but reminding them that every benefit received by anybody was, in fact, preceded by a sacrifice on the part of somebody. Insurance affirmed that the future was more important than the present in any plan of life which included progress, a thought which had a definite bearing upon the weakness of this generation for public debts. Year by year for nearly a century the institution had increased its assets and its responsibilities towards its members for whom these increasing assets were held in trust. In this way it served as a useful example to a world which had latterly been tempted to ignore that principle in its public affairs. Progress built upon unpaid debts would prove to be lacking in permanence.

If the members of the House of Commons could regard themselves as members of a mutual insurance office when the Chancellor of the Exchequer unfolded his Budget, they might expect to see some drastic changes in the arguments and the figures. Present-day difficulties would then rank behind future prospects. Instead, for instance, of subsidies to some industries, money would be forced into all industries by the natural method of the redemption of debt. Whether or not his apprehension at the rate of public expenditure and the dimensions of public debts was well founded, no shred of doubt could exist as to the service of the insurance offices in making the national position safer.

Civilisation in Account with Posterity

This argument could be illustrated in a simple way. Let them visualise a large ledger with a page headed "Civilisation in Account with Posterity," and glance at the items of the account 20 years ago and to-day. Let them imagine a debit and credit account as between one generation and the next, or as between the present and the future. In 1913 they would notice on the debit side—National Debt £716,000,000—and on the credit side among many other items—Life Assurance Funds £437,000,000. That was to say that the good people of 1913, in so far as they left their political liabilities to posterity, had the decency to cover 61 per cent. of the total with a life assurance asset. Now glance further down the page and refer to the figures for 1934. They would find National Debt entered at £7,409,000,000 and the total of all the life funds standing at £1,054,000,000, or a cover of 14.2 per cent.

Thus, considering only these two items in a long and complicated account, it might be said that while 1913 left less than half of its comparatively minor troubles to posterity, 1934 had relegated more than four-fifths of its much larger political debits to the charge of future generations. From this rough contrast they could draw either of two conclusions. They could say that public debts had been piled up too high, or that, as a nation, they were seriously underinsured. Perhaps there was a measure of truth in both reflections. But both led to the conclusion that there must be no more public borrowing, as was in some quarters so eloquently recommended to them, unless and until the savings of the nation had been brought into better proportion to its liabilities.

Sulphur Production

Extraction from Ores and Gas

THE output of the Sicilian sulphur mines, despite many difficulties and much competition from the United States, is now about 250,000 tons per annum. American output in 1933 was about 1,500,000 tons. Agreements were made in 1934 between the Sicilian and Central Italian (Montcatini) group on the one hand, and between the Sicilian and American producers on the other, whereby some degree of price stabilisation was effected. It has been necessary, however, for the Italian government to lend financial aid in the form of subsidies, to the extent of at least 10,000,000 lire.

In the new Billingham process of Imperial Chemical Industries, Ltd., lately described by Mr. Appleby, at Newcastle, it is the elemental sulphur which is produced. The reaction involved is very simple, namely, the reduction of sulphur dioxide by coke at a high temperature; a somewhat similar reaction is used in the latest Norwegian ("Orkla") process for dealing with pyrites, but, with metallurgical waste gases the difficulties of concentrating the gases sufficiently before reduction and of removing unwanted impurities such as carbon dioxide and carbonyl sulphide, were considerable. Details as to how this was accomplished have been placed on record ("J. Soc. Chem. Ind.," December 28, 1934).

Some of the most interesting developments in connection with pyrites are now being "planned" in Russia on a very ambitious scale, mainly for the direct production of sulphuric acid by the contact process, using a vanadium catalyst which is highly insensitive to poisoning and of high activity. The discovery of a suitable catalyst has, for the past two or three years, engaged the attention of Russian chemists. In 1933 about 450,000 tons of pyrites, 216,000 tons of ore flotation residues, and 52,500 tons of carbonaceous pyrites were dealt with for sulphur or sulphuric acid production. Under the new plan the flotation residues and carbonaceous pyrites, as sources of raw material, will be developed on a vast scale, so that by 1937 the ore residues dealt with will be no less than 1,200,000 tons, and the carbonaceous pyrites 250,000 tons, corresponding to a total production of sulphuric acid of 2,000,000 tons.

In Germany it has frequently been suggested that the sulphur content of metallic ores should be recovered; the new Billingham process would no doubt be of interest in this connection. The desulphurising of coal gas might also be extended, for if the average 1 per cent. of sulphur contained in coal could be entirely recovered from the 1,200,000,000 tons of coal consumed annually we should have more than sufficient sulphur to cover the world's present total annual demand of 3,000,000 tons. A large number of processes, either of the wet or the dry type, have been introduced for desulphurising gas. The process which seems to offer the most promise, from the sulphur recovery point of view, is the Thylox process ("Ind. Eng. Chem.," 1934, *26*, 130), and perhaps also the Seabord process.

The I. G. Farbenindustrie is now producing at least 5,000 tons of sulphur per annum, and probably much of this is derived from calcium sulphate by heating with clay and carbon, a method developed during the war. A somewhat similar method might be used with barium sulphate or heavy spar; attempts are also being made in Russia and elsewhere to utilise sodium sulphate for the production both of sulphur and soda.

Notes and Reports from the Societies

Royal Society of Arts

Stainless Steel

SPEAKING on the properties, characteristics and uses of stainless steel before the Royal Society of Arts on March 13, Mr. S. A. Main, of the Research Department, Hadfield, Ltd., Sheffield, said that the steels concerned were of two main types; first, the chromium steels, alloys of iron and chromium containing more or less carbon, which in its standard type has about 13 per cent. of chromium and 0.25 to 0.35 per cent. of carbon; and secondly, the nickel-chromium steels, alloys of iron with both nickel and chromium. In general in these steels carbon—the element which gives the principal distinctive character to ordinary steel as compared with iron—is very small in amount, only about one-tenth of one per cent. It is mostly unnecessary, and in many cases actually undesirable.

Mr. Main stated that one of the first applications of stainless steel in the chemical industry was in the manufacture of nitric acid. Imperial Chemical Industries, Ltd., which has been mainly responsible for this development, has in its extensive plants at Billingham made large use of nickel-chromium steel, which for practical purposes is unattacked by nitric acid at most temperatures and in most strengths.

Chemical Resistance

The use of stainless, or, as it should be called in this connection, chemically-resistant steel, has peacefully penetrated chemical manufacture and industries in which chemicals are employed, to such an extent that it would be difficult to cover the many applications individually. Besides nitric acid, of which use is made in the manufacture of celluloid, artificial silk, rubber, explosives and imitation leather and in dyeing, 18-8 is satisfactorily resistant to other acids which find general employment. Sulphurous acid, much in evidence in paper making, is also useful in dyeing and in the photographic industry. Crude oleic acid, used in the wool industry, is also without effect on this steel, as is acetic acid, entering into the manufacture of leather, paint and perfumery, and in dyeing. In the manufacture, canning and bottling of food 18-8 steel is often used, being immune against attack by practically all fruit and vegetable juices; also to acetic acid and the lactic acid contained in milk. Sulphuric and hydrochloric acids are among the few agents against which 18-8 is not entirely effective, and a steel which can be used with complete success with hydrochloric acid is yet to be sought.

Phosphoric acid is another important agent used in many industries and which presents difficulties. It is found, however, that if it is of a C.P. standard of purity nickel-chromium steels are quite competent to deal with it.

Construction of Scientific Instruments

In the construction of scientific instruments alloys of iron have been utilised for the useful physical properties which they provide—high permanent magnetism or a high retentivity. Stainless steels are now much used for such items as screws, links of mechanisms and other moving parts, structural members, dial plates, and specially in the manufacture of mirrors, which can be said to have reached a high state of perfection.

The stainless character of these steels is due to their being covered by a protective film which acts as a coating of lacquer or of vaseline; while such metals as gold or platinum remain perfectly bright and resist acids without such adventitious aids, stainless steels do not possess this characteristic. The protective film is not put on during manufacture, but is produced naturally by the action of the oxygen of the air on the steel. It is only a few atoms in thickness, colourless and transparent, and forms very rapidly. The reality of the film has been effectively demonstrated by Dr. Ulick Evans, of the University of Cambridge, who, by delicate chemical means, was able actually to separate it from the steel and examine it. Mr. Main concluded by referring to the work of Faraday. As Sir Robert Hadfield has shown in his book on Faraday's Metallurgical Researches, the search for a stainless metal for mirrors was one of his quests. Although his work did not result in a practicable stainless steel, one or two of his alloys were highly incorrodible.

Institution of Chemical Engineers

Joint Meeting at Manchester

A JOINT meeting of the Institution of Chemical Engineers and the Manchester Metallurgical Society will be held at Manchester on Friday, March 29. In the afternoon there will be a visit to the Partington gasworks, by kind permission of the Manchester Corporation. An evening meeting will be held at the Engineers' Club, Albert Square, Manchester, at 6.30 p.m., when a paper on Materials of Construction will be read by Mr. J. McKillop, the chair being taken by Mr. J. Dickson Hannah, president of the Manchester Metallurgical Society. This meeting will be followed at 8.15 p.m. by an informal dinner at the Engineers' Club.

Chemical Society

Sheffield : The Simplest Free Radicals

THE preparation of the free radicals methyl and ethyl was claimed by Kolbe and Frankland as early as 1849, but further work has proved that only the "radical-twins," namely, the ordinary ethane and butane, have been formed by their processes, said Professor F. Paneth in a paper read before the Chemical Society at Sheffield on March 15.

Gomberg's discovery in 1900 showed that certain more complicated organic derivatives of the trivalent carbon can actually be obtained, but these radicals are only present in solutions, and the marked influence of different solvents shows that there must be some interaction between solvent and radical; they are therefore not free in the full sense of the word. During the last few years, however, it was possible to demonstrate that methyl and ethyl can actually exist in the gaseous state for a measurable time. These free radicals can be prepared in different ways: by thermal decomposition of organometallic compounds or of purely organic compounds like hydrocarbons, alcohols, ketones, ethers, etc.; by decomposition of the same substances by means of electric discharges or of light; by interaction of alkyl halides with sodium vapour, etc. They reveal their presence by their property of removing metallic mirrors; the same process makes their indentification possible, as the products formed by the combination of the radicals and the metal can be collected and analysed.

The methods mentioned provide an easy way of preparing free methyl and ethyl. It is somewhat more difficult to obtain free benzyl, and the preparation of free phenyl and free methylene has also been claimed. It is very likely that in future more refined methods will allow of the preparation and identification of a considerably greater number of free radicals.

The time during which free radicals can exist in the free state depends on several factors: the nature and pressure of the gas in which they have been formed, the size and the quality of the vessel, and the temperature. In hydrogen, for example, free methyl disappears according to the two reactions:—

$$CH_3 + H_2 \longrightarrow CH_4 + H$$
$$CH_3 + CH_3 \longrightarrow C_2H_6.$$

The first takes place in the gaseous phase, while the second is a wall reaction. If the walls of the tube are heated, the second reaction is largely inhibited according to the diminution of the coefficient of accommodation. The first reaction can be suppressed either by using no carrier gas at all, or by applying helium instead of hydrogen. By making use of helium and heating the tube to 500° it is possible to increase the life period of free methyl from 10^{-3} sec. (as found in ordinary hydrogen and at room temperature) to 10^{-1} sec.; it can be shown that in this case on the average each free radical hits the wall of the tube 10,000 times before it is adsorbed.

The results are quite different if inside the tube there is a mirror of lead, zinc or any other element which combines with methyl or ethyl under formation of a volatile product; then apparently every single impact of a radical results in adsorption and consequently in formation of a definite chemical substance, like tetramethyl lead or dimethyl zinc. In the case of arsenic and antimony mixtures of different

products are formed which can be separated and identified. Incidentally it was found that the antimony analogue of Bunsen's cacodyl $(CH_3)_2Sb-Sb(CH_3)_2$, which has been sought in vain by applying the classical methods of organic synthesis is most easily obtained by combining free methyl with metallic antimony. It is likely that the study of free radicals will help much in elucidating the chemical reactions which occur in the thermal decomposition of organic substances.

Society of Dyers and Colourists

Manchester Section : Oxidation of Cellulose

SOME aspects of the oxidation of cellulose were discussed by Mr. H. A. Turner, M.Sc., A.I.C., in a paper read before the Manchester Section of the Society of Dyers and Colourists on March 15. Mr. L. G. Lawrie, A.I.C., presided.

The really serious studies which were now being prosecuted on the action of detergency in regard to the removal of the impurities from natural cellulosic materials by a physical process rather than by a destructive process, said Mr. Turner, would probably become so developed that cotton would be much less exposed to the risks of uncontrolled oxidation, and would possibly lead to a complete revolution in bleaching technique. He had hoped when the lecture was arranged to be able to deal in rather greater detail with two curious aspects of oxidation, one of them being the oxidation of hypochlorite, which was very greatly accelerated by the presence of leuco vat dyestuffs and the other what appeared to be the oxidation reaction associated with the evaporation of water. That work was now being developed, but had not yet been sufficiently advanced to enable him to do so.

It had been found that quite apart from the action of light the presence of a reduced vat dyestuff on a cellulose material such as cotton caused a very intense acceleration of the action. That modification was judged, and he thought reasonably so, by the rise in fluidity of the cellulose. The modification produced by hypochlorite in the presence of the reduced vat dyestuff was greater in a few seconds than was obtained normally without the accelerating influence of the dyestuff in several hours. This subject of contemporaneous oxidation, or the fact that when one had a substance present which was itself very readily oxidised, and which speeded up the oxidation of a second substance simultaneously present, cropped up in all sorts of places, and was not confined, of course, to textile chemistry.

Two instances might be mentioned which were definitely concerned with textile processing. One was the fact that bichromate oxidations seemed to be very definitely accelerated by the presence of an oxidisable material like oxalic acid, which was rather opposite to what would be at first imagined. One would have thought that the more readily reducible substance than the cellulose would take the brunt of the attack and would protect the cellulose or other oxidisable material. In discharging indigos with bichromate it was the presence of the oxalic acid which made the process successful, and also increased the vigour of the bichromate so that there was a very much greater risk of tendering the cellulose underneath.

Another interesting point was that discovered by Dr. Goodier and Mr. Scholefield some years ago, when they were trying to show that leuco vat dyestuffs were formed by the action of light on the vat dyestuff and that a reducing action resulted. They attempted to characterise the leuco dyestuff as it was formed by coupling it with a diazotised base, using the leuco vat dyestuff as a sort of naphthol. That process had been exploited and patented for the manufacture of certain classes of dyestuffs. It was found that with one or two dyestuffs there was coupling between a leuco vat dyestuff and the diazotised base, and that actually Variamine salt was one of the most successful. A considerable amount of tendering resulted, however, and they were never able to avoid that tendering. Diazonium compounds generally could act as fairly strong oxidising agents.

The importance of this acceleration of oxidation by a readily oxidisable substance was very great, because whenever an oxidising agent was used in connection with cotton or cellulosic materials it was employed to oxidise something present which was more readily attacked than the cellulose itself. Therefore, it was necessary to proceed with care, because there was always the chance of the primary oxidation turning the vigour of the attack on to the cellulose. It called, also, for a good deal of investigation because, at the present time, it was not known whether the presence of a reducible substance was going to protect the cellulose by taking the attack on itself first, or whether it was going to accelerate it.

Quite apart from the straightforward processing of cellulose there was the problem of the oxidation by air alone. Cellulose was a fairly reactive substance and light reaction was going on all the time. One of the most complete and careful pieces of work which had been carried out in connection with the air oxidation of cellulose was that done by Davidson, who measured the uptake of gaseous oxygen, namely, the diminution in volume of an enclosed quantity of air in contact with cellulose and alkali, and who found, and expressed quantitatively, what had been realised previously, that certain heavy metals, particularly iron, could accelerate oxidation to a very considerable extent.

Investigations had been conducted by Professor H. S. Taylor and Dr. Salley with respect to the oxidation of carbohydrate material leading up to air oxidation of cellulose, using a simplified substance called Mannitol. It had a backbone very like the units of cellulose, and its reactions could be followed in solution. It was known that it could be oxidised by air when it was illuminated by light, and that the reaction could be again accelerated by quantities of other substances, such as small quantities of iron and copper. Light caused the oxidation to proceed speedily, as did also the presence of iron; otherwise it proceeded quite slowly. The presence of alkali also had an accelarating effect. The system had been investigated spectrometrically, and it had been found that the action of alkali appeared to be that it encouraged the formation of a complex between the air and the Mannitol. The formation of metallic complexes with carbohydrate materials was, of course, well known. Iron appeared to be only really operative when it was not just merely floating about in the solution but when it was actually forming a complex.

Iron and Steel Institute

Annual Meeting

THE annual meeting of the Iron and Steel Institute will be held at the Institution of Civil Engineers, Great George Street, Westminster, S.W.1, May 1-3. The last two days will be devoted to a symposium on the welding of iron and steel, organised by the Institute in conjunction with other technical societies. The sessions will open each day at 10 a.m.

On Wednesday, May 1, the newly-elected president, Sir Harold Carpenter, Ph.D., F.R.S., will be inducted into the Chair, and the Bessemer Gold Medal will be presented to Professor A. M. Portevin. Announcement of the award of the Andrew Carnegie Research Scholarships for 1935-36, and of the Carnegie Gold Medal and the Williams Prize will also be made.

The annual dinner will be held in the Grand Hall of the Connaught Rooms, Great Queen Street, London, W.C., on Thursday, May 2, at 7 for 7.30 p.m. Tickets are 15s. each, exclusive of wine.

Papers to be read include " Third Report of the Corrosion Committee "; " An Investigation of Spring Steels " (J. H. Andrew and G. T. Richardson); " The Deflection of the Rolls in Plate, Sheet and Strip Mills " (J. Selwyn Caswell); " Resistance of Spring Steels to Repeated Impact Stresses " (G. A. Hankins and H. R. Mills); " Further Determinations of the External Heat Loss of Blast-Furnaces " (D. F. Marshall); " Non-Metallic Inclusions in Ferro Alloys " (B. Matuschka); " The Iodine Method for the Determination of Oxides in Steel " (T. E. Rooney and A. G. Stapleton); " Transformations in Iron-Aluminium Alloys " (C. Sykes and H. Evans); " An Investigation into the Oxidising Power of Basic Slags " (J. White, R. Graham and R. Hay); and " An Effect of Oxygen and Sulphur on Iron in Scaling " (J. M. Whiteley).

PRODUCTION of carbon tetrachloride in Japan is reported to be approximately 50 metric tons a month, all of which is manufactured by the Japan Soda Company. Two other chemical manufacturing concerns are considering the production of this item, and if their plans materialise it is only a question of time before carbon tetrachloride is exported from Japan.

Letter to the Editor

Saponification Process

SIR,—Will readers of THE CHEMICAL AGE be kind enough to help me with information on the following problem? The equations given below are designed to represent an identical process of saponification.

$$(1)\quad \begin{matrix} CH_2.O \\ CH.O \\ CH_2.O \end{matrix} \begin{matrix} CO.C_3H_7 \\ CO.C_3H_7 \\ CO.C_3H_7 \end{matrix} \begin{matrix} NaO \\ +NaO \\ NaO \end{matrix} \begin{matrix} H \\ H \\ H \end{matrix} \begin{matrix} CH_2.OH \\ =CH.OH \\ CH_2.OH \end{matrix} \begin{matrix} C_3H_7.CO.ONa \\ +C_3H_7.CO.ONa \\ C_3H_7.CO.ONa \end{matrix}$$

$$(2)\quad \begin{matrix} CH_2. \\ CH. \\ CH_2. \end{matrix} \begin{matrix} O\,CO.C_3H_7 \\ O\,CO.C_3H_7 \\ O\,CO.C_3H_7 \end{matrix} \begin{matrix} Na \\ +Na \\ Na \end{matrix} \begin{matrix} OH \\ OH \\ OH \end{matrix} \begin{matrix} CH_2.OH \\ =CH.OH \\ CH_2.OH \end{matrix} \begin{matrix} C_3H_7.CO.ONa \\ +C_3H_7.CO.ONa \\ C_3H_7.CO.ONa \end{matrix}$$

Have scientists ascertained which of the two graphic representations is the correct one, and, if so, why?—Yours faithfully,

T. B. PEACOCK.

Rose Cottage,
Wellington, Near Hereford.

Tube Works Explosion

Nine Men Injured at Newport

NINE men were taken to hospital after an explosion on March 18 at the British Mannesmann Tube Works, Newport, Monmouthshire. Four of the men taken to hospital were working over 100 yards from the plant and were struck by falling debris and glass. Five other men attended the hospital, but after treatment were allowed to go home.

The explosion occurred in a water gas plant. The dome of the gasholder was shattered and the whole of the gas inside dispelled into the air. Fortunately the plant is isolated from the general works and no one was gassed. The fire brigade helped to prevent a second explosion which was feared might occur.

Nearly 1,000 people are normally at the works, but at the particular place where the explosion occurred only ten men are employed. One of the managers of the British Mannesmann Tube Co. said that they did not know how the explosion occurred, and could not tell until the debris was cleared away and an inquiry held.

Dust in Factories

Danger of Explosions

THE danger of dust explosions in factories was stressed by Mr. G. Stevenson Taylor, Deputy Chief Inspector of Factories, lecturing on March 15 to the Tees-side Industrial Safety Committee at Middlesbrough.

Dust explosions, he said, are possible with over forty materials, as has been shown by the researches of Professor R. V. Wheeler. The chief of these are flour, sugar, malt, rice, various meals, ground cork, wood, paper, pitch and ebonite. The risk of such explosions could be minimised by the prevention of the escape of dust from machines and plant, the prevention of the accumulations of dust on floors and ledges, the prohibition of the use of naked lights, the provision of "chokes" in worm conveyors, elevators and the use of an inert gas such as carbon dioxide in machines for grinding.

A cause of ignition of dust clouds not generally recognised, said Mr. Taylor, was the formation of an electrostatic charge. Nearly all kinds of finely-divided material when blown into a dust cloud gave rise to electrical charges upon the dust and upon the air. Dust might also become charged as a result of friction against the surfaces in machines. If machines of this kind were not earthed and became charged under favourable conditions, as in dry weather, a spark discharge might occur with disastrous consequences. Mr. Taylor instanced the ignition of acetylene-air mixture in generators which are being repaired by means of a blow-pipe or soldering. Even the fact that a generator had been allowed to stand for some time was not always sufficient to ensure its freedom from gas, and great care should be taken to remove all traces of carbide from the acetylene plant and to ensure its freedom from acetylene before any repairs were attempted.

Chemical Matters in Parliament

Blast Furnace Fatality

IN the House of Commons on March 11 Mr. W. Thorne (Plaistow) asked the Home Secretary whether he had received a report from his factory inspector with regard to one man being killed and two others injured through an explosion at a blast furnace at the Appleby Works, Scunthorpe, Lincolnshire; and whether he could state the last date when the water-cooling system was tested.

Sir J. Gilmour replied that the explosion which occurred on March 5 was still under investigation, and he was not in a position at present to make any statement.

Concessions in India

Mr. T. Williams (Don Valley) asked the Secretary of State for India the number and nature of the concessions granted to Imperial Chemicals, Ltd., by the Government of India and the Provincial Governments, and the terms of years agreed to.

Mr. Butler (Under Secretary) stated that he had no information beyond what was contained in replies given to questions in the Indian Legislative Assembly on August 14 and the Punjab Legislative Council on October 24 and 29 and November 12.

Steel Imports

Mr. Macquisten on March 14 asked the President of the Board of Trade whether he had considered the communication made to him to the effect that a foreign country was assisting by varied methods its manufacturers of steel works plant to sell to British steel makers at uneconomic prices and so destroy the business of manufacturers of steel works plant in this country; and whether, in view of the danger to the country of being without adequate manufacturing facilities for steel works plant, he would take all possible steps to protect them from a competition directed to depriving Britain of a necessary part of her means of defence?

Mr. Runciman replied that his attention had been drawn to the communication referred to. If the United Kingdom manufacturers of the machinery in question considered the existing rate of duty inadequate, it was open to them to make representations to the Import Duties Advisory Committee.

The National Coal Survey

Examination of an Important West Yorkshire Seam

IN connection with the national coal survey, the Department of Scientific and Industrial Sesearch has issued, as Fuel Research Paper 35, a report on the examination of the Beeston group of coals from the Upper Beeston seam (H.M. Stationery Office, 2s. 6d.). The Upper Beeston seam was selected as the first to be surveyed in West Yorkshire from the laboratory established at Leeds because it is the most important in the area. The work was carried out under the direction of the West Yorkshire Survey Committee, supervised by Mr. A. M. Wandless, the senior officer of the Department in that area. After studying the Upper Beeston seam below ground, 18 pillar samples of the seam were obtained from various sites, each consisting of a pillar of coal representing the seam from floor to roof.

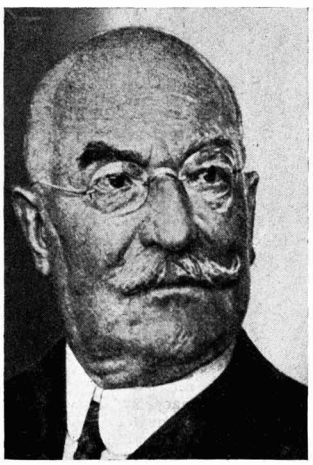
Taking the seam as a whole, the results show that the ash content and, with three exceptions, the phosphorus content of the coal are generally low, while the sulphur content varies from 1 to 1.5 per cent. The calorific value and the caking index were found to be greater in the north and north-east portions of the seam than in the south and south-east portions. The top coal is characterised by lower ash, lower sulphur, higher calorific value and lower phosphorus than that from the bottom of the seam, the concentration of the phosphorus in the bottom coal being remarkable. The analyses suggest that a high-class product can be produced from the top coal over the whole area, and that top and bottom coal should be separated before marketing.

The Upper Beeston coal is not widely used for the manufacture of metallurgical coke, but in the south and south-west the characteristics of the coal suggest that it could advantageously be used for this purpose, bearing in mind, however, the relatively high phosphorus content of a few of the sections.

Death of Famous German Chemist

Dr. Carl Duisberg, Chairman of I. G. Farbenindustrie

THE death occurred at his home at Leverkusen, on Tuesday, of Dr. Carl Duisberg, chairman and founder of the great German chemical concern, I. G. Farbenindustrie. Dr. Duisberg was the son of a manufacturer at Barmen. He went to school at Elberfeld and studied chemistry at Jena, Göttingen, Munich and Strasburg, taking his doctorate at the early age of 20. After a period of research at Munich, he entered the service of Farbenfabriken vorm. Friedr. Bayer and Co., in their Elberfeld dye works. For the next 50 years the story of his life was the story first of the development of Farbenfabriken from a small and straitened undertaking into a great and prosperous concern, and then of the growth and ascendancy of the great chemical trust.



The Late Dr. Carl Duisberg.

Before leaving Munich, Dr. Duisberg had proved himself a chemical investigator of genius by his discovery of benzopurpurin and benzozurin. At Elberfeld he was given charge of a small laboratory, out of which the vast chemical works of the I. G. Farbenindustrie at Leverkusen may be said eventually to have grown. While still young he travelled extensively, but chiefly in Great Britain and the United States, where, both as a scientist and as a merchant, he established the reputation of German dyes. To his first great discoveries of the red and many other artificial dyes having the especially valuable property of dyeing wool directly, without its being first steeped in caustic, he later added those discoveries of pharmaceutical products, such, for example, as phenacetin, for which the firm of Bayer and the German Chemical Trust are widely known.

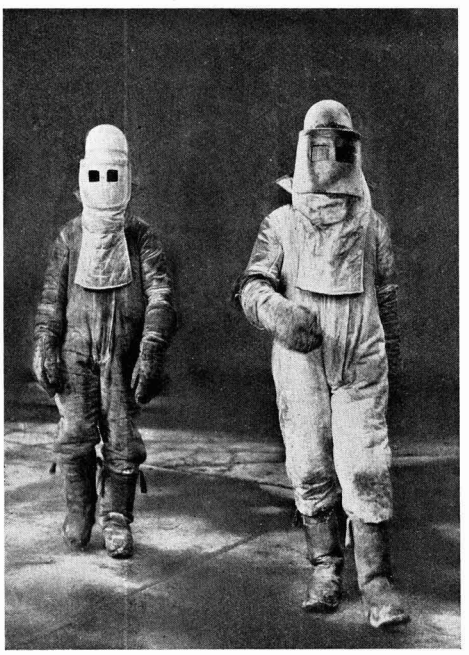
Dr. Duisberg first launched his idea of a comprehensive chemical trust which would eliminate wasteful and destructive competition in the opening years of the present century. In 1904, as the result of a memorandum which he had written, the Badische Anilin-und-Sodafabrik Farbenfabriken vorm. Friedr. Bayer and Co. and the A.G. für Anilinfarben-Fabrikation entered into a community of interests. The next of Duisberg's ambitions was not realised until in 1915, under the stress of war conditions, the five other large chemical firms joined in forming the I. G. Farbenindustrie (Community of Interests of the German Coal Tar Industry). Ten years later the eight firms belonging to the great Chemical Trust, or community of interests, were fused into a single undertaking, the I. G. undertaking, the I. G. Farbi Aktiengesellschaft, and Duisberg, inevitably, became the first chairman of its Board of administration.

As one of her greatest industrial leaders, Duisberg exercised strong influence in post-war Germany. He was opposed to the encroachment of public control in industry, and frequently issued warnings against the dangers of excessive short-term credits. He was a convinced and effective advocate of rationalisation, and took a leading part in it. He had a keen perception of the needs of scientific education and research, especially during the difficult post-war period, when traditional standards were, for a time, in danger. He created academic associations in which friends of science and learning joined together in materially assisting the universities, and co-operated heartily in the students' self-help and practical aid schemes. The German Students' Association, the Students' Mutual Loan Society, the American Work-Students' Service, the Students' Endowment of the German Nation, and the Students' Homes Movement, all owed an immense debt to him. He received many honours and distinctions, both in Germany and abroad, culminating in the festive celebration of his seventieth birthday three years ago. Dr. Duisberg rose to great eminence in Germany as an economic thinker and industrial leader, and held office as president of the Reich Federation of German Industry from 1925 until his seventieth birthday in 1931.

Fire Fighting Suits

Complete Immunity from Fire

WHAT are believed to be the first complete asbestos suits which will enable fire fighters to enter flames with immunity have been completed and tested by Bells Asbestos and Engineering Supplies, Ltd., at Slough. These suits were primarily devised to effect rescues from blazing aircraft, but



After the Test.

it is hoped that they may be used to save life from fire under almost any conditions. They have been tested under the most dangerous conditions, where the wearers entered blazing furnaces and worked for some time. Though they were enveloped by fierce flames, the men wearing the suits suffered absolutely no ill effects. The picture shows the suits immediately after the test.

British Overseas Chemical Trade in February

Ten per cent. Increase in Exports

ACCORDING to the Board of Trade returns for the month ending February 28 exports of chemicals, drugs, dyes and colours were valued at £1,573,976, as compared with £1,416,889, an increase of £157,087. Imports were valued at £866,212, as compared with £880,726, a decrease of £14,514. Re-exports were £40,572.

	Quantities. February, 1934.	Quantities. February, 1935.	Value. February, 1934. £	Value. February, 1935. £
Imports				
Acids—				
Acetic .. .. cwt.	9,284	12,471	15,053	17,997
Boric (boracic) .. ,,	3,213	2,516	3,170	2,478
Citric .. .. ,,	300	1,790	899	6,007
Tartaric .. .. ,,	5,807	1,320	23,454	5,607
All other sorts .. value	—	—	10,524	11,207
Borax .. .. cwt.	25,795	14,801	15,347	7,403
Calcium carbide .. ,,	81,934	92,374	45,577	51,450
Phosphorus .. ,,	1,444	4	4,443	22
Potassium compounds—				
Caustic and lyes cwt.	10,628	11,337	12,267	12,870
Chloride (muriate) ,,	22,956	46,632	9,891	13,895
Kainite and other mineral potassium fertiliser salts .. cwt.	227,246	256,507	35,205	33,906
Nitrate (saltpetre) ,,	5,589	8,158	4,929	7,759
Sulphate .. ,,	22,606	19,524	10,685	6,619
All other compounds ,,	6,962	8,343	11,724	13,688
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	14,174	95	4,325	57
Chromate and bichromate .. .. cwt.	5,062	4,010	7,107	5,366
Cyanide .. ,,	802	2,160	1,946	5,058
Nitrate .. .. ,,	6,080	79,867	1,314	17,608
All other compounds ,,	14,892	11,826	9,142	10,180
Other chemical manufactures .. .. value	—	—	197,734	182,263
Drugs, medicines, etc —				
Quinine and quinine salts oz.	92,632	68,493	7,965	5,807
Medicinal oils .. cwt.	1,859	2,564	3,938	9,894
Ointments and liniments cwt.	78	21	4,092	577
Proprietary medicines value	—	—	39,844	67,469
All other sorts .. ,,	—	—	39,905	27,917
Bark Cinchona (bark Peruvian, etc.) cwt.	239	699	1,018	2,577
All other raw or simply prepared .. value	—	—	29,858	31,312
Finished dyestuffs (coal tar) .. .. cwt.	5,158	2,575	141,462	68,104
Extracts for dyeing cwt.	2,646	4,062	8,574	9,678
Extracts for tanning—				
Chestnut .. cwt	18,418	20,648	13,170	14,168
Quebracho .. ,,	38,263	124,722	23,705	71,328
All other sorts .. ,,	31,749	22,095	25,103	16,619
All other dyes and dyestuffs .. cwt	620	1,014	4,861	16,701
Painters' colours and materials—				
White lead (basic carbonate .. .. cwt.	4,717	7,396	5,664	8,322
Lithopone .. ,,	23,123	12,672	15,585	7,990
Ochres and earth-colours cwt.	28,554	41,597	11,552	12,889
Bronze powders ,,	1,421	1,425	10,063	10,234
Carbon blacks .. ,,	22,752	26,793	28,441	37,761
Other pigments and extenders, dry .. cwt.	24,623	23,128	7,398	7,334
All other descriptions ,,	16,792	15,454	33,792	28,091
Total .. .. value	—	—	880,726	866,212
Exports				
Acids—				
Citric .. .. cwt.	3,490	1,886	11,433	7,205
All other sorts .. cwt.	3,490	1,886	11,433	7,205
All other sorts .. value	—	—	15,437	19,878
Aluminium compounds tons	1,525	1,859	18,429	21,821
Ammonium compounds—				
Sulphate .. cwt.	18,003	25,504	111,792	146,479
All other sorts .. ,,	777	2,820	12,544	33,013
Bleaching powder (chloride of lime) .. .. cwt.	47,977	42,871	13,127	14,121
Coal tar products—				
Cresylic acid .. gal.	83,064	102,752	8,158	8,622
Tar oil, creosote oil etc. gal.	1,978,591	1,460,575	32,958	33,406
All other sorts .. value	—	—	10,523	11,720
Copper, sulphate of tons	2,575	2,522	36,819	33,531
Disinfectants, insecticides cwt.	34,086	25,682	70,129	52,313
Glycerine .. .. ,,	7,496	17,928	14,817	40,656
Lead compounds .. ,,	12,798	11,455	15,944	13,358
Magnesium compounds tons	320	406	7,919	9,332
Potassium compounds cwt.	5,069	3,342	11,038	8,826
Salt (sodium chloride) tons	14,207	18,208	42,104	50,435
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	406,470	359,641	94,733	90,791
Caustic .. .. ,,	148,102	226,647	86,696	113,439
Nitrate .. .. ,,	7,595	12,134	2,791	4,533
Sulphate, including salt-cake .. .. cwt.	1,258	13,287	523	2,407
Zinc oxide .. tons	905	1,072	18,517	18,681
All other descriptions value	—	—	174,478	167,794
Drugs, medicines, etc.—				
Quinine and quinine salts oz.	134,070	90,986	13,337	9,794
Proprietary medicines value	—	—	84,313	111,245
All other descriptions ,,	—	—	128,752	124,792
Finished dyestuffs (coal tar)—				
Alizarine, alizarine red and indigo (synthetic) cwt.	1,341	882	9,614	5,752
Other sorts .. ,,	6,033	4,315	80,529	68,152
All other descriptions ,,	16,265	28,543	22,841	32,291
Painters' colours and materials—				
Ochres and earth colours cwt.	13,374	13,182	13,751	11,725
Other descriptions ,,	10,537	19,001	15,611	26,758
White lead .. ,,	4,564	11,489	8,760	20,057
Paints and painters' enamels, prepared cwt.	32,094	35,597	83,999	91,992
Varnish and lacquer (clear), coloured or not .. .. gal.	62,447	83,156	25,606	33,172
All other descriptions cwt.	24,962	29,819	51,058	64,648
Total .. .. value	—	—	1,416,889	1,573,976
Re-Exports				
Chemical manufactures and products .. value	—	—	12,517	13,691
Drugs, medicines and medicinal preparations—				
Manufactured or prepared .. .. value	—	—	23,032	9,959
Raw or simply prepared	—	—	10,607	11,172
Dyes and dyestuffs and extracts for dyeing and tanning .. .. cwt.	223	6,386	665	5,158
Painters' colours and materials .. .. ,,	178	301	466	592
Total .. .. value	—	—	47,287	40,572

News from the Allied Industries

Compressed Gases

ROTHERHAM WILL SOON POSSESS the largest and most up-to-date oxygen factory in Europe. This is the claim of the British Oxygen Co., Ltd., whose premises in the heart of Rotherham's industrial area are being extended to cover two acres. The new plant will probably begin to operate in the early summer.

Rubber

A NEW GERMAN ORDER issued by the Controller of Rubber and Asbestos forbids the use, without special licences, of rubber, new or old, for the manufacture of motor car tyres, technical and surgical rubber goods, soles and heels, goloshes, macintoshes, and sports goods, if they are made for home consumption.

Tanning

CELLULOSE FINISHERS are very busy so that shoe manufacturers evidently anticipate a renewed demand for bright coloured sandals this coming summer. Glove leather manufacturers are quiet as usual at this season of the year, but the demand for fancy leathers has continued and good orders were secured at the British Industries Fair. The requirements in shoe lining leathers are practically all for coloured leather and manufacturers are just now experiencing a very busy time.

Paint and Varnish

FURTHER EXPANSION IN THE BUSINESS of Pinchin Johnson and Co. is evidenced both by the increase of £66,127 in profits for 1934 at £320,333, and a proposed issue of ordinary and preference shares, the former on bonus terms. The amount available for dividend after providing for fees, taxation, etc., is up from £207,956 to £265,083. A final dividend of 10 per cent. is to be paid on the ordinary shares, raising the total distribution for the year from 15 per cent. to 17½ per cent. The directors are to ask for powers to raise the additional capital for the purpose of increasing the cash resources, to replace substantial capital expenditure in recent years and to place the company in a position to undertake further extensions. For this purpose it is proposed to increase the capital to £2,800,000 by the creation of 300,000 new 4 per cent. £1 second cumulative preference shares. Subscribers for these shares will be entitled to subscribe for one new ordinary share at 28s. for every four new preference shares. The present price of the ordinary £1 shares is 41s.

Photographic Materials

ILFORD, LTD., announce that it has been decided to redeem on November 1, 1935, the 500,000 6½ per cent. cumulative "A" preference shares of £1 each at 21s. 6d. per share, together with dividend (less tax) accrued to date of redemption. The company is holding an extraordinary meeting on March 25 to pass the necessary resolution to create 500,000 5½ per cent. cumulative preference shares.

Non-Ferrous Metals

THOMAS BOLTON AND SONS, the Widnes copper and tin smelters and refiners, propose to pay off on October 1, 1935, at 104 per cent., the outstanding balance of £266,900 6 per cent. first mortgage debentures. An issue of £400,000 of 4½ per cent. first mortgage debenture stock is to be made shortly at 100 per cent., and holders of the maturing 6 per cent. debentures may convert into an equivalent nominal amount of the new issue plus £4 per cent. either in cash or new stock.

Fertilisers

THE REORGANISATION of the Lautaro Nitrate Co. is foreshadowed in the report for the year ended June 30 last. It is pointed out that the Chilean Nitrate and Iodine Sales Corporation, created by the Law of January 8, 1934, which fixed the definite bases for the reconstruction of the nitrate industry, is now functioning normally, and that the many problems derived from the new state of affairs have already been resolved. The directors, therefore, consider that the time is approaching when the representatives of the creditors and shareholders may progress in their negotiations towards the final reorganisation of the company.

Dyestuffs

THE REDUCTION OF THE CAPITAL of Continental Tintex and Dye Products, Ltd., from £200,000 to £20,000 by cancelling paid-up capital which was lost or was not represented by available assets, was sanctioned by Mr. Justice Farwell, in the Chancery Division on March 19. Mr. Turnbull, for the company, said the issued capital was being reduced by £140,000, and it was also proposed to strike out from the assets side of the balance sheet the proceeds of a High Court action and the forfeited shares account. The directors were of the opinion that the true value of the assets shown as licences, trade marks, goodwill, etc., was £8,000 and not £84,000, and it was proposed to write it down accordingly.

Continental Chemical Notes

Sweden

SWEDISH TURPENTINE EXPORTS underwent a marked increase in 1934 to 2,108 tons (as compared with 1,618 tons in 1933).

Spain

A COMPANY HAS been registered at Barcelona, under the name of "La Riojana," for the purpose of exploiting certain potash deposits. Among the promoters is the French concern of Saint Gobain.

Poland

POLISH MANUFACTURERS OF TURPENTINE are forming an association with the object of promoting the export trade.

THE STATE POWDER FACTORY has taken over a superphosphate and sulphuric acid factory at Kielce and is reconstructing the plant with a view to operating a contact process for oleum (vanadium catalyst).

France

FRENCH COLONIAL TESTS on the suitability of latex in road-surfacing compositions have yielded promising results after two months' trials. About 300 yards of highway were coated with an asphalt substitute, comprising a latex-sand cement containing sodium sulphite and para-nitro-phenol as preservative "Revue Générale des Matières Plastiques," January, 1935).

Switzerland

A DRY-CLEANING SOLVENT MIXTURE claimed to avoid the drawbacks of white spirit and chlorinated hydrocarbons while combining their advantages, is declared in Swiss Patent 171,694 as containing about 40 per cent. deodorised aromatic coal tar hydrocarbons distilling at about 120 to 150° C. and about 60 per cent. mineral oil fraction of about the same distillation range. Before blending, the components are deodorised and freed from resin-forming ingredients by washing with 10 per cent. of oleum.

Italy

WHEREAS THE ITALIAN NATURAL SILK PRODUCTION declined to 3,120 tons from 3,280 tons in 1934, that of rayon jumped from 37,150 tons to 48,250 tons. 27 concerns are engaged in the rayon industry, which depends in large measure upon the foreign market, the increased output in 1934 being entirely accounted for by increase of export sales.

EXTRACTION OF POTASSIUM AND OTHER SALTS from sea water with the aid of solar radiation, utilising the so-called Niccoli process, is being undertaken by the Potassio Marino Company with government support. The process is being practised on a technical scale on the Red Sea coast of Erithrea, while experimental work is being carried on in Italian waters near Naples. Potassium and magnesium sulphates, magnesium chloride and sodium chloride are being extracted.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no price changes to report in the markets for general heavy chemicals, wood distillation products, perfumery chemicals, essential oils and intermediates. In the rubber chemical market the price of vermilion, pale or deep, is now from 4s. 5d. to 4s. 7d. per lb. In the coal tar products section the price of pure toluol has been reduced from 2s. 2d.-2s. 3d. to 2s. 1d.-2s. 2d. per gal. The only change reported in pharmaceutical chemicals is in the price of atropine sulphate, which is now 11s. 3d. per ounce. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—There has been no change in prices in the London chemical market during the week. The prices of coal tar products also remain the same as last week.

MANCHESTER.—Although European political developments are not conducive to increased confidence among traders they seem to have had little actual adverse influence on the Manchester chemical market during the past week. There are still occasional weak spots from the point of view of prices, but, taking the market as a whole, conditions in this respect are decidedly steady. Textile chemicals are not, by any means, moving into consumption on a satisfactory scale, although, in the aggregate, the quantities being taken up, mainly against contracts, are being maintained on about the recent scale. In other directions a moderate general movement has been reported this week. New forward buying continues relatively slow, and most of the business this week has been in respect of prompt or near delivery positions. Among the by-products, pitch is decidedly easy in tendency, with carbolic acid steady and in fair demand; the light materials are quiet.

SCOTLAND.—The Scottish heavy chemical market remains steady, no outstanding inquiries of importance being noted.

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 2½%. MANCHESTER: 11¾d. to 1s.

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 £55 ex store.

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

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 0½d. to 1s. 0¾d. per lb.

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

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

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

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

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

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

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

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

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

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

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

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

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

BARYTES.—£6 10s. to £8 per ton.

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

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

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

CADMIUM SULPHIDE.—2s. 4d. to 2s. 8d.

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

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

CARBON BLACK.—3¾d. to 4¼d. per lb. LONDON: 4½d. to 5d.

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

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

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

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

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

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

DIPHENYLGUANIDINE.—2s. 2d. per lb.

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

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

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £31 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.—7¾d. to 8¼d. per lb. for delivery up to June 30.

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

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: £37.

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: 10¼d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10¾d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8½d. 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: £23. 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 10. 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.

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.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 7¾d. to 8¼d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2¼d. per gal. MANCHESTER: Crystals, 7¾d. per lb.; crude, 2s. to 2s. 1d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 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, 8¼d. to 9d. per gal.; standard motor, 1s. 2d. to 1s. 2¼d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 6¼d. to 1s. 7d. LONDON: Motor, 1s. 5¼d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5¼d. to 5½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4¼d. f.o.r. North; 5d. London. MANCHESTER: 4¾d. to 5¼d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. 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. 2¼d. to 1s. 3¼d.; heavy, 11d. to 1s. 0¼d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3¼d.; 90/190%, 11d. to 1s. 2d.

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

PITCH.—Medium soft, 42s. to 45s. per ton. LONDON: 45s. per ton, f.o.b. East Coast port.

PYRIDINE.—90/140, 6s. 6d. 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.—Mar., £7 3s. 9d. per ton; Apr./June, £7 5s.; delivered in 4-ton lots to farmer's nearest station.

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

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

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

NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton.

Latest Oil Prices

LONDON, Mar. 20.—LINSEED OIL was firmer. Spot, £22 10s. (small quantities), April, £20 2s. 6d.; May-Aug., £20 15s.; Sept.-Dec., £21 5s., naked. SOYA BEAN OIL was quiet. Oriental (bulk), March-April shipment, £21 5s. per ton. RAPE OIL was slow. Crude extracted, £32; technical refined, £33 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £24 10s.; refined common edible, £28; and deodorised, £30, naked ex mill (small lots 30s. extra). TURPENTINE was quiet. American, spot, 49s. per cwt.

HULL.—LINSEED OIL.—Spot quoted £20 15s. per ton; March, £20 5s.; April, £20 7s. 6d.; May-Aug., £20 12s. 6d.; Sept.-Dec. £21. COTTON OIL.—Egyptian, crude, spot, £24; edible, refined, spot, £26; technical, spot, £26; deodorised, £28, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £18 10s., naked. GROUNDNUT OIL.—Extracted, spot, £30 10s.; deodorised, £33 10s. RAPE OIL.—Extracted, spot, £31; refined, £32 10s. SOYA OIL.—Extracted, spot, £24 10s.; deodorised, £27 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, 51s. per cwt.

Forthcoming Events

LONDON

Mar. 26.—Institution of the Rubber Industry (London Section). "Latex in the Boot and Shoe Industry." H. Bradley. Institution of Mechanical Engineers, Storey's Gate, London.

Mar. 27.—Institute of Fuel (London Section). "The Properties and Applications of Adsorptive Carbons." Hugh Griffiths. 6 p.m. Burlington House, London.

Mar. 28.—Institute of Vitreous Enamellers. "Factors to Increase Production in Enamelling Plants." B. B. Kent. 8 p.m. British Industries House, Marble Arch, London.

Mar. 28.—Chemical Society. Annual general meeting. "Recent Researches on Certain of the Rarer Elements." Professor G. T. Morgan. 3.30 p.m. Anniversary dinner. 7 p.m. Grosvenor House, Park Lane, London.

Mar. 29.—Society of Dyers and Colourists. Annual Dinner. 7 p.m. Dorchester Hotel, London.

Mar. 29.—Oil and Colour Chemists' Association. Annual dinner. Trocadero Restaurant, London.

Mar. 29.—Royal Institution. "The Neutron and Radioactive Transformations." Lord Rutherford of Nelson. 9 p.m. 21 Albemarle Street, London, W.1.

BIRMINGHAM

Mar. 25.—Institute of Vitreous Enamellers. "The Corrosion and Weathering of Glasses by Water, Acids and Alkalies." Miss V. Dimbleby. 7.30 p.m. Chamber of Commerce, New Street, Birmingham.

Mar. 26.—Society of Chemical Industry (Birmingham and Midland Section). "Synthesis of new Medicinal Alkaloids." Dr. J. A. Aeschlimann (Basle). 7.30 p.m. University Building, Edmund Street, Birmingham.

Mar. 27.—Electrodepositors' Technical Society. "Specifications for Cathodic Deposits." C. F. J. Carter. "Specifications for Anodic Deposits." Dr. S. Wernick. "The Testing of Electrodeposited Coatings." Dr. L. C. Bannister. James Watt Memorial Institute, Gt. Charles Street, Birmingham.

EDINBURGH

Mar. 26.—Institution of the Rubber Industry (Scottish Section). "Special Properties of Latex." F. H. Cotton. 7 p.m. Chamber of Commerce Rooms, Edinburgh.

GLASGOW

Mar. 29.—Society of Dyers and Colourists (Scottish Section). "Metals and Alloys in Textile Operations." J. G. Grundy. 7 p.m. Royal Technical College, Glasgow.

LEICESTER

Mar. 27.—Leicester Literary and Philosophical Society (Chemistry Section). Annual general meeting. 7.30 p.m. Museum, Princess Road, Leicester.

Mar. 27.—Society of Dyers and Colourists (Midlands Section). "The Level Dyeing Properties of Dyestuffs on Various Materials." J. C. Grundy. Leicester.

MANCHESTER

Mar. 29.—Manchester Literary and Philosophical Society (Chemistry Section). Annual general meeting. "The Paint Industry and its Development of Modern Finishes." W. A. Lowe. 36 George Street, Manchester.

Mar. 29.—Institution of Chemical Engineers. Joint meeting with the Manchester Metallurgical Society. "Materials of Construction." J. McKillop. 6.30 p.m. Informal dinner. 8.15 p.m. Engineers' Club, Albert Square, Manchester.

WORKINGTON

Mar. 29.—West Cumberland Society of Chemists and Engineers. Annual general meeting and smoker. 7 p.m. Workington.

Chemical Trade Inquiries

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

Finland.—The Commercial Secretary to H.M. Legation at Helsingfors reports that the Finnish State Railways are calling for tenders, to be presented in Helsingfors by April 1, 1935, for the supply of 900 tons of creosote oil. (Ref. B.Y. 7998.)

Iraq.—The Commercial Secretary to H.M. Embassy at Bagdad reports that the Bagdad District Water Board is calling for tenders, to be presented in Bagdad by March 30, 1935, for the supply of 20 tons of soft blue virgin lead in 1 cwt. pigs. (Ref. G.Y. 14926.)

Uruguay.—H.M. Consul at Montevideo reports that the State Electricity Supply and Telephone Administration is calling for tenders to be presented in Montevideo by May 13, 1935, for the supply of 250,000 kg. of lubricating oil for Diesel engines, 6,000 kg. of light oil, 14,000 kg. of medium oil, 3,000 kg. of extra heavy oil, 1,000 kg. of special oil, 10,000 kg. of lubricating oil for steam turbines, 12,000 kg. of oil for compressors, 60,000 kg. of oil for transformers and circuit breakers. (Ref. B.Y. 7998.)

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

ZINC-DUST PAINTS.—New Jersey Zinc Co. Sept. 6, 1933. 10571/34.

PRODUCING SULPHUR by means of reduction of sulphur dioxide. A. R. Lindblad. Sept. 6, 1933. 17557/34.

ZINC SULPHIDE, and process of making the same.—American Zinc, Lead and Smelting Co. Sept. 6, 1933. 22168/34.

AZO DYESTUFFS, manufacture and production.—I. G. Farbenindustrie. Sept. 6, 1933. 25307/34.

WATER SOFTENERS, and methods of making the same.—Victor Chemical Works. Sept. 5, 1933. 25365/34.

WATER-RESISTANT CEMENT, manufacture.—L. Forsen. Sept. 6, 1933. 25476/34.

MERCERISING LIQUORS.—J. R. Geigy Soc. Anon. Sept. 7, 1933. 25580/34.

ORGANIC MATERIALS, extraction.—K. Gebhardt (née Zurkalowski). Sept. 7, 1933. 25711/34.

PAINTS.—Metallges, A.-G. Sept. 7, 1933. 25801/34.

PIGMENT COLOURS, manufacture.—E. I. du Pont de Nemours and Co. Sept. 8, 1933. 25987/34.

PAINTS.—P. E. Harth. Sept. 11, 1933. 26105/34.

Specifications Accepted with Dates of Application

WETTING AGENTS and the like, manufacture.—E. I. du Pont de Nemours and Co. July 8, 1932. 425,217.

ANTITHYROIDAL SUBSTANCE, production.—A. L. Mond (Sachsisches Serumwerk A.-G.). July 29, 1933. 425,104.

FINE OR COLLOIDAL CLAY, method and means for production. R. J. Varcoe. Aug. 23, 1933. 425,036.

SYNTHETIC TANNING AGENTS, properties.—J. Y. Johnson (I. G. Farbenindustrie). Aug. 28, 1933. 425,047.

COMPOUNDS FOR PROTECTION AGAINST MOTHS, manufacture.—W. W. Groves (J. R. Geigy, A.-G.). Aug. 29, 1933. 424,967.

COMPOUNDS FOR PROTECTION AGAINST MOTHS, manufacture.—W. W. Groves (J. R. Geigy, A.-G.). Aug. 30, 1933. 424,972.

BASIC TRIPHENYLMETHANE DYESTUFFS soluble in water, manufacture.—I. G. Farbenindustrie. Sept. 3, 1932. 425,041.

MONOAZO DYESTUFFS insoluble in water, manufacture.—I. G. Farbenindustrie. Sept. 2, 1932. 425,042.

DETERGENTS.—R. Bushby. Sept. 4, 1933. 424,977.

VULCANISATION OF RUBBER.—I. G. Farbenindustrie. Sept. 9, 1932. 425,165-6.

AZO DYESTUFFS, process for the manufacture.—I. G. Farbenindustrie. Sept. 9, 1932. 425,167.

WATER-INSOLUBLE AZO DYESTUFFS and intermediate products therefor, manufacture.—I. G. Farbenindustrie. Sept. 9, 1932. 425,168.

MONOAZO DYESTUFFS insoluble in water, manufacture.—I. G. Farbenindustrie. Sept. 9, 1932. 425,226.

HYDROXYBENZENES, manufacture.—E. I. du Pont de Nemours and Co. Sept. 10, 1932. 425,230.

SULPHURIC ACID by the contact process, manufacture.—National Processes, Ltd., S. Robson and P. S. Lewis. Sept. 18, 1933. 425,179.

PAINTS, LACQUERS, AND VARNISHES, manufacture and production. J. Y. Johnson (I. G. Farbenindustrie). Oct. 5, 1933. 425,181.

OLEFINE CHLORIDES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Nov. 2, 1933. 425,061.

ACETALDEHYDE FROM ACETYLENE, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Dec. 27, 1933. 425,069.

ANHYDROUS CITRIC ACID, process for making.—Chemische Fabrik J. A. Benckiser Ges., and E. Aeckerle. May 1, 1934. 425,075.

CADMIUM PIGMENTS, production.—G. Siegle and Co., Ges. May 17, 1933. 425,080.

WATER-INSOLUBLE AZO DYESTUFFS and intermediate products therefor, manufacture.—I. G. Farbenindustrie. Sept. 8, 1933. 425,211.

Applications for Patents

(March 7 to 13 inclusive).

CELLULOSE FROM LIGNO CELLULOSIC MATERIALS, manufacture.—British Celanese, Ltd. (United States, March 13, '34.) 7286.

METAL OXIDES, reduction.—Calloy, Ltd., and G. N. Kirsebom. 7504.

HYDROXYCARBOXYLIC ACID, etc., manufacture.—A. Carpmael (I. G. Farbenindustrie). 7571.

AMINOAZO COMPOUNDS, manufacture.—A. Carpmael. 7572.

DYESTUFF FOR COTTON, manufacture.—A. Carpmael (I. G. Farbenindustrie). 7720.

WATER-INSOLUBLE AZO DYESTUFFS, manufacture.—A. Carpmael. 7721.

THIOUREA DERIVATIVES, manufacture.—A. Carpmael. 7870.

DERIVATIVES OF STEROLS, manufacture.—A. Carpmael. 7869.

BERYLLIUM, electrolytic production.—Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler and G. Jaeger. 7595.

ETHERS OF PARAFFIN WAX, manufacture.—E. I. du Pont de Nemours and Co. (United States, March 13, '34.) 7862.

CELLULOSE-ACETATE LACQUERS, ETC, manufacture.—G. Frost. 7668.

SYNTHETIC ENAMELS, ETC., manufacture.—G. Frost. 7669.

AZO DYESTUFFS, manufacture.—J. R. Geigy, A.-G. (Switzerland, April 7, '34.) 7810.

FLUORINATED ORGANIC COMPOUNDS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 7705.

LEATHER DYESTUFFS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 7706.

X-RAY PHOTOGRAPHS, production.—I. G. Farbenindustrie. (Germany, May 2, '34.) 7163.

VAT DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, March 7, '34.) 7164.

CYCLIC KETONES, manufacture.—I. G. Farbenindustrie. (Germany, March 31, '34.) 7811.

CONDENSATION PRODUCTS OF PHENOLS, ETC., manufacture.—Imperial Chemical Industries, Ltd. 7603.

GRANULAR MASSES containing hydrochloric acid, manufacture.—Imperial Chemical Industries, Ltd., and J. P. Baxter. 7864.

SUBSTITUTED BENZYL CARBINAMINES, production.—L. Mellersh-Jackson. 7598.

CARBON BLACK, manufacture.—J. Y. Johnson. 7158

AZO DYESTUFFS, manufacture.—J. Y. Johnson. 7159.

VINYL ACETYLENE, manufacture.—J. Y. Johnson. 7303.

AMINES, manufacture.—J. Y. Johnson. (May 15, '34.) 7687.

LIQUID RUBBER LATEX, compounds.—A. T. B. Kell. 7111.

CONCENTRATED GAS LIQUOR, manufacture.—W. T. Kitching and P. Parrish. 7456.

CRACKING HYDROCARBONS.—W. Lelgemann. (Dec. 19, '33.) 7585, 7586.

RECOVERY OF SULPHUR-DIOXIDE FROM GASES.—Metallges. A.-G. (Germany, July 20, '34.) 7324.

OILS, manufacture.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, April 25, '34.) 7348.

WASHING HYDROCARBONS and naphthalene out of gases.—Naamlooze Vennootschap Machinerieën-en Apparaten Fabrieken Meaf. (Germany, June 22, '34.) 7285.

RECOVERY OF SULPHUR from sulphurous gases.—National Smelting Co., Ltd., and S. Robson. 7508.

CONCENTRATED GAS LIQUOR, manufacture.—P. Parrish. 7456.

SULPHURIC ACID, production.—P. Parrish. 7559.

SULPHUR IN BENZOLS, elimination.—Soc. des Etablissements Barbet. (France, March 10, '34.) 7185.

DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, Jan. 24.) 7321.

METHACRYLONITRILE, polymerisation.—Triplex Safety Glass Co., Ltd., and J. Wilson. 7853, 7855.

POLYMERISABLE COMPOUND, manufacture.—Triplex Safety Glass Co., Ltd., and J. Wilson. 7854.

New Chemical Trade Marks

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

Opposition to the registration of the following trade marks can be lodged up to April 13, 1935.

Sekurat. 556,110. Class 1. Chemical substances for steeping, colouring and brightening textile fabrics and leather in the course of their manufacture. H. Th. Bohme A.G., 29 Moritzstrasse, Chemnitz, Saxony, Germany. September 27, 1934.

Merolan. 554,677. Class 1. Chemical substances for the treatment of timber against sap stain. British Dyestuffs Corporation, Ltd., Imperial Chemical House, Millbank, London, S.W.1. October 11, 1934.

Sekurat. 556,110. Class 1. Chemical substances, for steeping, colouring and brightening textile fabrics and leather in the course of their manufacture. H. Th. Bohme, A.G., 29 Moritzstrasse, Chemnitz, Saxony, Germany. December 4, 1934.

Perwoll. 557,176. Class 1. Soda for use in manufactures; and anti-corrosives. Henkel & Cie Gesellschaft Mit Besc Rankter Haftung, 67 Heyestrasse, Dusseldorf-Holthausen, Germany. January 16, 1935.

From Week to Week

MR. THOMAS WHARTON, Broadway, Morecambe, formerly of Heckmondwike, late of Alfred Wharton and Sons, Ltd., dyers, Dewsbury, left £30,326 (net personalty £25,234).

A VERDICT of "Accidental death" was returned at Ealing, on March 14, on Charles Julius Gladitz, a research chemist, who had claimed that he could make gold from lava.

AN ISSUE OF SHARES will be made shortly by Messrs. May Roberts (Ireland), Ltd., a company recently incorporated with a capital of £170,000 to take over the Dublin branch of May Roberts and Co., Ltd., wholesale chemists and druggists.

THE SECOND REPORT of the Royal Institute of Science, Bombay (1926-1934) which has just been issued, contains a concise summary of work at the Institute during recent years. Details of the Advisory Committee and the staff are given as well as lists of papers published, approved theses and researches in progress.

NOW THAT the production of sugar in India has greatly increased there is an overproduction of molasses which is causing the industry considerable trouble. Many of the factories have had difficulty in disposing of their production of molasses in any way whatever and this by-product is regarded as unsaleable.

A SETTLEMENT OF THE SALT WORKERS' STRIKE at the works of George Hamlett and Sons, Ltd., was announced on March 19. The settlement provides for the reinstatement of male and female workers who were employed by the firm on January 30 last, including the four men who the strikers alleged were victimised. The employers agreed to pay recognised district rates.

BEAKERS AND FLASKS in highly resistant glass are described in a new price list issued by A. Gallenkamp and Co., Ltd. The best technical knowledge and practical skill available in the English glass industry are applied in the manufacture of this chemical glassware, and the glass meets satisfactorily the most exacting requirements of the laboratory.

A MARKED EXPANSION IN EARNINGS is shown in the 1934 statement of Canadian Industries, Ltd., which is associated with Imperial Chemical Industries, Ltd., and with E. I. Du Pont de Nemours and Co. The net income totals $4,663,750, compared with $3,430,500 for 1933. The company has earned $6.43 per share on the combined "A" and "B" issues, compared with $4.63 in 1933.

NEWCASTLE-ON-TYNE and Gateshead Gas Co. has issued its 1935 Year Book, containing a report of the annual meeting of the company and full statements regarding its sound financial position. The Year Book also reviews the progress made in the use of gas during the year. In addition to special tariffs for gas supplied for industrial purposes, the company has introduced a block system of charging for gas for domestic use, and is considering modifications of the tariff in order to make it still more attractive.

CONSIDERATION IS BEING GIVEN by a group of local industrialists to a plan for the establishment of a casein industry in Tipperary. The Irish Free State Minister for Agriculture, however, has informed the promoters that unless a subsidiary company is formed for the purpose of utilising the casein the industry would be of little value. As far as can be ascertained the group is going ahead with its plans as the surplus milk disposal problem is particularly serious in Tipperary County.

A JOINT MEETING OF THE YORKSHIRE SECTION of the Society of Chemical Industry, the Chemical Engineering Group, with Refractories Association and the Refractories Section of the Ceramic Society will be held in Sheffield on Friday, April 5. Papers to be read include: "Some fundamental principles of Drying" (E. A. Fisher, D.Sc., F.Inst.P., director, Research Association of British Flour Millers); "The promotion of the drying of clay by the coagulating effect of acid" (H. H. Macey, M.Sc., A.R.C.S., D.I.C., F.Inst.P., British Refractories Research Association); "Modern Drying Machinery" (T. J. Horgan, B.Eng., A.R.C.S.I., A.M.I.Chem.E., Edgar Allen and Co., Ltd.).

THE BRITISH STANDARDS INSTITUTION has issued a revision of the British Standard Specification for portable chemical fire extinguishers, No. 138, the original edition of which appeared in 1922. An interesting feature of the new specification is the provision of performance requirements, and the words "materials and constructional strength" which indicated the scope of the first issue have accordingly been deleted in the title of the revision. Other features of the revision include provision for an expansion device to prevent a rising of the solution in the discharge tube by expansion of air, due to rises in temperature of the surrounding atmosphere, the stipulation that the required level of the solution in the container shall be clearly indicated on the exterior of the extinguisher, and a specification of the dynamic charge. The committee responsible for the preparation of this specification is now proceeding with the preparation of two new specifications for portable fire extinguishers of the foam and carbon tetrachloride type and these where completed will form a valuable addition to the present specification. Copies of this revised specification (No. 138—1935) may be obtained from the Publications Department, British Standards Institution, 28 Victoria Street, London, S.W.1, price 2s. 2d., post free.

MR. A. B. SIMPSON has been appointed a director of Barrow, Hepburn and Gale.

THE OFFICES of International Bitumen Emulsions are now at Abbey House, Victoria Street, S.W.1. Telephone: Victoria 6922.

MR. SAMUEL MALCOLM, for many years chemical engineer at the Jarrow Chemical Co.'s works, died on March 18, at his home in Newcastle, aged 92.

THE REGENT HOUSE, CAMBRIDGE, has gratefully accepted the offer of the Committee of the Privy Council for Scientific and Industrial Research to provide about £2,300 for the building and equipment of an extension of the low-temperature research station.

THE JANUARY ISSUE of the Bulletin of the Imperial Institute contains an article on the essential oil industry of Seychelles, reports on recent investigations at the Imperial Institute, accounts of recent researches on Empire products, and notices of recent literature.

FIRE BROKE OUT on March 13, at the Lower Gornal works of Gibbons Bros., Ltd., Dudley, gas engineers. The roof fell in, and Bilston and Stourbridge fire brigades worked for four hours before the fire was subdued. Considerable damage was done to the laboratory.

A MEETING TOOK PLACE on March 11, between representatives of the workers and the management of the North-British Rubber Co., in connection with the dispute at the company's Castle Mills, Edinburgh. About 900 men and women are at present out of work as the result of a decision not to accept the time and bonus system which the management were introducing to certain departments.

A MAN WAS SEVERELY BURNED on the head and arms on March 13, at Shallcross Bros. and Co., Ltd., chemical manufacturers, of Manchester. He was working in the drying chamber on celluloid films which took fire. He was taken to Ancoats Hospital for treatment. The Manchester Fire Brigade had little difficulty in mastering the flames, but the drying chamber was burnt out.

A STRIKE in the Irish chemical fertiliser industry was averted last week, following a conference arranged by the Department for Industry and Commerce. A claim had been put forward by the employees' union for wages increases of 10s. per week and improved conditions. After the conference it was announced that the dispute had been settled on a basis of 2s. per week increases to the men concerned.

AT THE SECOND ANNUAL WORKS SOCIAL of the I.C.I. (General Chemicals, Ltd.), Pilkington-Sullivan Works, Widnes, on March 15, Dr. A. Fleck, the managing director of the General Chemical Group, presented 32 of 34 long-service awards by the directors to commemorate fifty, forty, thirty-five, and twenty-five years' service respectively. Dr. Fleck said that he had seen from the programme that there had been over 600 long-service awards presented to workers from that works.

IT WAS ANNOUNCED at a meeting of the Leyburn (North Yorks) Council, on March 15, that the Express Dairy Co., Ltd., of London, had decided to erect a large factory on a site near Leyburn railway station for manufacturing dried milk and butter. An early start will be made with the erection of the factory and when work is started a considerable number of local workmen are to be engaged. The company is also to erect a large egg-collecting station. It is stated that the company will require 25,000 gallons of water a day.

EDGAR ALLEN AND CO., of Imperial Steel Works, Sheffield, propose to reconstruct. No depreciation has been proided on fixed assets since March, 1931, and, as certain buildings and plant have become redundant, existing book values of these assets are not now justified. Briefly, it is proposed to write down issued £1 ordinary shares to 13s. 4d.; to pay preference dividend in future less tax instead of tax free, and to cancel preference dividend arrears. Ordinary shareholders will be asked to contribute rateably out of their holdings 45,000 13s. 4d. ordinary shares, which, together with 22,500 unissued ordinary shares of 13s. 4d. (to be paid up in full by capitalisation of £15,000 of reserve), will be distributed pro rata amongst preference shareholders.

SIR FRANCIS JOSEPH was nominated on March 13 as the new president of the Federation of British Industries, to succeed Lord Herbert Scott. The decision was made at a London meeting of the Grand Council of the Federation, and the nomination will be confirmed in April. Born in 1870, Sir Francis left school at the age of 12 and commenced work as a railway messenger. In his varied career he has been a traveller, printer, advertising agent, stockbroker and colliery proprietor. He is chairman and managing director of Settle, Speakman and Co., Ltd., colliery proprietors, coal factors and shippers, of Stoke-on-Trent, Liverpool and Queenborough, and chairman of the Mossfield Colliery. He was chairman of the British Committee on Trade Barriers (1927-1932), member of the Overseas Trade Development Council (since 1930) and of the British Government Economic Mission to South Africa in 1930. He was also Assistant Secretary to the Ministry of National Service (1917-1918) and Deputy Director-General of National Labour Supply in 1918.

Company News

Tarmac, Ltd.—The payment is announced of 5 per cent. on the ordinary shares.

British Aluminium Co.—A net profit of £170,192 is reported for the year 1934, compared with £110,850 for 1933. The ordinary dividend is raised from 5 per cent. to 7½ per cent., and the amount carried forward from £52,778 to £55,374.

Salt Union, Ltd.—A profit of £218,983 is reported for 1934. A dividend of 2s. 4d. is announced on the preference shares and 9 per cent. on the ordinary shares. The carry forward is £10,987 compared with £7,004 in the previous year.

Dominion Tar and Chemical Co.—The report for 1934 shows net operating profit $553,630, against $478,517 for 1933, less interest, premium, depreciation, taxes and fees, $617,652 ($770,992), leaving net loss $64,022 ($292,475).

United Turkey Red.—For the year 1934 the report shows a loss of £10,830, against £8,400, plus £6,405 brought in, making debit balance £17,235; transferred from reserve £25,000, leaving credit £7,765 to be carried forward. The directors recommend that interim and final dividends on 4 per cent. first cumulative preference be met by taking £23,295 from first preference reserve. No dividend on 5½ per cent. second cumulative preference or on the ordinary shares is recommended.

Morgan Crucible Co.—A trading profit, after allowing for depreciation, of £336,606 is reported for 1934. To this is added £25,185 interest on investments, etc., and £551 from last account; less directors' fees, £2,750; interest on employees' loan obligations, £2,133; interest on 5 per cent. obligations, £4,442; tax, £85,892; final dividend 10½d. per £1 stock, £73,169, making total ordinary share distribution of £114,981; preference dividends, £70,499; capitalisation of £80,925 5 per cent. obligations to be retained for employment in business, £720 being carried forward.

Cooper, McDougall and Robertson.—Payment of 5 per cent., less tax, is announced on the ordinary shares, making 7½ per cent. for the year ended September 30, 1934.

Herbert Green and Co.—Payment of fractional interest of £2 8s. 11d. per cent., less tax, will be made on April 1 on the 6 per cent. first mortgage debenture stock.

Waxed Papers.—The trading profit for 1934 was £9,977. After deducting £5,330 loss on sale of Glasgow factory, placing £1,000 to reserve and paying 3¾ per cent. preference dividend for 1929, the balance of £5,687 is carried forward.

Thos. Firth and John Brown, Ltd.—In their report for the past year the directors state there was an expansion of 33.8 per cent. in the output in 1934, as compared with 1933. The net profit for the year is £345,030 and after meeting four years' dividend on the preference shares, it is proposed to pay a tax free dividend of 5 per cent. on the ordinary shares, to transfer £50,000 to reserve, and carry forward £42,021.

Minerals Separation.—The profit for 1934 was £34,880 as compared with £33,385 in 1933, to which is added £32,149 brought in, making £67,029. Provision for taxation takes £1,000 and directors' additional remuneration £1,244. A final dividend of 10 per cent. is recommended, making 15 per cent., less tax for the year, leaving to be carried forward, £34,785. Income from royalties was £45,233. Interest, dividends, etc., amounted to £17,704.

Cerebos, Ltd.—Profits for the year to November 30, 1934, have risen by £88,212, to £371,964, after allowing for depreciation. After providing for taxation, etc., the net profit is £283,514, compared with £226,975 for 1933. A dividend of 40 per cent., less tax, is to be paid on the 750,000 ordinary shares, involving £232,500 net. Last year the dividend was 30 per cent., tax free, so that this year's distribution is equal to 31 per cent. on a tax-free basis.

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Further particulars and application forms which must be returned completed not later than Saturday, 13th April, 1935, may be obtained from the Director, Science Museum, South Kensington, London, S.W.7. Envelopes should be marked "Assistant Keeper."