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# The Chemical Age

VOL LXIX

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No 1782

## CECA

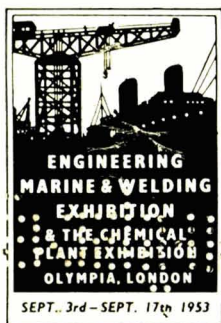
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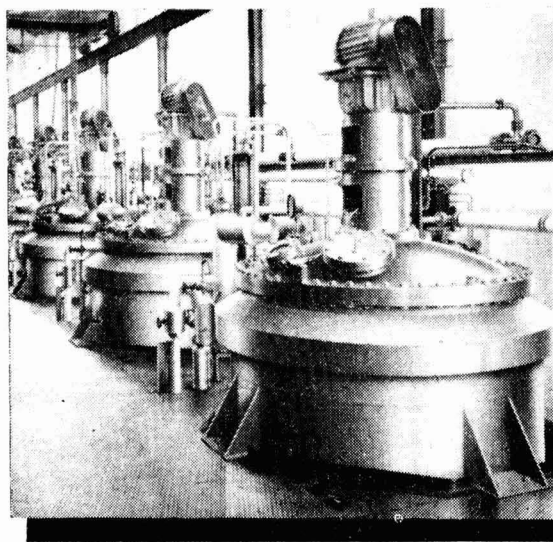
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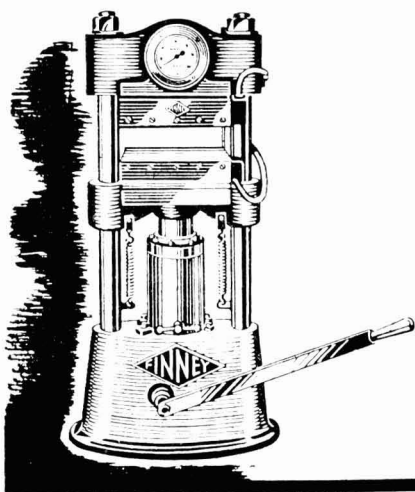
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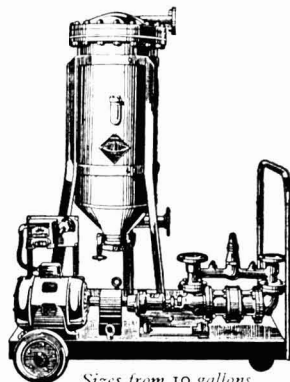
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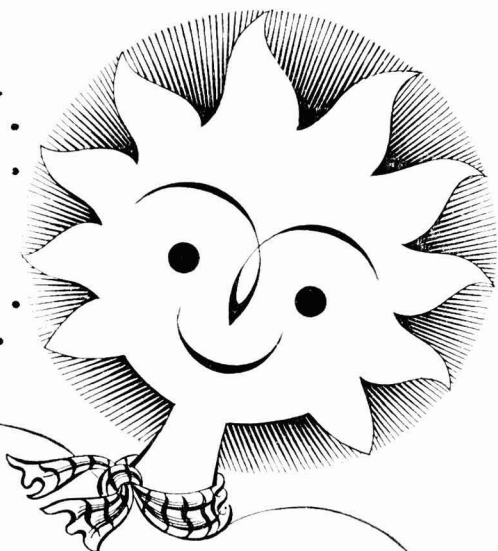


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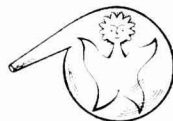
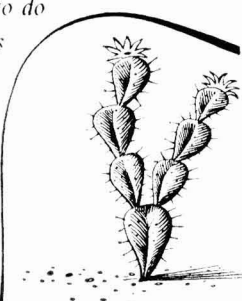
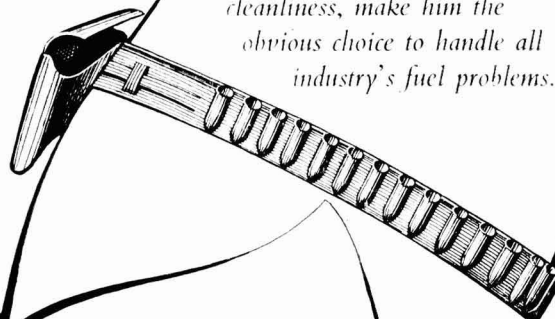
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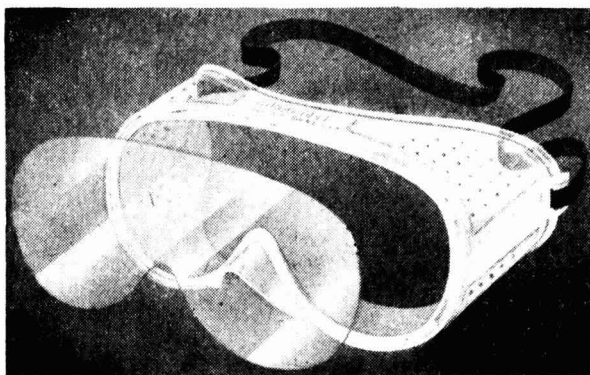
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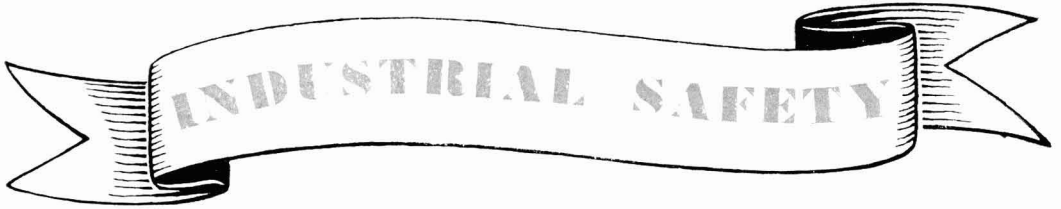
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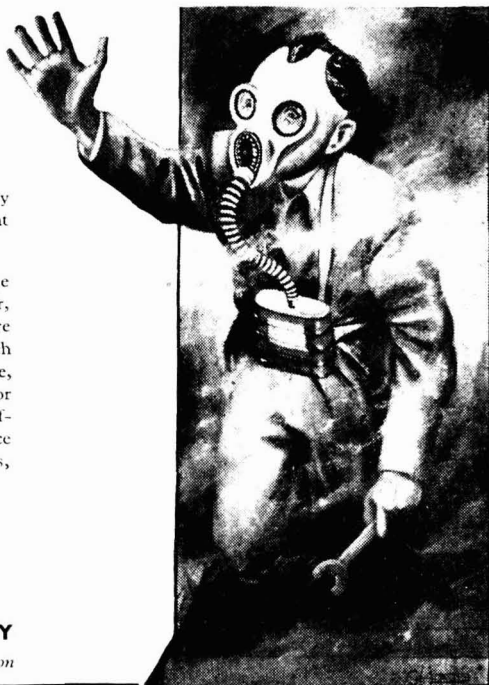
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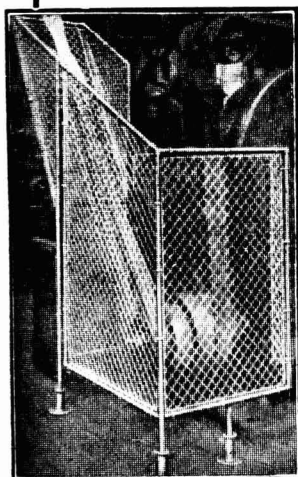
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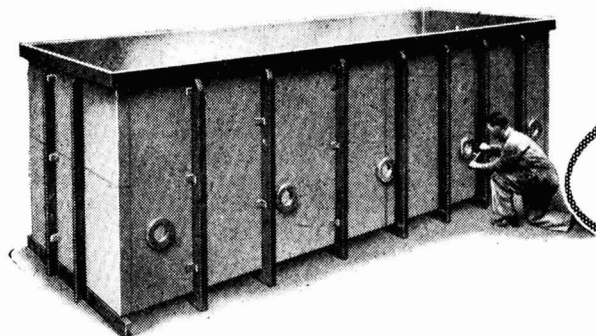
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## Our Point of View

# Public Ownership ?

THE Trades Union Congress' Interim Report on Public Ownership should not be disregarded. It certainly shows that left-wing plans to nationalise the chemical industry are empty and impractical, a fetish of political theory without justification in the past and without hope of benefit in the future. These conclusions are not, of course, reached in the TUC report, but they are there by sense and implication to be readily deduced by any objective and open-minded reader.

Three reasons for considering public ownership for the chemical industry are stated—its products are essential to a wide range of other industries; it is an industry whose rapid development can save imports and increase exports; and, thirdly, it has a monopolistic structure. We are now so used to reports by reformers and planners that this sober-sounding verbiage can all too easily be accepted as sound and relevant argument. But how does the fact that the chemical industry's products are widely essential as intermediate materials of general production influence the case for or against public ownership? Had certain materials been withheld from other industries, had important national needs not been met with anticipation, then there might indeed be some cause for concern. But the TUC report can produce no evidence of this kind. On the contrary, it has to admit that 'one feature of chemicals is the fact that its boundaries are difficult to define and that it is constantly branching out in new directions.' Nor is the fact that rapid development in the industry can save imports and gain export trade a relevant argument. The TUC cannot show that rapid development has not

taken place under private ownership. The report itself may well be quoted here—'there is nothing in the previous history of the industry, so far as it is known, to suggest that investment in the future will be inadequate.'

So much, then, for two of the reasons that are given for nationalisation or partial public ownership. As to the third—the industry's monopolistic structure—some relevance of argument must be conceded. Total monopoly is bad. It encourages the very reverse of competition. It inevitably prolongs the commercial life of obsolete processes and bolts the door against progress. But the question is, how much monopoly truly exists in the industry? It is said in the TUC report that 48 per cent of the workers are employed by the three largest units. Although this piece of statistical information (attributed to the Board of Trade) depends for its validity upon the basic definition of the chemical industry, let it be accepted as a measure of monopoly in the industry. Forty-eight per cent divided between three big groups—52 per cent divided between the many groups and small companies that represent the rest. Is this a highly monopolised structure? Marginal monopoly would seem to be very much fairer description, especially when it is borne in mind that many of the newer developments in chemical industry can be economically undertaken only on a very large scale, a scale that in a country of this size must encourage monopolistic tendencies, although in a larger country like the United States there would be more initial room for two or three competitive ventures. Again the report is worth quoting—'There have grown up in Britain since the war the new petroleum chemicals industry and the large'

scale production of synthetic detergents and of several new synthetic textile fibres. In each case the result has been that the area of industry in which large private monopolies are influential is being rapidly extended.' Thus we have an open admission—well worth permanent record—that these important new enterprises have been initiated by those sectors of the industry that are more monopolistic. (In fact, however, there has surely not for generations been as much rugged competition for the consumers' shillings and pence as is now being displayed by the manufacturers of synthetic detergents!)

The case for nationalisation, or for some degree of public ownership, is certainly one of the Left Wing's boneless wonders. Indeed, it has neither bones nor flesh and it might better be described as a not-so-blithe spirit that the extremists regularly call up to the obvious embarrassment of their more sensible colleagues.

So we have the TUC saying that there is need for public control over the chemicals industry though they cannot produce a single reason for saying so; but they go no further than recommending an inquiry into the facts before reaching a decision on the nature and extent of that control. Could uncertainty be more certainly expressed? Could doubts be more publicly demonstrated? And we have such ludicrous suggestions as the separate nationalisation of one major chemical company (Imperial Chemical Industries Limited), a sufficient step to promote development and check monopoly abuses! Could the impracticability (and open injustice) of nationalisation be more openly revealed? The truth is that the TUC cannot make out a case for nationalising the chemical industry, but they have been obliged to devote some half-hearted attention to it to placate their own—and the Labour Party's—more irresponsible followers.

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## Notes & Comments

### *Facts with a Punch*

**W**E recently published an article (THE CHEMICAL AGE, 68, 965) drawing attention to the value of punched cards in the filing of literature references and experimental data, and *Industrial and Engineering Chemistry* (August, page 17A) now reports what is probably the most ambitious of schemes yet devised. The Chemical-Biological Coordination Centre of the US National Research Council is using its sorting machines to analyse the correlation of chemical structure with biological activity, after taking four years to develop a suitable code for the cards. Details filed include a designation of the basic components or functional groups of each compound, and an approximate molecular formula; methods of administration; taxonomy and organ system involved; host, dosage, action and response. On each card is also a serial number designating the specific compound involved. It is obvious that no other indexing system could possibly

deal with this mass of data in a convenient way, and it is surprising and disappointing that greater use of punched cards has not been made in scientific establishments in this country.

### *A Scottish Extension*

**W**HEN the latest proposed extension to the Heriot Watt College, Edinburgh, has been completed, the East of Scotland will be provided with exceptional facilities for chemical industry research and technical education—as is fitting in a city which has an outstanding group of chemical and pharmaceutical concerns and a chemical tradition. It is particularly interesting to notice from the plans that the College is giving special attention to chemical engineering. The great bulk of the space will be devoted to specialised laboratories, the seven floors giving ample accommodation for a full range of subjects. Included in the scheme are premises for work on chemical research, building research, chemical engineering, general



research, metallurgy and fuel, ophthalmics, organic chemistry, hydrogenation, microphysical metallurgy, advanced optics, advanced physical chemistry and inorganic chemistry. Building work is expected to cover several years.

### Hydrazine

IT is almost paradoxical that a chemical suddenly needed for quite new functions should be most economically produced on a large scale by a process that was developed more than 40 years ago. Such is the case with hydrazine,  $N_2H_4$ , now needed as a rocket fuel. The process being used in the United States of America is the German Raschig process of 1907, based on the reaction of ammonia with sodium hypochlorite. There are several other routes to hydrazine—electrolysis of amides, and the decomposition of ammonia by light, controlled oxidation, and high temperature dehydrogenation, but none of these newer methods gives yields as satisfactory as the 1907 process. One other process—based on urea—is also being used today in America. Large-scale production has brought rapid price reduction. Anhydrous hydrazine was \$9 per lb. five years ago. It is now \$3 per lb. and an eventual stabilisation around \$0.50 per lb. is expected. Many of the more ordinary uses of hydrazine will therefore benefit from the 'rocket fuel' impetus to production. Hydrazine is a raw material for several pharmaceutical products, particularly for modern TB drugs (e.g. Isoniazid). It is also used in boiler-water treatment, in metal plating, for making special fluxes for soldering, and in the production of maleic hydrazide, the new plant-growth inhibitor. It is probable that many more uses of hydrazine will be developed once it is abundantly available at a low price. Hydrazine was used in World War II by the Germans as a rocket fuel and two large plants were erected in 1944. Hydrogen peroxide or liquid oxygen was used as the oxidant. First discovered by Emil Fischer (1875), first produced in a commercial process by Raschig (1907), and first developed as a rocket fuel, hydrazine has so far had an all-German history. The new \$3,000,000 plant in the USA may alter that course of events.

### Dust and Danger

THERE is still not enough fundamental knowledge about the physiological effects of dust particles, though basic research on these problems is steadily increasing. One conclusion now clearly emerging is that particle size is a highly influential factor, perhaps much more influential than the nature of the dust itself. For example, intravenous injections of various particles with rabbits have shown that death is much more likely if the particles are of 0.2 or 0.3 micron size than if they are 0.6 micron size. Clay, aluminium oxide, iron oxide, carbon, and antimony trioxide were all used in these experiments. Particle size variations caused sharper differences in mortality rates than differences in chemical nature. With silicosis, the extent of dust retention in the respiratory system and also the position of retention are now regarded as major factors. Retention depends upon particle size. Particles above 5 microns are retained in the nasal passages and upper respiratory tract, but below this size and down to 1 micron deeper and more dangerous retention occurs. Below 1 micron, however, alveolar retention decreases; on the other hand, the response to these very small particles is more severe and less dust can produce silicious symptoms with exceptional rapidity. Too little is yet known about the rate of clearance of very small particles from the lungs. British studies—injecting the lungs of rats with various sizes of flint dust—have shown that the 1 to 2 micron range produces the most severe effects. But the number of particles retained seemed relatively unimportant. The surface area of the dust absorbed seemed to be the critical influence. A fuller account of current views and experimental data on this important industrial subject will be found in *Industrial and Engineering Chemistry* (1953, 45, 8, 11A-114A). It seems a reasonable conclusion to say that the physical influence of size counts more than the chemical-cum-biological influence, though it remains true that dust particle sizes may be determined to a

considerable extent by the chemical nature of the material itself or by the chemical nature of the dust-forming operation.

### **Carbon Black in Canada**

**C**ARBON black, formerly heavily imported into Canada, from the United States, is now being produced on a large scale at Sarnia, Ontario. The expected output per annum is 20,000,000 pounds, but in due course a doubling of this capacity is possible. This means that between 30 and 60 per cent of Canada's carbon black imports will eventually be supplanted by home produced carbon black. There were previous efforts to establish carbon black production in Canada, but schemes based upon natural gas in Alberta never came to fruition. The Sarnia plant is based upon oil, the controlled combustion process being used; this is, of course, the same method that has been developed in England since the

war. All the capital for the new Canadian venture has been provided by America, a new company—Cabot Carbon of Canada Ltd.—having been created as a subsidiary of the Cabot organisation of Boston. The new industry will not receive tariff protection during its infancy. The fact that production costs are somewhat higher than in American carbon black plants has to be offset by the savings in transport cost. In any case neither the American sponsors of the project nor Canadian consumers have any doubts that all the carbon black that can be manufactured will find a ready market at home. The need for Canadian carbon black production has been stressed by Canadian rubber companies themselves and more than one American chemical concern with experience in this field was approached. Here in Britain we can only regret that yet another opportunity in the Commonwealth has been entirely absorbed by American capital and American technological 'know-how.'

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### **Lower Accident Rate**

**T**HE overall injury experience at American coke plants was improved sharply in 1952, according to the Bureau of Mines, US Department of the Interior. From reports submitted to the Bureau on 30,137 active coke ovens, the combined frequency rate, fatal and non-fatal, was 8.82 injuries per million man-hours of exposure to hazards and 7.59 per million net tons of the product produced. Each rate was substantially lower than its comparable rate of 11.08 and 9.20 in 1951, and each was also better than its respective rate for the previous four years.

At by-product plants, 7 employees were killed and 420 received disabling injuries. The fatality frequency rates were 0.12 per million man-hours and 0.10 per million net tons, each an improvement over its corresponding rate in 1951. The respective non-fatal rates of 7.16 and 6.13 were lower than in any one year of the 5-year period covered in this report.

Reports from operators of 14,023 active beehive ovens indicated that there were 1 fatality and 126 non-fatal injuries occurring at rates of 0.24 and 30.29 per million man-hours and 0.22 and 28.20 per million tons.

The respective combined rates of 30.53 and 28.42 were 21 and 11 per cent lower than the previous year's rates.

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### **Training Chemical Workers**

A NATIONAL scheme of training for the chemical industry, sponsored by the Chemical and Allied Industries' Joint Industrial Council, was announced at Smethwick last week by Mr. G. M. Hopps, of Bakelite Limited, who is chairman of the JIC Regional Committee.

Under the scheme, which comes into operation in the autumn, boys leaving school in the Midlands are being selected by local employers for a course at the Chance Technical College, Smethwick. The aim, said Mr. Hopps, was to impart to the student technical knowledge, which, with practical experience, would provide a skilled worker.

The chemical industry is offering a five-years' apprenticeship and will give practical training on all the most important chemical operations. The theoretical training will consist of attendance at the Chance Technical College and a four-years' City and Guilds course in chemical plant operation, with intermediate and final examinations.

# Organic Chemistry Progress

## Professor Clemo's Address to British Association

ADVANCES in organic chemistry were commented upon by Professor G. R. Clemo, F.R.S., in the course of his presidential address to Section B at the British Association's annual meeting at Liverpool on 3 September. He also took an interesting peep into the future. The title of his address was: 'A Suggestion and Some Consequences: Some Reflections on Liebig's Call to British Chemists at the Liverpool Meeting in 1837, together with Observations on the Nature of City Smoke.'

At the beginning of his address Professor Clemo referred to the fact that the first meeting held by the Association at Liverpool was in 1837. On that occasion, he said, the outstanding personality present was Liebig, who, having already transformed the technique of organic analysis, was led to study chemical changes during growth and decay in the plant world, and thus to change the practice of manuring.

Liebig stated:—

'There are many bodies similar to urea and allantoin, all of which will probably, at a future period, be produced by artificial means; but in order to arrive at this, the final object of investigation in organic chemistry, a great deal of labour, and that labour of a combined nature, will be required. I am certain that this object will be attained. Organic chemistry has made its first step, and already its field has been extended to a very surprising degree. We meet every day with new and unexpected discoveries. It is, however, remarkable, that in the country in which I now am, whose hospitality I shall never cease to remember, organic chemistry is only commencing to take root.

### Influence of Organic Chemistry

'We live in a time when the slightest exertion leads to valuable results, and, if we consider the immense influence which organic chemistry exercises over medicine, manufactures, and over common life, we must be sensible that there is at present no problem more important to mankind than the prosecution of the objects which organic chemistry contemplates. I trust that English men of science will participate in the

general movement, and unite their efforts to those of the chemists of the Continent, to further the advance of a science which, when taken in connection with the researches in physiology, both animal and vegetable, which have been so successfully prosecuted in this country, may be expected to afford us the most important and novel conclusions respecting the functions of organisation.'

### Great Advances

After summarising the consequences of Liebig's challenge, Professor Clemo went on later in his address to say:—

'Could Liebig return today he would surely exclaim that this country 'has surpassed all his notions.' The great advances in industrial organic chemistry are almost too numerous to mention, but outstanding among the discoveries are Caledon jade green and the phthalocyanines among the colouring matters, and Perspex, polythene, Terylene and Ardil among the plastics and fibres

Carothers began 'to synthesise giant molecules by strictly rational methods' in 1927, and yet the American chemists missed Terylene and they are now watching closely our work in the plastics field.

The selective weed killers and insecticides like Gammexane have also been largely developed here. On entering a seedsman's shop with its shelves stacked with tins of bio. thio, etc., it is no surprise to learn that the use of organic pesticides increased in the United States by 250 times between 1941 and 1951. Even so, Ordish in *Untaken Harvest*, published in 1952, claims that in 1947 the produce of 2,000,000 acres and the skilled work of 51,000 men was wasted in this country, and the tragic loss from foot and mouth disease will be familiar to all. An interesting departure in the practice of manuring has been recently introduced whereby urea is absorbed directly by the leaves of the plant. Incidentally, this key organic substance is now stated to be one of our big dollar-earning exports.

Concurrently with the dyestuff industry and often using its by-products, the drug industry began early to develop in Germany, antipyrine being introduced in 1886, aspirin in 1899, and it received a vast impetus

when Ehrlich laid the foundation of modern chemotherapy. It has now assumed colossal proportions; thus the USA in 1935 spent \$10,000,000, rising to \$100,000,000 in 1951, on drug research, the sales being \$291,000,000 and \$1,424,000,000 respectively for the same years. It is not surprising, therefore, that they have made rather startling discoveries in several lines and now even use drugs fairly generally as lie detectors! This country, however, is in no way behind and has made many notable contributions.

Good things, however, even more than bad tend to be abused. This applies with special force to drugs, since good health is our most priceless possession and its pursuit by the ailing is apt to lead to excesses. Thus it has been stated recently that no fewer than 10,000,000 aspirin tablets were used in this country last year.

### The Old Days

The critics of the use of anaesthetics and chemotherapy generally, however, might well reflect on the old days when, for instance, a brain operation could only be done by rubbing a hole in the skull with a stone.

The tremendous industrial developments touched on above are due to the building up of big research staffs by industry and their beneficial interplay with the academic staffs doing fundamental research in the universities. This also has its dangers and there is widespread concern and almost alarm at the dearth of science teachers in our schools. One set of figures is enough. For the session 1951-52, of the 482 honours science graduates from Oxford, only 17 became schoolmasters and all in public schools. Undoubtedly the relative salaries paid by industry and the teaching profession have a good deal to do with this and the following figures speak for themselves:

Age	Average Salary	
	Teaching (Grammar Schools)	Industry (from Institute of Chemistry statistics)
32	£651	£1,004
35	£705	£1,244
46	£726	£1,651
	Special responsibility £50 £100	Many industrial salaries are increased by 20 per cent.

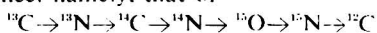
Pensions also favour considerably the industrial chemist. In addition, the satisfaction obtained from a research or manufacturing career producing results of far-reaching value also plays an important part.

A further serious consequence of this lack

of science teachers is that there appear to be very few science 'Heads' in our grammar schools. Thus for 25 such schools in Newcastle and Northumberland no fewer than ten 'Heads' graduated in classics, three in English, three in history, two in mathematics, two in physics, one in chemistry, one in biology, etc.

It is not easy to suggest a solution to this serious problem and yet one must be found soon. Can the universities help by encouraging research by science masters in schools? Are any schools doing research, as Clifton and Dulwich did to their great credit last century?

Now to look forward for a few moments. In spite of all the remarkable advances, particularly in structural and synthetic organic chemistry, Nature still does most of its great work behind its curtain. Our ignorance here is truly great, although considerable light has recently been shed on both the carbon and nitrogen cycles. The former used to refer to the intake of carbon dioxide by plants and its metabolism through many intermediate products and their final conversion to CO<sub>2</sub> again. Now, however, a quite new aspect of the cycle has been claimed to be of the profoundest importance, namely, that of



which needs apparently 5-6,000,000 years for its completion and is held to be the essential catalyst in the process whereby in the sun 592,200,000 tons of hydrogen are converted to 588,000,000 tons of helium per second with the conversion of the balance of 4,200,000 tons to produce the stupendous energy emitted by the sun and which keeps all life as we know it functioning. If the nitrogen-fixing bacteria in certain plants could function slightly better there would be much less need for synthetic nitrogen fertilisers. The study of chemical microbiology is probably our greatest need at the present time.

### Instances of Ignorance

To give a very few instances of our ignorance, we scarcely know how the vitamins function in nutrition; not even the simplest C which is essential for man and some other animals but not for others; or how the black pigment of our hair and skin is formed, or why the plant auxins make the hop climb the stick in one direction and the kidney bean in the other, or to prevent, let alone cure, cancer.

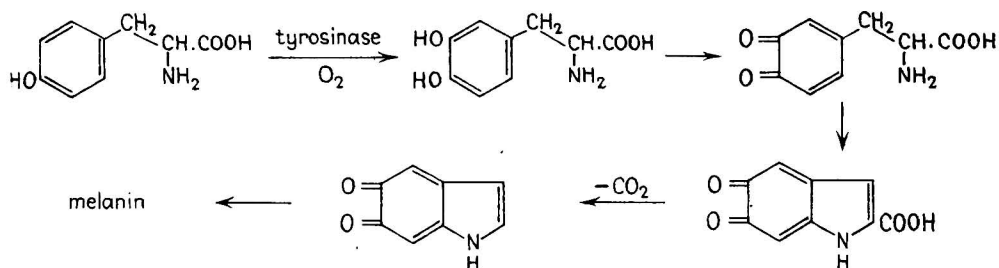


Fig. 1

In the elucidation of such problems it is not too much to claim that the discovery of the isotopes, particularly of carbon and nitrogen within the last decade, will play a decisive role. Their limited availability here is not so much a handicap as their great cost, as shown by the following figures:—

Ba<sup>14</sup>CO<sub>3</sub> with 1 mC. of activity in 40-45 mg., £12;

Ba<sup>13</sup>CO<sub>3</sub> 70 per cent enriched per gm. of <sup>13</sup>C, £40;

<sup>15</sup>NH<sub>4</sub>NO<sub>3</sub> 35 per cent enriched per gm. of <sup>15</sup>N, £80;

and H<sub>2</sub><sup>18</sup>O 5 per cent enriched per gm. of <sup>18</sup>O, £225.

The <sup>14</sup>C radioactive isotope is made in the pile, while <sup>13</sup>C is present in all carbon to the extent of 1.1 per cent, <sup>15</sup>N in the atmosphere to the extent of 0.38 per cent and <sup>18</sup>O in water to 0.2 per cent.

It is not surprising, therefore, that the bulk of the work done with them has so far come from the United States.

Nevertheless, I want now to indicate how <sup>13</sup>C has been used to gain a further insight into the mechanism whereby melanin pigments are formed from tyrosine.

In the majority of organic reactions involving a rearrangement of the carbon skeleton (e.g. through the migration of a carbon atom) or the elimination of a carbon atom, it is fairly obvious which atom has migrated or has been eliminated. There are, however, a few reactions in which this is not so obvious; and in which classical methods could not give, with certainty, the answer.

In such a case, the use of isotopic carbon (<sup>13</sup>C or <sup>14</sup>C) as a tracer can provide the answer, provided (a) that it is possible to synthesise the compound concerned specifically labelled with isotopic carbon in the appropriate position or positions, and (b) that (i) in the case of rearrangement reac-

tions, the rearranged isotopic compound can be degraded stepwise so that the position of the labelled atom may be determined, or (ii) in the case of a reaction involving the elimination of a carbon atom, the resulting one-carbon compound can be isolated.

An example of the latter type is in a recent study of the formation of melanin from tyrosine, 3:4-dihydroxyphenylalanine, 3:4-dihydroxyphenylethylamine and 5:6-dihydroxyindole. So far, the most important contribution to our understanding of the structure of melanin and of the reactions involved in its formation is due to H. S. Raper and his collaborators, who suggested the scheme for tyrosine shown in Fig. 1.

According to this scheme, the last stage of which has been established by the successful synthesis of 5:6-dihydroxyindole by Robertson, the carbon dioxide which arises during the formation of melanin from tyrosine has its origin in the carboxyl group of the amino acid. Tyrosine and 3:4-dihydroxyphenylalanine labelled with <sup>14</sup>C in the carboxyl group were therefore prepared as shown in Fig. 2 (overleaf).

When the resulting amino acids were treated with oxygen at pH 8 (in the case of tyrosine, also in the presence of tyrosinase), the evolved carbon dioxide, although radioactive, had only about half of the activity expected if it originated entirely from the carboxyl groups. It therefore follows that part of the evolved carbon dioxide originated from one or more of the other eight carbon atoms of the amino acid molecule. Moreover, it was also found that carbon dioxide is evolved when melanin is formed from the carboxyl-free compounds 3:4-dihydroxyphenylethylamine and 5:6-dihydroxyindole by passing oxygen through these solutions at pH 8. That this carbon dioxide should result by the complete breakdown of the molecule under such mild conditions is

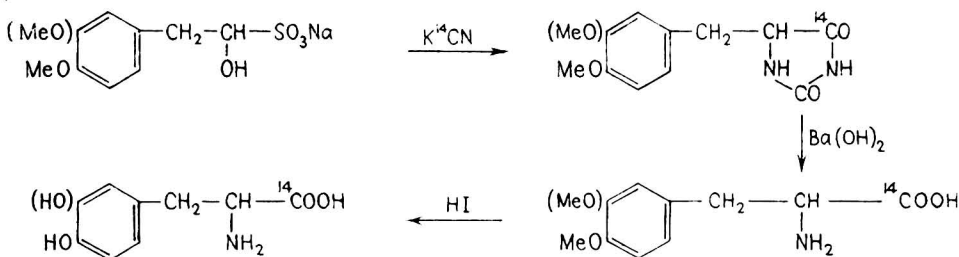


Fig. 2

unlikely, and, moreover, it has been shown that the carbon dioxide evolved from 3:4-dihydroxyphenylethylamine labelled with  $^{14}\text{C}$  in either the  $\alpha$  or  $\beta$  position of the side chain is of very low activity. These compounds were synthesised as shown in Fig. 3.

It therefore seems fairly certain that the carbon dioxide originates mainly from the benzene ring. We have shown that catechol also evolves  $\text{CO}_2$  under oxidative conditions and this can only come from the opening of the ring.

With regard to the great problem of cancer, apart from the limited, but valuable, treatment possible by therapeutic agents, and the use of radiation therapy, the real advances in treatment are still ahead of us and may yet baffle our researchers for many years. It would seem, therefore, the merest common sense to strain every effort at prevention, particularly since some steps to this

end are easily practicable. Statistics have been published which show that cancer in the respiratory system is on the increase, and this naturally focuses attention on the air, or rather smoke, we breathe, whether deliberately or unavoidably. The Registrar General's statistical review for 1948-49 states that the crude death rate for cancer showed a continuing steady rise and much of the male increase was attributed to cancer of the lung.

It was a surprise to learn recently that no single organic constituent of the smoke scourge has been isolated and definitely identified, although for too many years past this evil has been stressed in and out of season.

In conclusion Professor Clemo described the results of experiments which had been made to keep clean the supply of air to the new chemistry building at Newcastle.

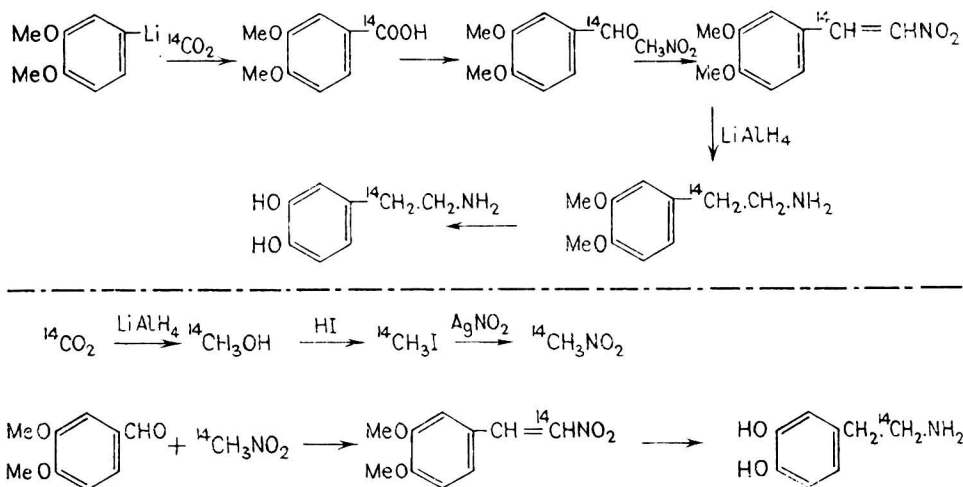


Fig. 3: Synthesis of 3:4-dihydroxyphenylethylamine labelled with  $^{14}\text{C}$  in the  $\alpha$  and  $\beta$  positions respectively.

# The Future of the Chemical Industry

## The TUC & Need for Public Control

**T**HERE is need for public control over the chemical industry 'because of its monopolistic structure and its importance to the economy.' Such is the view of the General Council of the Trades Union Congress, with the reservation, however, that 'in view of the difficulty of obtaining full information about its operations, the next Labour Government should institute an inquiry into the facts of the industry before a final decision is taken on the nature and extent of that control.'

These quotations are from the 'Interim Report on Public Ownership' recently submitted to the TUC by its General Council following the instructions it received at the 1952 annual congress to 'formulate proposals for the extension of social ownership to other industries and services, particularly those subject to monopoly control.'

After commenting on the attitude of the trade union movement to monopoly the Report expresses the view that the *prima facie* case for public ownership of a monopolistic industry must be considered strong where such an industry conforms with certain criteria set out in the Report.

### Importance of Chemical Industry

The Report continues:—One example, when the present Government's denationalisation plans are carried out, will be the iron and steel industry; TUC policy for the re-nationalisation of this industry is clearly stated in the 1952 Congress resolution 'Social Ownership.' Another industry of whose basic importance to the economy the country has become increasingly aware in recent years is the chemicals industry; it therefore requires special consideration.

The chemicals industry, in fact, deserves attention from the point of view of public ownership or control on three main counts. These are: first, that its products are essential to a wide range of other industries whose production would be crippled without them; second, that it is an industry which, as already stated, should be rapidly developed because of its import-saving and export potentialities; and third, its monopolistic structure.

For the most part, and with certain im-

portant exceptions like pharmaceuticals, the products of the chemicals and allied industries are raw materials for other industries and for other sections of the chemicals industry. The principal sections of the industry are the manufacture of heavy chemicals, dyestuffs, coal-tar products, petroleum chemicals, pharmaceuticals, explosives, fertilisers, pesticides, synthetic fibres and plastics; but there are many other products (e.g., paints) which are closely connected with the chemicals industry and are in some cases manufactured by the same firms.

### Greater Production Needed

Chemicals production will have to be increased, firstly, in order to enable other industries to expand. Thus higher agricultural output will require increased production of fertilisers and consequently of sulphuric acid. Development of synthetic textile fibres will also put new demands on the chemicals industry. Secondly, chemicals can contribute directly to increasing exports, though, if this is to happen, it will be necessary for us to be in the forefront with the development of new products and processes (e.g., petroleum chemicals) in order to meet competition from other countries. Measures adopted to increase food production in under developed countries are likely to lead to a very much increased demand for fertilisers which will make a further call on that industry. Thirdly, development of domestic production of certain chemicals can contribute to the saving of imports. Much has been done in this respect in the last few years but we still, in 1952, imported some £42,000,000 worth of chemicals, drugs, dyes and colours.

In structure, chemicals is one of the most highly monopolised of all our industries. This fact emerged from the study of concentration by Board of Trade statisticians, which showed that taking the chemicals group as a whole, 48 per cent of workers were employed by the three largest units. If the group is subdivided, a much higher degree of concentration is shown for certain products. In any case, it is well known that one large concern, I.C.I., dominates nearly all sections of the industry and that

several other large firms occupy dominant positions in certain sections. This high degree of monopoly, which is due to the series of financial mergers from which the giant I.C.I. was born, and also the technical and legal (i.e., patent) reasons that exist for monopoly in some cases, is enhanced by the fact that the big firms are responsible for such a large share of the industry's research that most new developments in the industry are undertaken by these firms. It is also well known that the industry's monopolistic arrangements extend to the international field.

One feature of chemicals is the fact that its boundaries are difficult to define and that it is constantly branching out in new directions. Thus there have grown up in Britain since the war the new petroleum chemicals industry and the large-scale production of synthetic detergents and of several new synthetic textile fibres. In each case the result has been that the area of industry in which large private monopolies are influential is being rapidly extended.

#### **Need for Public Control**

Chemicals was among the industries which we said in 1944 were in need of public regulation, but no specific proposals were then put forward. The General Council have given further consideration during the present year to the future of the industry during which the proposals of the Labour Party for 'a substantial degree of public ownership' of the industry were taken into account. The view of the General Council is that there is need for public control over the chemicals industry because of its monopolistic structure and its importance to the economy, but in view of the difficulty of obtaining full information about its operations the next Labour Government should institute an inquiry into the facts of the industry before a final decision is taken on the nature and extent of that control.

If public control is to take the form of public ownership this could be either of the whole industry or of one or more of the largest firms. Alternatively, public control might take the form of supervision by a public Board of Control without any change of ownership. The purpose of the inquiry the General Council propose should be to give the Government the full facts on which to decide which of these courses is most suitable for the industry, and in the light of this decision of principle what is

the most appropriate administrative structure.

It can be said meanwhile that public ownership would certainly give the Government greater control over the industry than could be obtained by any other means. It would, on the other hand, present certain difficulties, among which are that of defining the industry (this would, of course, be avoided if only one or a few leading firms were nationalised), and those raised by foreign holdings in some of the firms and by the foreign interests of some of the firms—both of which could result in international difficulties. However, it should not be necessary to acquire all the firms in the industry; ownership of I.C.I. alone might be sufficient for the purpose of promoting development and checking possible abuses.

Although supervision by a public Board of Control has been proposed on previous occasions by the TUC for control of industries not ready for nationalisation, it has obvious disadvantages when what is required is to ensure that essential investment is undertaken. We have no experience of this type of control to draw upon, but it does seem that it would be difficult for a Board of this sort to promote development, especially when one firm has such a predominant position in the industry. On the other hand it must be said that there is nothing in the previous history of the industry, so far as it is known, to suggest that investment in future will be inadequate; a more important consideration is whether it will be in the directions required by the public interest.

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#### **Tungsten Institute**

Formation of the Tungsten Institute with headquarters in Washington is announced by W. Lunsford Long, of Warrenton, North Carolina, president of the new organisation. Objectives of the Tungsten Institute are: To foster the progress and development of the American tungsten mining industry; to promote the use of tungsten; to afford the means of co-operation between the American tungsten mining industry and the Federal Government in all matters tending to promote the national defence and other matters of national concern; and to promote the mutual improvement of its members and the study of the metallurgy of and the arts and sciences connected with the tungsten industry.



## Artificial Sweeteners

### Ban on Use in Food : Saccharin Exempted

THE use in food of all artificial sweetening substances except saccharin is prohibited under the Artificial Sweeteners in Food Order, 1953 (S.I. 1953, No. 1311), which the Minister of Food, Major the Rt. Hon. Gwilym Lloyd-George, M.P., has made under Regulation 2 of the Defence (Sale of Food) Regulations with effect from 1 September.

The Medical Research Council, on the recommendation of the Food Adulterants Committee, has informed the Minister of Food that on present evidence they regard the use of certain artificial sweetening substances as ingredients in food as undesirable on health grounds. In the light of this advice, the Minister has decided, in agreement with the Minister of Health and the Secretary of State for Scotland, to prohibit the use of all artificial sweetening substances except saccharin. He will, however, be prepared to consider the exemption of any other sweetening substance shown to be harmless.

### Revised Standard

At the same time, the existing standard for saccharin tablets has been revised, the new standard being as follows:—

A saccharin tablet or other sweetening tablet containing saccharin:

(i) shall contain not less than 0.18 grain and not more than 0.22 grain of saccharin or the equivalent weight of soluble saccharin.

(ii) may contain as excipient sodium bicarbonate with or without other suitable substances. The total amount of excipient shall not exceed four times the maximum quantity of saccharin.

(iii) shall not contain more than 5 per cent water-insoluble matter, nor less bicarbonate than that required to render the saccharin completely soluble.

It will no longer be necessary for the description 'standard' to be applied to saccharin tablets, or for the saccharin content of each tablet to be stated on the packet.

In making this standard, the Minister has had regard to the recommendations of the Food Standards Committee, and to the representations which were received after the Committee's proposals were published in June, 1952.

## Courses in Chemistry

IN the session beginning Monday, 28 September, at Northampton Polytechnic, St. John Street, London, E.C.1, part-time day and evening courses will be provided in general chemical technology, metallurgy, electrodeposition and metal finishing (including corrosion science), fuel technology, glass technology and glassworking, and clay technology.

Classes in chemistry in preparation for the General Certificate of Education at both ordinary and advanced levels, the Intermediate B.Sc. (Eng.) and the University preliminary examinations, in engineering chemistry, in chemical engineering and in engineering metallurgy are also held in the Department of Applied Chemistry. These latter classes, organised in connection with National Certificate courses in engineering, are also suitable for students preparing for professional examinations.

The Polytechnic is an Institution approved by the Royal Institute of Chemistry for the preparation of candidates for the A.R.I.C. examinations.

In addition, the Polytechnic is offering two special lecture courses during the autumn term. On Tuesday evenings at 7 p.m., beginning 29 September, Mr. L. A. Barrett will deliver a course of twelve evening lectures on 'Refractories—Their Manufacture, Properties and Uses', and on Wednesday evenings at 7.30 p.m., beginning 30 September, Dr. O. Kubaschewski will deliver a course of eight evening lectures on 'Chemical & Metallurgical Thermodynamics'.

Details as to fees, enrolment dates, etc., are obtainable on application to the Head of the Department, Mr. J. E. Garside, at the address given above.

### Pharmacy & Poisons Act, 1953

Attention is drawn to the Poisons List Order, 1953 (SI 1953, No. 1300), and the Poisons Rules, 1953 (SI 1953, No. 1301), which came into operation on 1 September, 1953. These Statutory Instruments give effect to the Poisons Board's recommendations to the Secretary of State which are detailed in Home Office Notice dated 13 July, 1953 (see THE CHEMICAL AGE, p. 120). Copies of the Poisons List Order, 1953 (price 4d. net), and of the Poisons Rules, 1953 (price 3d. net), may be obtained from HMSO.

# Efficient Filtration

## The Paterson Stellar Filter for Fine Chemicals

**T**HE Stellar Filter of the Paterson Engineering Co., Ltd., of London, has been specially developed for chemical and laboratory use where a fine filtration is required.

It is extensively employed in the production of fine chemicals, insulin, liver and similar animal extracts, and other injection solutions, all of which must, of course, be completely free from any suspended matter.

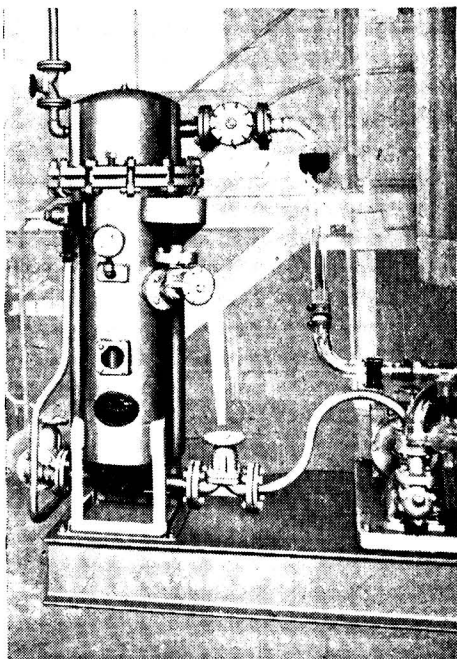
The filter element consists of a tube with equally spaced longitudinal ribs having a screw thread cut along the entire length, providing on each rib a series of grooves in which the consecutive turns of wire wound on the ribs is firmly located. The openings over the whole area of the element are of regular size and the result is a rigid element with the shortest possible flow and the minimum gap. The regularity of the openings ensures an even coating of filter aid with no break which would permit unfiltered liquid

to by-pass, thus ensuring absolutely uniform filtration.

As regards materials of construction, filter shells for general purposes with aqueous liquids are made of mild steel and lined when necessary with a hard plastic enamel. For foodstuffs and corrosive conditions stainless steel is used. The filter elements for water, oils and non-corrosive liquids are made with extruded brass tubular cores, electro-tinned and wound with either Monel or stainless steel wire.

Where it is imperative that the residual liquid should be conserved, special arrangements can be offered according to the nature of the application—siphon type elements, a reversible filter on trunnions or a separate small filter for dealing with the contents of the main filter.

The filtration of liquids containing more than a small amount of suspended matter, is usually facilitated by the continuous addition of filter aid throughout filtration. This addition of filter aid inhibits the formation of a skin of dirt on the pre-coat and by the deposition of further porous material continuously maintains an open filter bed throughout the run. The Stellar 'Jet Filtraider' enables this filter aid to be introduced proportionately into the stream of liquid immediately before the filter, and thus the abrasive diatomite does not pass through the pump.



*A Stellar Filter (of stainless steel construction) for syrups, etc.*

## New Diatomite Factory

A MAJOR step in the progress of the diatomite industry started at Staffin, Skye, a few years ago, will be taken this month when the Earl of Home, Minister of State, Scottish Office, opens the new factory which Scottish Diatomite Limited has built at Uig, Skye. The present temporary factory is only about three miles from Loch Cuiuir, from the dried-up bed of which the diatomite is transported to the factory for drying and refining. When the diatomite is processed now it has to be taken to Uig and shipped from there. The new factory—which is completely up to date—will therefore be of considerable advantage to the company.

# The Volumetric Determination of Calcium & Magnesium\*

by R. L. STEPHENS, B.Pharm., B.Sc., Ph.C., F.R.I.C.

THE classical methods of determining calcium and magnesium are lengthy and not well adapted to the routine determination of these elements in batches of preparations. The British Pharmaceutical Codex does not give limits for magnesium carbonate and calcium carbonate in compound powder of magnesium carbonate probably because of the lengthy nature of these determinations. A rapid volumetric method has been worked out which enables both these elements to be determined in two titrations.

The use of the disodium salt of ethylenediamine tetra-acetic acid as a volumetric reagent for the determination of hardness in water was first described by Schwarzenbach<sup>1</sup> and his co-workers in 1946. The same method was applied to the determination of calcium in pharmaceutical chemicals in America by Matock and Hernandez<sup>2</sup>, who reported that the method was more accurate and more rapid than the official method of the United States Pharmacopœia as well as being applicable to calcium phosphate for which, they stated, the official oxalate method cannot be used. Banks<sup>3</sup> has applied the same method to the determination of calcium and magnesium to coal ash and ceramic materials. Banks made the suggestion that stronger solutions might be worth investigating, and in the present work this suggestion has been adopted. Knight<sup>4</sup> suggested the use of a screened murexide indicator to make the end-point easy to recognise.

The strengths of solutions of ethylenediamine tetra-acetic acid used by previous workers have been low probably because of the small quantities of materials being tested. Banks used 0.02N solutions and direct titration; Matock and Hernandez used 0.03N solutions and back titration with magnesium chloride, which avoids interference from phosphate.

The present method employs 0.5N solutions and back titration with calcium or magnesium solutions as applicable. These stronger solutions give sharper end-points and permit the direct titration of weighed amounts of material without the need for

preparing dilutions. The method is of general application; the only important interfering substance is iron, which must be eliminated in the ordinary way if present.

Other divalent salts, such as zinc or strontium, will titrate in a similar way if present, but the absence of such salts in a pharmaceutical preparation will normally be established. One molecule of the disodium salt of ethylenediamine tetra-acetic acid combines with one atom of calcium or magnesium to form a chelate compound in which the calcium or magnesium ions are completely sequestered. Eriochrome Black T is used as an indicator in the presence of ammonia, changing from blue to magenta on the addition of divalent ions. This gives an end-point with both calcium and magnesium.

Calcium is estimated in the presence of magnesium by using murexide (ammonium purpurate) as an indicator in the presence of sodium hydroxide. Magnesium does not interfere because magnesium hydroxide is precipitated under these conditions. The colour change is from indigo to pink.

## Reagents

0.5N Disodium ethylenediamine tetra-acetate: 146 g. of the acid was dissolved in a slight excess of 5N sodium hydroxide (220 ml.) and diluted to 2 l. This was stored in a rubber stoppered bottle to exclude carbon dioxide which precipitates the acid.

0.5N Calcium chloride: 219.1 gm. of hydrated calcium chloride was dissolved in water and made up to 4 l.

0.5N Magnesium sulphate: 246.5 gm. of magnesium sulphate was dissolved in water and made up to 4 l.

Calcium indicator: 0.5 gm. Naphthol green, 0.2 gm. murexide ground together with 100 gm. sodium chloride.

Combined calcium and magnesium indicator: 0.2 gm. Eriochrome Black T (Solo-chrome) ground with 100 gm. of sodium chloride.

The solutions were standardised against pure calcium carbonate, the equivalent weight being taken as 50.04 by analogy with the acidimetric titration.

## General Method

The calcium and magnesium salts are

\* Read at the British Pharmaceutical Conference, London, 31 August, 1953, and published through the courtesy of the *Journal of Pharmacy and Pharmacology*.

brought into solution with the addition of the minimum amount of hydrochloric acid, in about 150 ml. of water and excess of 0.5N sodium ethylenediamine tetra-acetate added. The solution is then titrated with 0.5N calcium chloride in the following two ways to give the calcium alone and combined calcium and magnesium. Magnesium is obtained by difference.

#### Calcium Titration

To the solution containing excess of reagent, 4 ml. of 5N sodium hydroxide is added (more if the solution is already acid), 0.2 gm. of calcium indicator is added and 0.5N calcium chloride run in slowly. The end-point is reached when a tinge of red persists in the indigo blue solution.

#### Calcium & magnesium titration

To the solution containing excess of reagent 10 ml. of 5N ammonia is added and 0.2 gm. of Eriochrome Black T indicator. 0.5N calcium chloride or magnesium sulphate is added until the blue of the indicator turns through violet to magenta. There is some tendency for the magenta colour first produced to fade back to violet owing to the slow sequestration; the titration must be carried to a permanent colour.

#### Estimation of Calcium & Magnesium in Compound Powder of Magnesium Carbonate

The BPC gives limits for soluble alkali and total alkali, but the proportions of calcium carbonate and magnesium carbonate can vary widely without the powder falling outside these limits. In order to test the accuracy of the method, calcium carbonate and magnesium carbonate were assayed separately, then accurately weighed amounts were mixed together and the whole quantity dissolved in the minimum of hydrochloric acid and assayed by the general method. Table I shows the results obtained.

	By B.P. Method	By Titration
Calcium as CaCO <sub>3</sub> in mixture .. .. .	0.322 g.	0.322 g.
Magnesium as MgO in mixture .. .. .	0.108 g.	0.109 g.
CaCO <sub>3</sub> in calcium carbonate .. .. .	98.2 per cent	98.5 per cent
MgO in magnesium carbonate .. .. .	42.5 per cent	42.1 per cent

#### Estimation of Calcium in Compound Powder of Magnesium Trisilicate

It was found that the whole of the calcium

carbonate dissolved when compound powder of magnesium trisilicate was boiled with dilute hydrochloric acid but that the amount of magnesium present in the solution corresponded to all the magnesium carbonate and a variable proportion of the magnesium present as magnesium trisilicate. It was decided therefore to adopt a method for the determination of calcium carbonate in the routine examination of batches of this preparation.

Titration in the presence of the magnesium trisilicate was found unsatisfactory owing to the removal of calcium ions by the magnesium trisilicate by a base exchange mechanism at the endpoint. Filtration of the solution gave good results, the method adopted being as follows:

About 1.0 gm. of compound powder of magnesium trisilicate is digested on a water bath for 20 minutes with 50 ml. of water and 5 ml. of 5N hydrochloric acid and filtered, the filter is washed with a further 50 ml. of hot water. The solution is cooled, 20 ml. of 0.5N disodium ethylenediamine tetra-acetate and 10 ml. of 5N sodium hydroxide are added and the solution titrated with 0.5N calcium chloride using the murexide indicator.

#### Calcium in Calcium Gluconate

Gluconic acid does not interfere with this titration and since magnesium salts are not present the combined titration can be used and either 0.5N magnesium sulphate or 0.5N calcium chloride used for the back titration. While either method of titration may be used for calcium in the absence of magnesium, the less specific titration in the presence of ammonia and Eriochrome Black T was usually used since either reagent may be employed for the back titration.

About 2.0 gm. of calcium gluconate (or 10 ml. of 20 per cent solution) is dissolved in 125 ml. of water, 25 ml. of 0.5N disodium ethylenediamine tetra-acetate, 10 ml. of 5N ammonia and 0.2 gm. of Eriochrome Black T indicator are added and the titration completed with 0.5N calcium chloride or magnesium sulphate. For ampoules it is more convenient to use 2 ml. of 10 per cent solution and titrate using 0.1N solutions.

	B.P. Assay per cent	Titration per cent
Calcium gluconate .. .. .	101.2	101.1
20 per cent solution .. .. .	21.1	20.9
10 per cent solution .. .. .	9.9	9.9

### Calcium or Magnesium in the Presence of Phosphate

Estimation of calcium in the presence of phosphate using murexide indicator was not found to be satisfactory. This was due to the rapid precipitation of calcium phosphate which effectively removed calcium ions from solution and prevented the colour change in the indicator.

In the presence of ammonia and Eriochrome Black T a good end-point was obtained if magnesium sulphate was used for the back titration instead of calcium chloride. The following method has given good results for syrup of calcium lactophosphate:

10 ml. of syrup is measured in a pipette calibrated to contain 10 ml. and transferred by washing into a titration flask; 20 ml. of 0.5N disodium ethylenediamine tetra-acetate, 10 ml. of 5N ammonia, 100 ml. of water and 0.2 gm. of Eriochrome Black T indicator are added. The solution is titrated with 0.5N magnesium sulphate solution.

It was found that this method did not give a satisfactory end-point when used for calcium phosphate. It then became apparent that the sugar in the syrup of calcium lactophosphate was preventing the rapid precipitation of calcium phosphate and so producing a satisfactory end-point. Addition of syrup to the titration of calcium phosphate gave satisfactory results.

About 0.5 gm. of calcium phosphate is dissolved in 100 ml. of water with the addition of 2 ml. of 5N hydrochloric acid, then 20 ml. of syrup, 20 ml. of 0.5N disodium ethylenediamine tetra-acetate, 10 ml. of 5N ammonia and 0.2 gm. Eriochrome Black T indicator are added and the excess reagent titrated with 0.5N magnesium sulphate. The same method is used for calcium hypophosphite and calcium glycerophosphate.

### Calcium in Exsiccated Calcium Sulphate

About 0.5 gm. of finely ground plaster of

Paris with 25 ml. of 0.5N of disodium ethylenediamine tetra-acetate and 10 ml. of 5N ammonia are shaken at 40° for one hour. The whole of the calcium sulphate dissolves and the excess of reagent is titrated with 0.5N calcium chloride using 0.2 gm. of Eriochrome Black T indicator and about 150 ml. of water.

### Influence of pH

The general titration of calcium and magnesium using Eriochrome Black T indicator was found satisfactory between pH 9.6 and 10.4, corresponding to a wide variation in the quantity of ammonia added. Below pH 9.4 the end-point became less sharp. The titration of calcium alone was satisfactory above pH 11.2, but at this pH it was not specific for calcium as magnesium ions could still bring about the colour change of the murexide. Above pH 12.0 the titration proceeded normally, the ionisation of magnesium hydroxide being inhibited. The addition of extra sodium hydroxide up to a final concentration of 0.5N did not affect the titration.

### Effect of Temperature

Both titrations were carried out between 10° and 40° without influence on the results.

### Accuracy of Method

The end-point in these titrations could be judged to within 0.05 ml. giving an accuracy on a titration of 20 ml. of  $\pm 0.25$  per cent. Satisfactory replicate titrations could be obtained with this accuracy.

### Effect of Traces of Iron

The presence of 0.5 mg. of iron did not interfere with the titration using Eriochrome Black T beyond changing the colour of the indicator to indigo just before the end-point. The addition of hydroxylamine hydrochloride improved the colour of the indicator only if the temperature was raised to 60°. 1.25 mg. of iron interfered with the titration even

TABLE 3  
COMPARISON OF RESULTS WITH THOSE OBTAINED BY OTHER METHODS  
Found by  
Ethylenediamine  
Tetra-acetate

Compound Assayed	Tetra-acetate Titration per cent	Comparative Result per cent	Comparative Method			
CaCO <sub>3</sub> in compound powder of magnesium trisilicate	24.8	24.9	Permanganate titration of the precipitated oxalate.			
Ca(H <sub>2</sub> PO <sub>4</sub> ) <sub>2</sub> in calcium hypophosphite	101.5	101.7	Do.	Do.	Do.	Do.
CaC <sub>2</sub> H <sub>3</sub> (OH) <sub>3</sub> PO <sub>4</sub> .2H <sub>2</sub> O in calcium glycerophosphate	100.2	100.5	Do.	Do.	Do.	Do.
Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> in calcium phosphate	90.2	90.2	Do.	Do.	Do.	Do.
CaSO <sub>4</sub> in plaster of Paris	92.2	9.24	Residue on ignition.			
MgSO <sub>4</sub> .7H <sub>2</sub> O in magnesium sulphate	100.1	—	—			
MgO in magnesium oxide	99.2	99.3	By ignition.			
Mg(OH) <sub>2</sub> in mixture of magnesium hydroxide	8.62	8.62	By titration with sulphuric acid.			

in the presence of hydroxylamine at a raised temperature.

The titration using murexide as the indicator is somewhat more sensitive to iron. The end-point was still visible if 0.25 mg. of iron was present or 0.50 mg. in the presence of hydroxylamine. Owing to the instability of murexide this titration cannot be carried out above 50°.

### Stability of Solutions

The solution of disodium ethylenediamine tetra-acetate has been stored for 12 months without change in ordinary glass bottles. The amount of calcium dissolved from the glass is not enough to affect these relatively strong solutions. 0.5N magnesium sulphate is stable, 0.5N calcium chloride tends to form a slight deposit after a few months.

(Author's note: I wish to thank the directors of Wright Layman & Umney, Limited, for permission to publish these results.)

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- <sup>3</sup> Banks, *Analyst*, **77**, 484-489 (1952).
- <sup>4</sup> Knight, *Chem. and Ind.*, **51**, 1141 (1951).

## A New I.C.I. Factory

### 'Fluon' Again Freely Available

A NEW Imperial Chemical Industries plant to manufacture 'Fluon' brand of polytetrafluoroethylene has now come into operation, and 'Fluon' is freely available after three years of restricted supply. This was caused by an explosion which occurred in the original PTFE factory in 1950 and completely stopped production.

I.C.I. started producing PTFE on a limited commercial scale in 1948, and from the middle of 1949 almost the entire output was earmarked for vital Government needs, the small plant being unable to satisfy developing industrial demands. Immediately after the explosion, I.C.I. started work on the new and larger plant which is now operating.

Polytetrafluoroethylene, the only completely fluorinated high polymer, is remarkable for its wide range of working temperature, which extends from -100° to +250° or, in special circumstances, to 300°. In addition, it possesses extreme chemical inertness and solvent resistance, good mechanical properties, first-class electrical properties and unique low friction and non-stick characteristics.

The polymer is available as a granular white powder which can be fabricated by special techniques into a variety of forms—block and rod, extruded sleeving and cables, gaskets and packings, bearings and valve bases, film, and many others. These are all available from trade fabricators in this country.

Among other applications 'Fluon' is used in the chemical industry for gaskets and packings for pipework, valves, pumps and large vessels; diaphragms and valve seats, O-rings, oil seals, bellows and parts for pumps. (Such parts have been used outside the temperature range in which plastics normally operate, at high pressures and under extremely corrosive conditions.)

A special article dealing with 'Fluon' appeared in THE CHEMICAL AGE on 1 January, 1949 (pp. 10-14).

## Heavy Water Too Dear

PRICES for heavy water, used in the atomic process, are too high according to a claim made by Mr. John Dunworth, of the British atomic energy research station at Harwell, when speaking at the recent conference of nuclear physicists at Kjeller, near Oslo. He said he would rather see money invested at the moment in endeavouring to produce heavy water cheaply than in paying too large amounts at the present price.

Mr. Dunworth said the United States of America had quoted \$83 (about £30) a lb. for heavy water and so far Norway, one of the main producers, had not underbid that figure.

## Industrial Atomic Energy

THERE is no doubt that atomic energy plants for industrial power can be practicable and the cost would be reasonable according to a statement made by Dr. Gunnar Randers, head of research at the joint Dutch-Norwegian Atomic Institute at Kjeller, near Oslo, when addressing the recent conference held there. The establishment at Kjeller, he said, planned to build an atomic reactor with a power plant, using natural uranium in rod form, and heavy water. The new plant was estimated to cost between 25,000,000 and 30,000,000 kroner (£1,250,000 and £1,500,000 sterling).

# Smoke Points of Hydrocarbons

## Relationship with Molecular Structures

THE old qualitative test for distinguishing between aromatic and aliphatic compounds was to burn a small quantity and examine the flame, a smoky luminous flame indicating an aromatic structure. This test has been given a new quantitative significance by the demonstration that there is a definite relationship between the 'smoke point' and molecular structure of hydrocarbon compounds [R. A. Hunt, *Ind. Eng. Chem.*, **45**, 602 (March, 1953)].

'Smoke point' has been defined as the height in millimetres of the highest flame which can be produced without smoke when the compound is burned in a standard test lamp (such as a modified Factor lamp). A method of this type has been in use for many years to examine the quality of kerosene to be used for illuminating purposes. The smoke points of organic compounds vary widely and in an early examination of the properties of pure hydrocarbons it was shown that the values for straight chain paraffins were higher than for *cyclo*-paraffins, which in turn were higher than the corresponding aromatics.

A wickless lamp in which the fuel burnt at the surface of the liquid was used during the last war to study the suitability of a variety of organic compounds for the production of incendiary bombs. Some 25 hydrocarbons were examined in this way and several important generalisations were made relating the smoke point to the molecular structure of the fuel.

### Effect of Olefine Linkage

As might be expected, straight-chain aliphatic hydrocarbons had the highest smoke points and branching of the chain produced a lowering of the value, although the position of the side chain appeared to be relatively unimportant. *cyclo*-Paraffins had about the same smoke points as the highly branched paraffins. The introduction of an olefinic linkage into a saturated hydrocarbon produced a marked lowering of the smoke point.

The low values obtained with aromatic hydrocarbons did not appear to be greatly affected by the configuration of the side chain. It was concluded from these studies that the factor determining the smokiness of

a hydrocarbon fuel was the compactness of the molecule. The introduction of nitrogen or oxygen atoms into the fuel gave smoke points as high, or in some cases higher, than the parent hydrocarbon.

The smoke point of a fuel was found by the author of the paper quoted to have a parallel relationship with the amount of soot deposited from the flame, and thus he considered it of the greatest value in studying the combustion properties of the compounds present in petroleum fractions and in assessing their probable use as fuels. In all some 108 compounds were tested with a wide distribution of molecular weights and including representatives of paraffins, olefines, acetylenes, *cyclo*-paraffins and aromatics, together with other compounds containing sulphur and nitrogen.

### Solution in Dodecane

The results obtained confirmed the findings of earlier workers that the smoke points of aromatic hydrocarbons were uniformly low. Some differentiation was obtained, however, when the aromatic was dissolved in a normal paraffin such as dodecane. Thus the graphs of the smoke point against concentration of aromatic showed considerable difference with *sec*-butyl benzene and 1-methyl-naphthalenes, indicating that the burning characteristics of a fuel cannot be predicted from its aromatic content alone.

The behaviour of the aliphatic hydrocarbons is interesting. All the normal paraffins have high smoke points which decrease steadily with increase in the number of carbon atoms. The olefines have slightly lower values and these values remain more or less steady with the rise in molecular weight. The acetylenes on the other hand have much lower smoke points and these tend to rise with an increase in the chain length. This latter effect is perhaps to be anticipated as the degree of unsaturation can be considered to be decreasing.

The results with branched chain paraffins confirmed the earlier observations that branching of the chain markedly lowers the smoke point, but show in addition that the position of the side chain does exert an appreciable effect, particularly in the case of the methylheptanes and dimethyl-

hexanes. Among the aliphatic hydrocarbons examined, the 2,2-dimethyl substitution appeared to have the most profound effect.

The greatest divergence in the values of smoke points was found in the *cyclo*-paraffins and olefins. The value obtained for *cyclo*-paraffins was 117, 33 higher than *cyclo*-pentane and 70 higher than *cyclo*-hexane, and the variation for a specific change in structure such as the addition of a double bond or a methylene group is much greater than that obtained for the same change in the open-chain compounds. Thus the addition of a methyl group to either *cyclo*-hexane or *cyclo*-pentane produces a fall of 20 units and the addition of a further methyl group to methyl *cyclo*-hexane produces an additional fall of 23 units.

The straight chain alkyl *cyclo*-paraffins show an increase in the value of the smoke point with the rise in molecular weight after the low value for the methyl derivative, this probably being due to the decreasing contribution of the ring structure.

This behaviour is paralleled in the aromatic series when determinations are made in a paraffin solvent, toluene having a lower

smoke point than benzene, but the value for higher straight chain homologues rises gradually. For a given number of carbon atoms in the side chain the values obtained decrease in the order *n*-alkyl, *iso*-alkyl, *tert*-alkyl. An increase in the number of side chains depresses the value, while an increase in the chain length raises the value. The lowest figures obtained were with fused ring compounds.

Many of these observations can be correlated with Livingston's work on the octane number of fuels and many of the factors employed by him to calculate the octane number may be considered to apply also to flames at atmospheric pressure. He devised a series of rules to estimate the oxidation retarding effect of a number of groups according to their position in the fuel molecule. Among these groups were methyl, *tert*-alkyl, vinyl, *cyclo*-methylene and phenyl, the phenyl having the most powerful influence. The *n*-paraffin structure may thus be considered to be that most susceptible to oxidation, substitution by any of the groups mentioned resulting in a retardation of the oxidation rate and a fall in the smoke point. —J.R.M.

## Degussa 80th Jubilee

THE Deutsche Gold- und Silberscheide Anstalt (Degussa), in Frankfurt, have recently celebrated their 80th Jubilee, and in commemoration have brought out a very interesting book illustrating their great range of work. It is a purely scientific collection of papers, dealing with metals, inorganic chemistry, ceramics and glass, organic chemistry. Mentioning the main titles of the four chapters of this Jubilee book is sufficient to show that the working range of this famous company covers more or less the entire field of chemistry and its neighbouring spheres.

The company was founded more than 100 years ago, and originally was a pure silver and gold refining factory; it grew quickly and the partners extended the business to cover not only all rare metals and derivatives but also the manufacturing of the cyanide for processing their metals.

The ceramic and glass industries are two great users of gold, platinum and silver, for decoration; to meet this need, Degussa gradually became one of the greatest and best producers of ceramic and glass colours on the Continent. In addition, they were

one of the first manufacturers of pure oxide ceramics.

In connection with certain metal production and research, in addition to ceramics, Degussa developed special high temperature furnaces.

Not content with the vast fields of different aspects of applied chemistry, and of manufacture, Degussa is very active in all research work.

\* RESEARCH & PRODUCTION. Degussa, Frankfurt, 1953. Pp. 487. (In German.)

## Chemistry Courses

FULL details of the courses available in chemistry and other subjects at Norwood Technical College, Knight's Hill, West Norwood, S.E.27, are given in a general prospectus issued by London County Council. The college reopens for full-time day courses on 13 September, for part-time day and evening classes on 20-24 September and for evening classes on 27 September. All communications should be addressed to the principal (Dr. W. J. Thomas) at the college.



# Non-Sparking Tools

## Lessening Dangers of Fire or Explosion

**F**EAR of fires or explosions in chemical factories, oil refineries, distilleries and mines can prove a powerful psychological factor, both among the workers and the management; and the reports of fatal accidents which regularly appear do nothing to allay this fear. Any reduction, therefore, in the likelihood of these accidents means not only greater safety but greater productivity.

In all industries where inflammable or explosive materials are encountered the use of naked lights or flames, or the evolution of electric sparks, is strictly controlled. But, although it is well-known that sparks are commonly produced when steel tools, such as shovels, picks or cold chisels, strike against stone or concrete, these tools are still employed in large numbers in hazardous situations.

The main reason why ferrous metals are prone to sparking is the ease with which iron oxide is formed in air when iron particles are detached on impact. The particles are first preheated by the energy required to tear them from the parent metal; the subsequent oxidation is markedly exothermic (1,600 calories per gm.) and the temperature of the particles is rapidly raised to incandescence.

On the other hand, the heat of formation of, for instance, copper oxide is only 314 calories per gm., and the heat capacity of copper is also higher, with the result that particles are raised only to a considerably lower temperature, and sparking does not occur.

While it has long been known that most non-ferrous metals are practically non-sparking, their relatively low strength and hardness have ruled them out for the majority of tool applications. The position has changed, however, with the development of

stronger and tougher metals, such, for instance, as beryllium copper (a copper-base alloy containing about 2 per cent of beryllium) and aluminium bronze, a copper-base alloy containing some aluminium, nickel and iron.

The first use of beryllium copper for tools dates back to the 1930's and since that time tools have also been made from other improved copper alloys. Nickel-base alloys and aluminium-base alloys have been tested but were found to be rather more prone to sparking than the copper alloys. Trends in the United States seem to indicate that the competitive struggle between the various alloys is being decided in favour of beryllium copper and aluminium bronze, though tools made from Monel are recommended in certain special cases where the corrosion resistance of other metals is inadequate.

Tools with cutting edges, such as chisels, drills, knives, saws and shears, and tools like pipe wrenches and pliers which have gripping teeth, are best made of beryllium copper, the strength and hardness of which most closely approach those of steel. On the other hand, in the case of hammers, spanners, rakes, trowels, wedges, crowbars and similar tools, where less severe demands on the tool material are made, aluminium bronze may give equally satisfactory service and is less costly than beryllium copper.

The table given below summarises the principal mechanical properties of some non-ferrous alloys suitable for the purpose.

Unfortunately, the sparking properties of metals cannot be determined so easily as their mechanical properties. At one time sweeping claims were made in America that the use of proprietary non-ferrous alloy tools ensured absolute freedom from sparks. Fortunately a more sober viewpoint pre-

Material	U.T.S. Tons per sq. in.	0.1 per cent Proof stress, tons per sq. in.	Elongation, per cent on 2 in.	Hardness, B·indell
Beryllium copper (heat-treated castings or forgings)	80-90	66-70	2	360-400
High nickel aluminium bronze forgings	55-60	40-50	12-20	240-270
Aluminium bronze forgings to D.T.D. 197A	45-52	25-34	15-25	180-240
Aluminium bronze forgings to D.T.D. 164A	38-48	20-25	18-25	150-210
Monel (3.75 per cent Si) cast	40-45	40-45	0-4	230-300
Monel forgings	34-38	15-18	30-40	170-140
Monel castings	23-33	11-15	20-40	100-140

dominates today and it is realised that the composition of the tools is not the only criterion which determines the occurrence of sparks. Thus, when particles are removed from steel or iron bodies by impact, sparks may be produced due to the heat of oxidation of the iron, regardless of the kind of tool employed.

It is undoubtedly true, however, that even in such circumstances the risk of explosions is considerably reduced by the use of non-ferrous tools and that particles dislodged from such tools very rarely give rise to sparks. It is probable that the impact of certain copper alloys on ferrous metals will not cause sparks at all.

Production of non-sparking alloys in Great Britain is largely confined to two companies. Beryllium copper tools, castings, strip, rod and wire are manufactured by the Telegraph Construction & Maintenance Co., Ltd., and tools in aluminium bronze are made by Meigh Castings, Ltd.

#### Meigh Metal

Towards the end of 1950 certain gas boards conducted tests on non-sparking tools made in a copper-aluminium base alloy, containing nickel, manganese, and iron in about equal proportions and, as a result, an allocation of copper, sponsored by the Ministry of Fuel and Power, was granted and this enabled the delivery of some 5,000 tools, of various types and sizes, to the gas industry up to the end of August, 1952. The material was sold under the name of 'Meigh Metal' and with few exceptions the tools gave entire satisfaction. Percussive tools, however, presented a number of problems.

After preliminary tests had been made with percussive tools of classical design, the method of approach to production problems was changed and attempts were made not merely to develop the old type of tools in non-sparking material but to re-design tools where necessary to give the best results with new materials which have a set of characteristics different from those of steel.

The initial work entailed a considerable amount of research work which showed that it was necessary to use the process of 'strain hardening' and 'hammer hardening' to obtain the required characteristics. The natural resistance of the metal to wear by abrasion, corrosion, and oxidation proved to be of great value.

The elasticity (proof stress) and hardness of non-sparking material in either the 'as

cast' or 'forged' state, with or without heat treatment, was found to be far below requirements for certain applications, but it was known by previous experience in other work that the characteristics could be improved by 'cold working,' either before the metal is put into service or during service.

Despite much development work, however, and although these pneumatic tools gave quite good service when carefully used, Meigh Castings, Ltd., decided that the reduction in strength was too great compared with that of steel. Moreover, the care required in handling was not universally obtainable.

Attention was therefore turned to the production of 'composite tools,' and in March of this year it was announced that pneumatic wedges and diggers were in production. These have a steel shank of high tensile strength, sheathed with non-sparking alloy, generally in excess, so that the surplus may be removed by machining to requirements.

An obvious criticism of the composite tool is the danger of sparks from the steel shank, particularly when an external spring retaining device is used, but it is thought that, if the principle is found to be otherwise satisfactory, local protection can be given where necessary.

Work hardening occurs in the normal use of a percussive tool, and is beneficial up to a point, beyond which it should be curbed by periodical annealing at dull red heat.

#### Telcon Bronze

'Telcon' beryllium-copper is manufactured by the Telegraph Construction & Maintenance Co., Ltd., and contains 2 per cent beryllium and 0.25 per cent cobalt. It is quite malleable and ductile when fully softened and can be rolled to thin strip or drawn to fine wire.

It is readily forged hot or cold, can be satisfactorily pressed or drawn, and gives clean and sound castings. As supplied, it generally requires a final heat treatment—soaking at low temperatures for a short period—to develop the required hardness.

'Telcon bronze' safety tools have a hardness favourably comparable with that of steel tools, and they are resistant to a number of corrosive agents, such as sulphuric acid or sea water, having the corrosion resistance of a copper alloy. All types of tools are obtainable.

A special beryllium-copper is now available for the manufacture of plastic moulds, containing 2.7 per cent beryllium.

The fact that sparks may be produced by tools does not mean that a fire or explosion will result as a matter of course if they are used in an inflammable atmosphere. Much depends on the temperature at which a given combustible mixture will ignite. In order to raise the temperature of the gas or vapour to the ignition point the sparks must reach an even higher temperature. In addition, their heat content above the ignition temperature must be sufficient to allow the necessary amount of heat to be transferred to a minimum volume of the mixture.

It is obvious, therefore, that in view of the cooling effect due to convection, flying sparks are less dangerous than those whose path is obstructed by a thermal insulator at an early stage.

Among the gases and vapours which will ignite at comparatively low temperatures are ethyl nitrite, carbon disulphide, ethyl ether, hydrogen and acetylene. Petroleum vapours, town gas, methane and other gases are inflammable in varying degrees. Metals (such as magnesium, aluminium, etc.) in powder form and coal, sugar, grain or flour dusts also form highly explosive mixtures with air.

In each case certain concentrations of gas or powder in air are the most dangerous. Apart from the explosives, gas, and oil industries, fire and explosion hazards exist in many others, including works manufacturing paint, lacquer, matches, spirits and certain kinds of food.

There is no doubt that beryllium copper and other copper alloy tools are much safer to use than tools made of steel even though an accurate assessment of their relative sparking properties is not yet possible.

Acknowledgement is made to *The Engineer* (L. Bernhardt, 'Non-sparking Tools,' 4 July, 1952, p. 6) and *Gas Journal* (C. H. Meigh, 'Non-sparking Tools,' 5 November, 1952, p. 337) for material used in the foregoing article.

## Safety Data Sheets

A NEW safety data sheet on hydrogen peroxide has recently been published by the USA Manufacturing Chemists' Association. Chemical Safety Data Sheet SD-53 gives properties and information for the safe handling, storage and use of hydrogen peroxide.

Complete recommendations for safety procedures to be followed in unloading, storing, handling and waste disposal are

given in the Safety Data Sheet. A section on health hazards and their control outlines proper personal protective equipment and first measures in the event of contact with skin and eyes.

Safety measures for handling, loading, and unloading sulphur dioxide gas to avoid accidents are given in Chemical Safety Data Sheet SD-52, Sulphur Dioxide.

The safety data sheet gives properties, information about shipping containers and precautions to observe in unloading cylinders and tank cars, recommends proper personal protective equipment, and outlines first aid measures to be used in the event of contact with sulphur dioxide.

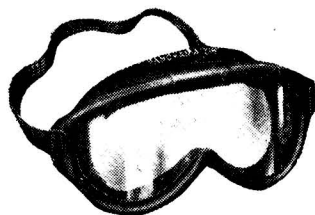
## New Safety Goggles

IN the chemical industry, splashes of corrosive liquids or dangerous solids are a common hazard, and the wearing of goggles is compulsory for many routine operations. The complaints most usually levelled against these goggles are that they seriously restrict the field of vision, and that they tend to mist over.

Two patterns of safety goggle specially designed for the chemical industry are produced by Stratford Products Safety Service Co., Ltd. The 'Panorama 218' is moulded from fine rubber and fits very closely to the contours of the face; it is highly inert, and the removable acetate window can be replaced in a moment. Designed to be worn over spectacles if necessary, this model has a wide field of vision, and the system of filters ensures a constant flow of air.

The 'Panoramette' is moulded in flexible PVC, making it lightweight but hardwearing, and is available in crystal clear, cream or dark green. The acetate lenses may be clear or coloured.

Further new developments are now nearing completion to give the chemical industry the best of eye and face protection.



'Panorama 218' goggles

## Flameproof Handlamp

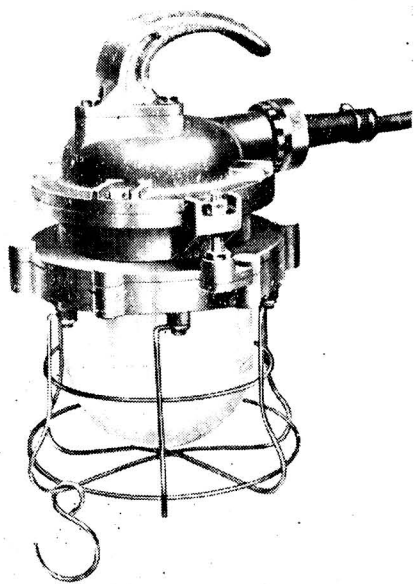
### First Fully Certified Model

**T**HERE has always been a demand for a flameproof handlamp for use in dangerous atmospheres as defined in B.S.S.299—Groups II and III. The Certifying Authority at Buxton has hitherto refused to grant a certificate of flameproofness to any handlamp, primarily because of the risk of damage to the flexible cable.

Simplex Electric Co. Ltd., of Broadwell, Oldbury, Birmingham, have always believed that a suitable design could be evolved, provided that a screened cable is used, as described in British Standards Code of Practice CP.1003/1948, clauses 306/1, 306/2 and 307. This belief has been rewarded and Simplex is now able to offer the first flameproof handlamp to carry the hallmark of a Buxton certificate. (Their 40/60 watt handlamp, F.8080, is covered by Ministry of Fuel and Power certificates. Flameproof No. 3139 covering Groups II and III gases.)

The handlamp is constructed of aluminium alloy. There are three main parts: a terminal box with cable gland and handle; a body portion with lampholder and terminals; and a well glass and ring and guard.

The connection box and top face of the



handlamp body are flanged in the normal way, and are joined by four shrouded bolts. The well glass ring has a spigoted portion which assembles to the handlamp body. Only two studs and nuts are used to secure these two portions together. This is an important feature of the design, as only the two nuts have to be removed before the well glass is detached for re-lamping. The spigot joint ensures that a flameproof path is maintained irrespective of the tightness of these two nuts.

A stout galvanised wire guard is supplied as standard. It is so designed that a straight edge in any position cannot make contact with the glass, and incorporates a hook so that the handlamp can be suspended. The shape of the guard is such that it can also act as a stand.

The shape of the handle has been chosen carefully to give comfort in use and has been designed so that the fitting will hang from the handle when hooked over a bar. The gland consists of an anti-kink polychloroprene packing washer which is compressed in the usual way. The gland will only accommodate cables which have an outside diameter varying between 0.46 in. and 0.5 in.

The handlamp has been designed for use with a particular type of cable: 3-core 23/.0076 tinned copper insulated with vulcanised rubber to BSS.7-250 volt grade; cores to be laid up with strengthening cords in the interstices, and insulated with further layer of vulcanised rubber or polychloroprene (neoprene); tinned copper braid screen with strands not exceeding 0.012 in. and enclosed overall in a heavy duty polychloroprene (neoprene) sheath not less than .05 in. thick; overall diameter .046 in. to .05 in.

In the UK this handlamp should only be used in conditions approved by the Factory Inspector. (This is a general requirement for all handlamps.) It is a condition of use that the type of cable described above is used with this handlamp.

*A general view of the Simplex certified handlamp, illustrating many of the features described in the above article*

## In the Editor's Post

# The Deodorant Action of Chlorophyll

SIR.—In a recent paper Mitchell (Wm. Mitchell, *THE CHEMICAL AGE*, 21 March, 1953, 443) has cited experiments purporting to establish a deodorant action of a commercial copper-containing green pigment derived from chlorophyll when applied to benzyl mercaptan. He states, 'The deodorisation thus appears to be an aerial oxidation greatly accelerated by the presence of the chlorophyllin.'

Experiments conducted in our laboratories do not confirm Mitchell's conclusion that the action observed is due to the green pigment. It is true that the power to bring about catalytic oxidation of benzyl mercaptan to di-benzyl disulphide is present in the crude commercial preparations on the market which contain copper uncombined with the green pigment. It can be shown, however, that this property resides in the impurity present rather than in the green pigment itself. This conclusion is established by two types of experiment.

In the first experiments copper uncombined with green pigment is removed from the crude commercial products tested. This can be accomplished by at least two methods. One involves repeated extraction with hydrochloric acid at pH 1 until the extracts are negative to the dithizone test for copper. To make sure that all the copper has been removed, the extracted precipitate is dissolved in alkali and freshly precipitated with acid sufficient to return the pH to 1, filtered off and the filtrate tested. The second method is the removal of copper by exhaustive dialysis in bicarbonate-carbonate solutions containing sufficient added ammonium salts to remove the extra copper as copper ammonia complex.

It has been found that commercial chlorophyll degradation products which possess the power to catalyse the air oxidation of benzyl mercaptan when tested by Mitchell's method lose this power after either of the purification procedures described. This establishes that the material responsible for the action is an impurity which may be removed either with hydrochloric acid or by dialysis against ammonia-containing solutions.

To establish that the impurity in question is the copper, the action of this substance alone was tested. It may be assumed that most commercial preparations of these copper complexes contain copper uncomplexed to the green pigment to the extent of 2.5-3.5 mg. per gram of crude pigment. On this basis, a solution was made containing 1 gm. each of sodium carbonate and sodium bicarbonate and 17 mg. of ammonium chloride per 100 ml. This was used as a control in the oxidation experiments. For the test solution, 5.3 mg. of anhydrous cupric chloride was added to each 100 ml. It was found that this test solution possessed the power to catalyse the air oxidation of benzyl mercaptan in the same manner as the crude commercial preparations of green pigment. The control solution lacked this power.

Thus it is reasonable to conclude that the catalytic action observed is due to the copper impurity and is not due to the green pigments present. This observation also explains the fact observed by Mitchell that green pigment recovered unchanged from the benzyl mercaptan reaction mixture no longer possesses the original catalytic power. In this treatment, it is possible to remove the copper as cuprous benzyl mercaptide, thus freeing the pigment from the active impurity.

Mitchell's paper contains other inaccuracies which trace to the same assumption as the preceding, namely, that an action possessed by a crude mixture containing chlorophyll degradation products is inherent in the green pigment portion of that mixture. Attention should be directed, in addition, to another error. He says: 'I propose to refer to some of the recent criticism that has appeared. This has found the clearest expression . . . in a lecture given last December to the American Chemical Society by Dr. Alsoph H. Corwin, of John Hopkins University. This has received very wide publicity—unfortunately much wider than that given to his subsequent statement in which he retracted much of his criticism.' The statement referred to by Mitchell constitutes no retraction of any of the criticism contained in the lecture. The burden of

establishing that any effective pharmacological or cosmetic action resides in green pigments derived from chlorophyll still lies with those who affirm that such action exists.—Yours, etc.,

ALSOPI H. CORWIN,  
Professor of Chemistry.

Dept. of Chemistry,  
John Hopkins University,  
Baltimore, Md., USA.

7/Aug./'53.

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### Leather Chemists to Confer

NO fewer than 22 papers will be presented at the conference which the International Union of Leather Chemists' Societies is holding in Barcelona from 13-18 September.

The authors of the papers come from 10 countries and include two from England—Mr. J. S. Mudd, who will present a paper entitled 'The Evaluation and Control of Leather Finishes,' and Dr. K. G. A. Pankhurst, whose contribution is entitled 'The Action of Large Ions on Collagen and Gelatin.'

In addition to the papers, there will be discussions on 'The Physical Merits of Leather' and 'Can Overlapping in World Leather Research be Avoided?'

Through a simultaneous translation system it will be possible to hear speakers in Spanish, French, English or German, the necessary apparatus being installed in the Aula Magna of Barcelona University, where the scientific meetings will be held.

Further details of the conference are obtainable from the IULCS secretary, Mr. A. Harvey, F.R.I.C., 'Craigieburn,' Duppas Hill Road, Croydon.

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### Oils, Fats & Waxes

A SPECIAL post-graduate course on 'The Modern Chemistry of Oils, Fats and Waxes, with Special Reference to Analytical Methods,' is to be held during the autumn term at Acton Technical College, High Street, Acton, W.3.

The course will be of value to industrial chemists, research workers and others engaged in industries concerned with the refining and utilisation of oils, fats and waxes, soap manufacture, edible fats, drying oils and wax-containing materials. The subject matter will include recent work on

autoxidation of component fatty acids, new metallic soaps of the rarer metals, and modern analytical technique in oils, fats and waxes.

Accommodation is limited and early application is essential.

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### New Drug for Diabetes

IN his chairman's address at the British Pharmaceutical Conference in London on 31 August, Dr. G. R. Boyes (research chemist, Allen & Hanburys Ltd.) announced that a new preparation for the treatment of diabetes would probably be available in the autumn.

Insulin zinc suspension, he said, would keep the average diabetic in control with one injection in 24 hours instead of having to mix two insulin preparations, one short and one long lasting. The latest discovery combined rapidity of action with prolongation of effect and was free from foreign protein.

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### Antibiotics in Animal Foods

A JOINT announcement by the Agricultural Departments in the United Kingdom states that from 1 September penicillin and aureomycin (the latter in a restricted form) can be supplied for use in the food of pigs and poultry, subject to certain safeguards. Hitherto, the use of these antibiotics for feeding to animals has been subject to specific prescription by veterinary surgeons. They will be available in two forms—(a) as a concentrated or compound feedingstuff to which the antibiotic has been added before sale to the farmer; and (b) as a supplement which can be mixed, in accordance with directions given on the label, by the farmer who mixes his own feedingstuffs.

Under the Therapeutic Substances (Supply of Antibiotics for Agricultural Purposes) Regulations, 1953, the Agricultural Ministers have power to require that certain information shall be given on the labels that must be attached to every container of an antibiotic supplement or bag of feedingstuff containing an added antibiotic. Model forms of label have now been approved, giving information about the antibiotic and about the storage and use of the product. The labels also bear warnings against feeding the product to ruminant animals and to stock used for breeding.



# The Chemist's Bookshelf

INSTRUMENT TECHNOLOGY, Volume I. By E. B. Jones. Butterworth Scientific Publications, London. 1953. Pp. 315 + xii. Price 35s.

The general text of this book is preceded by an introduction outlining clearly the meaning of the terms 'accuracy', 'precision', and 'sensitivity', which are important in describing the qualities of various instruments. The book is then divided into four main sections which deal with the principle and methods used for measuring pressure, level, flow and temperature.

Section one defines the units used in measuring pressure, following which manometer, ring balance, Bourdon tube, and bellows type instruments are dealt with in detail.

Measurement of level is described in the second part under the headings of direct methods, and pressure-operated instruments. In the former are grouped the hook type of level indicator, the sight glass, float-actuated mechanisms, and electrical methods, while the latter include simple pressure-actuated mechanisms, static pressure-actuated mechanisms including purge systems, weighing tubes, and buoyancy type instruments.

Flow meters are divided into quantity and rate-of-flow meters. After describing briefly the quantity type of instruments, the author deals with rotating mechanisms used as rate-of-flow meters, and then presents a concise, clear treatment of the principles of fluid flow as applied in flow measurement by pressure differential methods. The Pitot tube, the venturi, orifice and weir type of instruments are then described, together with methods of installation. The section concludes with notes on integration.

The final portion deals with temperature measurement. After describing the various scales of temperature, a description is given of expansion, vapour pressure, resistance, thermo-electric, and optical instruments. Where applicable, the theory of each type of instrument is clearly outlined, and measuring and recording by potentiometric

and Wheatstone bridge methods are described. A small part of this section is also devoted to simple electronics which will give the average student sufficient insight to understand the more simple instruments using electronic mechanisms.

This book is well written, easy to read and extremely well illustrated. Not only are the various instruments described, but their useful ranges and particular applications are indicated. The author has done wisely in excluding control mechanisms and automatic control in general, which are to form the subject matter of the second volume.

A valuable addition to the published work on instruments, this book will find a wide use by all students who require a knowledge of the subject for examination purposes. It will provide an admirable basis for the teaching of instrumentation at universities and technical colleges, and many qualified chemical engineers may find it very informative.—E.J.C.

SCIENCE NEWS 29. Penguin Books, London. 1953. Pp. 128. 2s.

Two articles in this latest issue of 'Science News' are of more particular interest to the chemist. 'The Movement of Individual Atoms in Metals' is by R. S. Barnes, of the metallurgy division of AERE, Harwell, where he is carrying out researches in this particular subject. It is a study which can have particular importance for the industrial metallurgist, being applicable to such processes as metal coating, or the sintering of metal powders. This article is in the best traditions of 'Science News,' being simple to understand, yet authentic, and well illustrated with diagrams.

'Cheese Biology,' although concerned in part with the microbiology of cheeses, is close enough to the modern trends of chemistry to be of interest to all but the most dyspeptic of chemists; and the other articles, on 'Ocean-bed Prospecting,' 'Methods in Psychology,' 'Germination' and 'Phenomena of Supersonic Flight,' make good scientific reading.—B.I.

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# HOME

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## Use for Methane Gas

Methane recovered from the undersea workings at the Haigh Colliery, near Whitehaven, is now being pumped to the Whitehaven works of the Northern Gas Board, reformed by catalytic process and delivered into the town's normal supply system.

## Iron & Steel Making Course

Thirty-five boys from 16 public schools have spent this week in Sheffield as guests of the United Steel Companies Ltd., who arranged a short course on iron and steel making for them, in the hope that it would assist them in deciding the type of career they would like to follow when they leave school.

## Ban on Molybdenum Lifted

The Treasury has announced the suspension of restrictions on the use of molybdenum in case-hardening and constructional steels in member countries of the Organisation for European Economic Co-operation. Imposed in May last year, the restrictions resulted from shortages of molybdenum and nickel on world markets. The new decision does not apply to nickel.

## Centenary Celebrated

To mark the centenary in August of the birth of Sir Henry Wellcome, a four-page supplement to *The Times* was published on 25 August. It contained articles and photographs of Sir Henry's life and interests, on his achievement in building the firm of Burroughes Wellcome & Company and on the many scientific institutions he founded. An account of the Wellcome Trust was also included.

## Films in Industry

Five industrial sessions, beginning 22 September, will form an important part of the Seventh Annual Congress of the International Scientific Film Association at the Royal Festival Hall, London, during September. The industrial time-table is: 22 September, high-speed and vocational guidance films; 23 September, training films; 24 September, method study films; 25 September, industrial welfare films. Further information is obtainable from the General Secretary, Scientific Film Association, 164 Shaftesbury Avenue, London.

## Visit to I.C.I. Petrochemicals

Dr. R. Holroyd, of Imperial Chemical Industries, has extended an invitation to members of the Parliamentary and Scientific Committee to visit the petrochemical plants of the company at Wilton, on 30 October.

## Crops Destroyed

Because they may have been contaminated by selenium used in manufacturing processes at the Westinghouse Brake and Signal Company's works, vegetables from allotments and gardens in two roads at Chippenham, Wiltshire, were destroyed on the recommendation of the local medical officer of health. The gardeners concerned have been compensated by the company.

## Laboratory Blaze

The overturning of a ladle containing molten slag set fire to the walls of the chemical laboratory at the West Hartlepool Steelworks and the blaze spread to the near-by railway and destroyed a 15-ton wagon before the local fire brigade subdued the outbreak two hours later. A woman laboratory assistant, Mrs. Amy Porter, was burned and had to be taken to hospital.

## Ban on Drugs

The Government is urged to lift the ban on the export of streptomycin and other drugs to China 'without delay' in a statement issued by Glasgow branch of the Union of Democratic Control. It was pointed out that streptomycin was used almost exclusively for the treatment of human tuberculosis and it was estimated that there were 30,000,000 cases in China. Streptomycin was also used in the standard treatment of plague.

## Chemical Industry Employment

The latest issue of the *Ministry of Labour Gazette* shows that at the end of June the total number of people employed in the chemical and allied trades was 486,900, the number engaged in chemicals and dyes being 212,800. The first total compares with 486,400 at the end of May and the second with 212,300 at the end of May. The number registered in the chemical and allied trades as unemployed at 13 July was 4,954.



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# OVERSEAS

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## German Dividends

Two of the three major successor companies of I.G. Farben—the Bayer Works and the Farbwerk Hoechst—have resumed dividend payments, both paying 4 per cent, subject to tax.

## Indian Penicillin Factory

The penicillin factory at Pimpri, India, is expected to go into production by April, 1954. The construction of the factory buildings is progressing satisfactorily. Fourteen key technical officers for the factory have been engaged.

## Aluminium in West Germany

Reconstruction of West Germany's aluminium industry is almost complete, according to industry sources. It will bring the country's annual production capacity for the metal to approximately 120,000 tons, which is regarded as sufficient to cover domestic demand for the next few years. It is estimated that production during the current year will amount to 110,000 tons.

## More Rubber Consumed

Canadian consumption of natural, synthetic and reclaimed rubber during June totalled 7,977 tons against 7,506 tons for May, with natural rubber at 3,216 tons (3,101 tons in May), synthetic at 3,443 tons (3,180) and reclaimed at 1,318 tons (1,225). Month-end stocks, reports the Bureau of Statistics, amounted to 9,777 tons, as compared with 10,451 tons at the end of May.

## Northern Rhodesian Minerals

In the first half of this year minerals worth nearly £50,000,000 were produced in Northern Rhodesia. The 27,805 long tons of blister copper produced during June were officially valued at £7,281,988, while the gross sum realised for 12,193 long tons of electrolytic copper was £3,264,556 sterling. Cobalt, zinc, and lead added £451,265 and the balance came from small outputs of limestone, manganese ore, mica thin concentrates and beryl.

## Overseas Agents

Styrene Co-Polymers Ltd. have appointed two further overseas agents, as follows: Denmark: Erik Paulsen, 1 Vestre Farimagsgade, Copenhagen V. (Tel.: Byen 9926); Switzerland: Emil Scheller & Company Ltd., Zurich (Tel.: [051] 32 68 60).

## Petroleum Scholarships

Six young scientists from the Commonwealth have been awarded scholarships by the Shell Petroleum Company, valued at £750 a year, to encourage study and research in sciences relating to petroleum. They will begin two years' post-graduate work at British universities this autumn.

## Shares in Uranium Mine

Herr Grotewohl, the East German Prime Minister, is reported to have announced that East Germany and Russia would have 'equal shares' in the reorganised Wismuth Company, which has mined millions of tons of uranium-bearing soil for the Russians in East Germany since the end of the war.

## Sulphur in India

Explorations of the pyrites deposits at Amjor, in the Shahabad district of Bihar, by the mining section of the Geological Survey of India, have given indications that the site may become a substantial producer of sulphur. India imports about 52,000 tons of sulphur every year, there being little production of the mineral within the country at present.

## Israel to Make Detergents

A start has been made on the construction of a \$300,000 plant in the Haifa Bay area—the first unit of a petrochemical industry—by the Kadimah Chemical Corporation. The plant, financed by American capital, will manufacture a detergent by a process which utilises air oxidation. The process is stated to have been discovered accidentally and developed in the laboratories of the local Zevah Paint Company.

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## PERSONAL

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As a result, primarily, of the marked increase in overseas markets, a number of changes have been made within the Innoxia organisation. MR. A. ALBERMAN, managing director of Innoxia (England), Limited, announcing the changes, said that he felt that the reorganisation would do much to ensure the company's continued success in the future.

Mr. Alberman has made two new appointments to the board of directors: his sons, DR. KENNETH ALBERMAN, M.A., Ph.D., A.R.I.C., and MR. MICHAEL ALBERMAN. Dr. Alberman is Mr. Alberman's elder son. He is a research chemist with a Cambridge Degree who has done research work both at Cambridge and at the Atomic Energy Research Establishment at Harwell. He is in charge of research in the firm's laboratories at Balls Pond Road. Mr. Michael Alberman, the younger son, has been already in the business for some years.

MR. R. A. LODGE, the general manager, has been appointed export director, and is about to leave on a tour of South Africa and Australia. MR. A. J. DERMOTT, who for two and a half years has been deputy sales manager, has now been appointed home sales manager.

MR. GLANVILL BENN, chairman of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, has joined the board of The Shipping World, Ltd. In 70 years of service to the maritime industries the company has built up the largest and most comprehensive publishing organisation in this special field. In addition to the weekly journal 'The Shipping World,' the publications of the company include 'World Shipbuilding,' 'The British Shipbuilding Compendium,' 'Ports of the World,' 'Merchant Ships Under Construction,' and 'The Shipping World Year Book and Who's Who.'

MR. M. R. FOX, a technical officer of the I.C.I. Dyestuffs Division, who has been elected a Fellow of the Textile Institute, has studied particularly the behaviour of vat dyes at high temperatures, and has lectured on this and allied subjects in this country and overseas. He published a book on

dyeing and vat dyes in 1946 and is the author of several papers published in learned societies' journals. Another new Fellow of the Institute is DR. S. M. MUKHERJEE, research physicist, Indian Jute Mills Association Research Institute, Calcutta, who received his Ph.D. in 1951 from Leeds University, where he worked on X-ray and electron microscope investigations of cellulose fibres degraded with acids. New associates of the Institute include MR. C. COOPER, Bleachers' Association, Ltd., Bolton; MR. E. M. OSTROWSKI, Calico Printers' Association, Ltd., Birch Vale, nr. Stockport; and MR. J. S. KNOWLES, John Binns & Sons, Ltd., Darlington.

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### Obituary

SIR THOMAS WESTON JOHNS TAYLOR, C.B.E., principal of the University College of the South West, Exeter, who died suddenly last week-end while on holiday in Italy, was a well-known chemist.

On returning to Oxford after serving in the 1914-18 war he was elected a Fellow of Brasenose, where he was tutor in chemistry. He became University Lecturer in Organic Chemistry in 1927 and held the post for the remainder of his time at Oxford.

In 1931 Sir Thomas was elected to a Rhodes Travelling Fellowship and from 1936 to 1939 was a member of the Council of the Chemical Society. Shortly after the war broke out in 1939 he joined the chemical warfare branch of the Royal Engineers and served in the Middle East until 1942 when he was appointed secretary to the British Central Scientific Office in Washington and subsequently its director. He was later transferred to the South-East Asia Command as head of the Operational Research Division.

In October, 1946, Sir Thomas was appointed head of the new University College of the West Indies. This was no easy task, but when, a few months ago, he was called home to take the post at Exeter, he left behind a sturdy and growing institution. His work was recognised by the conferment of a knighthood on him in July, 1952.

# Publications & Announcements

THE applications of the BNF Jet-Test (for measuring the thickness of electro-deposited coatings at any point on a plated article) and the method of use of the BNF Jet-Test Outfit are described in detail in a new edition of the BDH booklet on this subject. The method, originally devised on behalf of The British Non-Ferrous Metals Research Association by S. G. Clarke at Woolwich in 1936, and sponsored by the Association, is widely used in the plating and engineering industries. It is applicable to a variety of coatings on aluminium, brass, copper, steel and zinc basic metals, and to determinations of the thickness of individual layers in composite coatings. The booklet is supplied without charge. Recent additions to the BDH catalogue include casein hydrolysate, particularly suitable for culturing *Mycobacterium phlei* and *Lactobacillus bifidus*; and analytical solutions for the determination of blood-glucose by the arsenomolybdate method.

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WHEN there are very large numbers of a single article or component to be gauged rapidly a projector provides the best means of carrying out the process efficiently, but it is important, in order to realise the full use of such a device, that the handling time should be reduced to a minimum. The Hilger production projector has been specially designed for the rapid routine gauging, by projection in relation to templates, of large numbers of objects of the same kind. It has been specially arranged so that the adaptation of automatic holding devices can readily be made, and the position of the fixtures and clamps is most accessible for rapid, simple handling. Details of this apparatus are given in a brochure obtainable from Hilger & Watts, Ltd. (Hilger Division), 98 St. Pancras Way, London, N.W.1.

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TWO publications have recently been received from the Copper Development Association. 'Copper in Instrumentation' (pp. 152, 45 illustrations) deals with the uses of copper and its alloys in certain classes of measuring and control instruments; pressure- and strain-responsive instruments; electromagnetic instruments; and temperature-responsive instruments. Sections are devoted to the application of copper alloys

to diaphragms, capsules, bellows, Bourdon tubes, strain gauges, coils, shunts, etc. The second number of 'Technical Survey' (pp. 31) reviews further progress in the production, application and technology of copper. Both publications are obtainable free of charge from the Association at Kendals Hall, Radlett, Herts.

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ARRANGEMENTS for the symposium on analytical chemistry to be held by the Midlands Society for Analytical Chemistry in the University of Birmingham between 25 August-1 September, 1954, are progressing and it is now possible to make an interim announcement. There will be three or four plenary lectures, and the other lectures will be divided into two distinct categories: original and unpublished work; and authoritative surveys of recent advances in the specialised fields of analytical chemistry and industrial analysis. These will include papers presented by a number of chemists of international repute. There will be an exhibition of specialised apparatus by the trade and demonstrations of special techniques, and a collection of rare old chemistry books which will include the Joseph Priestley collection. Visits of scientific and non-scientific interest will be arranged. There will also be various social functions during the period of the symposium.

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JENOLITE LTD. have recently added a new preparation to their range of chemical degreasants. It is the Emulsion-type Degreaser, which may be used in the concentrated form supplied or in warm water dilutions up to 1:1 to meet individual requirements. Claimed to be especially effective when applied by agitation with a stiff brush, it may also be applied by the standard immersion process. Non-inflammable, it is stated to be an excellent degreasant for all types of metal where no attack can be tolerated. A typical application is on aircraft components or on the underside of motor vehicles, where in addition to grease the usual layers of dirt and caked mud are efficiently and speedily removed by the subsequent water rinse, leaving a spotless metal surface. Further details and technical information are obtainable direct from Jenolite Ltd., 43 Piazza Chambers, Covent Garden, London, W.C.2.

THE development of 'Aeroquip' flexible hose lines with detachable, reusable fittings represents an entirely new departure in the field of flexible tubing. Generally, hose lines have been looked upon as a necessary evil and efforts have often been made to eliminate them wherever possible in order to minimise the chances of failure. This was particularly true when conventional hose lines with swaged-on fittings were used. Such fittings cannot be removed from a damaged hose to be attached to a new piece of hose. With the use of 'Aeroquip' flexible hose, stocks can be cut to a minimum, because hose lines can be hand-assembled on the spot, using bulk hose and the particular fittings needed. Super Oil Seals & Gaskets Ltd. have now been appointed British licensees for these products.

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MADE from resilient reinforced rubber, Harefield flexible doors will withstand the constant buffeting to which the passage of heavy trucks, etc., subjects them, and their flexibility allows a smoother passage demanding less energy from workers and speeding up transport. The doors are supported on tubular hinges, and fitted with Perspex windows. They can be made to any size or shape, by Superbuilt Products Ltd., Bell Works, Harefield, Middlesex.

\* \* \*

THE literary, scientific or technical periodical has come to stay—more, it has won such an honoured place among the tools of research that it has attained the right to be treated *sui generis*, and not as a poor relation of the book. It is probable that periodicals have been the delight of scholars and the bane of housewives ever since they were first invented. The librarian, information officer or research worker may be forgiven if he sometimes shares the prejudice of the housewife, for these paper publications, easily torn and mislaid, and having separate indexes—dog-eared sheets that are in perpetual danger of being swept away as rubbish—can indeed, if they are allowed to, become a nuisance. Mr. David Grenfell, who is chief cataloguer at the National Film Library and a past information officer at Aslib, has had much to do with periodicals and knows how to handle them. He has experienced the problem they can present in both libraries and

information departments, and from this experience has compiled an instructive manual—*Periodicals and Serials: Their Treatment in Special Libraries*. All concerned with these vital sources of information will find this handbook useful. The acquisition of periodicals, their accession, circulation, arrangement, cataloguing and disposal are all covered in the work, published by Aslib and obtainable from 4 Palace Gate, London, W.8, at 12s. 6d., plus 6d. postage.

\* \* \*

FURTHER information on an experimental water-repellent product, Silicate D 3032, has been issued by Midland Silicones Limited, 19 Upper Brook Street, London, W.1. Preliminary tests have been carried out in the treatment of newly laid concrete, where the setting time for road surfaces or precast concrete may be greatly reduced by surface treatment. It is claimed that by incorporating D 3032 into the dilution water of cement and concrete mixes, the water absorption is reduced, but at the same time the compressive strength is reduced and the setting time increased. As a soil and clay stabiliser and water-repellent, D 3032 may be used for cinder tracks and irrigation ditches to decrease the loss of water through seepage. It can also be used as a water-repellent treatment for leather, paper, wood, glass, building materials and masonry. Copies of Silicone publication D 11-2, giving more detailed information, are obtainable on request.

\* \* \*

CHEMICALS Trading Company, Ltd., 102 Bishopsgate, London, E.C.2, have been appointed UK agents for Antipyr, the impregnating agent for imparting a flame-retarding, water-repellent and anti-rot finish to textiles. Antipyr white (Type No. 550) is a white emulsion designed for impregnating fabrics in grey and white textiles; Antipyr RPL 308 (Type No. 551) contains a small amount of pigment, the shade having been selected in such a manner that the olive-drape shade RPL 308 demanded by American authorities is retained following suitable pre-dyeing of the fabric; Antipyr RAL 6003 (Type No. 552) gives the green-olive shade demanded by the French authorities when used on camouflage nets which have been suitably pre-dyed. Other shades of Antipyr emulsion can readily be manufactured on request.

# Law & Company News

## Commercial Intelligence

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

### Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary but such total may have been reduced.)

G. BRAMALL (TUNGSTEN), LTD., Sheffield. (M., 5/9/53.) 27 July, mortgage to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on land adjoining Petre Street, Sheffield, with power, trade, machinery and fixtures, etc.

UNIVERSAL CHEMICAL PRODUCTS, LTD., Birmingham. (M., 5/9/53.) 30 July, £5,000 mortgage, to Mrs. G. Dodd, Edgbaston and another; charged on 74 Great Hampton Street, Birmingham, and a strip of land at rear. \*£5,000. 20 July, 1951.

### Satisfaction

LANGLEY STEPHENS, LTD., Newport (Mon.), chemists. (S., 5/9/53.) Satisfaction, 29 July, of charge registered 31 August, 1951.

### Changes of Name

The following changes of name have been announced: D. McDermott (Insecticides), Ltd., to D. McDermott (Chemicals), Ltd., on 20 July, 1953. British-European Pharmaceutical Co., Ltd., to Evans Medical (Europe), Ltd., on 23 July, 1953. High Speed Machines, Ltd., to Herbert A. Walford (Holdings), Ltd., on 28 July, 1953. Hydrocarbon & Resin Developments, Ltd., to Lodsco Ltd., on 23 July, 1953. Guglielmo Pearson, Ltd., to William Pearson (Argentine), Ltd., on 28 July, 1953. I. R. Phillips, Ltd., to J. O. Llewelyn, Ltd., on 8 August, 1953. John W. Howorth, Ltd., to J. Wylie Crocker, Ltd., on 12 August, 1953. Shaka Salt & Chemical, Ltd., to Shaka (Midlands), Ltd., on 31 August, 1953.

### Increases of Capital

The following increases of capital have been announced:—MAY & BAKER, LTD., from £1,287,500 to £2,037,000; MILLGATE CHEMICALS, LTD., from £1,000 to £3,000; W. C. STREET & SON, LTD., from £3,000 to £5,000; PHARMACEUTICAL LABORATORIES GEIGY, LTD., from £5,000 to £50,000.

## New Registrations

### Kilco Chemicals Ltd.

Private company. (N.I. 3240.) Capital £100. Manufacturers and dealers in chemicals and chemical compounds. Directors: Mrs. I. B. McGladery, G. McGladery. Reg. office: 13 Donegall Square North, Belfast.

### S. Haydock & Co. Ltd.

Private company. (N.I. 3241.) Capital £15,000. Chemists' sundriesmen. Directors: W. J. Haydock, M. Haydock, E. Haydock, W. Stewart. Reg. office: 21/3 Corporation Street, Belfast.

### Paul A. Daniels Ltd.

Private company. (522,730). Capital £100. Processing and bottling of linseed oil, turpentine and other liquids, etc. Directors: P. A. Daniels, Mrs. B. A. Daniels. Reg. office: 59 Sloane Street, S.W.1.

### Quartzglass Ltd.

Private company. (522,707). Capital £100. Manufacturers of and dealers in fused quartz for optical and electrical and chemical purposes, including the buying and selling of quartz crystals and the fabrication of fused quartz glass in scientific and optical instruments and components. Subscribers: R. D. Norman, J. D. Forsyth. First directors are to be appointed by the subscribers. Secretaries: Bradley Securities Ltd., 89 Kingsway, W.C.2.

### Borax Consolidated Ltd.

An interim dividend of 2 per cent less tax has been declared by Borax Consolidated Limited on the deferred ordinary stock of the company for the year ending 30 September. Stockholders received a total of 10 per cent for 1951-52, with a final dividend of 5½ per cent and a bonus of 2½ per cent.

### The Distillers Co. Ltd.

In a statement circulated in connection with the forthcoming annual meeting of the Distillers Company, Ltd., in Edinburgh, on 18 September, the chairman, Sir Henry J. Ross, says the profit of the group for the year to 31 March last, after writing off stocks as found necessary during the year, was £13,205,539, which compared with the exceptionally high figure of £21,265,450 for the previous year and £17,934,520 in 1951. During the year to 31 March last there was a period of transition with sharp recessions in certain trades, resulting in reductions of stocks held by industry generally. All sections of the group suffered some reduction in profit earnings during the year, but the chemical section suffered the most severely. The output of synthetic industrial alcohol and isopropyl alcohol from the plant of British Petroleum Chemicals Limited at Grangemouth was in excess of the designed capacity and the monomeric styrene plant of Forth Chemicals Limited at Grangemouth was operating to designed capacity. Despite intensive competition, the factory at Speke enjoyed a reasonable level of production of penicillin and streptomycin during the year and there was considerable improvement in the position regarding plastics.

### A. Boake, Roberts & Co. (Holding) Ltd.

Profits of £24,933 for the year ended 31 March last are reported by A. Boake, Roberts & Company (Holding), Ltd. This is after transferring £75,000 from stock reserve towards meeting stock losses incurred and is subject to tax of £17,635 as against £320,564 for the previous year. Profits for the previous year were £571,129. The chairman, Mr. F. G. Pentecost, states that the value of sales in the home market declined by 34 per cent and a similar decrease occurred in the export sales. The volume of sales did not decline to the same extent, but 'the decline in production was serious and many of our plants were idle for varying periods during the year.' As from 1 April last the whole of the manufacturing and trading activities of the undertaking were transferred to a newly-formed subsidiary, the parent concern becoming a holding company. Mr. Pentecost states further that although there is some trade revival, 'we are nowhere near our 1951 turnover and competition, if anything, is becoming more fierce.'

### Bowmans Chemicals Ltd.

The dividend on the preference shares of Bewmans Chemicals Limited due 1 October next is to be paid, but dividends due 1 October, 1952, and 1 April, 1953, are to be left in arrear for the time being, according to a statement made by the directors. The last ordinary payment was 12½ per cent, less tax, for 1950-51.

### Boots Pure Drug Co.

For the half-year ending 30 September next an interim dividend of 5 per cent is declared by Boots Pure Drug, Ltd. This is the same as a year ago. A second interim dividend of 5 per cent and a final dividend of 10 per cent made a 20 per cent total for the year ended 31 March, 1953.

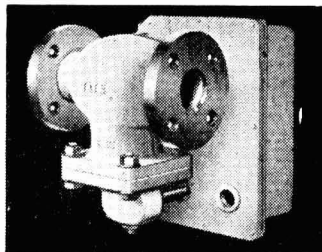
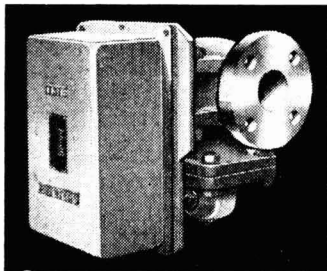
## Market Reports

LONDON.—Trading in most sections of the industrial chemicals market has been on a fair scale during the past week, with contract delivery specifications covering good quantities. Reports indicate that buyers are taking a longer view in covering future requirements. Export trade appears to be broadening with rather more inquiry from the Commonwealth countries, and from South America, but many of these inquiries have yet to reach the order books. The undertone in the coal tar products market is stronger but prices remain unchanged.

MANCHESTER.—Fresh inquiry and actual business in the general run of chemicals on the Manchester market during the past week has been on a reasonably good scale, especially from the cotton, woollen and rayon sections, and prices with an odd exception keep steady. Deliveries of the alkalis, potash compounds and the ammonia and soda products against contracts are being called for fairly satisfactorily. The demand for the fertiliser materials has not yet emerged from the seasonal lull, though a fair business is being arranged in basic slag and the compounds. In the tar products market, creosote oil, carbolic acid, and the benzols and xylols are still about the busiest sections.

GLASGOW.—The upward trend of business has been maintained, and merchants and manufacturers alike are reporting increased turnover as compared with this period last year.

# TATE SOLENOID-OPERATED SEMI-BALANCED VALVES



RANGE:  
1/2" to 4" bore  
5lbs. to 200 lbs./sq.  
PRESSURE  
TOTALLY-ENCLOSED

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## JONES, TATE & Co., Ltd.

VICTORY WORKS, BRADFORD.

**STAINLESS STEEL**

We are specialists in the manufacture of Bolts, Nuts, Studs and Machined Parts from bar materials, in all classes of Heat-resisting and Stainless Steels.

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SANDIACRE, Nr. NOTTINGHAM  
Tel: SANDIACRE 2209 — Grams: SCREWS SANDIACRE

## Company Meeting

# Benn Brothers, Limited

## New Publishing Records Announced at Annual Meeting

THE fifty-seventh annual meeting of Benn Brothers, Ltd., publishers of THE CHEMICAL AGE, was held on 28 August at Bouverie House, Fleet Street, London, E.C.4. In the absence abroad of the Chairman, Mr. Glanvill Benn, Mr. Norman French, managing director, presided.

In the course of his speech the chairman said:—

The accounts again show that the strong financial position of the company has been well maintained and, indeed, improved. Apart from the satisfactory profits produced by the journals and directories, the market value of our investments and revenue from them both increased.

The prosperity of Benn Brothers, Ltd., has been based these 70 or more years past on the appearance week by week and month by month and year by year of reliable trade journals and directories. These valuable periodicals supply their readers with the equivalent of the intelligence reports without which no admiral, general or air marshal would risk committing his forces. That is why the trade newspaper is missed so much if it fails to make its regular appearance on the desk of the business man.

We have not been content to rest on past laurels. Several of our journals have established new publishing records. *The Hardware Trade Journal* published a bigger weekly issue than any previously achieved since its foundation in 1874; a special number of *The Leather Trades Review* proved to be the largest in the 86 years' history of that journal; and the 1953 *Newspaper Press Directory* was the most successful in the history of this, the oldest and, as we claim, the best trade directory of its kind.

For the first time since 1940 we were able to revive that most valuable annual—valuable alike to its readers, advertisers and publishers—the special review number of *The Timber Trades Journal*.

Of our post-war acquisitions special mention may be made of the marked progress of the monthly journal, *Fire Protection Review*, which not only serves those engaged in the public fire services of the country, but also the large and increasing

body of private and industrial fire brigades.

Reference is made in the report to the fact that, as proprietors of *The Cabinet Maker*, the company was happy to present prizes of £500 for the National Design Competition organised by the Furniture Makers' Guild. There is special interest in this, for *The Cabinet Maker* was itself founded over 70 years ago by the late Sir John Williams Benn on his firm belief in the importance of good design.

Our success was again due in considerable measure to the services of an accomplished and experienced staff, to whom the thanks of directors and shareholders alike are due. To mark the Coronation year the Board distributed an increased staff bonus.

The report and accounts were adopted.

Sir Ernest Benn, C.B.E., Bart., was re-elected to the Board, and the election of Mr. N. B. Livingstone Wallace, D.S.C., as a director was confirmed.

## KEEBUSH

Keebush is an acid-resisting constructional material used for the construction of tanks, pumps, pipes, valves, fans, etc. It is completely inert to most commercial acids; is unaffected by temperatures up to 130°C; possesses a relatively high mechanical strength, and is unaffected by thermal shock. It is being used in most industries where acids are also being used. Write for particulars to—

## KESTNER'S

5 Grosvenor Gardens, London, S.W.1

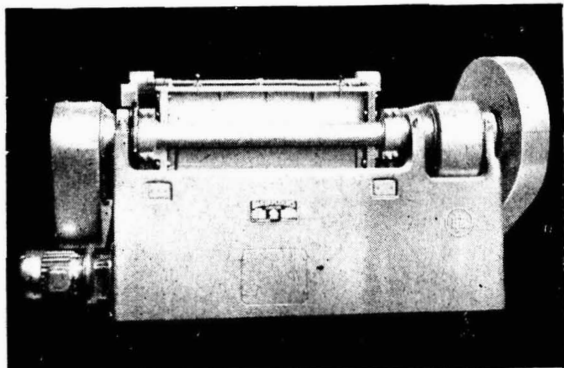
## IRONAC METAL FOR RESISTING ACIDS

VALVES, TAPS AND CASTINGS  
FOR CORROSIVES  
HAUGHTON'S METALLIC  
CO., LTD.


30, St. Mary-at-Hill, London, E.C.3.



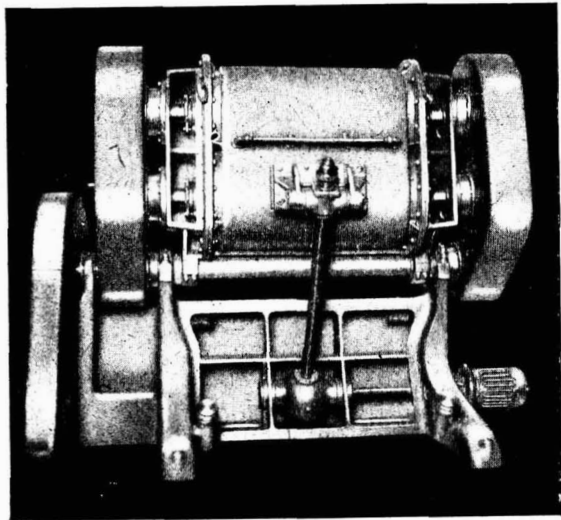
# UNIVERSAL MIXING MACHINES




Above. Front view of a Size 17 Type VIII Class B.B. for 176 gallons per mix.

STAND 15 - ROW H · Ground Floor  
GRAND HALL 

Below. Rear view of same machine tilted for emptying.



"Universals" are produced in several standard types and classes to serve a wide variety of industrial purposes and are capable of numerous adaptations to special requirements. Capacities range in 19 sizes from 1½ pints to 2200 gallons per mix: troughs can be jacketted and blades cored for steam or brine circulation: many are supplied for mixing under vacuum and/or pressure: and we have had 75 years experience of making them.



**ENGINEERING  
MARINE & WELDING  
EXHIBITION  
& THE CHEMICAL  
PLANT EXHIBITION  
OLYMPIA, LONDON  
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In use today for Butter · Perfume and Cosmetics · Moulding Powders Gravy Salts · Foundry Sand · Pigments Pharmaceutical Products · Fertilisers China Clay · Paint · Soap · Dyestuffs Chocolate · Confectionery · Abrasives · Casehardening Compounds Spices · Patent Flour · Glass · Pickles Textile Finishes · Gypsum and other purposes too numerous to include here.

**BAKER PERKINS**  
*Engineers* LTD  
WESTWOOD WORKS - PETERBOROUGH

# CLASSIFIED ADVERTISEMENTS

## EDUCATIONAL

**A.M.I.Chem.E.** More than half of successful candidates since 1944 have been trained by T.I.G.B. All seeking quick promotion and higher pay in the Chemical and Allied Industries should send for T.I.G.B. prospectus, 100 pages of expert advice, details of guaranteed Home Study Courses for A.M.I.Chem.E., B.Sc.(Eng.), A.M.I.Mech.E., A.M.I.Prod.E., C. & G., etc., and wide range of Diploma Courses in most branches of Engineering. Send for your copy today. **FREE. T.I.G.B., DEPT. 84, 46a, NORTH ROW, LONDON, W.1.**

## SITUATIONS VACANT

*The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive, or a woman aged 18-59 inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order, 1952.*

**SENIOR SCIENTIFIC OFFICERS, SCIENTIFIC OFFICERS, PATENT EXAMINER AND PATENT OFFICER CLASSES.** The Civil Service Commissioners invite applications for permanent and pensionable appointments to be filled by competitive interview during 1953. Interviews will continue throughout the year, but a closing date for the receipt of applications earlier than December, 1953, may eventually be announced. The Scientific posts are in various Government Departments and cover a wide range of Scientific research and development in most of the major fields of fundamental and applied science; in biological subjects the number of vacancies is small; individual vacancies exist at present for candidates who have specialised in palaeobotany and foraminifera. The Patent posts are in the Patent Office (Board of Trade), Admiralty and Ministry of Supply.

Candidates must have obtained a University Degree with First or Second Class Honours in an appropriate scientific subject (including Engineering) or in Mathematics, or an equivalent qualification; or for Scientific posts, possess high professional attainments. Candidates for senior Scientific Officer posts must in addition have had at least three years' post-graduate or other approved experience. Candidates for Scientific Officer and Patent posts who took their degrees in 1953 may be admitted to compete before the result of their degree examination is known.

**AGE LIMITS:** Senior Scientific Officers, between 26 and 31, but specially suitable candidates under 26 may be admitted. For Scientific Officers and Patent Classes, between 21 and 28 during 1953 (up to 31 for permanent members of the experimental Officer class competing as Scientific Officers.) Inclusive London Salary Scales: Senior Scientific Officers, (men) £917-£1,075; (women) £681-£917; Scientific Officers, (men) £440-£812; (women) £440-£576; Patent Examiner and Patent Officer Classes, (men) £440-£760; (women) £440-£576; women's rates under review. Somewhat lower rates in the provinces.

Further particulars from the **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, TRINIDAD HOUSE, OLD BURLINGTON STREET, LONDON, W.1** quoting No. S.53/53 for Senior Scientific Officers and S.52/53, S.128/53 for the other posts. 23125/110/JLH.

## SITUATIONS VACANT

**CHEMICAL ENGINEER** required for industrial instrument manufacturers. Some sales experience preferred and willingness to travel essential. Salary, £600-£700 per annum, plus allowances. Interesting job with good prospects. Apply **BOX No C.A. 3255, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4**

**DEVELOPMENT** Department of Heavy Chemical Manufacturer (largely inorganic) has the following vacancies for **CHEMICAL ENGINEERS**:

- CHEMICAL ENGINEER**, qualified, some experience desirable; age preferably 24-28. Salary dependent on qualifications and experience, but not less than £600.
- PROJECT LEADER**, qualified A.M.I.Chem.E., or equivalent, several years' industrial experience. Age preferably 28-32. Salary dependent on qualifications and experience, but not less than £800.

Replies, which will be treated in strict confidence, to **BOX No. C.A. 3248, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

**ENGINEER** required by Chemical Engineering firm in Westminster District of London. Qualifications required are: age about 30; B.Sc. or equivalent; good knowledge of physics and thermodynamics desirable; good mathematics; understanding of chemistry desirable; practical works' experience of assistance; understanding of general office procedure and technical sales an advantage. The position offers excellent opportunities to a man having these qualifications coupled with a keen business outlook. Write stating age, qualification, salary required to **BOX No. C.A. 3252, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

**GRADUATE CHEMICAL ENGINEER** required by leading manufacturers of instrumentation and automatic controls, to be responsible for chemical plant sales. Experience of chemical plant or petroleum plants and an aptitude for developing projects and outside contacts, an advantage. Good prospects and salary, pension scheme on establishment. Write details to **ELECTROFLO METERS CO., LTD., ABBEY ROAD, PARK ROYAL, LONDON, N.W.10.**

## FOR SALE

**CHARCOAL, ANIMAL AND VEGETABLE** horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—**THOS. HILL-JONES, LTD., "INVICTA" MILLS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE 3285 EAST.**

**FOR SALE**—One second-hand Marshall Horizontal self-contained **ECONOMIC STEAM BOILER**, overall length approx. 7 ft. 0 in. by 5 ft. 3 in. diam., evaporation approx. 850 lb. per hour with feed at 170°F., maximum working pressure 80 lb. sq. in. Complete with duplicate feed pumps and many accessories. Clean insurance examination record. Can be inspected on site. £300 collected. **WOODS OF COLCHESTER LTD., BRAISWICK WORKS, COLCHESTER**

**REGULAR** supply of **CAESIUM** concentrates (pollucite) available. Write **BOX NO. C.A. 3250, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

## FOR SALE

## C. BARBER, LTD.

**BOILING PAN**, C.I., jacketed, 150 galls.

**BOILING PAN**, 30 galls., copper with C.I. jacket, arranged for hand tilting.

Three Welded Horizontal Cylindrical, 500 gall. **STORAGE TANKS**, double compartment.

**STORAGE BINS** in stainless steel cylindrical with covers, 40 20 14/10 galls. capacity.

Cannon Steam jacketed enamel lined **PANS**, 10 and 25 galls. All new and unused.

Doulton 25 gall. **COPPERS** with lids. New and unused.

Several new and unused double trough type steam jacketed **MIXERS**, Fitted twin contra-rotating Z blades. Arranged for hand tilting and suitable wet or dry mixing. Capacity 25 galls.

**C. BARBER LTD.**  
**SILVERDALE GARDENS**  
**HAYES MIDDLESEX**  
Telephone—Hayes 2735/6

**COMPLETE SPECIAL PROCESS SOAP PLANT**, to deal with 10 cwt. lots including Electrically Driven Crutching Pan, with agitators. Fitted with special electric motor and reduction gear. Including all tanks, piping, etc. Made by Hanson & Edwards, Ltd., Warrington, in 1949. Enquiries to **MESSRS. WORMWALDS & WALKER, LTD., DEWSBURY MILLS, DEWSBURY.**

**ECONOMIC BOILERS**—9 ft. diam. by 12 ft. 6 in. Foster Yates, 200 lb. w.p.; 8 ft. diam. by 14 ft. Paxman, 180 lb. w.p. Twenty others, all sizes.

**TWO** Whesoo Open Top Riveted Steel **MIXING TANKS**, 13 ft. 9 in. diam., 15 ft. deep, 9/16 in. plate.

**NEW GALVANISED PIPING**. Immediate delivery. Johnson Filter **PRESSES**, 25 in., 18 Frame, practically new.

**TWO** 35 ft. long by 9 ft. diam. Lead-lined **TANKS**. Stainless Steel **FILTER TANK**, 3 ft. 6 in. diam.

**ONE** Stainless **CONICAL HOPPER**, 7 ft. 3 in. diam., overall depth, 7 ft. 6 in.

**TWO** Broadbent **WATER-DRIVEN CENTRIFUGES**, 30 in. diam., 12 in. deep, 1,150 r.p.m., 150 lb. pressure.

**SIX O.T. TANKS**, 7 ft. diam., 14 ft. deep, rubber and brick lined.

Six Aluminium **CONDENSERS**, 14 ft. long by 2 ft. 6 in. diam. 386 Tubes, 7/8 in. o.d.

**FORTY** Riveted **RECEIVERS**, 8 ft. 6 in. long, 5 ft. 9 in. diam., 76 lb. w.p.

**CAST-IRON PIPES**, 5000 ft. Each 6 in. and 8 in. **NEW VALVES** in Stainless, Gunmetal, Enamel Lined. Free Catalogue. "Watkins Machinery Record," available

**FRED WATKINS, (BOILERS) LTD.,**  
**COLEFORD, GLOS.**

**ONE** unused Broadbent **SUSPENDED OVERDRIVEN HYDRO-EXTRACTOR**, type 27 (28), size 48 in. Stainless steel perforated basket, gauze, backing plate, rings; sheathed spindle. Complete with motor and contactor to suit 440 volts, 3 phase, 50 cycle supply. Offers: **BOX NO. C.A. 3254, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

**SURPLUS** to requirements. 2½ tons **RHODAPAS M (LOW VISCOSITY P.V.A. POLYMER)**; 5 cwt. ¼ sec. **CLEAR N/C CHIPS (82% N/C 18% DBP)**; 35 gals. **PYRIDINE 90's**; 6½ cwt. **CALMET**. These products have been stored indoors, are in good condition and are offered at below cost price. Samples available. **BOX NO. C.A. 3253, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

## FOR SALE

**3** **JACKETED INCORPORATORS**, double "Z" arms, double geared, power-driven tipping motion, with counterbalancing weights.

**3**—Baker Perkins and Werner Jacketed **MIXERS**, screw tipping pattern, friction pulley drive, single geared, with double-fin type agitators.

**4**—Gardner **RAPID SIFTER MIXERS** and **MIXERS** only, various sizes, one with brass fitted interior and glass-lined end plates.

**27**—Various **POWDER DRESSING** or **SIFTING MACHINES**, totally enclosed, with barrels from 80 in. long by 22 in. diam. to 120 in. long by 30 in. diam., belt driven with collecting worm in hopper bottoms.

**4**—Recessed Plate **FILTER PRESSES**, 30 in. square 70 plates in each, centre fed.

**2**—Johnson **FILTER PRESSES**, 24 in. square, side feed and enclosed delivery, fitted 29 plates and 30 frames.

**1**—Johnson **FILTER PRESS**, 36 in. square, plate and frame type, double inlet and enclosed delivery ports.

Johnson Oil **FILTER PRESS**, Premier type, plates 2 ft. 8 in. by 2 ft. 8 in., of which there are 45, with angle lever closing gear.

**1**—Johnson **FILTER PRESS**, 42 cast-iron plates, 32 in. square, centre feed.

Steam-heated **FILTER PRESS**, Premier type, 32 in. square, with 30 recessed plates

**1**—Johnson **FILTER PRESS**, 46 plates, 32 in. square, centre feed, bottom corner open delivery.

Wood **FILTER PRESS**, fitted 69 ribbed plates, 2 ft. 8 in. square, with top centre feed and bottom enclosed delivery channel.

**1**—24 in. and **1**—30 in. **HYDRO EXTRACTOR**, self-balancing, swan-neck type, self-emptying bottom, belt driven.

**1**—30 in. and **2**—36 in. Ditto with enclosed motors, 400 volts, 3-phase, 50 cycles.

Heavy Cake **CRUSHING MILL**, 2-pair high, by Nicholson, for cake up to 3 in. thick, rolls 30 in. long, top with coarse teeth 9 in. diam., bottom, with finer teeth 12 in. diam.

**5**—sets A.A. **CRUSHING ROLLS** for linseed, cottonseed, etc., 48 in. long, belt driven, with feed hopper, side frames, baseplate and striking gear.

Bennett Copper-built **EVAPORATOR**, 4 ft. diam. by 4 ft. 6 in. high, steam-jacketed bottom, mounted on legs, with swan-neck vapour pipe and separate vertical belt-driven vacuum pump.

"U"-shaped Horizontal **MIXER**, 7 ft. long, 3 ft. wide, 3 ft. 3 in. deep, belt and gear driven, end outlet, square horizontal centre shaft with cast radial type mixing arms, last used for linoleum paste.

**3**—5-roll **REFINERS**, fitted chilled iron, water-cooled rolls, 40 in. long, 16 in. diam., belt and gear driven with clutch drive suitable for motor, by Baker Perkins, Ltd.

**7** ft. Torrance Positive-driven **EDGE RUNNER**, 2 vertical Paint Pug Mills, 2-bar Disc Paint Grinding Mills, and 2 Horizontal 40-gallon capacity Cox Pug Mills for paint.

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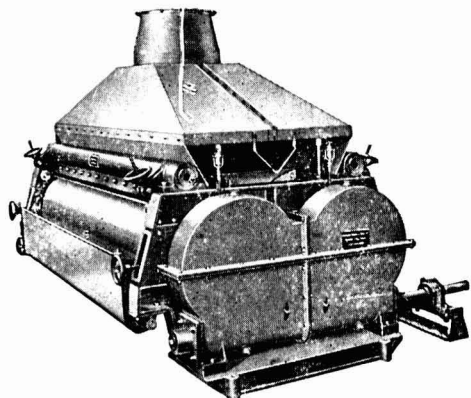
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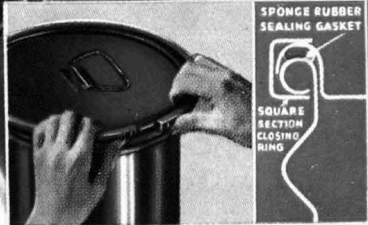
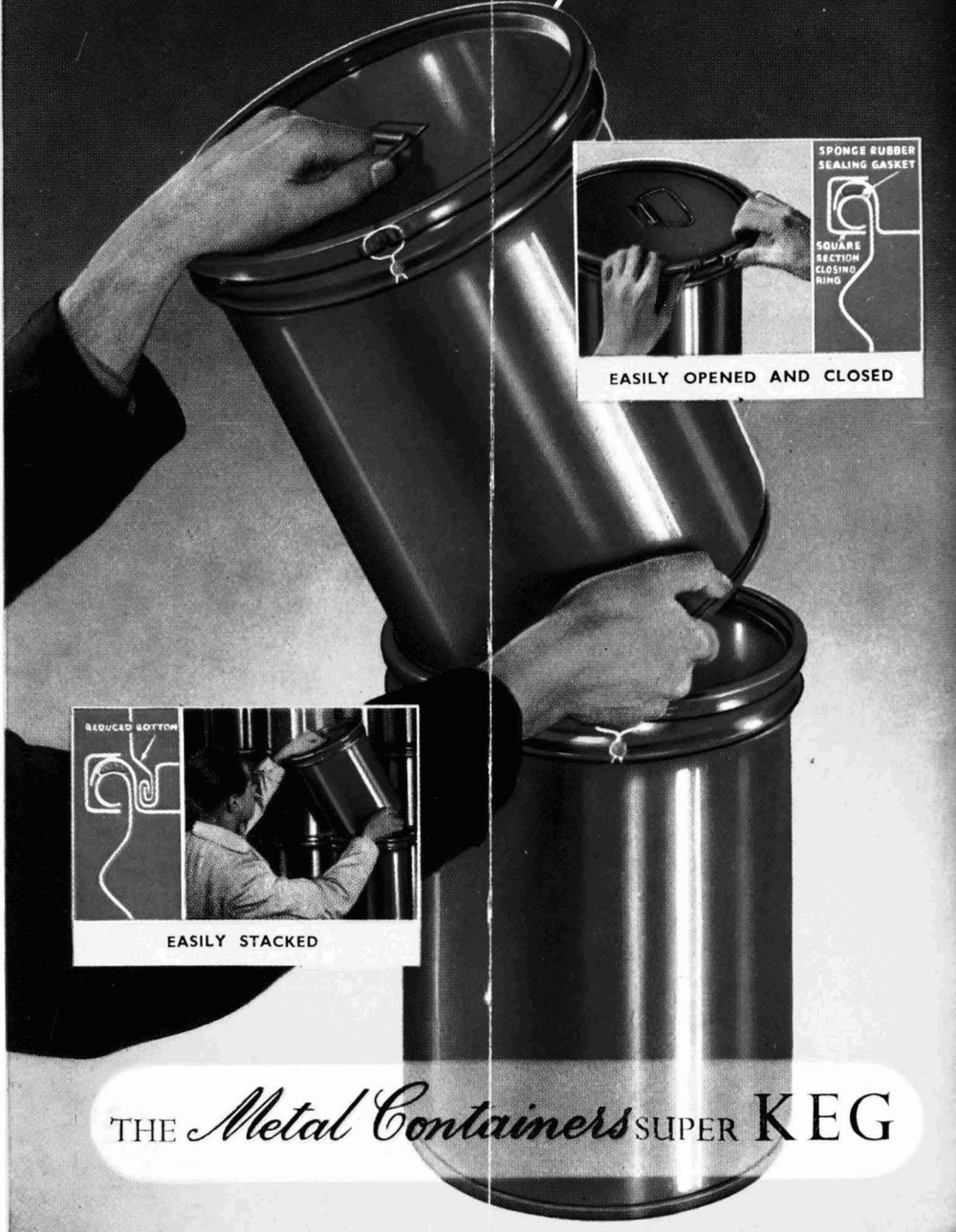
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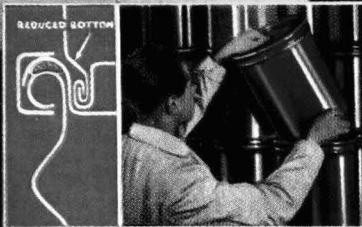
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