THE Chemical Age

VOL. LXXV 18 AUGUST 1956 No. 1936

Volume LXXV
Number 1936

The Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

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SINGLE COPY 1/3 (BY POST 1/6) ANNUAL SUBSCRIPTION 52/6

West German Competition

WHEN the Suez Canal affair dominates so much thought and emotion—and perhaps more of the latter than the former—trying to capture interest in Western Germany's export trade activity is rather like putting up a lantern slide in the middle of a Cinemascope programme. New problems push the old and familiar aside. What, after all, is this venerable threat to our economic existence when now there are so many threats? Nor is that question a piece of rhetorical inversion. John Citizen, whether plain Mr. or John Citizen, B.Sc., or even MP, might well reflect in 1956 that for generations leader writers, retired ambassadors, and colonels on the reserve, have predicted the direst of calamities ahead, and this minute island has still survived. However, August is customarily the month for flesh-creeping soothsaying—perhaps experts in prognostication feel that holiday-makers enjoy XYZ-on-Sea all the more if they feel it is their last holiday of all.

Until recently, it has been difficult to judge the advancement of Germany's export trading. Whether measured in volume or value, yearly percentage increases in sales have been naturally large, for in the earlier post-war years a war-shattered industry could put up only a token performance. The reality of Western Germany's export selling since 1945 hardly commences until 1953. If we take the 1953-55 period, we find that her exports have expanded by 40 per cent *in volume* (which is a better measure than by value) and her share in the world trade of manufactured goods has risen from 13.3 to 15.6 per cent (THE CHEMICAL AGE, 4 August). These are not changes to be glossed over as signs of recovery from Germany's lowest ebb. They are changes following recovery; products of a new industrial virility.

Germany's increased share of world trade is not being secured at UK expense in isolated particular—all exporting countries except Japan and Canada have suffered. Nevertheless, there is evidence that UK export trade is being affected more than most. In 1950 our share of world trade in manufactures was 25.5 per cent; by 1955 it had fallen to 19.8 per cent. A good deal of this decline may be attributed to our own circumstances rather than to the influence of German competition. Of the 5.7 drop in percentage, the fall between 1950 and 1951 was 3.5. So, from 1951 to 1955, the decline has been more gradual—from 22 to 19.8 per cent of world trade—and it is during that period that German competition was a powerful factor.

Without seeking to encourage attitudes of complacency, there is one important reason why in the 1950s Western Germany has been able to improve exports more emphatically than Britain. Germany has never been a big textile producer or exporter—her share in world trade has recently ranged round about the 5-8 per cent level, whereas the UK share exceeds 20 per cent. There has been a sharp and general textile depression followed by intense competition between the main textile producing countries.

British exports have fallen in value and world share. There has been no comparable change in Germany's smaller textile trade. Indeed, based to a greater extent upon synthetic fibres, this has risen in 1953-55 by 39 per cent in value, and from 1950-55 by over 200 per cent in value. There may be a moral to be drawn from the sidelines: That when the textiles trade is difficult, modern synthetic fibres, though more expensive than most of the naturals, can still expand their sales.

Most common talking-point whenever the fortunes of British exports are discussed is cost of labour. Is it a fact that our labour costs are too high by comparison with those of other countries? Too often, this argument can become, without realisation, no more than a comparison of average standards of living. However, there is no easy comfort in any Anglo-German comparison on this matter. To quote a recent Board of Trade survey, 'Weekly earnings have advanced faster than output in the United Kingdom, while in Germany output per man has advanced faster than earnings. . . While labour costs per unit of output moved little and probably fell in Germany over the two years (1953-55) United Kingdom costs rose significantly.' Indeed, this survey goes further in precision and says that in 1953-55 output per man in Germany increased by twice as much as it did here. Here is a fundamental difference that cannot be covered with varnished whys and wherefores, and one that must be reflected in export prices. At the same time, there seems to have been little change since 1953 in relative costs of fuel and raw materials; some are a little cheaper in Germany, others a little dearer—but the overall picture is one of close similarity, with any advantage, which at best is only slight, enjoyed by the UK. As this other major factor in manufacturing costs is so little different, the apparently enlarging German advantage in labour costs has no ready answer. Except, of course, the obvious answer—reduction in our labour costs. But who would dare to call this simple?

In past years we have occasionally commented on this subject, usually with particular reference to competition in chemicals. Hitherto, we have been able to conclude that although the great German chemical industry was rapidly recovering, our own increased share in world trade was little affected. Certainly fears in the late 1940s that Germany would quickly recapture chemical trade gained by the UK could be readily disposed of by facts. It is no longer quite so easy to maintain this assessment. These figures, from the same Board of Trade survey, may be cited:

WORLD TRADE IN CHEMICALS

(*percentage shares*)

	1951	1953	1955
Germany	13.5	16.4	17.4
UK	17.3	17.1	16.7

Because world demand for chemicals is steadily expanding, we can perhaps be too easily complacent about our own export effort in this field. Our 16.7 per cent share of world trade represents in absolute terms, whether by volume or value, appreciably more than our 17.3 or 17.1 per cent share earlier in the 1950s. We can, without wishful thinking, dismiss, as inevitable facts, Western Germany's rise in world share from 1951-53 —a rise of nearly three percentage points —as results of recovery. We cannot similarly dismiss the rise from 16.4 per cent in 1953 to 17.4 per cent in 1955. That indeed does represent competitive expansion. During the same period our share has dropped by four tenths of a percentage point. A small amount certainly, but is it a sign of further falls to come, the start of a descending graph-line? This sentence, referring to UK trade in 1956, from another Board of Trade source is not irrelevant: 'Exports of chemicals which rose strongly up to the end of 1955 now appear to have levelled off, but in the first half of this year they were 10 per cent more than a year ago.' The rise in chemical export figures in the second half of 1955 put the total figures for the year into much better perspective, as is well known. Is this 10 per cent (incidentally a value measure) improvement in 1956 over the first half of 1955 enough to make 1956 in the end a better year? This seems doubtful. If so, our 1956 share of world chemical trade will fall below 16.7 per cent. But will Germany's rise above 17.4 per cent? These are matters for very sober reflection.

NEWS BRIEFS

Tred Symposium

Technical and commercial aspects of Monsanto Chemicals' styrene-butadiene co-polymers Tred 50 and Tred 85 will be discussed at a symposium to be held at Fulmer Hall near Bucks on 11, 12 and 13 September. Dr. V. McG. Morgan will open the symposium and Mr. M. W. Waugh will deal with the marketing aspects of Tred. Technical aspects of Tred will be considered by Mr. K. R. Taylor and the film 'The World that Nature Forgot' will be shown. Tred is at present available on pilot plant scale; large-scale production is planned to begin in a few months at Monsanto's Newport (Mon) works.

Parke, Davis Accident

Three research workers were injured and taken to hospital on Wednesday 8 August after an explosion in the laboratory of Parke, Davis & Co. Ltd., Hounslow, Middlesex. The explosion occurred in a laboratory where vacuum distillation of a new pain-killing drug was taking place. The research workers were: Dr. B. N. Feitelson Mr. T. Goodburn and Mr. A. D. Reynolds. Three staff firemen were also detained in hospital.

Trade with Egypt

The Board of Trade have contacted all subscribers to its special register information service regarding the effect of the current financial restrictions on United Kingdom Trade with Egypt. The traders are advised that payment is not being made out of blocked Egyptian sterling accounts for goods exported to Egypt, except for goods delivered or shipped on or before 27 July and for goods in respect of which confirmed bankers credits had been established on or before that date. The Board state that there is no prohibition of exports to Egypt other than of arms and warlike material, though export licences continue to be required for certain specified goods.

Harrogate Conference Plans

Delegates to the eleventh national conference of the British Institute of Management and the Institute of Industrial Administration, to be held at Harrogate from 31 October-2 November, will devote much of their time to three main topics. These will be: management, profits and living standards. An opening address is to be given by Dr. the Rt. Hon. Charles Hill, PC. MP, Postmaster-General, and he plans to outline the general approach to be adopted towards the three topics—which, in fact, constitute the official theme of the conference.

NW Fuel Luncheon Club

The 1956-57 session of the North Western Fuel Luncheon Club will be opened on 26 September by Mr. David Renton, Q.C., M.P., Parliamentary Secretary to the Minister of Fuel and Power. The second meeting will be on 31 October, at which the presidential address will be delivered and the annual general meeting held.

Atomic Energy Department

An atomic energy department has been formed by Babcock & Wilcox, and will become operative from 2 October. The department will be responsible for development, proposition and contract engineering in the atomic field and will operate in close collaboration with the existing sales, engineering, commercial and manufacturing departments of the company.

New Electronic Company

A new company, Fireye Controls, has recently been formed to manufacture and sell electronic controls for power and industry. One of its principal lines will be the Fireye flame failure detection apparatus. The company's works will be at Beddington Farm Road, Croydon, Surrey.

Hydrofluoric Acid Plant

Plans to build Canada's first liquid hydrofluoric acid plant have been made by the Nichols Chemical Co., which is affiliated to the Allied Chemical and Dye Corp. of the United States. Construction will be carried out at the company's Valleyfield, Quebec, works. At present all hydrofluoric acid sold in Canada is imported from the United States and Europe.

Titanium Prices Fixed

Laporte Titanium Ltd. announced this week that, subject to national or international influences, the selling prices of any of the company's manufacturers in the home market would not be increased before 31 March 1957 or thereafter, as far as might be practicable. A similar announcement has been made by Laporte Chemicals Ltd. governing the stabilisation of prices of hydrogen peroxide, sodium perborate and all other peroxygen compounds, barium compounds, sodium sulphide and industrial detergents.

Dr. Herbert Levinstein

SIR JOHN BENN writes:—I shall always remember the encouragement I received as a young reporter on THE CHEMICAL AGE from Dr. Herbert Levinstein, whose death was briefly reported in these pages last week. I had been sent to Leeds to cover the annual meeting of the Society of Chemical Industry in 1925, when the presidential address by Mr. W. J. U. Woolcock gave a world survey of the dyestuffs industry. I vividly recall Dr. Levinstein's enthusiasm in talking to me about the development of this industry in which he had played an outstanding part as technical director of the British Dyestuffs Corporation. But what made our conversation memorable were his charm and kindness, which were shown on the many occasions when we met again during the next 30 years.

H. Levinstein

Perhaps the combination of Rugby and Manchester University helped to make Dr. Levinstein so completely at ease, whether on an academic occasion or at a business gathering. For his engaging manner went with technical knowledge which gained immediate attention and respect in any company.

Member of Peace Delegation

As a practical chemist and manufacturer his experiments with industrial dyes were put to the national advantage in World War I when supplies from Germany were suspended. He also actively assisted the Government in measures to counter the threat of chemical warfare, and was a member of the British delegation to the Peace Conference in Paris in 1919. Dr. Levinstein became a leading figure in learned and professional circles and, as already noted in the obituary in THE CHEMICAL AGE, he was elected president of the leading chemical societies in the course of his long career.

As Prime Warden of the Dyers' Company he was able to use his gifts in yet another field, and several times he used his kindly influence to obtain grants for the John Benn Boys' Hostel in Stepney. It was at his instigation that the Dyers' Company helped to repair the swimming bath after the war, and several members of the Court visited the hostel with Dr. Levinstein in this connection. With Mrs. Levinstein, my old friend was a regular attendant at our annual hostel dinners.

His many friends and admirers will join me in expressing deepest sympathy to his widow, who supported him in all his activities.

Leather Chemists Societies

THE NEXT biennial meeting of the International Union of Leather Chemists Societies will be held in Rome, Italy, from 15 September to 19 September 1957, under the auspices of the Italian Leather Chemists' Association. An official reception will be held on the Sunday evening.

Conference will open on Monday morning, 16 September, with various addresses and lectures. Tuesday, 17 September; all-day session on the manufacture of leather. Wednesday 18 September; sightseeing in Rome. Thursday, 19 September; presentation of scientific papers, followed by the official banquet.

Members of member-societies of the International Union are reminded that papers for selection by the executive committee, accompanied by a short summary, should be forwarded to Mr. A. Harvey, International Union of Leather Chemists Societies, 'Craigieburn', Duppas Hill Road, Waddon, Croydon.

Chemical Industry Expenditure

CHANGES in revised forecast expenditure in 1956 compared with forecast expenditure in 1955 for the chemical and allied trades, are given in the *Board of Trade Journal* of 4 August. There is now an increase of 31 per cent over 1955 estimates.

For manufacturing industry as a whole expenditure during the first quarter of 1956 was 27 per cent higher than in the first quater of 1955, but 12 per cent lower than in the fourth quarter of 1955. Compared with the first quarter of 1955, expenditure on plant and machinery was up by 23 per cent and on building work by 47 per cent. Expenditure in the chemical and allied trades was more than one-half as high again as in the first quarter of 1955.

NOTE & COMMENT

AUTOMATION IN PERSPECTIVE, is the title of a survey published in *The Economist* of 28 July. 'Chemical plants,' states the survey, 'where the product is usually a liquid or gas, are most readily operated by automatic controls.' Prior to automation (in the widest sense of the word), in a simple process, the operator would check the temperature and decide whether to adjust the rate of liquid flow into the reaction vessel. Now, rate of input may be automatically modified whenever the temperature in the vessel reaches a preset level.

Chemical process industries were among the first where mechanical devices were employed to link a sequence of industrial operations into a continuous process. This was mainly because the nature of the materials concerned made manhandling difficult or dangerous. Now, in the newer, continuous processes, particularly the processing of radio-active materials, condition of the materials at any one stage has become critically important.

Electrical control systems are, therefore, coming to the fore. However, most units of modern continuous chemical processes are certain to be gauged and readjusted pneumatically or hydraulically, while electronic control is used comparatively seldom. Among the advantages claimed for the latter system is the powerful and instantaneous response obtained, although the various parts of the equipment may be located at a distance from each other. By building up automatic control installations from automatic controlling elements, transmitters, receivers and relays, the most complex functions can readily be performed.

It is not felt that 'all chemical plant designers quite grasp the possibilities, for example, in speed of operation, that the degree of automatic control now practicable may offer them,' states the survey. 'There appears to be no technological barrier to further extension of the use of feed-back controls.'

Theoretically control systems for a whole plant, with a master controller controlling all variables and resetting other controllers to effect optimum conditions throughout, are possible. In practice, few seem to be operating.

Turning to less specific references, the survey draws attention to a feature of industry today, namely the increasing number of laboratories being used (for 24 hours a day) to check and control factory processes, from raw material through various intermediate stages to the finished product. It is in this field that automation offers widest possibilities. The tedious and time-consuming work of routine analysis can be taken over from scientists and technicians and continuous operation effected. Moreover, there is no question of fatigue, so that the results obtained have a uniform degree of accuracy.

But the problem of maintaining that accuracy over long periods and securing against breakdown is still a real one. Also control equipment is costly and this, together with the lack of engineers and technicians, is unfortunately limiting the rate of installation of control systems.

Suez – and Beyond

ACTION by the Egyptian government to 'nationalise' the Suez Canal administration has not, as yet, affected supplies of oil and other commodities imported by the canal route. If, however, shipping is delayed or stopped for any length of time, the chemical and allied industries in this country could be seriously affected. An alternative route, involving greater distances or possibly extra handling of cargoes, could result in shortages and higher prices of basic materials and, consequently, of finished products. Our export trade, particularly to the Far East, could also be disturbed. The firm line adopted by the Government is to be welcomed. Actions speak louder than words, while the conference now in session in London should suit those who favour words before actions. Britain is possibly more dependent on the Suez canal than any of the Western nations and therefore more vulnerable to the

actions of any political adventurer who might try to 'control' the waterway. Britain's interests, to say nothing of those of Australia, New Zealand and other Commonwealth territories, must be safeguarded and the Suez canal put under some form of administration not subject to the tender mercies of pressure groups. In the flare-up over Suez Britain's dependence on Middle East oil supplies is, of course, in the forefront.

By the Sea

A COUPLE of items having marine topicality for many readers at the present time—who are, we hope, getting sunshine as well as rest at one spot or another on the coast—deal with oysters and pebbles. Re oysters, it is often required in biological research that these sea inhabitants shall be marked, and one of the practical problems has been to find some way of durably marking them to withstand salt water. US workers have reported most favourably (*Nature*, 1956, **178**, 273) on a new adhesive that enables labels to remain intact for eight months. Two coats have to be applied, one before the paper label is put into position and one above it; and the second dressing fully protects any pencil-markings made upon the label. The chemical nature of the adhesive is not stated, but its name is 3M EC-1341, and was provided by the Minnesota Mining & Manufacturing Co. Not perhaps a sweeping advance in science to comment upon, but there may be many different reasons why living or dead objects that are immersed in salt-water have to be labelled—and the well-known 3M organisation seems to have the answer.

The other seaside item—also described by research workers in *Nature* (1956, **178**, 257)—deals with the drift of sea-bed pebbles. Radio-isotope barium-140 was used to 'label' pebbles off Scolt Head island on the Norfolk coast earlier this summer. The short half-life of Ba-140, 12 days, and its emission of beta-rays and low-energy gamma-rays, made it suitable for this type of investigation; a more powerful and longer-lasting radio-isotope might carry health hazards. After labelled pebbles were dumped from a boat, their subsequent positions were located by drawing over the sea-bed a Geiger-counting instrument, encased in brass and mounted on a heavy metal sledge. It was shown that even in ordinary weather, free from storms, though with a few squalls, pebbles move along the sea bed. The greatest movement traced was one of 450 ft. in just under six weeks; movements in the order of 200 ft. in about four weeks were more typical. It should be added that the experimental pebbles were large—all rounded and about two inches in diameter; the movement of smaller pebbles would perhaps be less surprising. This kind of knowledge is of interest to geographers and geologists—and chemists on holiday will be more concerned with the motion of pebbles that strike uncovered toes or insert themselves between sock and shoe. Nevertheless, it seems an interesting application of the radio-labelling technique. It may be easy enough to label or mark pebbles, but by what other method could they easily be found a few weeks later?

British Oxygen's New Plant

THE BRITISH Oxygen Company has established a new Northern Ireland headquarters, costing £500,000, at Castlereagh, Belfast. A modern factory and administration offices have been built on a six-acre site on the industrial estate at Prince Regent's Road.

The factory's entire production of oxygen-acetylene, nitrogen, compressed air and medical gases is being used in Northern Ireland. Liquid oxygen, which was formerly manufactured at Glasgow and shipped to Northern Ireland, is now being produced in the new factory.

Plans are being made to mark the establishment of the headquarters with an open-week in September, when customers will be invited to see machines, using gases manufactured by the company, in operation.

Coke Oven Development

Orders to the value of nearly £4 million have been received from Stewarts & Lloyds Ltd. by the Woodall-Duckham Construction Co. Ltd. in connection with the Corby coke oven development scheme. A complete new coke oven installation comprising 50 ovens, coal-blending and handling plant, by-product plant, and coke-screening and distribution plant, will be built. Work on the first stage of this project will begin shortly.

PEOPLE in the NEWS

● MR. WILLIAM F. WATKINS has been named assistant manager of government services for the plant food, insecticides, and industrial chemicals divisions of Olin Mathieson Chemical Corp, it was announced by MR. G. P. VINCENT, manager of government services, recently. Mr. Watkins will work in the corporation's Washington, DC, office. Mr. Watkins joined Olin Mathieson in 1953 as an agronomist in the plant food division. For the previous five years he has been chief of the fertiliser, seeds and pesticides branch of the food and agriculture division of the International Co-operation Administration. During this time, Mr. Watkins also served in Paris as fertiliser consultant to the ICA.

● DR. W. J. WORBOYS, commercial director of Imperial Chemical Industries Ltd., has been re-appointed chairman of the Council of Industrial Design.

● Three members of the staff of the Centre d'Etudes pour les Applications des l'Energie Nucleaire, of Mol, Belgium, have temporarily joined the staff of Nuclear Development Corp. of White Plains, NY, US. They are HENRIE DOPCHIE, JACQUES PLANQUART and FRANCOIS VAN GEERTRUYDEN. The Belgians are assigned to duty in connection with Belgium's engineering test reactor, now in the early stages of design. It is claimed that it will be one of the world's most advanced reactors.

● Four appointments of research chemists to the staff of the FMC Chemicals Central Research Laboratory, now being completed at Princeton, New Jersey, US, were announced recently. DR. GINO R. TREVES, who holds a D.Sc. degree from Turin (Italy) and a M.S. degree from Cornell University, joins the organic chemistry department. MR. JOHN A. GANNON joins the polymerisation section of the plastics and polymers department. Mr. Gannon received his B.S. and M.S. degree in organic chemistry at Boston College. Following seven years in the research department of the Thiokol Chemical Corporation, he was with National Starch Products before joining FMC. MR. MURRAY H. REICH will also be in the polymerisation section of the plastics and polymers department. He gained his B.S. in chemical engineering from the City College of New York and his M.S. in chemistry from the University of Akron. Since 1947 Mr. Reich has been with the Government laboratories of the University of Akron working in synthetic rubber research. MR. CHARLES DETHAN joins the polymer evaluation section of the plastics and polymer department. He is a graduate of the Royal Hungarian Technical Institute in Budapest, and has his M.S. degree in physical chemistry from Louisiana State University.

● The first annual University scholarship awarded by Thomas Hedley & Co. Ltd. (see THE CHEMICAL AGE, 26 May, 1173) has been won by MR. H. P. MARTIN, a draughtsman in the drawing office of the company's engineering division. Mr. Martin, who is 28, joined Hedley in January 1955, and has acted as site engineer at the company's buildings at both Manchester and Newcastle. The scholarship is tenable at King's College, Newcastle, in the University of Durham.

● MR. F. W. MARTIN has been appointed deputy chairman of Tube Products, the Tube Investments subsidiary which specialises in the manufacture of ERW tubes. He has been succeeded as joint managing director of Tube Products by MR. E. D. E. ANDREWES.

● MR. DAVID A. KRESSIN has been appointed European sales representative of Eastman Chemical Products Inc., a subsidiary of Eastman Kodak Co., in The Hague, Netherlands, where the company opened a sales headquarters on 15 August. Mr. Kressin has been in charge of chemical sales in the company's Cincinnati office since it was opened early in 1954.

Mr. D. A. Kressin

People in the News

● Following the recent expansion and reorganisation of Comploflex Co. Ltd. the following appointments have been made. MR. S. POLKINGTON, general sales manager, is appointed general commercial manager, with direct responsibility for both home and export sales. MR. J. PICKTHALL, formerly Northern sales manager, is promoted to home sales manager and will be assisted by two newly appointed assistant sales managers—MR. C. V. HADLEY, in charge of the liquids handling side, and MR. H. J. BERGIN, non-liquids handling. The newly formed export department is to be under the direction of MR. A. R. DAVIES, and MR. R. A. USHER is promoted to the newly created post of service manager.

● MR. G. N. F. WINGATE, who has been appointed director and general manager of Distington Engineering Co. Ltd., from 1 August, has for the last five years been at Steel, Peech & Tozer, Rotherham branch of the United Steel Companies Ltd., where he has been works manager (services).

● MR. J. H. PATCHETT who joined Dorman Long & Co. Ltd., Middlesbrough, 37 years ago as an assistant blastfurnace manager, has been appointed a director of the firm. Mr. Patchett at present is superintendent of production at the company's iron and steel works.

● MR. NORMAN F. CHAPPELL has been appointed purchasing agent for St. Maurice Chemicals Ltd. and for its subsidiary McArthur Chemical Co. Mr. Chappell was purchasing agent for Merck & Co. Ltd., Montreal, before joining St. Maurice Chemicals.

● MR. ROBERT W. SCHRAM has joined Union Carbide Development Co., a division of Union Carbide & Carbon Corporation, where he will be concerned with long-term corporate planning and evaluation of new business opportunities.

● MR. CHARLES COOPER, M.Sc., M.Inst. Gas E., M.Inst.Chem.E., joint managing director and head of the gas and chemical engineering division of W. C. Holmes & Co. Ltd., of Huddersfield, retired in July after 38 years' service with the company. He will, however, retain his association with the company as technical consultant. Mr. Cooper is also a director of BHD Engineers Ltd., a holding company in which W. C. Holmes & Co. Ltd., is one of the principal members. A native of Ashton under-Lyne, Mr. Cooper graduated at Manchester University in 1910, and obtained M.Sc. by thesis in 1911. Then followed two years in a teaching and research post at the Royal Technical Institute at Salford, and five years as chief chemist to a firm of tar distillers and acid manufacturers. Mr. Cooper has been succeeded as head of the gas and chemical engineering division by MR. R. J. S. THOMPSON, B.Sc., F.R.I.C., M.Inst.Gas E.

● MR. CYRIL S. DINGLEY, executive director of British Industrial Plastics Ltd., has completed 50 years' service with the firm. He started in 1906 as a works chemist when the BIP was known as British Cyanides Co. Ltd. Mr. Dingley is also a director of Messrs. Streetly Manufacturing Co., and BIP (Tools) Ltd., and sales director of BIP (Chemicals) Ltd. He was one of the founders of the Plastics Institute and chairman in 1937; he was chairman of the British Plastics Federation from 1952 to 1954. After World War I he was engaged in an investigation of supplies of potash from blast furnace gas, and for a short time was works manager of the British Potash Co. He became concerned in plastics from 1924 onwards when the British Cyanides Co. began making synthetic resin and moulding powders.

● MR. W. A. DICKIE and MR. C. H. COLTON have been appointed additional managing directors of British Celanese.

● The Smithson Research Fund Committee of the Royal Society and the University of Cambridge has awarded the Smithson Research Fellowship to DR. ANITA I. BAILEY of Newnham College, Cambridge. Dr. Bailey, who is a graduate of the University of Witwatersrand, South Africa, is to carry out an investigation on the surface energy of some solid materials and of the variations in this quantity which may occur when physical conditions are varied. The research is to be done at the Department of Physical Chemistry, Cambridge University.

● MR. JOHN B. BRUNDRETT and MR. KENNETH J. ELLAM have been appointed directors of the United Indigo and Chemical Co. Ltd.

by H. W. Cremer C.B.E., M.Sc.,
and
G. Brearley B.Sc.

Plant Construction With Non-Metals as Materials

PRIMARY purpose of this paper is to provide a composite picture of the present wider availability of non-metallic constructional materials in chemical engineering, rather than to attempt to classify the various types as regards their specific uses.

The classic distinction between metals and non-metals is nowadays of no consequence so far as the fabrication of chemical plant is concerned. It would be unfortunate if a distinction convenient and appropriate to the pure scientist, should bestow a legacy upon the applied scientist giving an impression that there is conflict between the two types of material.

In the past fundamental concepts of matter in the solid state were either imperfectly developed or non-existent. Metals or non-metals were selected as being appropriate to a particular process without the thought now devoted to why one type of constructional material should prove more suitable than another.

During the early days manufacturers, to a large extent, had to employ non-metallic materials of construction because the metals and alloys then available were unsuitable for the purposes required. Thus, sulphuric acid was made in England in glass globes in the early eighteenth century. A further decade passed before larger lead chambers took their place.

Stoneware Drainpipes

A century ago, hydrochloric acid was manufactured in stoneware drainpipes. It was to the non-metallic materials that the pioneers instinctively looked for corrosion resistance when scaling up from laboratory experiments to manufacturing units.

Such were the limitations in quality, mechanical strength, size and shape of non-metallic materials that manufacturers welcomed the advent of stainless steels in the twentieth century despite some early disappointments in their use in fabricated form in the chemical industry. During the first quarter of this century the tendency was to turn from the employment of a non-metallic material of construction. A clear-cut division still existed between metals and non-metals in the minds of plant constructors, although this point of view was based on different considerations from those of the pure chemist. However, the anxieties facing plant designers and fabricators have been eased considerably by modern developments in both fields.

For a time progress in physical and process metallurgy was more spectacular but it was accompanied by equally significant advances in the production of improved types of non-metallic construction materials. No conflict exists between these basically differing types of material—the metal and the non-metal. They are complementary in the modern chemical industry, and advances in both directions do not render old or new materials in either field obsolete. The result is a 'new look' to chemical plant. Non-metal is used conjointly with metal. This represents one of the great advances in modern plant construction.

Demands on Plant Constructors

Progress in modern chemical synthetic methods makes great demands on plant fabricators, but it is notable that while demanding a wide variety of constructional materials, the industry largely satisfies its needs through its own discoveries. For example, the production of the first synthetic resin, almost 50 years ago, benefited the plant designer as well as the public.

With the development of new or improved materials have come improvements, and developments, in their methods of fabrication and application which are just as important. Improvements and developments in older types of non-metallic material, glass, rubber, stoneware etc., possibly inspired by the competition of newer materials, should not be overlooked. The production of bricks and tiles to finer tolerances; the production of improved cements and bonding materials; the spray-gun application of linings; the reinforcement of plastic materials as laminates; the ever increasing size of glass equipment; the greater capacity of enamelling muffle furnaces have all played their part in the wider current use of non-metals in chemical plant construction.

Summary of lecture delivered at the 75th annual meeting of the Society of Chemical Industry in July.

Plant Construction

The authors have frequently debated the question 'What should be included in the term "constructional materials" as applied to modern chemical plant?' Hitherto, the term 'chemical plant' has tended to be limited to an appliance that is essentially a 'container', with auxiliary connections and controlling devices for the physical or chemical operation required to be carried on within it. A wider conception of 'chemical plant' should be generally accepted because of the increasing use of non-metallic materials *within* the plant as opposed to their uses, with or instead of metallic materials, in constructing the vessel which contains them. In future plants this point may be important; non-metallic materials will acquire greater significance in plant design if this wider conception is justified.

Turn of the Circle

For example, it is generally accepted that tower packing may be regarded as a conventional constructional material in a chemical plant, but when ion exchange resins are used in bulk for a much wider variety of purposes than at present (and there is every indication of this happening in the future), is there not sufficient justification for regarding them as constructional materials equally with the material of which the mere outer shell containing them is fabricated? It is a moot point admittedly, but it is one to which more than passing notice may have to be given in the future. Increasing attention must be given to the conservation of our essential materials, particularly metals, and to their recovery from ores and residues formerly considered to be too lean to permit economic separation. Future possibilities of the use of ion exchange processes in this direction suggest that the turn of the circle is nearing completion. Non-metals are now to be used to renew supplies of the metals which formerly tended to displace them.

Another point is the increased use of non-metallic protective coatings to prevent the pick-up of traces of metals or the slight discoloration of chemicals and materials made to ever increasing standards of purity.

Briefly, non-metals are used as plant construction materials in the following ways:— (1) Alone, e.g., glass, wood, carbon, concrete; (2) as resistant coatings or surface treatments, e.g. enamelled cast iron, glass lined steel, synthetic resin or rubber lined steel, glazed bricks and painted, varnished or lacquered surfaces; (3) as composite materials, e.g. synthetic resin laminates; (4) as ancillaries, e.g. gaskets, cements for jointing materials (5) as items of plant other than for containing, conveying etc. the process materials, e.g. tower fillings, catalyst supports, ion exchangers porous filters, and diffusers.

The physical characteristics which determine the choice of constructional materials include:— (1) Resistance to chemical attack; (2) limitations as to size, shape and workability; (3) stability to pressure, vacuum and mechanical stress; (4) resistance to temperature changes; (5) heat transfer properties; (6) weight/strength ratio; (7) ease of cleaning or sterilising; (8) electrical properties; (9) ability to be fabricated *in situ;* (10) pliability; (11) transparency; and (12) inflammability.

Other general considerations which determine choice include: (1) Cost; (2) ability to be repaired and readily maintained; (3) ability to be modified in shape or size or to permit the accommodation of ancillary fittings.

Obviously no single non-metallic material possesses all or even a majority of the above physical characteristics, nor is any one of them sufficiently versatile to be suitable for use in all the forms listed. The same may of course be said of the metals and their alloys. Nevertheless, there is today a large assortment to choose from and by using one in conjunction with another or in conjunction with a metallic material, usually acting as a support, most current needs of the plant designer and fabricator can be met.

Extended Range of Non-Metals

Several factors have been responsible for the extended range of non-metallic materials. Shortages from two world wars increased the search for alternatives or synthetic substitutes. In some cases, e.g. rubber, the synthetic material was found to possess certain desirable properties absent in the natural product. In the case of wood widely used for storage vats and for reaction vats, replacements were in some cases found by the use of enamelled iron, glass, rubber, tile or plastic lined steel or concrete tanks and vessels made from laminated plastics.

An important factor was the discovery of synthetic materials, the most spectacular of which were synthetic plastics.

Although production of products of this type in the UK is now about 300,000 tons per

Anhydrous Ammonia Plant

THE CHAIRMAN of the board of Dominion Foundries & Steel Ltd., of Hamilton, Ontario, Mr. F. A. Sherman, has confirmed that his firm has signed an agreement with North American Cyanamid Ltd., Niagara Falls, Ontario, and that North American Cyanamid is proceeding with its engineering studies for an anhydrous ammonia manufacturing plant to occupy approximately 10 acres adjacent to Dofasco's blast furnaces and by-product coke ovens.

Dofasco has as by-products the two components necessary for the manufacture of ammonia-hydrogen contained in coke-oven gas and nitrogen. Coke-oven gas, the main by-product from making coke, necessary for the operation of a blast furnace, is used for processing and heating in Dofasco's main plant but, with additional coke ovens now in operation, this gas will be stripped of its hydrogen content on the way to the main plant. In making pure oxygen for Dofasco's oxygen steel-making process, nitrogen is obtained. Some will now be recovered for making ammonia.

It is not hard to visualise the advantages that would accrue from locating an anhydrous ammonia plant close to the source of all its raw materials.

Laboratory Ware Prices

THE British Laboratory Ware Association announced last week that at a meeting on 10 July its members unanimously passed the following resolution:—

'Resolved that with a view to effectuating the Government policy of price stability all members will as from 1 September next, agree to maintain for a period of six months their own existing prices for laboratory apparatus both in the UK and overseas. And that all members of the BLWA and all the principal manufacturers of proprietary brands of laboratory apparatus, be sent a copy of this resolution and urged to co-operate with the Association by confirming their support of the resolution.'

Electro-Finishing Factory

NOW nearing completion at the Abbey Works, Margam, are the premises of Margam Electro-Finishes Ltd. a development of the Steel Co. of South Wales.

The plant, described as a factory within a factory, is said to be the most up to date of its kind in the world. It is designed to coat sheet steel electrolytically with zinc and phosphate, providing protection against rust and other corrosion.

Plant Construction

annum and output has approximately doubled over the past five years, their use in chemical plant fabrication has not increased in proportion. The lining of vessels with phenolic resin is well established despite its lack of resistance to strong alkalis. Vessels made from phenolic and furane resins incorporating powdered or fibrous fillers have also been in use for many years. Larger vessels made from cast or laminated sheets bolted and flanged are also being increasingly used.

Polythene sheet has been adapted for use as a chemically resistant lining and polythene tubing, which permits the use of long lengths without joints and is resistant both internally and externally to chemical attack, is finding extended application in chemical plants. It is proving an excellent material for effluent drains which can be of all welded construction of large diameter.

Unplasticised polyvinyl chloride which, in addition to being resistant to corrosion is heat resistant and non-inflammable, is being used in increasing quantities for fans and ducts for handling corrosive vapours as well as for conveyor belting. Glass reinforced epoxide resins are also used for the fabrication of piping and smaller vessels.

Few of these polymers, whether linear or cross-linked can be used continuously at temperatures in excess of 250°C. It is hoped that future progress will be in the production of derivatives able to withstand higher temperatures. Progress is already being made in this direction and some fluorine derivatives such as p.t.f.e. have proved exceptional.

Products of the glass industry, the ceramic industry and the carbon products industry have also been used in plant construction.

The production of these new and improved non-metallic materials of construction during the last decade has been accompanied by the accumulation of a large amount of knowledge on their basic structures and valuable experience in their application.

This holds out the real hope that the new industrial tools which will be called for in the future will be forthcoming.

From all Quarters

Yugoslavian Projects

Russia is to begin immediately construction work on a nitrogen fertiliser factory at Pancevo, near Belgrade, Yugoslavia, the annual capacity of which will be 360,000 tons of fertiliser. A superphosphate works is also to be built in South East Serbia at Kosovska Mitrovica which would include a sulphuric acid plant of 120,000 tons a year capacity, the total output of superphosphate being 250,000 tons a year.

Low Pressure Polythene

Staatsmijnen in Limberg, who hold an exclusive licence for the Benelux countries on the Ziegler polythene process, is building a low pressure polythene plant at one of its coke oven sites at Emma in Beek. The plant, the capacity of which is not announced, is expected to come on stream next year.

Synthetic Detergents

Synthetic detergents are being produced by an American company at Caracas, Venezuela, and as a result, imports of synthetic detergents are barely 12 per cent of 1951 imports. Demand continues to increase and it is reported that a second production unit is shortly to be constructed at Valencia. Development of synthetic detergent manufacture in Venezuela has made severe inroads into soap markets and production of soap in 1955 was only 14,000 tons compared with 20,000 tons in 1948.

To Manufacture Heavy Water

Czechoslovakia's Ministry for the Chemical Industry has announced that heavy water is to be produced in Czechoslovakia, for use as a moderator in the first atomic power station, the building of which is to commence in 1957 and is expected to be completed in 1960.

Methanol Plant

Part of India's reparations following World War II included a methanol plant removed from BASF, Ludwigshafen. This plant, which was dismantled for transportation, has lain idle at Sindri for some years but is now being erected and commissioned by Russian engineers and technicians.

Modern Equipment Installed

Modern equipment has been installed at the Consolidated Refineries, Haifa, which will increase by 20 per cent the supply of gases to the nearby plant of Fertilizers and Chemicals. This will enable the company to expand its production of fertilisers.

Argentina's Chemical Imports

The Argentine Central Bank has just issued circulars, Nos. 2535, 2538, 2549 and 2550 which state that automatic exchange permits will be granted for various imports from the Sterling area and other sources. The imports listed are mainly chemical.

Oil from China

There are indications that the largest producing oilfield of China, at Yumen, Kansu Province, North-West China, is ready for increased production. Compared with last year, production this year is to be increased at least 26 per cent. An official of the National Planning Committee recently stated in Peking that the 1959 target was 4,670,000 tons a year and it is presumed that most of this would come from Yumen.

Synthetic Rubber Plant

A proposal to build and operate a petrochemical plant for the manufacture of GR-S type synthetic rubber has been made by the American Burke Research Co. to the Iraqi Government. The initial capacity proposed would be sufficient to meet about half of Iraq's home demand for synthetic rubber, but it is envisaged that the plant would be extended later to cover the whole of the domestic requirements and provide a surplus for export.

Battelle Radiation Source

A source of gamma radiation has been installed at the Battelle Memorial Institute's laboratories at Frankfurt, West Germany. It consists of 1,500 curies of radioactive cobalt-60 which were shipped from the Institute's main laboratory at Columbus, Ohio. The radiation potential of this amount of cobalt-60 is said to be equal to about $15 million of radium, but the cost is only about $5 a curie.

Mexican Expansion

Still Large Raw Material Importer

MEXICO is still a large market for imported chemicals, chiefly raw materials and ingredients, says an article in the 21 July issue of *Foreign Trade*, published by the Department of Trade and Commerce of Canada. This is in spite of a ten-fold increase in production between 1940 and 1950. This rate of expansion is being maintained, goes on to say the article, which is by Max T. Stewart, Commercial Councillor in Mexico.

The value of imports of chemicals rose between 1944 and 1954 from 150.4 million to 1,051 million pesos. On the average the United States supplies 77 per cent of these imports.

Chemical products now constitute about 12 per cent of Mexican imports, says Mr. Stewart, and this figure can be broken down in part as follows: 18.7 per cent raw materials, 16.8 per cent drugs, 15.1 per cent synthetic resins, 12.5 per cent insecticides, 11.2 per cent antibiotics and 5.1 per cent paints, varnishes and raw materials for the paint manufacturing industry.

According to Mr. Stewart, the Mexican chemical industry made its greatest strides during World War II. Between 1940 and 1944 the value of all domestic industrial production rose by 159 per cent, and of chemical production by 243 per cent. By 1946 chemicals had become the second most important industry in the country as an employer and the third largest from the point of view of investment.

In conclusion the article says that recently completed studies indicate an expanding market for Mexico's chemical industry at home and abroad. Numerous raw materials, as yet undeveloped for use on an industrial scale, are available. The National Bank of Foreign Trade has commented on the abundant supply of sodium chloride, sodium carbonate, magnesium salts, and calcium in its natural state. Much greater production of alkaline substances is therefore possible.

The position of the Mexican chemical industry may be summarised by saying that with raw materials available, domestic demand rising and exports developing, there are prospects of a bright future. But large imports, especially of raw materials and certain ingredients, are still needed.

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Sulphuric Acid Plant

THREE South Australian companies, Cresco Fertilisers Ltd., The Adelaide Chemical & Fertiliser Co. Ltd. and Wallaroo Mount Lyell Fertilisers Ltd., joined together to form Sulphuric Acid Ltd., whose new plant was recently opened at Birkenhead, South Australia (see THE CHEMICAL AGE, 1956, **74**, 1184).

Annual capacity of the plant is claimed to be 100,000 tons, thus assuring South Australia of supplies of acid for the manufacture of superphosphate.

Simon Carves (Australia) Pty. Ltd. built the plant to the design of the parent company, Simon Carves Ltd. of Stockport, England. Some of the equipment was built in England but much of the fabrication was carried out in Australia, and South Australian engineers made a considerable contribution to the project.

Cresco Fertilisers, managing agents until December 1954, supervised the planning and construction of the plant, which went into production on 8 August 1955.

The largest consumption in peacetime of sulphuric acid is for the manufacture of superphosphate which takes more than 80 per cent of all the acid made in Australia.

Atomic Energy in Austria

A COMPANY, domiciled in Vienna, was registered in May 1956, under the title Oesterreichische Studiengesellschaft für Atomenergie GmbH; the issued capital is 6.24 million schilling, of which the State holds 51 per cent, the balance being subscribed by some 60 undertakings, including banks, institutions, and nationalised and private industrial organisations.

There is to be a supervisory board of 27 members under the chairmanship of Dr. Rudolf Stahl. The technical manager will be Dr. Michael Higatsberger of the Physics Institute of the University of Vienna.

Haifa-Elath Oil Pipeline

British and US interests are reported to be holding talks with Israel on the construction of an oil pipeline from Haifa to Elath, in the Gulf of Aqaba. Costing about $30 million, the pipeline would carry about four million tons of oil a year, which represents the present annual capacity of the refinery at Haifa. It is understood that the pipeline would take a year to complete.

US Polymer Research

British Visitor Gives His Impressions

IN JULY, Dr. W. R. Moore of the Department of Chemistry and Dyeing at Bradford Technical College attended the Gordon research conference on organic coatings which was held in New Hampton, New Hampshire, US. Following the conference he visited a number of academic and industrial polymer research laboratories in the New England States. He has recorded his impressions for THE CHEMICAL AGE. Dr. Moore says that in such a short visit anything more than a brief survey was, of course, impossible.

Methods of Measurements

In the field of organic coatings considerable interest is being shown in the application of statistical methods to measurements of such properties as hardness, flexibility and elasticity, their changes with methods of preparation and their mutual interaction. Much work is being done on the nature of adhesion of films to wood and metal substrates, definitions of adhesion and methods by which it can be measured. Interest is being shown in the application of polymer solution theory to phase separation in coatings and solution properties of film forming materials. Organic studies include interactions occurring in the formation of alkyd-amine resins catalysed by heat or acids, the chemistry and uses of pentaerythritol resins and uses and modifications of silicones.

In the wider field of polymer chemistry much academic research is concerned with the application of more recent thermodynamic treatments of dilute solutions to a wide range of polymers and polyelectrolytes. Although, as in this country, more fundamental work is done in academic institutions it is not neglected in industrial research laboratories. The American Viscose Corporation have recently recruited a group of research chemists to make fundamental studies of cellulose with the ultimate aim of strengthening viscose and widening its applications. There is considerable liaison between academic institutions and industry; many senior academic research workers act as consultants.

A particular feature of industrial research is the wide and increasing use of instrumental methods. Apparatus developed in laboratories seems to be rapidly developed by US instrument makers for routine use in industrial research and analysis. A recording instrument for gas phase chromatography has been developed and commercial light scattering equipment is common. Other examples include an instrument for automatic ultra-violet spectral scanning of chromatographic effluents, and a method by which the acetyl content of cellulose acetate is obtained by infra-red absorption spectrophotometry.

Considerable work on the development of new polymers for use as fibres, resins and plastics is being carried out, and the epoxy resins have had considerable development as plasticisers, stabilisers, coatings, lubricants and chemical intermediates. New solvents for some of the more difficult soluble polymers have been developed. Among these is dimethyl sulphoxide, which is a cellulose xanthate and swells cellulose strongly. It is a solvent for acrylic fibres and is said to be used in the separation of aliphatic and aromatic liquids. Other solvents recently developed include ethylene and propylene carbonates and tetramethylene sulphone, all of which have high dielectric constants.

High Salaries

Salaries of industrial research chemists are, by UK standards, high. There is considerable competition for the 'annual crop' of Ph.Ds. (they start at a salary of about 6,000 dollars a year) and a growing tendency to recruit from the UK and other European countries. Working hours and conditions resemble those of the UK.

Industrial applications of polymers have outrun basic theory. The impression is gained that efforts are being made by industrial and academic research chemists to close this gap, thereby obtaining a better knowledge of industrial processes and methods for improvement of process and product. In such work, instrumental methods seem characteristic of US polymer research generally.

Interaction of Cellulose Derivatives with Solvent

by W. R. Moore

The first half of this article, which appeared in last week's issue, developed the general thermodynamic theory of polymer-liquid interaction and discussed the semi-empirical free energy parameter χ which is a measure of solvent power in a thermodynamic sense. The second half of the article extends this work and suggests methods for the calculation of various solubility parameters

IF CERTAIN assumptions are made, estimates of δ_2, the solubility parameter of the polymer which precipitates, are possible. At the precipitation point $\chi = 0.5$. If solvated polymer and mixture mix with absorption of heat, then, to the approximation that the mixture can be regarded as a single liquid, we may write

$$0.5 = \chi_s + KV_m(\delta_m - \delta_2)^2/RT$$

where V_m, the molar volume of the mixture, is given by

$$V_m = V_1V_p/(\phi_1V_p - \phi_pV_1)$$

where V refers to molar volume. K may be taken as unity. If the value of χ_s is known, δ_2 can be calculated. χ_s is likely to be small and lattice theory suggests a value of 0.12 (**22**). Using this value in all cases and the δ_m values in Table 3 last week we obtain the δ_2 values in Table 4.

The values for cellulose nitrate precipitated by hexane decrease markedly on ascent of each series of solvents, as perhaps is to be expected if solvated polymer precipitates. Values obtained with toluene as precipitant are larger and the decrease is less marked. A differently solvated polymer may be precipitated. δ_2 values for ethyl cellulose decrease slightly on ascent of each series but the values obtained with the non-polar solvents are larger and effectively constant. Values for cellulose acetate with hexane and toluene as precipitants are similar and, apart from the doubtful case of nitromethane, do not vary much with solvent.

Values obtained with ethanol are smaller and more variable. Although the doubt attached to the δ_m values obtained with ethanol makes the corresponding values of δ_2 doubtful, it is possible that a polymer partially or wholly solvated by ethanol may precipitate. Ethanol is known to be capable of solvating both hydroxyl and acetyl groups (**3, 9**).

Although the rather large assumptions made in the estimation of the values of δ_2

TABLE 4
Values of δ_2

Solvent	Cellulose nitrate		Cellulose acetate			Ethyl Cellulose
	Hexane	Toluene	Hexane	Toluene	Ethanol	Hexane
Acetone	10.25	10.5	11.24	11.10	9.52	9.46
Methyl ethyl ketone	9.72	10.41				9.35
Methyl *n*-propyl ketone	9.44	10.34				9.30
Methyl *n*-amyl ketone	9.13	10.24				9.20
Methyl *n*-hexyl ketone	9.06	10.11				
Methyl acetate	10.14	10.56	11.07	11.10	9.37	9.43
Ethyl acetate	9.56	10.42				9.32
n-propyl acetate	9.31	10.31				9.21
n-butyl acetate	9.19	10.23				9.13
n-amyl acetate	9.12	10.19				9.16
Chloroform						9.11
Carbon tetrachloride						10.08
Benzene						10.06
Toluene						9.96
Pyridine			10.98	11.03	10.01	
α-picoline			10.68	10.82	9.30	
β-picoline			10.96	11.05	9.94	
γ-picoline			10.77	10.91	9.80	
Nitromethane			—	9.68	10.89	
Aniline			—	11.43	10.46	
Dioxan			11.10	11.10	9.80	

make them only suitable for qualitative comparison they help, in certain cases, in interpreting the variation of volume of precipitant with solvent. Comparison of the δ_2 values for ethyl cellulose with the δ_1 values for the solvents shows that in the cases of acetone, methyl acetate and chloroform $\delta_1 > \delta_2$.

Addition of hexane to these solvents should initially result in an increase of solvent power which reaches an optimum and then decreases on further addition. In other cases $\delta_1 < \delta_2$ and addition of hexane should decrease solvent power. The χ values in Table 5, obtained from osmotic pressure measurements on dilute solutions of ethyl cellulose in solvent/hexane mixtures, show the predictions to be true.

TABLE 5

χ values for ethyl cellulose/solvent/hexane systems

Solvent (proportions by volume)	χ
Acetone	0.45
Acetone/hexane 2:1	0.42
Acetone/hexane 1:1	0.41
Acetone/hexane 1:2	0.45
Methyl *n*-propyl ketone	0.37
Methyl *n*-propyl ketone/hexane 5:1	0.43
Methyl *n*-propyl ketone/hexane 5:3	0.44
Methyl *n*-propyl ketone/hexane 1:1	0.47
Methyl acetate	0.41
Methyl acetate/hexane 2:1	0.34
Methyl acetate/hexane 1:1	0.35
n-butyl acetate	0.24
n-butyl acetate/hexane 5:1	0.33
n-butyl acetate/hexane 5:4	0.36
Chloroform	0.34
Chloroform/hexane 2:1	0.31
Chloroform/hexane 1:2	0.36

In the cases of cellulose acetate with hexane and toluene as precipitants all the δ_2 values, with the exception of that obtained with nitromethane, are greater than the corresponding values of δ_1. Addition of either precipitant should cause solvent power to decrease and this has also been verified. The volume of precipitant tends to be smaller as the difference between δ_2 and δ_1 increases. If the entropy and heat evolution contributions to χ do not vary much with solvent the observed variation of volume of precipitant with χ follows. Because of the doubt attached to the δ_2 values obtained with ethanol as precipitant, simple interpretation of the variation of volume of ethanol with solvent does not seem to be possible.

The variations of the volumes of precipitants with solvent are also difficult to interpret in the case of cellulose nitrate. Values of χ suggest that butyl acetate and methyl amyl ketone are the best solvents and these require the largest volumes of hexane in each solvent series. If χ_s and the contribution to χ which results from heat evolution do not vary much, the best solvent should be that whose solubility parameter is closest to that of the solvated polymer. The differences between δ_1 and δ_2 do not suggest that these two solvents are the best. This may be a consequence of assumptions made in the interpretation of the values of χ and in the estimation of δ_2.

It is possible that some desolvation of less firmly bound solvent occurs on addition of hexane. With toluene as precipitant the δ_2 values are larger and less variable than with hexane. δ_1 is always less than δ_2 and the differences increase on ascent of each series of solvents. In view of the possibility of toluene taking part in solvation it is unlikely that there will be any simple relationship between the volume of toluene required for precipitation and χ values obtained from osmotic studies on solutions in pure solvents.

These tentative interpretations of the precipitation results seem, however, to account fairly well for those obtained with ethyl cellulose and cellulose acetate. They may provide an alternative and complementary view to the mechanistic theory of Doolittle (**17**), who found that the molar concentration of solvent at the precipitation point approaches a minimum as a homologous series of solvents is ascended. This would seem to correspond to the limiting value of δ_m observed on ascent of each series.

Solvent Power

There would seem to be at least two requirements if solvents are to be placed in order of thermodynamic solvent power by the precipitation method. The precipitant should not specifically interact with the polymer, as is possible in the cases of toluene with cellulose nitrate and ethanol with cellulose acetate. Also, as Gee (**23**) has pointed out, the solvents to be compared, and the precipitant, should all have solubility parameters on the same side of that of the polymer.

The variation of the viscosities of dilute solutions with concentration of polymer c is illustrated in Figs. 6-9 by typical plots of viscosity number, η_{sp}/c, against c. η_{sp} equals $(\eta - \eta_o)/\eta_o$, where η is the viscosity of the solution and η_o that of the solvent.

Most of the plots show upward curvature at concentrations above *ca.* 0.2 gm./100 ml. Such curvature, which is not observed with flexible polymers at such concentrations, results from hydrodynamic interaction between extended chains and increases with both molecular weight of polymer and solvent power of solvent.

A number of parameters, derived from viscosity measurements, have been suggested

Fig. 6

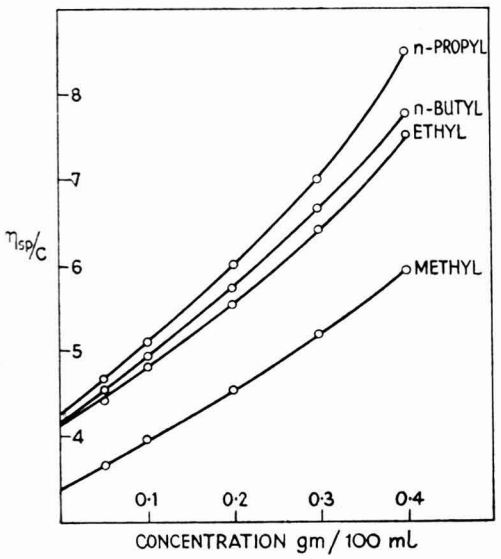


Fig. 8

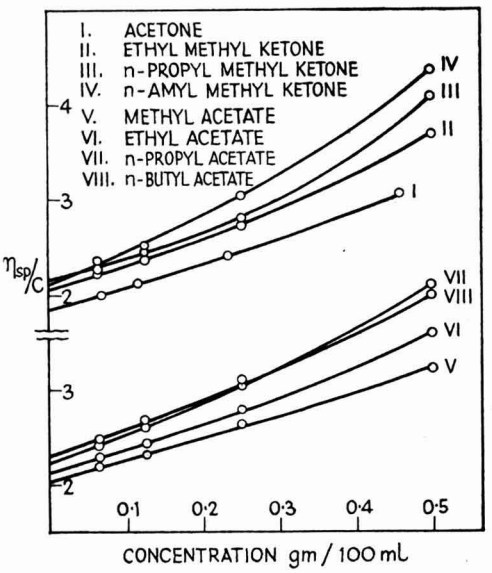
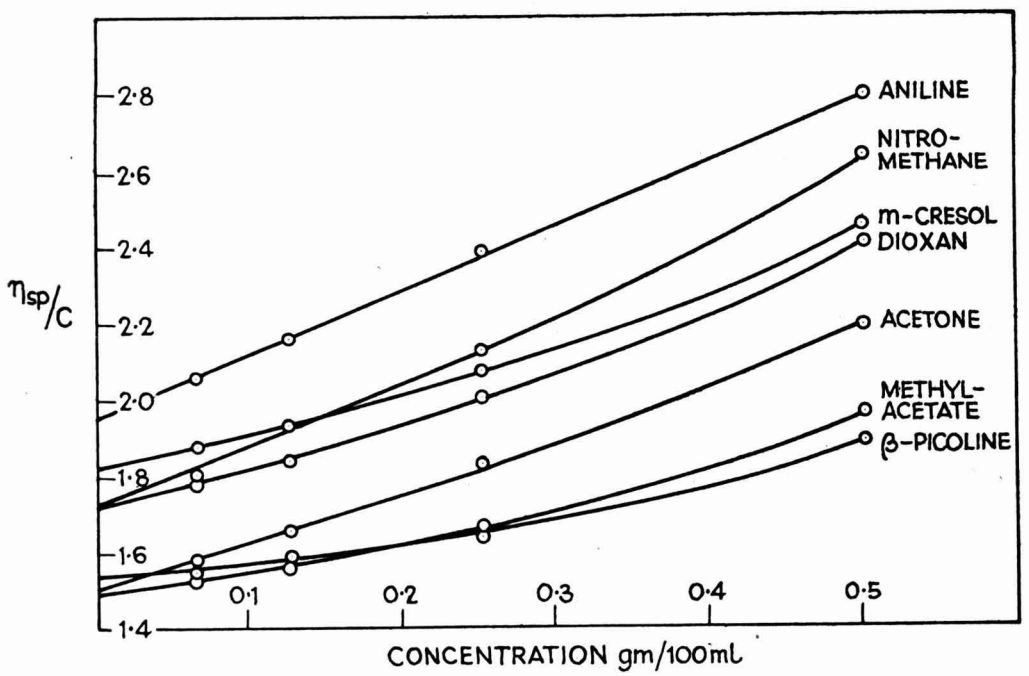


Fig. 7



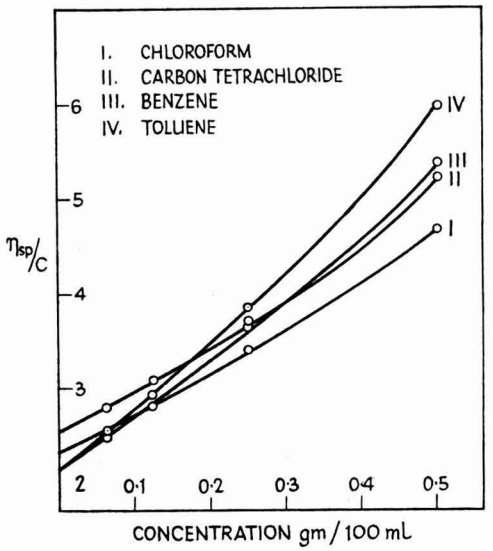


Fig. 9

as measures of solvent power. With flexible polymers, the variation of η_{sp}/c with c is given by

$$\eta_{sp}/c = [\eta] + k'[\eta]^2c$$

where $[\eta]$, called the limiting viscosity number or intrinsic viscosity, is the value of η_{sp}/c as c tends to zero. In the case of flexible polymers, $[\eta]$ increases and k' decreases with increasing solvent power. The initial slopes of viscosity number against concentration plots have been suggested as measures of solvent power for polar polymers (**24**). For such polymers Spurlin (**13**) has suggested that k_s, the ratio of the slope of a plot of $\log(\eta_{sp}/c)$ against c to the limiting viscosity number, decreases with increasing solvent power. Values of these different parameters, with values of χ, are given in Table 6.

$[\eta]$ seems to increase with solvent power in each homologous series of solvents for cellulose nitrate and ethyl cellulose and to tend to a limit as χ decreases. Although the chains are stiffer than those of flexible polymers some variation in configuration seems possible. The small variation of $[\eta]$ with solvent shows that this is not large but the limiting value may reflect complete extension, slightly less extended configurations being adopted in poorer solvents. The values of $[\eta]$ are greater, with cellulose nitrate, for alkyl acetates than for ketones of comparable solvent power, and larger values of $[\eta]$ are obtained with ethyl cellulose in the poor non-polar solvents. Solvent type is clearly important.

This is particularly so in the case of cellulose acetate. There is no obvious relationship between $[\eta]$ and χ. Acidic solvents and aniline tend to give higher values of $[\eta]$ than the basic pyridine and picolines with more neutral solvents, such as acetone and methyl

TABLE 6
Viscosity Parameters

Solvent	*Cellulose nitrate*					*Ethyl cellulose*				
	$[\eta]$	k'	*Initial slope*	k_s	χ	$[\eta]$	k'	*Initial slope*	k_s	χ
Acetone	2.79	0.49	3.8	0.42	0.27	1.86	0.68	2.3	0.57	0.46
Methyl ethyl ketone	3.29	0.40	4.3	0.38	0.21	2.00	0.59	2.5	0.58	0.42
Methyl *n*-propyl ketone	3.56	0.44	5.6	0.41	0.15	2.16	0.54	2.5	0.45	0.37
Methyl *n*-amyl ketone	3.82	0.41	5.8	0.42	0.02	2.14	0.59	2.7	0.63	0.38
Methyl *n*-hexyl ketone	3.49	0.30	3.7	0.34	0.16					
Methyl acetate	3.33	0.54	5.9	0.43	0.30	2.03	0.51	2.0	0.49	0.41
Ethyl acetate	4.11	0.35	5.9	0.36	0.22	2.10	0.58	2.1	0.49	0.40
n-propyl acetate	4.23	0.38	6.7	0.41	0.13	2.21	0.53	2.2	0.55	0.33
n-butyl acetate	4.20	0.43	7.2	0.38	0.015	2.28	0.62	2.3	0.48	0.24
n-amyl acetate	4.21	0.35	6.2	0.40	0.02	2.26	0.50	2.25	0.49	0.28
Chloroform						2.30	0.70	3.7	0.68	0.34
Carbon tetrachloride						2.50	0.68	4.3	0.60	0.46
Benzene						2.20	1.06	5.0	0.87	0.48
Toluene						2.23	0.94	4.6	0.96	0.47

Solvent	*Cellulose acetate*				
	$[\eta]$	k'	*Initial slope*	k_s	χ
Acetone	1.49	0.61	1.35	0.53	0.45
Methyl acetate	1.48	0.28	0.60	0.42	0.46
Pyridine	1.46	0.22	0.45	0.33	0.28
α-picoline	1.37	0.54	1.05	0.44	0.36
β-picoline	1.55	0.05	0.10	0.30	0.285
γ-picoline	1.30	0.81	1.35	0.48	0.26
Nitromethane	1.73	0.48	1.45	0.51	0.44
Aniline	1.96	0.45	1.75	0.37	0.38
Dioxan	1.70	0.39	1.15	0.42	0.38

acetate, which give intermediate values (**5**). Intramolecular hydrogen bonding between primary hydroxyl and acetyl groups on neighbouring glucose residues is possible and may stiffen the chains.

Acidic solvents and aniline, bound to acetyl groups by hydrogen bonds, do not break the intramolecular bonds. Basic solvents, attached to hydroxyl groups, may do so and permit less extended chains and lower values of $[\eta]$. This suggestion helps to explain the decrease in $[\eta]$ with increasing degree of substitution of cellulose acetate (**25**). Acetylation will remove hydroxyl groups and hence the intramolecular bonds so that less extended configurations will be possible.

There is no apparent relationship between k' and χ, with any of the three derivatives, no doubt because of the extended nature of the chains. The initial slopes of the viscosity number against concentration plots vary considerably, but $[\eta]$ varies only relatively little in each homologous series of solvents for cellulose nitrate and ethyl cellulose. Since the initial slope can be written as $k'[\eta]^2$ it is unlikely that k' will vary with solvent power in the manner observed with flexible polymers. The initial slopes tend to increase with solvent power in each homologous series of solvents for both cellulose nitrate and ethyl cellulose. High slopes are, however, associated with the poor non-polar solvents for ethyl cellulose showing that factors other than solvent power affect the slope. Association of polymer, leading to structural viscosity effects or to extensive hydrodynamic interaction between aggregates, would be expected to increase the slope.

Spurlin Parameter

There would seem to be no clear relationship between the Spurlin parameter k_s and solvent power. Spurlin, Martin and Tennent (**26**), using benzene, acetone and methyl acetate as solvents for ethyl cellulose, found k_s decreased with increasing solvent power. Table 6 shows this to be so, as far as these three solvents are concerned, but not if the whole range is considered. Association in poor solvents may lead to high values of the slope of a logarithmic plot of viscosity number against c and to large values of k_s. In good solvents of the same type the variations of slope and $[\eta]$ seem to give roughly constant values of k_s.

It must be emphasised that the work described refers to dilute solutions. In technical applications more concentrated solutions are used. The precipitation results compare well with those obtained with such solutions but rather different viscosity behaviour may be expected. It is possible that poor solvents, because of structural and aggregation effects, may give higher viscosities than good. Extrapolation of results obtained with dilute solutions to more concentrated ones is a problem requiring solution. Other problems include the precise nature of the solvation process and the restriction of relationships, in many cases to homologous series.

The general features of cellulose derivative-solvent interaction seem, however, to be fairly clear. If solvation and the stiffness of the chains is taken into account it seems possible to interpret many properties of dilute solutions, at least qualitatively, in terms of current theories of high polymer-solvent interaction.

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(Concluded)

French Oil Storing Company

A company is shortly to be set up in France for the storing of oil products from the refineries of the French oil company, Antar-Petroles de l'Atlantique. The new company will have a capital of Fr 150 m., comprising 15,000 shares of Fr 10,000 each.

Rationalisation Saves

IT IS ESTIMATED by the German Chemical Manufacturers Association that in 1955 alone the industry saved about DM 2,000 million by rationalisation in the widest sense, i.e., stretching from production plant to distribution. The Association believes that in the last five years the saving in chemical industry has been about DM 6,000 million which is almost half of the gross turnover of the industry in 1955. These savings have been made by the more rational use of raw materials, auxiliaries, packaging materials, fuel and labour. On average these five factors comprise 50 per cent of prime cost in the industry.

An outcome of this rationalisation programme is that in the period 1950—June 1956, prices of chemical products have increased by only 6-7 per cent, whereas prices for energy, investment goods and almost all important basic materials have risen by several times this amount.

Iron & Steel Industry

For instance, products of the iron and steel industry have increased by nearly 80 per cent in the same period and of the coal industry by almost 60 per cent. The latter is particularly serious since coal is used in chemical industry as a source of energy and as a raw material. Price of high voltage current increased by about 48 per cent, which is also grave since the chemical industry is the largest consumer of current, accounting for about one-quarter of total industrial consumption. In West German industry as a whole prices rose by about 20 per cent, i.e., around three times as much as in the chemical industry.

A further important factor on the cost side is that gross hourly earnings of a chemical worker rose by about 40 per cent in this period. Earnings of salaried staff, too, increased by the same order of magnitude.

Small Instrument Exhibitions

The Scientific Instrument Manufacturers' Association is issuing a document entitled *Code of Practice for the Organisation of Small Instrument Exhibitions.* This contains some two dozen informal suggestions for the running of small *ad hoc* instrument displays, such as in connection with meetings, conferences etc. Copies are available, free of charge, from SIMA at 20 Queen Anne Street, London W1.

US Nuclear Fuel Project

FORMATION of a nuclear fuel division to produce nuclear fuel elements and reactor cores has been announced by Olin Mathieson Chemical Corporation, US. Mr. M. F. Meissner, corporate vice-president, will be in charge of the division. This new enterprise, we understand, was prompted by a number of factors. The most prominent of these was the general acceptance that power supplied by nuclear fuel will play a vital part in the future growth of the nation's economy. It was also recognised that nuclear fuel, as opposed to conventional fuel, could be shipped more cheaply due to the higher power potential obtained from smaller quantities. The Corporation further noted that nuclear fuels enable industry to become more closely located to its markets instead of being forced to locate near natural power resources. In order to start production as quickly as possible, equipment is now being installed in space that has been reconstructed at the Winchester arms plant in New Haven, Connecticut. Pilot operations are scheduled to start some time this month. A larger facility will be made operative within the next 18 months to permit full scale production of nuclear elements. No site has been selected as yet for this plant.

Corrosion Meeting

THE Iron and Steel Institute is organising a corrosion meeting to be held at its offices, 4 Grosvenor Gardens, London SW1, on Friday 12 October. This meeting will be held by arrangement with the British Iron and Steel Research Association. The chair will be taken by Dr. H. H. Burton, C.B.E., president of the Institute, supported by Dr. J. Pearson, assistant director of the ISI.

Subjects to be discussed are: 'The corrosion resistance of low alloy steels,' 'The corrosion resistance of wrought iron,' 'Corrosion resistance of some austenitic Cr-Ni steels of 18/8/Ti composition.' 'The effect of variation in chemical composition and thermal treatments,' 'Effects of sulphate-chloride mixtures in fuel-ash corrosion of steels and high-nickel alloys' and 'The stress corrosion cracking of austenitic stainless steels.'

Anyone interested should write to the secretary of the Institute at the above address.

OCCA Symposium

APPLICATION should be made as soon as possible for the Oil & Colour Chemists' Association's symposium, 'Some Implications of Colour' which will take place on 20 September at University College, Gower Street, London WC1. Lunch will be in the Upper Refrectory at University College.

Titles of the papers to be given will be 'Colour Gamuts of Pigments' by E. Asherton and D. Tough; 'Assessment of Light Fastness' by J. G. Gillan and 'Personal Experience with the Inter-Society's Colour Council Aptitude Test' by M. Hess.

Tickets, 6s each to members of the Association and 12s each to non-members, and application forms, can be obtained from Mr. R. H. Hamblin, Oil & Colour Chemists' Association, Memorial Hall, Farringdon Street, London EC4. Luncheon tickets are 7s 6d each.

Rubber in Engineering

DETAILS are now available of the forthcoming one-day conference, 'Rubber in Engineering', organised by The Natural Rubber Development Board. It will take place on 27 September at the Institution of Electrical Engineers, Savoy Place, WC2.

The papers under consideration are:—'Rubber Must be Used Correctly' by Dr. W. J. S. Naunton, 'Load-deflection Relations and Surface Strain Distributions for Flat Rubber Pads' by Dr. A. N. Gent, 'The use of Rubber in Heavy Engineering', by S. W. Marsh, 'Dynamic Fatigue Life of Rubber Components' by P. W. Turner, and 'Rubber in Agricultural Engineering' by S. J. Wright.

Application for places, which are restricted to qualified engineers, should be made to The Conference Secretary, The Natural Rubber Development Board, Market Buildings, Mark Lane, London EC3.

New Machinery

FOUR BROCHURES describing pre-plasticisers and injection moulding machines made by R. H. Windsor Ltd., Leatherhead Road, Chessington, Surrey, have recently been published. Claimed to be the latest in fully automatic injection moulding machines, the SH4 is self-contained and hydraulically operated, and is provided with fully or semi-automatic cycle control. The capacity moulded per shot is four ounces and the plasticising capacity per hour is 30 to 40 lb.

Indian Drug Industry

INDIA is sending a 10-man delegation to the Soviet Union, East and West Germany, Switzerland and Italy to study production techniques and hold discussions with leading manufacturers on India's plans for developing the drug and allied industries.

The seven-man Russian team which recently carried out an extensive survey of the pharmaceutical industry in India has submitted its report to the Government. The team studied the question of manufacturing penicillin, streptomycin and other antibiotics, all the important vitamins, analgesics, antipyretics, antimalarials, anti-TB drugs and glandular products.

The Soviet team recommended the establishment of a number of plants to manufacture these drugs; also for the production of basic chemicals and intermediates for feeding plant for the manufacture of synthetic drugs.

Over the last few years there has been considerable development in the manufacture of pharmaceuticals and drugs in India. Total value of production to-day is about Rs. 350 million (£26.5 million per year). Imports, however, have been rising and now stand at Rs. 150 million per year.

Pure & Applied Chemistry

THE XVIth International Congress for Pure & Applied Chemistry will be held in Paris from 18 to 24 July 1957, simultaneously with the XIXth Conference of the International Union of Pure & Applied Chemistry. It will be preceded by the centenary celebrations of the Société Chimique de France.

The congress will be divided into three sections:—physical chemistry, inorganic chemistry, and organic chemistry. About 15 main lectures will be delivered.

A circular setting out the final organisation of the congress will be distributed in September. Further details can be obtained from the Secrétariat Général du XVIéme Congrès International de Chimie Pure et Appliquée, 28 rue Saint-Dominique, Paris (7è).

$500,000 Market

Import quotas for essential goods have just been opened in Uruguay. The goods include chemicals, pharmaceuticals and drugs and the share of the quotas available to the UK for this group is $500,000.

Publications & Announcements

THE FORMS, properties and uses of a wide range of fluorocarbon products—from plastic resins to acids and dielectric fluids—are described in a new eight page brochure published by The M. W. Kellogg Company. Developed to meet the most exacting operating requirements, corrosive and humid atmospheres and high or low temperatures, KEL-F fluorocarbon products (the brochure states) now consist of moulding and extrusion plastics, dispersions and coating resins, a fluorocarbon rubber series, oils, waxes and greases, printing inks, acids and alkanes. In service in the chemical, electrical, aviation and equipment fields, these materials are characterised by extreme chemical inertness, thermal stability, zero moisture absorption, and high dielectric strength.

* * *

THE Gas Council has released a catalogue giving details of the films and filmstrips that are available on loan. The filmstrips listed may be purchased at 10s per copy inclusive of lecture notes. Among the new films is 'The Story of Gas', a series of 14 educational films describing the manufacture, distribution and utilisation of gas. Filmstrips and wallcharts complete this series which is accompanied by comprehensive teaching notes. The Council request that a minimum of 14 days' notice be given of the date on which films are required. Details are obtainable from the Gas Council, Film Library, 1 Grosvenor Place, London SW1.

* * *

A BROCHURE published by Compoflex Co. Ltd. gives details of the first British metallic vibration eliminator, which the company recently introduced. This vibration eliminator is claimed to be the flexible answer for situations where pipes are misaligned or exposed to movement such as vibration. Various typical applications are suggested for connecting gas, air, oil, steam and water pipes, and a complete description is given of the make up of the eliminator. There is a table giving detailed specifications of the two types of end fittings, together with the maximum temperatures and working pressures according to whether the material used is copper alloy or monel and stainless steel. Copies of the leaflet may be obtained from the London Flexibles Centre of Compoflex Co. Ltd., 23-25 Northumberland Avenue, London WC2, or from the Northern Flexibles Centre at Huddersfield Road, Oldham, Lancs.

* * *

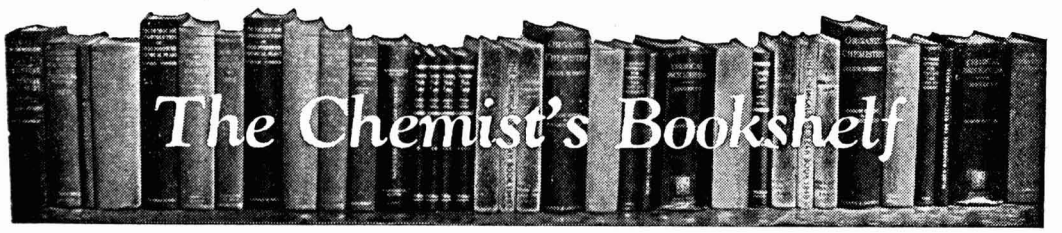
A NEW 20 page booklet describing briefly the complete line of Mathieson chemicals for industry has been issued by Olin Mathieson Chemical Corp. During the past half dozen years, Olin Mathieson has greatly enlarged and diversified its operations in the industrial chemicals field. The new booklet covers the company's organic, inorganic and speciality chemicals, listing characteristics, grades, containers and producing points for each. Principal uses are given for organic chemicals and specialities. The booklet is available from Olin Mathieson Chemical Corp., Industrial Chemicals Division, Baltimore 3, Md, US.

* * *

THE British Standards Institution announces the publication of *British Standard for Spherical Ground Glass Joints* (BS 2761 : 1956). Nominal dimensions and tolerances are given for six sizes of joint, including most of those already well established in Britain and some which are in common use in the US. The tolerances specified have been carefully selected to ensure satisfactory interchangeability of cups and balls, and suitable test methods are described in appendices. Copies of this Standard may be obtained from the British Standards Institution, 2 Park Street, London W1, price 2s.

* * *

COPIES of the well-produced *Rohm & Haas Reporter* for January-February and March-April have been received from the company's agents in the United Kingdom, Charles Lennig & Co. (Great Britain) Ltd. Another good example of printing for industry is *Enchiridion*, published by Firth-Vickers Stainless Steels Ltd. The frontispiece of the issue (number 10) illustrates the unusual application of stainless steel in the form of a nightgown described as 'sheer as nylon and light as thistledown'. The garment 'actually made out of stainless steel' is not 'in regular production' !



TABLES OF PHYSICAL AND CHEMICAL CONSTANTS AND SOME MATHEMATICAL FUNCTIONS. XIth edn. By E. W. C. Kaye and T. H. Laby. Longmans, Green & Co., London. 1956. Pp. 233. 25s.

This revision of the tables of Kaye and Laby has been carried out under the supervision of an editorial board consisting of Dr. H. Barrell, Dr. E. A. Coulson, Professor N. Feather, F.R.S., and Dr. J. M. C. Scott, who are to be congratulated on producing a volume only 50 pages longer than its immediate predecessor, yet containing a high proportion of the more useful of the vast amount of data which has accumulated during the past decade. One does not envy them their task in the future.

Presentation of Data

Many of the tables have been printed in much smaller type but the compactness is nevertheless only partially illusory. It has been achieved largely by a more economical presentation of data, though some tables, such as those of emission spectra of solids and gases and of diffusion coefficients of neutral gases, have been omitted altogether. The omission of this last table is to be regretted and the reviewer suggests that it be reinstated in place of the table of ionic diffusion coefficients, data about which are already given in the table of ionic mobilities.

The tables have been re-arranged into three main parts—general physics, chemistry and atomic physics—with a few mathematical tables at the end. The major additions are all desirable and include much new data on acoustics, photometry, electro-chemistry and thermochemistry. A section on statistical tests is particularly welcome.

As in earlier editions, a brief resumé, containing appropriate references, is given at the beginning of each section. This is a valuable characteristic of Kaye and Laby which would be still more useful if greater attention were paid to a discussion of the accuracy of the data. Taking a specific example, ionisation potentials are almost all tabulated to two decimal places but no warning is given that the last figure is unreliable for many of the elements. There is a comprehensive index which appears to be superior to those of previous editions though, curiously, it includes neither 'heats of formation' nor 'standard free energies'; if one persists, it is found to contain 'free energies of formation'.

Only long usage can test effectively the correctness of the data reproduced in these tables. Some random checks by the reviewer discovered only two errors. Tyndall's measurement, reported in 1938, of 14.3 $cm^2volt^{-1}sec^{-1}$ for the mobility of Hg^+ in He is reproduced (a value which was always difficult to understand). However, it was measured again by Biondi in 1953 and he obtained a value of 19.9. The second error is the failure to distinguish between *Hartree* and *atomic* units of energy in the table of general atomic constants.

These criticisms are however, minor ones. The Kaye and Laby tables represent an unusual achievement, the volume being of reasonable size yet containing a considerable store of useful data. The price is also reasonable and no scientific worker should be without a personal copy.—

A. DALGARNO.

PRINCIPLES OF METALLOGRAPHY. By Georg Masing. Springer-Verlag, Berlin, Göttingen, Heidleberg. 1955. Pp. 153, with 140 illustrations.

In 15 years this little book has run to four editions, indicating its popularity. This is not surprising because the original edition, published in 1940, was built up around lectures on the subject and endeavoured to set out clearly the basic principles of metallography in a manner which would commend itself to the beginner.

Further editions followed in 1941 and 1951 and it is therefore the 1951 edition only which will have had a review in the

The Chemist's Bookshelf

English language. This is not put forward as the principal reason for this review because the feature that strikes one in connection with this publication is its compactness; the author has managed to pack into 153 pages all the fundamentals of metallography, as can be seen from the contents. These include a discussion of the atomic structure of metals and alloys, and the synthesis and structure of alloys in systems with and without mixed crystal and compound formation. The process of crystallisation, processes in the solid state (e.g., synthesis of iron-carbon, zinc-copper, zinc-aluminium alloys), thermal treatment, plastic deformation and re-crystallisation, all get separate chapters and indicate the fullness of this little book.

It is unfortunate that the book will undoubtedly suffer from the disadvantage of being written in German. Many English-speaking readers will ignore it simply from this fact, and yet, the easy style of German would make it readable to many not fluent in the language. It is to be hoped that this review may encourage some to have a closer look at this book, who otherwise would not, because, in its small bulk they will find much worth reading.—R. J. MAGEE.

PROCEEDING OF THE INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY. Vol. 4, Cross Sections Important to Reactor Design. Compiled and published by the United Nations Scientific Secretariat, New York. 1956. P. 357. 54s.

Several years ago, within a branch of the United Kingdom Atomic Energy Authority, a specific cross section was required. Two values were quoted and, in an attempt to resolve the difference, reference was made to Harwell. The answer was soon forthcoming; they both came from security classified reports—the more accurate came from that with the higher classification! At Geneva much of this information was declassified for the first time. D. J. Hughes as chairman of session 17A introduced a comparison of the 'Cross Sections of Fissionable Materials' with a comment on the uniqueness of the situation wherein the work of many independent groups, over the last ten years, was compared for the first time and found to be in very satisfactory agreement. Accordingly, as a scientific document, this volume (which records this and kindred sessions of the Conference) is of great importance. However, in its experimental detail, it will be an embarrassment to nearly all but the specialist.

The whole volume is devoted to the elaborate techniques necessary for obtaining cross section measurements for non-fissionable and fissionable materials. The different neutron source characteristics may be obtained from nuclear reactions induced by the beams from Van de Graaff generators, cyclotrons, syncro-cyclotrons and the whole range of particle accelerators. Other methods use nuclear reactors as the neutron source. The experimental application of these neutrons involves complex instrumentation. Within this field, there is much of interest in the principles of application of electronics, especially to timing and discrimination. Also, the development of radiation detectors has been necessitated by these techniques and is briefly noted in many places.

The detailed analysis of capture and fission cross sections necessitates the accurate determination of the isotopic constitution of the specimens investigated. This is the field of high resolution mass spectroscopy. Several papers refer briefly to this (viz. pages 595, 596 and 644), but here reporting the development of 'solid source mass spectrometers' is very much subsidiary to reporting the estimated cross sections.

Although the volume will be of interest to the non-specialist, he will be relieved that the vital results which it circulates will soon be absorbed into *Data Books of Nuclear Engineering* for easier reference.—J.S.M.B.

Restrictive Trading Agreements

The office of the Registrar of Restrictive Trading Agreements was opened at Chancery House, Chancery Lane, London WC2 (Telephone CHAncery 2858) on 7 August. The kinds of agreements to be registered and the dates for registration are set out in an Order made on 2 August by the Board of Trade. Details of the way in which registration is to be carried out will be given in regulations to be made by the registrar, and these will be issued before the Registration Order comes into operation on 30 November. The regulations will also lay down the fees to be paid for inspecting the register etc.

Detergent Dangers

Favourable Court Decision

'WHAT evidence is there that Teepol is a dangerous product?' asked Mr. Justice Barry in a recent High Court case. 'I am bound to say I can find none.'

Mr. Justice Barry was giving judgment in the case of Emily Olley v. London Transport Executive as the First Defendants, and the Shell Chemical Co. Ltd. (at that time the Shell Chemical Manufacturing Co. Ltd.) as the Second Defendants. On 30 April 1956 judgment was given in favour of the Defendants.

Mrs. Olley was employed as a general cleaner by London Transport Executive and she was instructed to clean a steamer which, she said, was excessively dirty and which resulted in excessive exposure of her skin to Teepol. Her case was that she was in contact with Teepol for a considerable time on 11 and 12 February and that by 25 February she was suffering from an incapacitating attack of dematitis.

The Judge decided that there was a connection between these two events. On the other hand it was established that Mrs. Olley was a woman with a constitutionally sensitive skin.

Before Teepol was put on the market in 1942 said the judge, and again in 1949, eminent dermatologists were consulted and in all some quarter of a million tons had been sold in the UK. It had not been established that a single case of dermatitis was due to the use of Teepol.

The Judge concluded by saying: 'On the evidence before me I can only find against the Second Defendants if I were prepared to hold that every manufacturer of washing soda, every manufacturer of soap, and every manufacturer of synthetic detergents of any kind was placing a dangerous substance upon the market and was liable to any user, however exceptional, who happened to be allergic to his particular product.

'I cannot make a finding of that kind; and, in the absence of such a finding, the evidence is that Teepol is considerably less likely to cause skin irritation or dermatitis than a vast number, if not all, of the competing substances. As I say, apart from the Plaintiff, no single case of dematitis due to Teepol has been proved. In those circumstances, I find it impossible to say that any liability rests upon the Second Defendant in this case.'

MARKET REPORTS

LONDON There has been no outstanding feature on the industrial chemicals market during the past week, and new spot business has been limited. A good export enquiry has been in circulation and actual bookings have been up to recent levels. Prices generally are unchanged with quotations displaying a firm undertone. Similar conditions apply to the coal-tar products market where the movement remains satisfactory for the period.

MANCHESTER Prices generally on the Manchester chemical market during the past week have maintained a firm front, though with the exception of sulphate of copper (which has advanced rather sharply to £102 12s 6d per ton) there have been few actual changes of any consequence. The wide range of textile chemicals are being taken up against contracts in fair quantities and most other industrial outlets are calling for reasonably steady deliveries. Fertilisers continue in moderate demand. Ready outlets are still being found for the leading tar products.

GLASGOW Although a nominal amount of orders are being received, business generally has been quiet in the Scottish heavy chemical market. As reported last week, the effect of the holiday period in certain areas is still being felt. On the whole prices have remained fairly steady, although there is still an upward tendency taking place in certain directions. The export market continues favourable.

BLEU Trade with UK

Following the trend of previous years, BLEU exchanges with the United Kingdom show an overall decrease in April, but remained in favour of the Union. The fall appears to be due to substantially lower exports of certain commodities, including chemicals and electric- and non-electric machinery. Sales of non-ferrous base metals and petroleum products, however, increased. Value of BLEU exports to Britain totalled £6,841,000 (c.i.f.), a decrease of £520,000 on the March figure. United Kingdom sales in April to BLEU totalled £5,402,000 (f.o.b.) and fell short of the March total by £597,000.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

New Registrations

Price's Laboratories Ltd.

Private company. (16,156). Registered in Dublin 21 June. Capital £1,000 in £1 shares. Objects: To act as wholesale and manufacturing pharmacists, chemists and druggists. The subscribers (each with one share) are: Cecil Hollinshead, 62 The Rise, Mount Merrion, Co. Dublin, engineer; James Coffey, 26 Clare Street, Dublin, manager. The first directors are not named.

Permavu Ltd.

Private company. (569,950). Registered 7 August. Capital £1,500 in £1 shares. Objects: To carry on the business of processors and manufacturers of and dealers in chemical compounds for industrial and domestic purposes etc. The permanent directors are: Samuel Shinwell, 27 Glengall Road, Edgware, Middlesex; Kenneth P. Britton, 33 Links Road, Epsom, Surrey; Charles P. Butcher, 33 Russell Hill, Purley; Peter R. L. Drew, 4 Flower Lane, Mill Hill, London NW7. Secretary: Basil Threadgold. Registered office: 20 Southampton Place, London WC1.

Brox (Manchester) Ltd.

Private company. (569,708.) Registered 31 July. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in anti-tobacco smoking tablets and fire extinguishers etc. The directors are: Mrs. Annie Brock and Frederick Brock, both of Conifers, Lostock Hall Road, Poynton, Cheshire. Secretary: Annie Brock. Registered office: 379 Buxton Road, Stockport, Cheshire.

F. J. Whelan Ltd.

Private company (569,985). Registered 8 August. Capital £1,000 in £1 shares. Objects: To carry on the business of consulting, analytical, manufacturing, pharmaceutical and general chemists, herbalists etc. Directors: Frederick J. Whelan and Mrs. Hetty Whelan, both of Spring Villa, Oughtibridge, near Sheffield, and James Pennington, 8 High Street, Standish, Lancs. Secretary: Hetty Whelan. Solicitors: Campbell Pasquill & Bullough, Wigan. Reg. office: 8 High Street, Standish, Lancs.

Company News

Uclaf Ltd.

The authorised capital of Uclaf Ltd. has been increased to £500,000 divided into 500,000 ordinary shares of £1 each, of which 299,000 have been allotted to Uclaf SA and 1,000 to Roussel Laboratories Ltd. in each case for cash at par. It is expected that the Stratford factory will be producing Cortisone and derivatives and other special Uclaf products by October 1956.

Potter & Clarke Ltd.

Profits of Potter & Clarke Ltd. after all charges, except tax, fell from £11,564 to £6,550 in 1955. Once again no dividends on the £100,000 six per cent cumulative preference and £100,000 ordinary capitals are recommended. In their preliminary statement for the year the directors state that it is proposed to reduce and reorganise the capital.

Olin Mathieson Chemical Corp.

Olin Mathieson Chemical Corporation, US, state that domestic and Canadian sales during the six months ended 30 June were $300,050,408, an increase of 11 per cent over the $270,800,964 reported in the first half of 1955. Net income totalled $21,603,517, or $1.63 a share, compared with net income in the same period last year of $19,941,739, or $1.60 a share. For the three months ended 30 June 1956, Olin Mathieson's domestic and Canadian sales totalled $155,709,731, an increase of approximately 10 per cent over total sales of $142,103,684, in the second quarter of 1955. Net profit in this period rose to $11,523,418, against $10,998,502 for the second quarter of last year. This was an increase of approximately 5 per cent. Earnings in the past quarter equalled 87 cents per share of common stock, compared with 88 cents per share

earned during the second quarter of 1955 on a substantially smaller average number of shares outstanding. During the second quarter the board of directors declared a dividend of 50 cents a share which was paid on 9 June to stockholders of record on 17 May. The regular quarterly payment of $1.0625 on the 4.25 per cent convertible preferred stock was declared payable on 1 September to stockholders of record on 17 August.

Iraq Petroleum Co.

A gross profit on sales of oil and pipeage of £6,873,457 is reported by the Iraq Petroleum Co. for 1955 compared with £7,048,257 for the previous year. The associated undertaking, Basrah Petroleum Co., made a gross profit on sales of oil of £3,854,809 compared with £1,505,842 in the previous 12 months. Mosul Petroleum's gross profit on sales of oil increased from £485,720 to £994,399 in 1955.

Atmospheric Pollution

Councillor H. Goodall, chairman of the Health Committee, has told Runcorn UDC of a conference held recently between the local authority and ICI Ltd., on the subject of alleged atmospheric pollution from the company's works at Western Point, Runcorn. Councillor Goodall said that ICI's ideas of dealing with the question were far-reaching. The apparatus they were considering was an improvment on the equipment of 1946. It was expected to eliminate by electric precipitation most of the dust emission. The subject is to be reviewed by Runcorn UDC in three months time. Atmospheric pollution stations on Runcorn hill and Runcorn golf course are to be re-sited at the village hall, Weston, and in the area of Western church.

Obituary

MR. REGINALD ATKINS THORPE, chairman and joint managing director of The English Grains Co. Ltd. and The Trent Yeast Extract Co. Ltd., Burton-on-Trent, died on 6 August at the age of 57.

The directors of W. J. Bush & Co. Ltd., record with deep regret the death of MR. F. H. PRIEST who was manager of their Mitcham works for over 50 years. He leaves a widow, a daughter and a son, Mr. F. W. Priest, who succeeds him as manager. Mr. Priest was 75 years of age and in his 61st year of service with the company. Throughout his working life he had been associated with the Mitcham factory, and its development during his long term of management holds a significant place in the Bush story of progress.

Wills

MR. THOMAS H. HEWLETT, Director of Dyestuffs at the Board of Trade during the second world war, and from 1940 to 1945 Conservative MP for the Exchange Division, Manchester, who began work with the Anchor Chemical Co. when he was 13 and rose to be chairman of the company, and chairman and director of other companies, left £248,389 gross.

MR. CHARLES HENRY BRENNAN, of Brockhill, Brockhill Road, West Malvern, formerly of Bristnall Hall Road, Langley, Oldbury, purchasing controller of Albright & Wilson Ltd., chemical manufacturers, Oldbury, who died on 31 March last, left £16,591 8s 5d gross, £8,009 8s 7d net value. (Duty paid £314.) Probate has been granted to Arthur Webb, of 336 Moat Road, Langley, the sole executor.

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Printed in Great Britain by THE PRESS AT COOMBELANDS LTD., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154 Fleet Street, E.C.4, 18 August, 1956. Registered at the General Post Office. Entered as Second Class Matter at the New York U.S.A., Post Office.