THE Chemical Age

VOL. LXXI 7 AUGUST 1954 No. 1830

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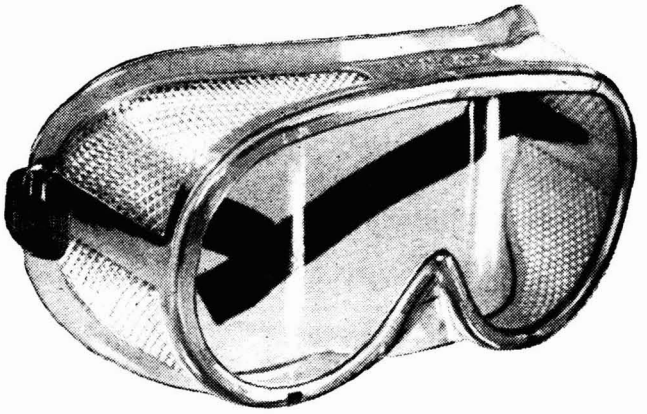

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Editor : E. A. Running *Publisher & Manager : John Vestey*

MIDLANDS OFFICE :
Daimler House, Paradise Street, Birmingham
Phone : Midland 0784/5

SCOTTISH OFFICE :
116, Hope Street, Glasgow, C.2.
Phone : Central 3954/5

LEEDS OFFICE :
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Productivity

HAS any other new or newly familiarised word established itself so fixedly in our verbal coinage as 'productivity'? Farmers have long possessed the word 'fertility' for expressing the output-capacity of acres, but it is only recently that factory-based industry has felt the need for a word to cover the output-capacity of organised manufacturing resources. However, there is always a great deal of danger in new words for new purposes. As a technical term for well-defined use by modern specialists in industrial organisation, as a word meaning something more than mere output and expressing the trend of output change in relation to the employment of this or that industrial resource, 'productivity' is a word of considerable value. But has it not already been debased by excessive usage outside this proper field?

A new pamphlet issued by the British Productivity Council—apparently the first of a series of 'BPC Action Pamphlets'—has prompted these querulous thoughts. Its title is 'Why Productivity?'—but the major part of its text seems to be yet another re-statement of obvious facts about the country's economic state and prospects. There is little in it that has not already been said over and over again in the annual Economic Surveys published by the Treasury. 'We have to buy from abroad—to take a few examples—half the food we eat, all our petroleum and cotton, all our tobacco, half our iron ore, four-fifths of our wool and soft woods . . . .' This is factually correct, of course, but is it the job of the British Productivity Council to hammer away at these basic facts of British life? Clearly, the Council thinks so, and by implication it believes that progress in raising productivity is greatly dependent upon educating the general public. 'More money is not much good if it buys less and less, because costs and prices are rising.'

How far is the essential function of leadership in industry being delegated or even discarded when the idea of raising productivity has to be 'sold' in this manner and at this level? Is raising productivity in industry a task for councils and committees? Have we become so self-consciously democratic that we must persuade the stoker that the installation of a new boiler which will produce more steam per ton of fuel is a good thing because it can make both the country and the firm that employs him more prosperous? Have we, alternatively, become so democratic that we must persuade a manufacturer that he might sell more if production costs were lowered by the installation of up-to-date equipment?

'Some manufacturers would say: Why should I bother to increase productivity, when I am doing quite well at the present and the future of markets is uncertain?' Perhaps it is always a little unfair to detach such banal sentences from their fellows, but this last quotation is surely somewhat odd? Any manufacturer with the kind of mentality indicated should have been extinguished by the force of competition several decades ago, and if his outlook has to be converted by pamphlets it is very doubtful whether the country can benefit from his continued survival. It would be a much more pertinent contribution towards better productivity to ask whether manufacturers with this outlook do in fact exist today and,

secondly, to inquire into the conditions that have made such survivals possible and profitable.

The British Productivity Council is a conjoint organisation representing 'management and workers in every type of industrial activity.' In cruder terms, whatever is said in its name must suit the views of both employers and trades unions. As a result, one of the more important problems of productivity progress is discussed as follows. To the question, 'If my firm increases its productivity, that means its costs are cut. Where do these benefits go? Do I get some?', this reply is gven: 'The proceeds of such savings have a number of calls on them from (a) lower prices, (b) wages and salaries, (c) the firm's equipment or re-equipment, (d) reserves as a safeguard for the future, (e) the shareholders. There is always debate on the shares that each of these should take and their relative importance; the order in which they are placed here is not intended to give support to any particular view about this. It may, however, be said that the importance of (c) must not be overlooked. Unless a firm is continually striving to maintain and increase its efficiency, it must fall behind its competitors and therefore—if nothing else—be a far less sure provider of employment. As for (b) it is the function of the trades unions concerned to ensure that their members get their share. However, as far as wages are concerned, this whole question forms the subject-matter of our well-tried collective bargaining system.'

This, indeed, is a soft answer that turneth away all controversy! But does anybody genuinely suppose that this will melt any of the ice in a suspicious worker's mind? Does anybody imagine that it needs to be said at all to workers who are not suspicious? On this highly relevant matter those who represent management and ownership have been content to say little or nothing and those who represent the leadership of the trades unions have been pleased to seize the opportunity of again stressing their function. If everything in the garden is so lovely and simple, there is no possible need for a pamphlet of persuasion.

To criticisms such as these the British Productivity Council may well say, 'Should nothing be done to popularise productivity at all levels?' The short answer is that nothing which is done so tediously and weakly is worth doing at any level, but this probably dodges the fundamental issue. Productivity is the responsibility of those who lead industry and it cannot be delegated to committees, nor is it something to be brought about by industry as a whole. Improvement in productivity is part of the competitive structure of industry; if it needs to be stimulated in this or that branch of industry, nothing will stimulate it faster than the knowledge and evidence that firm A is turning out a good product at lower costs than firms B to Z. Henry Ford was not a committee or a council. If this is looked upon as an out-of-date view, open to the criticism that no firm can raise productivity if its workers are unwilling to co-operate, the answer is that it is the job of management to secure that co-operaton.

The problems involved are made to seem far larger whenever productivity is discussed in such broad collective terms. This is a practical matter to be discussed in terms of a specific change in working methods or in terms of a new plant or machine. It is the job of an industrial leader to show that the new method or new plant on its particular task and site is going to be beneficial to all concerned; if there are suspicions and prejudices, it is the job of leadership to show that they are in fact groundless. In general terms of discussion, the human factor of resistance is much bigger than it turns out to be in specific cases.

None of this must suggest that the British Productivity Council is a futile or redundant body. In its earlier form as the Anglo-American Council of Productivity, it produced a series of excellent practical reports that came to much closer grips with the subject. At this higher level the Council has done good work and can do so continuously. Drawing attention to methods or machines that improve productivity in certain industries or factories is indeed useful; so, too, is drawing attention to restrictions and disincentives that tend to stand in the way of improvement.

Notes & Comments

Careful Balance

CLOSE on the heels of their recent notes on volumetric glassware (see THE CHEMICAL AGE, 1954, **71**, 217) the National Physical Laboratory has published number 7 in the same series of booklets, on 'Balances, Weights and Precise Laboratory Weighing' (HMSO, 46 pp., 2s.). The notes are limited to knife-edge balances and it is assumed that readers will have at least some superficial acquaintance with the general design and use of such balances. Within these terms the publication can be regarded as a first-class and extraordinarily inexpensive text-book on weighing. Here again the novice will be the one to profit most, though there can be very few chemists who will find that they already know as much about balances and weighing as this book covers. Considerable attention is given to construction and constructional materials and the influence of these factors upon the standard of accuracy that a good analyst can attain. Modern developments here have brought an interesting parallel with the case discussed last week, the danger of detergents as cleaning agents for volumetric apparatus — plastic materials should be used very cautiously in the construction of balances or their cases because they are readily susceptible to static electrification. The section on weights, though shorter than that on balances, is particularly important. The methods and principles of NPL testing are well set out and anyone who tends to take his weights for granted should read and re-read these pages.

The Empty Chair

THE NPL must be highly commended for publishing these specialised 'Notes.' It is well known that many of our specialised analysts are much concerned today that there is relatively less attention to the teaching of analytical chemistry in universities. It is a subject that has lost 'space' as other chemical subjects have grown in size and detail. Is there today at any British university a Chair for Analytical Chemistry? Paper after paper is published now with grateful acknowledgments to other people for the analytical data. It cannot be a good thing for accurate analytical work to become more and more the skilled prerogative of fewer and fewer, yet that would seem to be the contemporary trend.

Blue Water

THE problem of controlling water weeds is a very large one, affecting the amenities of lakes and rivers and often seriously disturbing navigable waterways. Though a problem occurring in most countries, it is still largely unsolved except by laborious methods. A communication in *Nature* last month (1954, **174**, 187) suggests that copper sulphate may be a useful aquatic herbicide. The evidence comes from Sudan Government work on irrigation water systems and once again shows that research planned to study one effect can often pay a bonus dividend by revealing another quite different effect. In this case copper sulphate was used to treat canal water as a possible control for water snail population and two canals branching off the same irrigation water supply could be employed for 'treated' and 'untreated' comparison. Both canals were first hand-weeded. The one receiving an initial dose of copper sulphate at 30 ppm. and thereafter a continuous 1 ppm. supply was not only free of the water snails for nearly 12 months but it was also free from weed re-invasion.

In the Bag

IN some later experiments to study weed control in both the canals the higher continuous rate of 2 ppm. was used. No weeds grew within three kilometres of the point of copper sulphate introduction. Incidentally the method of application was quite simple, canvas bags

containing the chemical being suspended in the entrant water supply. Some troublesome weeds could grown only in small colonies within as much as 10 kilometres of the application point. How far the use of copper sulphate could be developed for large-scale control of water weeds is a problem for further study. Keeping large flow-volumes of water supplied with even as little as 1 ppm. might prove more costly than regular expenditure upon labour for weed removal; on the other hand, local concentrations at particular points in a stream or canal might give enough control to reduce the infestation problem to tolerable size. There is, of course, nothing new in the idea of using copper sulphate as a herbicide. For land weeds it has often been recommended as a mild weed-killer, especially if mixed with ordinary salt.

Hopeful Remedy

OUR leader last week on education (page 215) coincided with the publication of the FBI recommendations on the vexed subject of science teacher shortage (page 273). The special committee appointed by FBI has backed the method of economic incentive as the most hopeful remedy and the suggestion that the maximum salary should rise from the present £941 to £1,500 will no doubt rank as a very fearsome cat among the educational pigeons. It is nevertheless gratifying that a practical and virtually external body of opinion has not evaded this basic and difficult aspect of the problem. Too many previous pronouncements have retreated from this issue and therefore have served no useful purpose. The cost of implementing the FBI proposals would be about £1,500,000 a year, although some press comments assume it would involve a sum nearer three times this amount because teachers of non-scientific subjects would insist on receiving the same treatment. It is fair to ask whether the cost of curing an industrial country's greatest technical weakness should be inflated by the collective strength of professional organisation. For this will certainly become the crux of the problem—if indeed it is not so already.

The Same Cure

THE firmer presentation of the basic facts in this country coincides with a similar statement in the United States. There an ACS committee has said that the demands for science teachers in the next few years cannot conceivably be met unless there is some change in the present rate of science teacher enrolment. The remedies suggested are increased salaries for science teachers, improved prestige, and enlarged opportunities for science teacher training. The same national ailment, the same cure! It will make a bad situation even more disastrous for Britain if America grasps this nettle more boldly and more speedily. In our arrangements for producing scientists and technologists we already lag behind seriously enough. Shall we have to wait for useful action in Britain until the argument is strengthened by the fact that the case has been proved in the United States?

Rheology & Settlement

THE 1954 Symposium of the Oil and Colour Chemists' Association on 'Rheology and Settlement of Pigmented Systems,' will take place on Thursday, 23 September, from 10.30 a.m.-1.0 p.m. and from 2.30 p.m.-4.30 p.m. in the chemistry theatre of University College, Gower Street, London, W.C.1.

In the morning Professor Stacey G. Ward, of the Department of Mining, University of Birmingham, will speak on 'Properties of Well Defined Suspensions of Solids in Liquids,' and Mr. J. Pryce-Jones will speak on 'The Rheological State of a Suspension as a Criterion for the Study of the Flow and Settlement of Paints.' The afternoon session will be devoted to the discussion of the lectures.

The price of tickets will be 5s. each to members of the Association and 10s. each to visitors. Tickets for luncheon, which will take place in the Upper Refectory at University College, can be obtained, at 5s. 6d. each. Application forms for the symposium and luncheon are obtainable from R. H. Hamblin, General Secretary, Oil & Colour Chemists' Association, Memorial Hall, Farringdon Street, London, E.C.4. Tel.: CENtral 2120.

Work & Future of Research Associations

Talk by Past & Present Chairmen of Committee of Directors

AT the last meeting of the Parliamentary and Scientific Committee, held on 13 July, a discussion on the work and future of the Research Associations was initiated by Mr. G. L. Bailey, C.B.E., Dr. S. Whitehead, and Sir Reginald Rootes. We print below extracts from the addresses of the first two speakers.

Address by Mr. G. L. Bailey, C.B.E., M.Sc.; Immediate Past Chairman, Committee of Directors of Research Associations, and Director of BNFMRA.

CONFRONTED with the problem of trying to present to you, within any reasonable space of time, something of the work of 41 research associations, we have decided that it would be of most interest if we concentrate mainly on the work that the associations do in the application of research results to industry.

The research association idea has, since its inception in 1917, been unique to this country, although there is now evidence of its adoption in certain countries on the Continent. Industry in the United Kingdom is, on the whole, co-operative and is well organised through trade associations who can speak on industrial policy for a group of manufacturers with common interests. It is not a long step to a corresponding co-operation in research and in the exchange of technical information. With the encouragement of the Department of Scientific and Industrial Research, 41 industries have formed research associations, and their total income today amounts to about 4,500,000, of which about £3,000,000 comes from industry, and £1,250,000 from the Exchequer through DSIR.

The general object of a research association is to encourage the use of scientific knowledge by industry. This involves two main steps: the acquisition of the scientific knowledge and its application. To avoid misunderstanding, however, I must make clear that the research associations spend more money on research than they do on application and have some very important research achievements to their credit. For example:

Drs. Martin and Synge were awarded the Nobel Prize in Chemistry for 1952 for their work in the Wool Industries Research Association on partition chromatography which has contributed so substantially to developments in almost every branch of chemistry—particularly to the recent rapid development of antibiotic drugs.

The new anti-corrosive composition formulated by the British Iron and Steel Research Association has made it possible to omit the summer application of this paint to the *Queen Mary* and the *Queen Elizabeth* because the winter coatings last twelve months instead of six.

Apart from this background research, a substantial part of the research programme of the associations is devoted to more immediately practical things such as the development of new materials for a particular purpose, or of new processes. All firms are interested in background research but the large company and the more modern industry is less interested in work of more immediate applicability than the small firm. The larger firm has its own research organisation capable of developing a new material or process and rightly in many cases wants the commercial advantage of the final product.

Little Demand for Sponsored Work

Work in both these categories is largely carried out in the US in sponsored research institutes such as Battelle or Mellon, partly because in that country co-operation within industry is somewhat discouraged by the Sherman Anti-Trust Laws. In this country there is apparently no great demand for sponsored research since the work is either done co-operatively for a whole section of industry, or privately in the industrial laboratory of the larger firm. The smaller firm rarely wants, or could afford to pay the substantial cost of a private major investigation. The cost of research is not a large proportion of industrial production costs but there is no doubt that co-operative research work is much cheaper than separate individual effort. More important, however, it can be much more efficient because the committees of the various research associations provide means for the

pooling of the available knowledge in the industry. The discussions between the technical men from different firms, makers and users, often provide a lot more information on a problem than was previously known to exist.

On the other hand, the research associations carry out quite a large number of minor private investigations for their members with the object of facilitating the application of some piece of knowledge, but the expenditure on such individual items of confidential work is generally limited to a few hundred pounds.

Testing & Evaluation

Finally, reference might be made to such lines of research as the formulation of methods of testing and evaluation of industrial products (large sums of money are spent annually by the research associations in helping the British Standards Institution) and in the investigation of ideas which although important on a broad view offer small chances of either immediate success or commercial reward. For example, the studies of the fuel cell by the Electrical Research Association, and of the rolling of metal powders by the Non-Ferrous Metals Research Association, are examples of potentially important forward-looking projects, the successful outcome of which is at least speculative.

Clearly the research done within the associations forms a small part of the useful sum total of industrial research. Each research association has an information department which combs the published literature and brings to the notice of both the scientist and the industrialist those items which could be useful to them. As a corollary of this, these information departments accumulate a body of factual information, properly indexed and easily handled, from which they can produce information of value to a particular inquirer who knows what he wants, but does not know where to find it. Many thousands of inquiries of this sort are answered by the research associations each year. I might interpolate here that the research associations are not disconnected individual entities, but work together in many fields, particularly in the supply of information. The research association directors meet together three times a year for discussion on common problems in the Committee of Directors of Research Associations and through that committee much mutual assistance and exchange of information is effected.

The issue of a report to members or the publication of a scientific paper from another laboratory will be quite sufficient for a firm employing competent technologists. The smaller firm, however, with limited technological resources often wants more help than this. To make sure that the manufacturer has adequately described his difficulty or that he will see the full implications of any paper he is sent it is necessary to send to his works an individual with up to date 'knowhow' in the industry concerned, who will find out the real trouble and show how it can be corrected. This sort of work is done extensively by nearly all research associations under the heading of liaison service. In some associations where I know the position, sums of the order of 15-30 per cent of the total expenditure of the associations are devoted to this work and this is, I submit, possibly the best possible way of helping to improve the technical efficiency, and hence also the productivity, of the small firm in the industry.

Address by Dr. S. Whitehead, F.Inst.P., Chairman, Committee of Directors of Research Associations and Director of ERA.

LET me mention one or two points for which Mr. Bailey had no time. The first is co-operation with universities and technical colleges. Apart from normal collaboration between institutions, research associations make grants amounting to about £80,000 p.a. But they do not trespass on DSIR research training grants. Indeed, their recent conference decided that too much of this training was confined within university precincts. Nor do they usually put an industrial problem to a university. They think this is liable, as in the US, to divert academic effort from the invaluable contributions to knowledge which universities can make. Their policy is, therefore, to interest universities in the inadequately explored portions of fundamental science on which industries are based. To this end they sometimes endow bursaries and fellowships, but oftener they make grants to enable senior university staff to pursue their ideas. Mr. Bailey has already told you of their own fundamental work. In co-operation with universities they have contributed

a considerable section of the theory of the solid state, particularly fibres, dielectrics metals and magnetic materials, including the discovery of new materials.

If a research association serves a scientific industry much of its work is absorbed through the research and development departments of its members. But discoveries which are expensive to develop or do not fit very well into existing policy have to fight for a place.

Development Groups

The obvious method is the persuasion of individual members and, on the whole, RAs have really been good at this. The Launderers RA and the Paint Research Station have so persuaded numbers of small unscientific concerns to risk innovations and, at the other end of the scale, the Iron and Steel RA and Shirley Institute have instituted large projects in great companies. The next method is to form a group who will share the cost of development. If successful, the members of the group later enter into ordinary competition on the basis of their skill in production, marketing and subsequent improvement. The co-operating group is especially useful if it can include both manufacturers and users. This applies when the user can contribute expert knowledge of requirements and learn at an early stage how to adapt his operations; the Government can also enter when national interests are involved.

During and since the war the Government has been successful in placing research and/or development contracts. RAs cannot usually afford from their general funds other than quite small projects, such as instruments and test equipment. Indeed the Government found a separate organisation, the NRDC, necessary for the ordinary commercial applications of its work. The Corporation has been discussed fully in Parliament. I need only say that RAs find it very helpful and some have agreed that it should develop all or most of their inventions. In a somewhat analogous manner 3 RAs (Coal Utilisation, Electrical Research Association and Shirley Institute) have formed development companies.

Their structures are similar. The research association is the sole or nearly the sole shareholder. It has the right to any profits and the reversionary interest on liquidation. It provides technical services and controls staff. The board of the development company includes leading business men in the industry, together with the director of research of the RA and others who can link directly the parent with the subsidiary. Experience has already shown the development company to be a useful piece of commercial mechanism. Some years must elapse before its value in extending industrial exploitation of discoveries can be assessed.

The scientific value of RAs is now accepted. Nor is it questioned that they raise the general scientific level of industry and increase the employment of scientists and engineers up to director level, which the Manchester Research Council has rightly stressed. Experience has shown that they are compatible with as much or as little competition as industries may desire. Industrial secrecy is no problem when one recalls the brevity of the life of closely guarded military secrets. Research associations have to earn their keep from voluntary subscribers. Why then are they so often asked to justify the whiteness of their one small ewe lamb of income when the colour seems not to be questioned of the 99 and a fraction sheep expended by the government, the universities and industry?

Lord Waverley recently suggested that certain industries might economically and advantageously divert a slight proportion of their research and development expenditure to RAs. He led a deputation from this committee which secured, *inter alia*, increased government sympathy. Perhaps our inclination to let our members have the first credit may suggest some defect in the exploitation of inventions. If so, I confidently assert that we are at least as good as the best industrial research departments in the number of projects which are exploited. But we are not complacent and I hope I have convinced you that we are examining and actively pursuing all the methods by which scientific discovery can be most rapidly, most generally, and most fruitfully applied.

Change of Address

Metals Industries Ltd. have moved to Universal House, 60/62 Buckingham Palace Road, London, S.W.1. Telephone: Sloane 5587, 5814, 5618.

First Heavy Water Reactor

DIMPLE in Operation at Harwell

DIMPLE, Britain's first heavy water reactor (or atomic pile) which has been built at the Atomic Energy Research Establishment, Harwell, is now in operation, announces the United Kingdom Atomic Energy Authority. This Deuterium Moderated Pile, Low Energy, is a low-powered thermal neutron research reactor. The heavy water moderator is contained in a tank which is surrounded by a graphite neutron reflector. Outside this is a concrete radiation shield. The reactor fuel is submerged in the heavy water.

Both the type of fuel and its arrangement in the tank can be changed quickly so that what is, in effect, a different design of reactor can be built up in a matter of a few days. The reactor will only be operated at very low power so that its structure does not become sufficiently radioactive to prevent the necessary handling. The behaviour of the wide variety of design can, therefore, be investigated experimentally in a relatively short time.

The versatility of DIMPLE will make it an extremely valuable tool in the design of future power producing reactors and for measuring essential constants in reactor physics. One of its first functions will be to carry out experimental work for the new and more powerful heavy water reactor which is now being built at Harwell to provide the high neutron flux essential for some research purposes.

Whessoe Works Activities

THE widespread activities of the Whessoe Works, at Darlington, where a big proportion of the capital plant for Britain's basic industries is made, is described in the July issue of the *Tees-side Journal of Commerce*. It is estimated, says the article, that 400,000,000 gal. of petrol could be stored in the tanks Whessoe makes in a single year—a figure representing one-third of this country's total annual consumption of petrol. On the actual refining side site-built columns and heat exchangers, which are integral parts of process plants, are built by Whessoe. The firm also built the catalytic cracking plant at the Shell Stanlow Refinery, the first, it is stated, ever built by a British firm. A post-war expenditure of £750,000, says the article, has transformed the Whessoe works, where not only are the firm's traditional products produced efficiently, but the equipment has been built to undertake platework to far more exacting standards than previously achieved.

Society for Nuclear Energy

Representatives from eight European Atomic Energy Commissions, meeting in London during June, agreed to establish a European Atomic Energy Society to promote co-operation in nuclear research and engineering. The eight nations represented were Belgium, France, Italy, Holland, Norway, Sweden, Switzerland, and Great Britain. Sir John Cockroft was elected president of the society for the first year; Mr. Gunnar Randers, director of the Dutch-Norwegian Joint Establishment for Nuclear Energy Research, was elected executive vice-president; and Dr. Bertrand Goldschmidt (France), vice-president.

Duty-Free Imports of Machinery

Mr. Peter Thorneycroft, President of the Board of Trade, announced in the House of Commons on 29 July that the Government had accepted the Wilson Smith Committee Report on duty-free entry of machinery as a whole and, with one reservation, proposed to put into effect its recommendations as from 4 August. The basic recommendation, he explained, was that some discretionary system to permit the duty-free entry of machinery in suitable cases was in the national interest, but the committee did not recommend the continuation of so general and widespread a scheme as that which obtained before duty-free licensing was suspended in 1952.

BISOL Price Reductions

British Industrial Solvents announces that as a result of considerable extensions to its plant, which are now complete and in full operation, it is able to reduce substantially the prices of BISOL acetoacetanilide, aceto-acet-*o*-chloranilide and acetoacet-*o*-toluidide. With effect from 3 August, the new prices for 1-ton lots, delivered UK, bags included, will be: acetoacetanilide £455, acetoacet-*o*-chloranilide £725, acetoacet-*o*-toluidide £540.

Science Teachers Urgently Needed

Higher Pay Proposals to Increase Recruitment

REVISION at the earliest possible moment of the salary scales of science teachers so as to make teaching as a career more attractive and a modification of National Service requirements to enable them to take up teaching appointments sooner are among the recommendations put forward by an independent committee set up by the Federation of British Industries to consider the shortage of science and mathematics teachers.

The committee, whose chairman was Dr. Percy Dunsheath, chairman of the FBI education committee, and included Dr. B. K. Blount (DSIR), Mr. A. D. Bonham-Carter (Unilever Ltd.), Dr. W. S. Bristowe (Imperial Chemical Industries Ltd.), Mr. J. A. Oriel (Shell Petroleum Co. Ltd.), Mr. L. H. A. Pilkington (Pilkington Brothers Ltd.), and Mr. Madron Seligman (the A.P.V. Co. Ltd.), were representative of industry, the universities, technical colleges, schools and other organisations employing scientists, but each member served in a personal capacity.

Although the present shortage of science teachers was serious enough, says the report, it would assume even more alarming proportions in the next five or six years unless action was taken very quickly. Because of the increased birth-rate towards the end of the war and in the years immediately following, the secondary school population was now beginning to increase rapidly. Over the period 1950-60 an average annual deficit of 230 men and women science teachers was envisaged and the accumulated deficiency over the ten years would therefore be well over 2,000. Moreover, if the number of pupils remaining at grammar schools beyond the age of 15 continued to increase at the average yearly rate for 1947-53, the requirements would be greater still.

Decline in Quality as Well

The committee recalls that the report of the National Advisory Council on the Training and Supply of Teachers suggested that there had been a decline in the quality of science teachers recruited since the war. They (the committee) emphasised that a falling-off in quality was not less serious than a numerical shortage, for it meant that in an attempt to maintain the numerical strength of their science staffs, the schools were having to recruit teachers of less suitable qualifications.

If the deficiency was not remedied it would have the effect of bringing many of Britain's great industries to a standstill since it would be impossible to staff them with the required number of scientists and technologists.

It was difficult to forecast accurately industry's demand for scientists, but all the indications in its post-war development were that the demand was likely to increase for three reasons.

Reasons for Increased Demand

First, the science-based industries had not yet reached the end of their scientific and technological development, and indeed the end was not remotely in sight. Between 1948 and 1953 the chemical industry increased its production by 50 per cent and the engineering industry by 30 per cent and in each case the increase had been almost entirely due to the scientific and technological development that had taken place during these years.

Second, the traditional craft-based industries would require more scientists as their processes became better understood, or new processes replaced old ones.

Third, scientific discoveries would almost certainly lead to the development of entirely new industries, which would require large numbers of scientists.

It could safely be assumed that industry's demand for young science graduates would continue to increase. Similarly, it was believed that the Government service and the national industries would need more scientists.

Discussing factors affecting the recruitment of science teachers, the committee reports that before the war the schools had no difficulty in recruiting well-qualified science graduates.

Since the war, however, it had become less easy for the following reasons: (a) the relative financial position of science graduates in teaching and in industry had worsened for the teacher since the war, and

to those seeking a professional career in teaching the disparity was too great to be ignored; (b) the appeal of research was particularly strong for young science graduates and there were now many more opportunities than there were before the war to undertake research in the universities, industry and Government service; (c) the prestige of teaching as a career had on the whole declined, partly because of inadequate financial rewards and partly, in the case of grammar school teaching, because of the post-war changes in the educational system which had adversely affected the position of the grammar schools.

Pay Discrepancy Main Cause

Chief cause of the shortage, the committee feels, is the discrepancy between the rates of pay of older teachers in schools and those of the older scientists in industry or in the technical schools.

In the scientific civil service graduate scientists were employed in two classes, namely, experimental officer and scientific officer. The minimum expectation to scientific officers was £1,472 and of experimental officers £850, though most graduate experimental officers probably reached £1,162. Salaries of teachers in technical colleges were calculated according to nine grades. It was interesting to note that the lowest grade carried the basic salary laid down in the main Burnham report, but that the technical college teacher had the opportunity of rising to a post as head of a department at one of several grades, of which the highest, applicable to a large department, carried a salary of £1,490 rising by annual increments of £25 to £1,640. A young graduate might start in the second grade at a salary of around £600 a year, and an older man with good academic qualifications or special industrial experience might be appointed straight away as a senior lecturer at a salary of £1,040 a year, although this would be very exceptional.

The committee states that they were strongly of the opinion that the actual salary system was capable of substantial improvement and ought to be changed at the earliest possible moment in order to provide greater incentives for the graduate science teacher.

They felt that special allowances did not possess the maximum incentive value which the situation demanded because they were renewed on an annual basis and theoretically could not be relied upon by the individual. Further there were wide discrepancies between the practice of one local education authority and another in allotting such allowances. They strongly recommended that special allowances should be discontinued.

The committee's salary proposals suggest the establishment of four grades of assistant master with the possibility of promotion at any stage, as follows:—

Grade 1: Starting salary £580 for pass and third-class honours degree, and £620 for first- and second-class honours degree at the age of 24—advancing by £20 increments to £900.

Grade 2: A £50 increment on promotion and an annual advance of £25 to a maximum of £1,100.

Grade 3: An increment of £60 on promotion and annual increases of £30 to a maximum of £1,300.

Grade 4: An increment of £80 on promotion and annual increases of £40 to a maximum of £1,500.

In making these proposals the committee say they considered that £900 might represent the maximum salary for, say, 50 per cent of the graduates, £1,100 for, say, 30 per cent, £1,300 for, say, 15 per cent, and £1,500 for, say, 5 per cent. Bearing in mind that they were recommending the abandonment of special allowances, Grade 1 might not represent any substantial increase, but the new salary structure provided opportunities for promotion. Selection for promotion to the higher grades should be made by reason of merit rather than by age seniority, promotion generally being accompanied by an increase in responsibility.

To adopt their scheme for graduate science teachers only would, the committee estimated, cost approximately £1,500,000 a year. This was a large sum, but they felt it was justified on the grounds of equity and vital national need. Should it be contended that the cost of the proposed scheme was prohibitive they pointed out that the alternative to large expenditure was likely to be the gradual drying up of the source of scientific manpower and, ultimately, disaster for British industry.

After the question of salaries the

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New Gas-Making Process in Operation

Plant Productivity Doubled at Partington Works

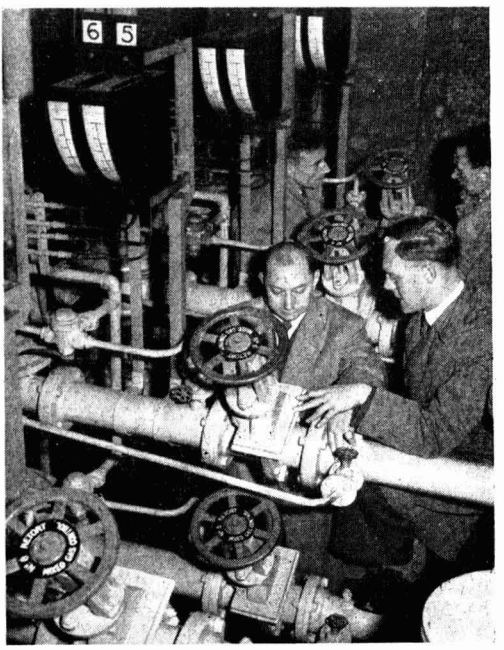
GAS and coke manufacture by the revolutionary new 'Rochdale' process, which doubles the productivity of vertical retort gas-making plant, is now for the first time in full commercial operation at the Partington works of the North Western Gas Board, near Manchester.

Plant, which was built to make 2,000,000 cubic feet of gas per day, is now regularly producing double that quantity, and instead of processing 110 tons of coal daily it processes 224 tons as a normal routine with little additional labour.

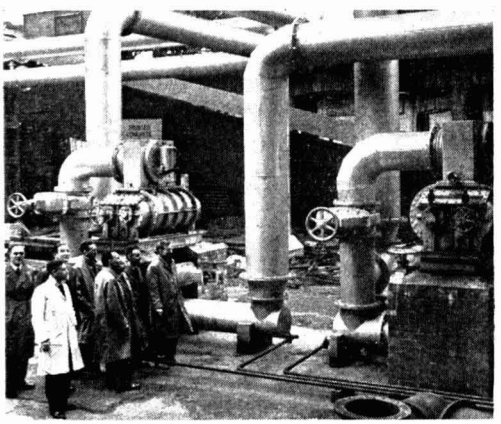
The secret of the 'Rochdale' process, which has been developed from an almost forgotten 30-year-old patent by the board's technicians during the past three years and proved in pilot plants at Rochdale, Partington and Bollington, lies in the injection of gas at the base of the retorts during carbonisation.

By speeding up the heating process within the retorts, the injected gas halves the time required for carbonisation, improves the quality of the coke produced, and also greatly increases the thermal efficiency of the plant.

The equipment needed for converting the plant at Partington to work by the new process has been designed by the board's own engineers. It is worked automatically and is so simple and foolproof to control that any unskilled worker can operate it.



Volume control valves and flow indicators governing the supply of carrier gas to each converted retort being inspected by visitors



The huge pipes which bring the coal gas and water gas into the retort-house where they are blended and used as carrier gas

So far, 16 of the 32 vertical retorts in one of the retort houses at Partington have been converted; the remaining 16 retorts in this plant are to be converted in the immediate future. Design, manufacture and installation of the conversion equipment have been completed in the remarkably short space of six months.

Feature of the new process which may possibly prove to be even more important than the doubled plant productivity is that it enables coals normally considered unsuitable for gas-making to be carbonised as successfully as the highest grade coals.

For some time the board has been conducting experiments at its Bollington works in blending coals with a view to opening up for gas-making an entirely new range of coals. At Partington, however, the coals

being used are those normally used for gas-making.

The retort house at Partington now using the 'Rochdale' process in half its retorts originally cost, with coal and coke-handling plant, £780,000. The cost of modifying the whole house to the 'Rochdale' process will be some £38,000, or £1,190 per retort.

Carburising Atmosphere

New Instrument Determines Quality

A NEW instrument for measuring the quality of carburising atmosphere has been developed by the General Electric Co. Ltd. It consists essentially of a compartment (with a transparent front) inside which is an iron wire which is carburised in the atmosphere under test and cooled rapidly so that it is transformed to martensite. In this condition the electrical resistance of the wire is a measure of its carbon content and hence of the carburising potential of the atmosphere. Values of the electrical resistance of the quenched wire can be directly related to carburising potential from a calibration curve. Operation of the gauge is straightforward and one measurement takes about 15 minutes.

The carburising potential measured on the GEC carbon gauge is the carbon content of a steel with which the atmosphere would be in equilibrium at a given temperature. For example if the carburising potential of an atmosphere is measured on the gauge as 0.65C then this atmosphere would be neutral to a 0.65C steel at the same temperature. This method of evaluating the quality of a controlled atmosphere is particularly useful in such processes as the hardening of medium or high carbon steel where decarburisation is to be avoided, the restoration of carbon to surfaces of parts which have been decarburised during casting or heat treatment and the carburisation of steel to some specific value of carbon content.

A panel-mounted carbon gauge is normally supplied, but where the instrument is required for use on several furnaces it can be supplied as a portable unit. The gauge wire runs through a compartment at the top of the panel. The carburising gas passes through this compartment and is burned as it emerges from the nozzle. Heating current through the wire is adjusted by a variac. For measuring the resistance of the gauge wire after carburising the voltage developed across it is measured for a small known value of current. The carburising potential of the gas can then be read off from the calibration chart.

New Canadian Company

MR. T. L. BROOK, president of New British Dominion Oil Co. Ltd., Calgary, states that a company is now being formed under the name of Northwest Nitro-Chemicals Limited, in which company New British will own a substantial equity. He states this chemical company will have as other equity owners, Ford, Bacon & Davis, engineers of New York City, Frank McMahon, of Pacific Petroleums Limited, and others. The company is being incorporated for the purpose of constructing an $18,000,000 petrochemical plant in Southern Alberta to manufacture initially chemical fertilisers. The plant will use as its source of natural gas the Etzikom field in which the major portion of New British's reserves lie.

Science Teachers Needed

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committee felt the second reason for the shortage of graduate science teachers was the appeal of research, which undoubtedly led many graduates away from teaching to industry or Government service. Many science graduates, however, though genuinely interested in research, found that after a few years' experience that they were unlikely to make a significant contribution in this field. Financial considerations had hitherto made it almost impossible for them to contemplate transferring to teaching, but if salaries of graduate teachers were improved the committee believed that such transfers would be much more easy to effect.

Though admitting that the problem of deferments for intending graduate science teachers was thorny, the committee nevertheless came to the conclusion that some sort of deferment was necessary. It proposed that intending teachers should be required to take full-time National Service for the period necessary for basic training and then be released to take up teaching on condition that they served in the Territorial Army or with a school cadet corps.

The Concealed Hazard

And Health of Industrial Workers

HAZARDS to which the worker in industry is exposed may be divided roughly into two types:—(a) those in which the effects follow closely on the operation of the causative factors, and where all who are exposed show the same effects, and (b) those in which there is a considerable time interval between first exposure and the manifestation of the effects, and where the causative factors act in different degrees on those exposed.

The best example of the first type is probably physical force. With few exceptions its effects follow immediately on its application, and the link between cause and effect is readily apparent; also the application of violence produces the same effects in all exposed. Other examples are some of the highly toxic substances used in industry. The main point about all the members of this class is that their dangerous properties are recognised, and means to reduce risk to the workers can be introduced with a high degree of success.

Variable Period & Effects

The problems arising from the second type of hazard are more complex for the reasons stated, namely, that the time lag between exposure and effect may be long, and that the effects produced vary in severity in different individuals. There are many examples of this type—and it is the type with which we shall be mainly concerned here—but as an extreme example we may cite certain substances which when absorbed into the body give rise, after a lapse of time, to cancer of the bladder; and they only do so in a proportion of those exposed. The difficulties of dealing with such factors are at once obvious; in fact it is interesting to speculate whether, if a substance like potassium cyanide, when swallowed, took about ten years to act, and acted only on about 10 per cent of the population, it would even now be listed as a poison.

Before considering the hazards involved, we shall classify the factors which may affect health, at the same time reminding ourselves that many of these factors act also outside the place of work. We shall adopt the following rough classification:

(a) General environmental factors (heating, lighting, ventilation, etc.).

(b) Specific environmental factors (noxious substances, bacteria).

(c) Emotional factors.

Since psychiatry at the present time has reached the stage of development which characterised chemistry about 100 years before the birth of Robert Boyle, we shall confine ourselves to the first two.

GENERAL ENVIRONMENTAL FACTORS

Ill effects from gross defects in the environment are to be expected. It is obvious that marked overheating or intense cold would impair efficiency to such a degree as to necessitate the application of measures for improvement; this would apply also to bad illumination or inefficient ventilation. Such defects would fall within our first classification of hazards in that they would produce their effects after only a short interval, and would produce those effects in all exposed.

There are, however, a number of minor hazards whose individual effect is small, but whose cumulative effect is far from negligible. The law relating to the general enenvironment is contained in Part I of the Factories Act 1937, which deals with (among other things) temperature and ventilation, cleanliness and over-crowding. A typical section is number 5 which deals with lighting, the provisions being as follows:—

5.—(1) Effective provision shall be made for securing and maintaining sufficient and suitable lighting whether natural or artificial, in every part of the factory in which persons are working or passing.

(2) The Secretary of State may, by regulations, prescribe a standard of sufficient and suitable lighting for factories or for any class or description of factory or parts thereof for any process.

(3) Nothing in the foregoing provisions of this section, or in any regulation made thereunder, shall be construed as enabling directions to be prescribed or otherwise given as to whether any artificial lighting is to be produced by any particular illuminant.

(4) All glazed windows and skylights used

Industrial Safety

for the lighting of workrooms shall, so far as practicable, be kept clean on both inner and outer surfaces and free from obstruction. Provided that this section shall not affect the whitewashing or shading of windows and skylights for the purpose of mitigating heat or glare.

In short, adequate lighting must be provided, and the Secretary of State is given powers to define adequate lighting. Similar sections deal with heating and with ventilation. Theoretically this is excellent, but in practice environmental conditions must often fall below the standards required, especially in the smaller factories. It may be argued that factory inspectors exist to enforce the law; but it is obvious that the cost of maintaining a number of inspectors sufficient to visit every factory in the country at frequent intervals would be prohibitive. It may even be difficult for the individual in charge of the factory or even the section to make frequent detailed examinations.

The Act usually states that 'Provision shall be made for securing and maintaining' certain standards. Provisions made for 'securing' are usually adequate, especially in new premises; it is in 'maintaining' standards that faults arise. Electric lighting equipment deteriorates through age, and windows become obscured by modifications to premises inside and out. Obstructions placed in ventilating channels during extremely cold weather are forgotten and hamper the free circulation of air when warmer weather returns.

The results of comparing certain factors with the standards laid down by Act of Parliament and Ministerial Regulation would, in many work-places, be surprising. Lowered standards remain unnoticed because their immediate effects are not dramatic. Their effects over a period on efficiency and on the health of the workers may, however, be far from negligible.

SPECIFIC ENVIRONMENTAL FACTORS

While dust and dirt cause no dramatic effects, it seems reasonable to suppose that workers who do not have the pores of their skin blocked with dirt particles, and who do not have dust constantly entering their mouths and noses, will have less chance of suffering deterioration in health than those unfortunate people who do.

The first sentence of the 1937 Act states, 'Every factory shall be kept in a clean state,' and it is also enacted that accumulations of dirt and refuse shall be removed daily by a suitable method from the floors and benches of workrooms, and from the staircases and passages, and that the floor of every workroom shall be cleaned at least once in every week by washing or, if it is effective and suitable, by sweeping or other method. Cleanliness of walls and ceilings is also provided for.

The belief that dirt is an essential part of the factory atmosphere is difficult to eradicate in spite of the fact that, as the Chief Inspector of Factories states in his Annual Report for 1951, 'cleanliness has become much easier in recent years through the greater variety of paints available, the use of vacuum cleaners and the use of more suitable floorings.' He describes how vacuum cleaners solve the problems of fluff on beams and ledges, and the use of new paints produces colour schemes against which dirt is easily seen, and surfaces from which it is easily removed.

In one factory, an old worker aged 80 expressed the opinion that it was in cleanliness that the greatest improvement in working conditions had been made. In the past, the cleaning of floors and benches, if it was done at all, was done by the factory hands in addition to their other work. It is now realised, especially in the bigger concerns, that removal of waste and the cleaning of floors and walls justifies the employment of special workers—and it is worth remembering that this type of work can often be extremely well done by those who are described in educational circles as 'sub-normal' and who are extremely happy on finding themselves faced with tasks well within their capabilities.

NOXIOUS SUBSTANCES

Where very toxic substances are in use, methods of protection are usually adequate by reason of the drastic effects which result from exposure. There are certain substances, however, where it is possible to have minor faults in the protective routine; and these will not become evident until further deterioration occurs or an unduly sensitive individual is exposed.

Toxic substances may be roughly divided

into those which have to enter the body, and those which act on the skin. An excellent example of the first, which we shall use to illustrate the general principles of protection, is lead. Lead in various forms may enter the body by being breathed in or being swallowed; an important quality of lead is that it is not destroyed in the body, and it is excreted only slowly. This means that if the daily intake is even very slightly in excess of the amount excreted, a store of lead sufficient to cause poisoning will be built up.

The general principles of protection against lead poisoning can be modified for use against any substance which can be inhaled or swallowed. The most effective method is, of course, to replace the toxic substance with one which is less toxic or not toxic at all (the classic example of this was the replacement of white phosphorus by red in the match industry), but this is not always practicable. We must therefore adopt methods which will prevent the substance from entering the body.

Inhalation Protection

For prevention of entry through inhalation we install exhaust ventilation whereby any dust or fume set free from the substance being worked is carried away from the worker in a current of air, and is removed completely from the place of work. Some difficulty arises from dust given off when the substance is being moved within the factory. This may be overcome by keeping the substance wet, but if this is not practicable, all movement should be carried out in closed containers.

Swallowing can take place from the presence of dust and fume, but the main factor is the contamination of the hands with subsequent transfer to food. Here, prohibition of eating and smoking in places where the substance is used, and the provision of adequate washing facilities, are the measures to be adopted.

With regard to substances which act on the skin, the first line of defence is to prevent them from getting on to the skin by proper design of equipment or the use of protective substances which can be spread to form an impervious barrier over the skin. The next is to remove the substance before it does any damage; in the case of many substances, e.g. some of the mercury preparations used in the explosives industry, thorough washing at the end of the work period is sufficient. The removal, however, must be thorough, and in many cases special methods of testing this thoroughness are employed. For some substances, indicator soaps are available which continue to colour the washing water as long as any of the chemical remains on the skin; washing is carried out in running water, and when the water runs clear it can be taken that the amount of substance remaining on the skin is insufficient to cause any irritation.

One important group of skin irritants comprises a number of lubricating oils, some of which contain synthetic rubber to increase their adhesiveness. If removal is incomplete, skin irritation results; the fact that, after washing, no black areas remain on the skin does not indicate that removal is complete. There is, however, a simple and accurate method of testing the efficiency of any removal process, and that is to view the skin—usually of the hands—in the light from an ultra-violet lamp. When this is done, any oil which remains becomes fluorescent and is easily detected.

In the case of substances which adhere to the skin, workers sometimes discover solvents which remove the offending substance easily and quickly; but such discoveries should be exploited with the greatest care since many of them have harmful effects, especially on sensitive individuals. Some of the new detergents fall into this category, since they remove along with the stains a high proportion of the natural fats. In many cases, substances used in industry are indicated as causes of dermatitis when in fact the condition arises from the use of irritant cleansing agents.

BACTERIA

Bacterial infection is, of course, a risk outside as well as inside the factory; but this is no excuse for neglecting to cut to a minimum the risk of spread of infection within the factory. Most of the common infections in this country are spread through the inhalation of germ-laden drops of saliva projected into the atmosphere by others. This can be prevented by the proper spacing of workers, and the provision of adequate ventilation to change the atmosphere of the work-room at frequent intervals.

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It is unfortunate, however, that the common infections are rife when outside temperatures are low, and there is a tendency to prevent adequate air renewal by blocking ventilation channels and tightly closing windows. Workers take the view that since the only risk is a sore throat or the common cold, the degree of discomfort involved in maintaining an adequate air flow is not justified. If, however, a case of open tuberculosis is present in the vicinity—and such cases could be present for some time before being forced to seek advice—the absence of proper ventilation could have serious results leading to inconvenience of a degree much greater than would arise from bearing for a short time a temperature very slightly, or even considerably, below what is regarded as ideal for comfort.

THE WORKS DOCTOR

Our action in leaving the works doctor to the end is intentional since we believe that too many managements regard the preservation of health as the province almost exclusively of the doctor. Preservation of health is the responsibility of management, who can obtain the answers to technical problems from their doctor (if one is employed), from the local medical inspector of factories or from consultants in industrial medicine. It is a good thing for any doctor to be acquainted with the conditions under which his patients work, and much good can result from industrial concerns inviting local practitioners to see over their works.

Ill health and inefficiency can arise from the action of a number of slight defects over a period of time. It is because of their lack of sudden and dramatic effect that these hazards continue to operate when serious defects would be detected and quickly rectified.

Foot Safety Week

PRIME object of National Industrial Foot Safety Week (25-30 October) is to encourage factory workers to wear suitable footwear while at work. The general attitude of most workers is that their old shoes—no longer smart enough for outside wear—are good enough for work. The idea of buying a pair of boots or shoes specially for work appeals to very few. As a result, no less than one quarter of all industrial accidents cause injury to the feet or toes.

Worn soles permit pentration by nails or other sharp objects. Loose soles can trip the wearer, and are particularly dangerous if the worker is on stairs, a ladder or scaffolding. Worn heels lead to stumbling, fatigue and general unsteadiness. Women's heels are unsuitable if excessively high. Soft or flimsy shoes give no protection against heavy objects which fall or are accidentally dropped on the feet. But despite all the hazards to which the feet are exposed, it is not uncommon to see both men and women at work in heavy industry wearing cast-off dance shoes.

The Royal Society for the Prevention of Accidents, which is organising the campaign, has prepared special posters and leaflets to encourage workers to protect their feet. The society has also invited civic heads and chambers of commerce throughout the United Kingdom to give their support to the campaign.

New Safety Manual

A NEW comprehensive safety manual entitled 'Guide for Safety in the Chemical Laboratory' was recently published in America by D. Van Nostrand Co. Inc. A co-operative venture of the chemical industry representing over five years of research and preparation, the book was edited by members of the General Safety Committee of the Manufacturing Chemists' Associtaion Inc.

The 228-page book, profusely illustrated with over 70 charts, tables and photographs, covers a wide range of subjects, including handling of chemicals, protective equipment and devices, contamination control, specific first aid instruction, safety procedures in the packaging and transportation of chemicals, toxicity and other significant topics. Up to date in every way, an entire section is devoted to the latest methods for the safe handling and use of radioactive materials, a topic of increasing importance as the uses of nuclear energy become more widespread.

Spontaneous Ignition in Iron Pyrites

Recommendations for Treatment & Prevention

DEVELOPMENT in the United Kingdom of the flash-roasting of finely pulverised iron pyrites as a source of sulphur dioxide in the manufacture of sulphuric acid has directed attention to the possible risk of spontaneous heating and ignition of pyrites. A review of the relevant information available in the literature has been prepared by the Fire Research Station of the Joint Fire Research Organisation, and is referred to in their report for 1953.

The occurrence of spontaneous heating in pyrites is due to atmospheric oxidation of the pyrites with the formation of ferrous sulphate and sulphuric acid and evolution of heat, at a rate which is appreciable at ordinary temperatures.

$$FeS_2 + 3O_2 = FeSO_4 + SO_2$$
$$2SO_2 + O_2 + 2H_2O = 2H_2SO_4$$

The first stage, which is slow compared with the second, occurs in dry air and leads to an accumulation of ferrous sulphate on the surface of the pyrites, which eventually retards the reaction. Oxidation to iron oxide and sulphur dioxide only becomes appreciable at high temperatures. It has been found that the rate of sulphur dioxide production increases rapidly as pyrites is heated above 340°-360°. Russian workers found ignition temperatures for pyrites which varied between 350° and 450°, the lower values occurring with samples of small particle size and in the presence of increasing amounts of copper in the ore. Other investigators obtained ignition temperatures of 410° and 440° respectively for coal pyrites and commercial iron pyrites.

Continued oxidation of pyrites at atmospheric temperatures accompanied by leaching by water results ultimately in the formation of limonite; i.e., hydrated ferric oxide.

May Be Primary Cause

Most investigations of the spontaneous heating of pyrites have been directed to the determination of its rôle in the spontaneous heating and ignition of coal. Although pyrites is not necessary for the occurrence of this phenomenon, its presence will assist the process and it may sometimes be the primary cause, although a considerable quantity in a finely divided state is likely to be necessary.

The self-heating of pyrites placed in heaps either for storage or, as formerly, for the manufacture of concentrated sulphuric acid by weathering, has long been known, while the heating arising from the oxidation of iron sulphides in spent oxide from gas purifiers is a known fire hazard. Pyrites in the finely divided state has a reputation for being hazardous.

Greater Hazard Than Coal

It is evident that, under conditions suitable for unretarded reaction, finely divided pyrites would present a greater fire hazard from spontaneous ignition than does coal. It has been calculated that, assuming the heat loss to be zero, a sample of pyrites could heat from an initial temperature of 30° to ignition in three hours, while an average oxidisable coal would require 48 hours under the same conditions. However, the presence or absence of water is likely to be decisive for the occurrence of dangerous heating in practice. Although most of the heat available from the oxidation in the presence of moisture is evolved in the reaction in the absence of moisture, the rate of heat production in the absence of moisture may be too low to cause an appreciable rise of temperature in a mass of pyrites unless the heat losses are very small.

Experience of fires in the Huelva pyrites mines, Spain, is summarised. The ore in these mines consists mainly of cupreous iron pyrites, this being an intimate mixture of iron pyrites and chalcopyrite, occurring with zones in which the chief mineral is chalcocite. Fires occurred either in zones containing the softer and more readily oxidised chalcocite or in primary ore which was either unusually soft or which had been moved or had fallen naturally. Fires would break out several weeks after such a fall. There was evidence that the primary cause of the fires was the exothermic oxidation of the fractured mineral.

In the absence of combustible material, such as timber, the temperature would rise until sulphur dioxide was evolved. If timber

Industrial Safety

was present, and if the air supply was adequate, the timber would eventually be ignited and cause a 'sudden' outbreak of fire. In a limited supply of air the timber was reduced to charcoal, which would ignite when exposed to air during digging-out operations in the fire area. Fires also occurred in heaps of broken mineral and it was noted that heaps of lumps were more likely to heat than heaps of fines, presumably because of reduced air access to the interior of the latter.

Cooling by Ventilation

The fires were difficult to control, the methods employed being flooding, mining out, and cooling by copious forced ventilation. When an area which had been flooded was opened up, the fire was apt to break out again. Cooling by ventilation was effective only if large volumes of air could be passed at a high rate; otherwise the rate of reaction was merely increased. It seems probable that, provided the temperature is below 100°, forced ventilation will be effective by virtue of the removal of moisture and retardation of the reaction as much as by cooling.

Investigations of the causes and control of fires in pyrites mines have been carried out in the USSR. The evidence suggests that the oxidation of pyrites, particularly in the finely divided state and in the presence of small amounts of water, is accompanied by a rapid rise of temperature, but that this rise does not continue to the ignition temperature of the pyrites, because of the greatly reduced rate of oxidation of dry pyrites. It has been suggested that mine fires could be caused by the self-heating of pyrites dust in contact with wood hydrolysed by acid mine water.

The information obtained from the survey leads consistently to the conclusion that freshly pulverised iron pyrites will certainly heat if accumulated in bulk (e.g. stored in hoppers to which air has access), and it may present a greater hazard than pulverised coal. If the pyrites is free from moisture the risk of dangerous heating can be considerably reduced, but it cannot be regarded as non-existent. There should be no wood or other combustible material in the hopper.

It is not possible at present to predict the size of pile liable to result in dangerous heating or the safe dimensions for storage hoppers. The fire hazard in any particular storage system can only be gauged by careful observation of the behaviour of the temperature.

If heating in storage hoppers is found to be sufficiently great to require counter measures, these may consist of one or more of the following: reducing the amount stored; reducing the period of storage; filling the hoppers, or at last diluting the contained air, with an inert gas such as flue gas or carbon dioxide.

Cooling by ventilation, if at all practicable, should be tried only with great caution. Attempts to control the heating by sealing the hoppers may be difficult since, in the oxidation of dry pyrites, three volumes of oxygen are used in the production of one volume of sulphur dioxide which, in a closed hopper, will lead to a pressure reduction of two-fifteenths of an atmosphere; i.e., about 2 psi.

Radiation Hazards

RADIATION hazards in industry will be the theme of the third conference of the British Occupational Hygiene Society to be held at the London School of Hygiene and Tropical Medicine on 1 November. The preliminary programme announces that the following papers will be given:—'The Health of Workers Exposed to Ionising Radiation,' by Mr. A. S. McLean, principal medical officer, Department of Atomic Energy, Industrial Group; 'Radiation Safety in the Industrial Group of the Department of the Atomic Energy,' by Mr. D. R. R. Fair, head of the health physics division, Department of Atomic Energy, Industrial Group Windscale Works, Sellafield; 'Protection Against X-rays and Gamma-rays in the Industrial Field,' by Mr. W. Binks, radiological protection service, Ministry of Health and Medical Research Council; and 'Safety Criteria in Atomic Energy,' by Mr. F. R. Farmer, assistant director (production), Atomic Energy Industrial Group headquarters, Risley. The final programme and form of application for the conference can be obtained from the Society's hon. secretary, Mr. P. C. G. Isaac, Public Health Engineering Laboratory, King's College, Newcastle-on-Tyne.

Safety Notebook

INCREASED use of fluorine and its compounds in recent years has led the US Bureau of Mines to assemble information on the health hazards of these substances, in a report published on 12 July. The principal fluorine-bearing minerals used in large-scale industrial operations are fluorspar, cryolite, and sedimentary phosphate rock. Aluminium and beryllium smelters, oil refineries and manganese foundries are the principal types of plants where there are possibilities of exposure to fluorides, and they are also used on a small scale in about 31 other processes. The report discusses the toxic effects of fluorides on vegetation, animals and human beings; summarises published material from 1857 to January 1954, and outlines protective measures; and lists physical and toxic properties of 73 fluorine compounds.

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A LIGHTWEIGHT Neoprene glove, specially designed for use with α-emitters, low-energy β-emitters and chemical and bacteriological research using dry box and hood techniques, is being marketed in America by Erskine-Healy Inc., 420 St. Paul Street, Rochester 20 (Export representatives: Rand Exporting Co., 1300 Commerce Building Rochester 4). Although the thickness of the glove is only 0.01 $\pm$0.002 in., it is resistant to abrasion, oils, greases and most chemicals, except chlorinated and aromatic hydrocarbons (which cause some swelling) and strong oxidising acids. A tapered sleeve is made to cover a range of port openings, and the maximum length of gloves, which are available in two sizes, is 38 in.

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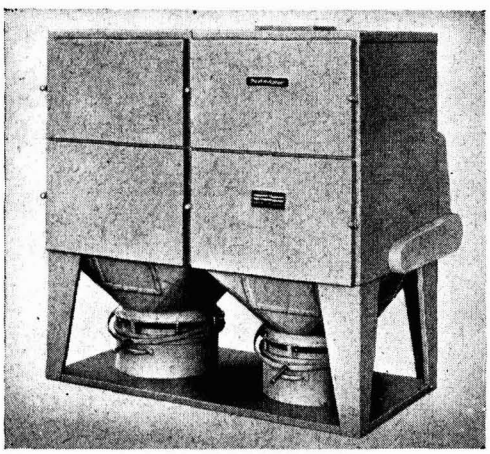
UNIT dust collectors of the fabric type have, in the past, been designed for hand shaking of the filter media. A new device has now been designed by Dallow Lambert & Co. Ltd. (Spalding Street, Leicester) to ensure adequate and effective shaking at predetermined intervals, thereby eliminating the human element.

This automatic shaker can be applied to the complete range of Dallow Lambert fabric type filters. It consists essentially of special control gear which governs the electrically driven shaking mechanism. This control gear is interlocked with the fan motor starter so that the shaking time cycle is commenced whenever the fan motor is switched off.



The automatic shaker attached to a Dallow Lambert Dustmaster DM 100 series, type 201

After a suitable time interval, in which the fan impeller comes to rest, the shaking mechanism comes into operation for a set period of time. As it is essential that the filter should not be shaken while air is passing through the fabric, the control gear is arranged so that during both the first time interval and the shaking period, and also for a short time after shaking, it is not possible to restart the fan. After the time cycle has been completed, the mechanism resets itself ready for the next operation.

As a further refinement, the electrical controls can be interlocked with the machine or operation which is being served by the dust collector. The arrangement gives the further advantage that the machine, fan, and shaker controls are operated by one push button station.

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THE Minister of Labour and National Service has made the Dangerous Machines

Safety Notebook

(Training of Young Persons) Order, 1954 (SI. No. 921). The Order prescribes dangerous machines at which a young person must not work unless he is fully instructed as to the dangers arising and the precautions to be observed, and either has received a sufficient training or is under adequate supervision.

The Order, which replaces an earlier one made in 1938 (SR & O 1938, No. 485), is made under Section 21 of the Factories Act, 1937, and prescribes not only the machines mentioned in the previous order but the following additional machines:—

Carding machines and gill boxes in use in the wool textile trades.

Calenders, washing machines and garment presses in use in laundries.

Pie and tart making machines.

Worm pressure extruding machines.

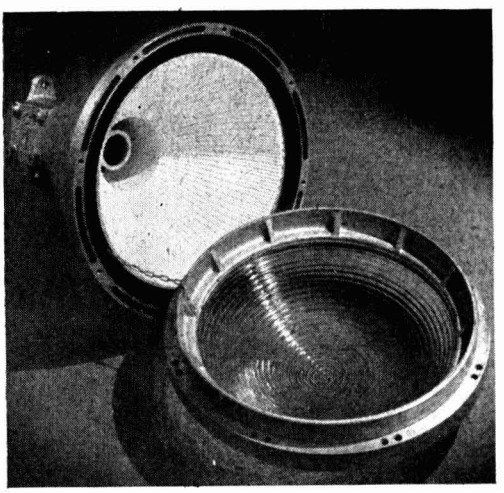
Loose knife punching machines.

Wire stitching machines.

Corner staying machines.

Semi-automatic wood turning lathes.

The Order came into operation on 1 August.



The Victor flameproof, weatherproof lamp, style No. 4461 with 300 watt fitting

VICTOR Products Ltd., of Wallsend-on-Tyne, have over the past four years devoted much of their time to producing a range of flameproof equipment in line with the requirements of the oil industry. They have paid particular attention to the problems of weatherproofing and this has resulted in an entirely new range of weatherproof/flameproof lighting fittings for use in exposed positions. The fittings are now in production. This new range is for 100/150, 150/200 and 300 watts for Groups I, II, and III. All three fittings comply with BSS. 889, and incorporate the following design features: complete weatherproofing achieved by gaskets on all joints; top or through-way junction box; internal reflector; shallow diffusing glass.

* * *

SUBSTANTIAL reduction in fatal accidents from falls of ground was unfortunately offset by a considerable increase in the number killed in accidents with explosives, states the report for 1952 of HM Inspectors of Mines and Quarries (HMSO, 2s.). It was a lamentable fact that most, if not all, of the accidents occurring each year ought not to happen, and it was deplorable that men of experience and knowledge in the handling of explosives should occasionally resort to careless practice.

* * *

PYRENE Co. Ltd. have announced the development of an entirely new method of generating mechanical foam. The Ministry of Supply has placed a contract with the Pyrene Company on behalf of the Air Ministry, for crash tenders equipped with the new 'Pyrene' foam-making appliances.

These new tenders will be capable of producing a total foam output of 6,000 gal. within 1½ minutes, at the maximum rate of discharge. The provision of a foam monitor enables a powerful, far-reaching jet of foam to be concentrated upon a blazing aircraft immediately the tender reaches the scene of the fire. Under certain conditions the foam monitor can be brought into action as the tender approaches the fire.

The monitor, which provides a powerful initial foam jet up to a distance of 114 ft., is mounted on the roof of the driving compartment and controlled and directed from within the cab. This gives an output of no less than 2,500 gal. of foam per minute.

The new crash tender is also equipped with four 60-ft. lines of foam delivery hose, two on each side of the vehicle. In normal practice, the two hose lines nearest to the outbreak are brought into action after the foam monitor has made its initial attack on the fire. They enable the crew of the tender to tackle the fire at closer quarters and from

different angles. To maintain a powerful discharge of foam from the very beginning, it is possible to bring one hose line into operation while the monitor is still in action, the two sources of foam combining to give over 4,000 gal. per minute.

* * *

ALSO demonstrated by the Pyrene Co. Ltd., at their main works recently, was a new fire-fighting tender with a foam output of 10,000 gal. per minute and an initial total output of 180,000 gal. without replenishment of the foam compound. The tender, claimed to be the most advanced of its type, provided one of the highlights of a special display of modern fire-fighting appliances developed by the Pyrene Company for the protection of oil refineries and storage tank installations. Built on a Leyland Hippo chassis, the new tender has been designed to meet the specifications of a leading oil company for one of their overseas refineries, to which it was immediately shipped after the demonstration. It carries a bulk supply of 650 gal. of foam-making compound, foam generation being effected by two 700/900 gpm. Dennis two-stage turbine fire pumps.

* * *

PAMPHLETS from James North & Sons Ltd. (Godley Mills, Hyde, Cheshire) the well-known makers of PVC gloves and clothing, concern 'Personal Protection for Chemical Workers' and 'Instruction on the Care and Maintenance of PVC Gloves and Clothing.' The former outlines ways in which workers can be encouraged to wear safety clothing, the processes for which protective clothing is compulsory, the importance of colours in clothing intended for different purposes, and issuing and recording of kit. The second contains a comprehensive survey of the Factories Act 1937 and the Orders made under that Act, as they affect the provision of protective clothing, and gives details of cleaning methods to be adopted for the removal of the commoner substances from overalls.

* * *

A REPAIR service for PVC gloves, aprons, overalls and tarpaulins is announced by G. McCormick & Co., Parsonage Chamber, Blackfriars Street, Manchester 3. Where required the items can be laundered before return, and all gloves are air-pressure tested after repair. The company state that they will be pleased to repair a sample free of charge for a prospective customer.

Safety Notebook

AN INFLATABLE plastics hood has been developed by Plysu Products Ltd. (Woburn Sands, Bletchley, Bucks), to protect the wearer from dust particles and vapours in chemical plants and other situations where similar harmful conditions exist.

The hood, which is fabricated from PVC sheet with high frequency welded seams, has a transparent visor and a generous 'skirt' which tucks into the neck of normal protective clothing and covers the shoulders. A compressed-air line is fitted to the hood and the constant flow of air keeps the wearer reasonably cool, prevents the formation of moisture or misting effects on the visor and also prevents the entry of dust or vapours at the 'skirt.' Even if a material defect should develop in the hood, the entry of dust or vapour is still prevented as the internal pressure is slightly higher than the external atmosphere.

A complete plastic suit with an integral transparent hood has been developed, which also incorporates the compressed-air principle. It is designed for use in atomic energy plants to provide complete protection against radioactive dust and particles. The first of these suits have just been supplied to Harwell and the Windscale plutonium factory in Cumberland. Compressed-air is fed into the suit to maintain an internal pressure of approximately 0.5 psi., the excess escaping through an exhaust valve in the back of the jacket.

* * *

SIR HUGH BEAVER, Chairman of the Government Committee on Air Pollution, which is working on its main report, is to address the annual conference of the National Smoke Abatement Society at Scarborough on 22 September. Other features of the conference will be the Des Voeux Memorial Lecture by Sir Edward Salisbury, Secretary of the Royal Society and Director of Kew, on 'Air Pollution and Plant Life' and the presidential address by Sir Ernest Smith.

Iron Oxide from Copperas

North Thames Gas Board Patent

THE titanium dioxide industry in Britain uses large quantities of sulphuric acid for dissolving ilmenite. This results in the formation of thousands of tons of copperas as a waste product. In 1951, when a serious shortage of sulphur existed in the United Kingdom, attention was directed to the possibility of finding a use for copperas in the gas industry, by which its sulphur content could be converted into ammonium sulphate.

BP.704690

As a result of this work, an application for a British patent was filed by the North Thames Gas Board, covering 'improvements in or relating to the treatment of ammoniacal liquor,' with particular reference to a process yielding substantially pure ammonium sulphate and an iron oxide material which can be used for the purification of gases. The application has now been granted as BP.704690 by the Patent Office.

It had previously been proposed to produce a gas purifying material and ammonium sulphate by the interaction of ammoniacal liquor and waste pickle liquor, but difficulties were presented by the formation of impure ammonium sulphate, mainly because precipitation was incomplete. The investigators then found that by treating ammoniacal liquor with copperas, either in the solid form or in the form of a slurry, in a two-stage process, it was possible to obtain substantially pure ammonium sulphate and to secure the complete precipitation of iron from the copperas.

In the process covered by the specification, copperas in the form of fine crystals or as a slurry with filtrate from the process is added to the ammoniacal liquor in such quantity that the total ammonia (free and combined), calculated as NH_3, represents up to 10 per cent excess by weight of the quantity of total ammonia required theoretically to react completely with the copperas. The ammoniacal liquor may be in concentrated form and is the product of the steam stripping of gasworks ammoniacal liquor.

The reaction is preferably carried out with agitation between 60° and 100°, but it is possible to operate from room temperature upwards. In the example given, the mixture is agitated and heated by direct steam to 70°. The reaction may be carried out either as a continuous or as a batch process. If desired, the process may be controlled by means of the *p*H of the mixed solution.

The precipitate is removed by means of any form of filter, but preferably a rotary vacuum filter, and is washed separately with a small amount of warm water. An additional 15 per cent of the concentrated ammoniacal liquor is then added to the filtrate without further heating and the mixture is again filtered. The filtrate, now substantially free from iron, is stripped with live steam to remove excess ammonia and the ammonium sulphate is concentrated and crystallised in the usual way.

The combined precipitates may be used for the purification of coal gas and may be mixed with a filler, consisting of peat, sawdust, or any suitable fibrous material. The proportion of filler should be such that the weight ratio of iron oxide to filler in the final product is of the order of 2:1. Alternatively or additionally, the combined precipitates may be mixed with burnt oxide or with solvent-extracted spent oxide. They are adjusted to the desired moisture content and are spread in the air to complete the oxidation of the iron to the ferric state. The combined precipitates may also be employed in the form of press cake or nodules.

Institute of Metals

SWITZERLAND is the venue of the 46th annual autumn meeting of the Institute of Metals to be held from 6 to 14 September. It is being held there at the invitation of the Societe Suisse des Constructeurs de Machines and the Association Suisse pour l'Essai des Materiaux. The programme will open in Zurich on Monday, 6 September, and members and ladies will leave Zurich on 11 September for Montreux, from which towns additional visits to works will be paid until the afternoon of Tuesday, 14 September.

Manufacturers of Casco synthetic resin and casein glues, Leicester & Co., Ltd. announce that they are now in a position to supply polyvinyl acetate glue, which is being marketed under the trade name of Cascorez. Inquiries for details and samples should be addressed to the sales department of the firm, North Baddesley, Southampton.

NYLON TECHNOLOGY. By Karl H. Inderfurth. McGraw-Hill Publishing Co., London. 1953. Pp. 335. 46s. 6d.

In this book, which covers the subject of nylon textile processing, the author under whose name the book has been written has called on experts in particular fields of textile processing for their specialist knowledge, which greatly increases its value.

The introductory chapter, 12 pages long, gives a brief but interesting survey of the researches that led to the commercial production of nylon as a textile fibre.

The first chapter gives an account of the physical and chemical properties of nylon yarn, and chapters 2 to 12 cover what might be termed the mechanical textile processing of nylon. It is very noticeable that the writers have had considerable experience of natural fibres and nylon, since throughout the book comments, notes and warnings of differences in properties indicate a practical knowledge of the processes.

Chapters 2, 3 and 4 discuss the spinning of nylon staple on cotton, worsted and woollen systems respectively, and chapter 5 is concerned with twisting, winding, coning, tinting and sizing of yarn. Types of sizes are suggested and how to determine amounts of size applied. The types of and reasons for faulty packages are detailed and methods of correction.

Warping, beaming and slashing (sizing), and quilling and weaving of nylon yarn, are described in chapters 6 and 7. Chapter 8 gives a full account of American methods of stocking manufacture, and chapter 9 details the knitting of socks and outerwear.

Preparation and types of warp knit fabrics are described in chapter 10, and methods of setting, such as steam, hot air, radiant heat are considered. Chapter 11 gives an account of the preparation of tyre cord, and chapter 12, the manufacture of sewing thread. The last three chapters deal with dyeing, printing and finishing.

Throughout the book the particular properties of nylon are stressed in relation to the process being considered. A large amount of exact information regarding mechanical processes is given and machinery is well illustrated both with photographs and line diagrams. It is definitely a practical book and will be a useful addition to any textile mill library and of use to anyone handling this material.—G. E. STYAN.

WASSERBESTIMMUNG MIT KARL-FISCHER-LOSUNG. By Ernst Eberius. Monograph in Applied Chemistry and Chemical Engineering Technique No. 65. Verlag Chemie GmbH. Weinheim/Bergstr. 1954. Pp. 138. 38 illustrations and 83 tables. DM. 12.80 (cardboard).

Many procedures are known for the determination of water content. A few of these have general application but are limited in some way. Certain factors are essential in any method to be recommended; the determination should be exact and reproducible; independent of the state of aggregation of the material; specific and unaffected by outside influences; quick and not requiring lengthy preparation; and able to be carried out at room temperature. Of all the procedures available for water determination these conditions are satisfied in a special way by the Karl-Fischer method, which can be employed for the determination of free and bound water in most inorganic and organic compounds, natural and technical products, salts and salt hydrates, strong and weak acids, hydrocarbons, alcohols, amines, textile fibres, solid and liquid fuels, explosives, food and drugs, condensable and uncondensable gases to name but a few. Those who have had occasion to use the Karl-Fischer method will in all probability not have had the necessity or the opportunity to apply it in more than a few of the above-mentioned fields. They

will, therefore, welcome this monograph by a friend of Karl-Fischer, who has had wide experience in the development and application of this method.

The objectives of the monograph are to indicate (1) difficulties and detours that may be avoided, (2) the variety of problems that may be tackled, and (3) improvements and inherent possibilities in the method.

The monograph is divided into two main sections. Section I outlines in detail the development of the method, the production of the reagent according to (a) Fischer and (b) Mitchell and Smith, American exponents of the method, purification of the components of the reagent (iodine, sulphur dioxide, pyridine and methanol), methods of standardisation of the reagent, the influence of temperature, stability of the solution and the titration by the (1) visual, (2) photometric, (3) electrometric and (4) dead-stop methods.

The applications of the method are set down in Section 2 (pp. 55-133) and this is divided into three sections: (A) inorganic chemical applications. (B) organic chemical applications and (C) applications to industrial chemistry and natural products. The selection is very wide and those interested in water or moisture determination will find something of value in this section. Another feature that may be mentioned is the description of the method for the determination of functional groups, hydroxyl, carboxyl, carbonyl and so on. 148 literature references are given. The monograph is well written and illustrated. The German is easy to follow so that English readers with 'a little German' may find it well worth purchasing.—R. J. MAGEE.

OILS, FATS AND WAXES. By C. Griffiths. Scientific Publications (Great Britain) Ltd. London. 1954. Pp. 90. 10s. 6d.

This inexpensive little book, based on a series of lectures, is intended as an introduction to the subject of oils, fats and waxes for the student, the chemist and the technologist. While it cannot be said to replace the much larger and more expensive treatises upon the subject, nevertheless it contains enough basic information to make it a valuable elementary reference book. The writing is excellent and the material so well arranged that it may be read for its intrinsic interest alone.

The first chapter explains the composition and gives a classification scheme of oils and fats. This is followed by a description of the properties of marine and terrestrial oils, animal and vegetable fats, vegetable and insect waxes. Chapter 3 covers the identification by means of chemical and physical tests of the separate classes of oils, fats and waxes, the determination of specific members of each class, and the identification of the components of each member. There are very useful tables of properties and compositions included in the text of this section. The methods suggested are those which have become standard over many years and consist mainly of simple chemical operations. For reasons of space and simplicity the more modern elaborate instrumental methods of analysis have been omitted.

The next chapter is devoted to descriptions of the less familiar vegetable oils and fats such as perilla, walnut, and safflower oils, Borneo tallow and nutmeg butter. Once again tables of properties are included. Testing is dealt with in a further chapter, and then the industrial applications are described, particular attention being paid to the food and paint industries, soap, leather and linoleum manufacture. The textile industry is covered in a separate chapter which discusses the various textile oils such as the soluble sulphated vegetable oils, typical analyses of which are given in some detail.

The final chapter dealing with recent advances in the chemistry of oils, fats and waxes gives a short account of the separation by means of column and paper chromatography of fatty acids and the use of the chromatographic methods in the elucidation of structure. An account of the variation in properties and structure of several oils with their origin is discussed and a rational system of nomenclature is suggested. A short list of references appears at the end of this chapter, but unfortunately the references are not numbered and numbers do not appear in the text, so that one must rely on the names of the authors to locate a particular reference.

The book is well produced, and there are only one or two minor errors, such as the incorrect form of the word 'stationary' on page 79. There is a good index and the tables of properties are themselves separately indexed. The book can be heartily recommended to both the student and the practising chemist.—J.R.M.

HOME

Titanium Plant for Sheffield

A plant for the melting of titanium and titanium alloys is to be installed by William Jessop & Sons Ltd., of Brightside Works, Sheffield, a unit of the BSA group. It is stated that it will represent a major contribution to titanium capacity in Great Britain. Technical aid has been obtained under an agreement with one of the largest American producers of titanium.

Britain's Scientific Instruments

Mr. C. E. T. Cridland, newly-elected president of the Scientific Instrument Manufacturers' Association, told guests at a luncheon last week that British scientific instruments had no superiors—and that was why all the world should know about them. For his part, he intended to make it one of the principal planks in his presidential policy to ensure that the world is told about SIMA's 120 member-firms, which employed 250,000 of Britain's finest technicians.

I.C.I. Employees at Wilton

Imperial Chemical Industries Ltd. have informed Eston (Yorks) urban council that the number of employees at the new Wilton Works would increase from 5,000 at the end of this year to 8,500 by the end of 1957. This number did not include men employed by contractors on constructional works. The firm said they would appreciate any help the council could give in providing houses for men who would have to be imported from other areas.

Chemical Society Research Fund

The Research Fund of the Chemical Society provides grants for the assistance of research in all branches of chemistry. About £700 per annum is available for this purpose, the income being derived from a donation of the Worshipful Company of Goldsmiths, from the Perkin Memorial Fund, and from other sources. Applications for grants will be considered in November next and should be submitted on the appropriate form not later than Monday, 15 November. Applications from Fellows will receive prior consideration. Forms of application together with the regulations governing the award of grants may be obtained from the General Secretary, Chemical Society, Burlington House, Piccadilly, London, W.1.

Leather Trades' Chemists

The annual conference of the Society of Leather Trades' Chemists is to be held in the large chemistry theatre of the University, Leeds, on Friday and Saturday, 24 and 25 September. During the proceedings honorary membership is to be conferred on Mr. A. Harvey in recognition of his services to the Society over the past 40 years. Mr. Harvey will also be the guest of honour at the dinner on the Friday evening.

Invitation to Students

Wild-Barfield Electric Furnaces Ltd., makers of industrial heat treatment plant, Elecfurn Works, Watford By-Pass, Watford, Herts, announce that they will be pleased to welcome parties of up to 30 senior engineering students from technical colleges and members of technical societies to their Watford works from 1 September to 31 May 1955 on a limited number of weekly afternoons (Monday to Friday).

Tar Distillation Plant Contract

The Scottish Gas Board recently awarded a contract to Proabd (England) Limited of 76, Victoria Street, London, S.W.1 for the design and installation of a complete continuous tar distillation plant, capacity 150 tons per day, for their Provan chemical works, Glasgow. Work has already commenced on site, and the plant is expected to be put into operation towards the end of 1955.

Procter Memorial Lecture

The sixth Procter memorial lecture under the auspices of the Society of Leather Trades' Chemists, will be delivered by Dr. J. T. Randall, Wheatstone Professor of Physics, University of London, King's College, entitled 'Observations on the Collagen System' on Friday, 24 September, at 2 p.m. in the large chemistry lecture theatre, Leeds.

Sulphate-Reducing Bacteria

About 12 people are working at the Chemical Research Laboratory on the effects of sulphate-reducing bacteria, and the total cost of the research is about £13,000, Mr. Bevins, Parliamentary Secretary to the Minister of Works, told the Commons on 27 July.

OVERSEAS

Demand for High-vacuum Equipment

Increased demand for high-vacuum equipment in Canada has prompted W. Edwards & Co. (Canada) Ltd., wholly-owned subsidiary of W. Edwards & Co., of London, to open an assembly plant and service centre in Islington, near Toronto.

South African Glass Firm Merger

A message from Johannesburg states that to effect a merger of the Union Glass Company with the Consolidated Glass Works the latter concern is making an offer to acquire the issued capital of Union Glass to the basis of four 5s. shares in Consolidated Glass for every one £1 share in Union Glass.

Improved Yeast

Two biochemists at the University of Wisconsin, Dr. J. S. Chiao and Professor W. H. Peterson, have developed a method of yeast culture which gives a much greater yield of methionine, the amino acid in which yeast has hitherto been most inadequate. By increasing the amount of nitrogen salts in the culture medium or, particularly, by adding cystine to the medium, production of methionine is increased, making yeast more valuable as a supplemental food.

New Chemical Polishing Process

A simple process for chemical polishing of aluminium has been developed at the National Metallurgical Laboratory, Jamshedpur, India. The surface of the metal is well washed with benzene or any other suitable solvent to make it completely grease-free. It is then dipped for four minutes in a mixture containing orthophosphoric acid, nitric acid and acetic acid in suitable proportions and kept between 118° and 122°. The metal is then removed and washed with water.

Mineral Development in Turkey

A contract will shortly be let for the construction of a nitrogen plant at Kutahya to produce an annual volume of 117,000 tons of nitrogenous fertilisers for agricultural use as well as nitric acid for national defence requirements. A French mining concern is investigating the possibility of operating the existing bauxite mine near Akseki, in Antalya province, which has an estimated reserve of 5,000,000 tons.

Aden Refinery Progress

The new 5,000,000-tons-a-year oil refinery being built by the Anglo-Iranian Oil Company at Aden came into operation on 1 August—four months ahead of schedule. Construction began on 1 November, 1952, and the refinery, which has cost approximately £45,000,000, was originally scheduled to be commissioned in December.

West Norway Aluminium Plant

Eighty-eight of the 274 furnaces at the new aluminium plant at Sunndalsöra, West Norway, are now in operation. Production is now at the rate of almost 14,000 tons of aluminium a year. When in full production, the Sunndalsöra plant will have an output of over 40,000 tons a year. The total aluminium output in Norway last year was 55,000 tons. The new plant should raise the total output to almost 100,000 tons. Most of the aluminium is exported.

Oil Refinery to Produce Next Year

Australia's new £A40,000,000 oil refinery at Kwinana, Western Australia, is expected to produce its first petroleum products early next year. The refinery is being built by Anglo-Iranian Oil Company Ltd., and will be operated by a subsidiary, Australasian Petroleum Refinery Ltd. It is situated 14 miles south of Fremantle. The refinery will produce 2,770,000 tons of refined products a year, including motor spirit, fuel oil, aviation fuel and kerosene. It will use about 3,000,000 tons of crude oil, from the Middle East, for its production.

Draft Standard for Two Chemicals

The Indian Standards Institution has circulated draft standard specifications for pentachlorophenol and carbon disulphide, technical, to interested parties in the country. The draft specification covering pentachlorophenol prescribes the requirements such as chlorinated phenol content, matter insoluble in alkali, freezing point, etc., and also details their methods of test and sampling procedures. The proposed specification for carbon disulphide, technical, prescribes sampling procedures and requirements such as specific gravity, range of distillation, residue on evaporation, acidity, etc., along with their methods of evaluation.

PERSONAL

DR. A. D. E. PULLIN, of the California Institute of Technology, has been appointed a lecturer in physical chemistry at the Queen's University, Belfast.

PROFESSOR ALEXANDER KILLEN MACBETH, C.M.G., is retiring at the end of the current year from the Chair of Chemistry in the University of Adelaide.

A committee set up by the Minister of Transport to keep the problem of pollution of the sea by oil under review, and make recommendations include the following:— MR. E. LE Q. HERBERT, general manager, Shell Refining and Marketing Co. Ltd.; DR. F. B. THOLE, Ministry of Fuel and Power; MR. S. A. ASHMORE, Department of the Government Chemist; and DR. B. A. SOUTHGATE, Director of Water Pollution Research Laboratory.

MR. G. P. BRIDGES, manager of the building department of Simon-Carves Ltd., Cheadle Heath, Stockport, has been appointed a director of the company.

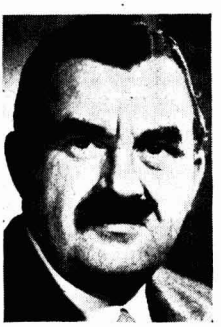
R. HARDING BLISS, professor of chemical engineering and fellow of Jonathan Edwards College at Yale University, has accepted the editorship of the *A.I.Ch.E. Journal*, a new publication to be issued for the first time in January, 1955, by the American Institute of Chemical Engineers. Dr. Bliss will undertake his new position in addition to his teaching programme at Yale Author of sections in 'Chemical Engineers' Handbook' by J. H. Perry and 'Chemical Engineering Economics,' by Chaplain Tyler, Dr. Bliss was consultant to the National Defence Research Committee during World War II and before that was affiliated with Rohm & Hass for two years.

MR. SIDNEY ROGERSON, who in 1952 was lent by I.C.I. to the War Office, is relinquishing his appointment as publicity adviser to the Army Council at the end of the month. As he would be due for retirement from I.C.I. in December 1956, he has felt it impracticable to return for only two years to his old post of publicity consultant to that company, and is retiring on pension at the end of the current year. He hopes to continue work as an independent consultant. He joined the I.C.I. as Press Officer in 1930.

MR. W. D. MORRISON has been named assistant to the director of the development department of Celanese Corporation of America. Until his promotion, Mr. Morrison for the last two years was assistant manager of the product development department of the Chemical Division of the company.

SIR JOHN T. STAMP will take over the duties of director of the Moredun Institute of Animal Diseases Research Association at Gilmerton, Edinburgh, on 1 October. He succeeds DR. J. RUSSELL GREIG, director at the Institute for some 25 years. Sir John was trained at the Royal Dick and Edinburgh University. He has been since 1946 Chief Veterinary Investigation Officer to the Edinburgh and East of Scotland College.

MR. N. F. PATTERSON has been appointed director of Monsanto Chemicals. Joining Monsanto in 1946, Mr. Patterson became works manager at Ruabon in 1947, and in July 1949 was appointed general manager of production, with responsibility for all the production operations of the company. He is a director also of Monsanto (Soil Conditioners) Ltd., and Monsanto Plastics Ltd., subsidiary companies of Monsanto Chemicals Limited.



Obituary

MR. JOHN STANLEY HERBERT DAVIES, of Knutsford Road, Wilmslow, lecturer in chemistry at Salford Technical College for four years has died aged 61. Most of his life Mr. Davies was an industrial chemist and after World War I he did research on mustard gas. Then followed 15 years' research work with I.C.I. Before going to Salford he was director of research on medicinal products for British Schering Ltd.

Publications & Announcements

THE principles, development and application of sectional superheaters to all types of steam raising plant are dealt with in a useful little booklet issued by Bolton's Superheater and Pipe Works Ltd., of Stockport. The subject is dealt with comprehensively in non-technical language, and illustrated with a number of diagrams and photographs, the various sections dealing with such questions as thermal efficiency, the limits of boiler efficiency, the effects of superheat on reciprocating engines, turbines, process vessels and pipe lines. Other sections are concerned with types of superheaters and design factors.

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A RECENT issue of 'Heat Engineering' (March-April, 1954), published by the Foster Wheeler Corporation, 165 Broadway, New York 6, contains a description of the first Casale ammonia synthesis plant to be completed in America at the Pennsylvania Salt Manufacturing Co.'s works at Wyandotte. The process differs from most other ammonia synthesis processes in two major respects: it uses pressures of 9,000 to 12,000 psi., and recirculates unconverted gases by an exclusive ejector recirculating system. While this is the first installation in the US, there are more than 40 units in various parts of the world, producing over 5,000 tons of anhydrous ammonia per day, with an ammonia content of not less than 99.5 per cent and an oil content of not more than 5 ppm.

* * *

REMOTE transmission of pressure (or suction) values has for some time been done electrically, but for safety and other reasons it is sometimes desirable to use a pneumatic transmission system in place of an electrical one. George Kent Ltd., Luton, announce the addition to their range of instruments of an air-operated pressure transmitter to meet these circumstances. This instrument is purely a transmitter; it does not include any recording or indicating mechanisms. Any normal pressure or suction value can be measured and is converted to an air signal which bears a linear relationship to the measured value. This air signal is fed to a receiving instrument which continuously indicates or records the measured value. Two types of measuring element can be fitted in the instrument. For pressure ranges of 0-15 to 0-2,000 psi., a Bourdon tube is employed; while for suction values, and pressure ranges of 0-3 to 0-14 psi., bellows units are used. The measuring element is connected by means of a suitable linkage to a Kent Mark 24 transmitter. The transmitter operates on the normal air-supply pressure of 17 psi.; and this is taken from the main air supply via a filter and a combined relay/pressure reducer.

* * *

AUTOFINING, a desulphurisation process developed by Anglo-Iranian Oil Co. Ltd., has been in successful operation at the Llandarcy refinery for the past year. *The Kelloggram*, 1954, No. 2, published by the M. W. Kellog Co., 225 Broadway, New York 7, who are American licensors of the process, discusses its principal features and gives details of the operation of the 3,500 bpd. plant.

* * *

PROBLEMS of rust in connection with the shipping industry are reviewed in a 16-page leaflet published by Jenolite Ltd., manufacturers of chemical specialities, 13-15 Rathbone Street, London, W.1. The publication, which is well-illustrated, consists primarily of articles re-printed from the firm's house magazine, 'Jenolite News,' with additional news, features and technical notes relating to the company's products.

* * *

IRONWORKS extensions costing £15,000,000 at the Appleby-Frodingham Steel Company, Scunthorpe, are described in an attractive booklet, 'Seraphim,' issued by the public relations department of the United Steel Companies Ltd., of 17 Westbourne Road, Sheffield. The plant, which was formally opened by Sir Charles Forbes, chairman of the Iron and Steel Board, on 29 July, and comprises two large blast furnaces (the 'Queen Anne' and the 'Queen Victoria') and ancillary ore-preparation sinter plant, is expected to boost the works' production of pig iron by 600,000 tons per annum. When some older furnaces have been taken out of commission Appleby-Frodingham will produce 1,400,000 tons per year. The project is the result of 10 years of research which sought an answer to the deteriorating quality of the local ores.

Law & Company News

Commercial Intelligence

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.)

SILVER FOUNTAIN PRODUCTS LTD., Smethwick; manufacturers of bleach preparations. 28 June, charge to Barclays Bank Ltd., securing all moneys due or to become due to the bank; charged on 330 and 332 Ladypool Road, Sparkbrook, Birmingham. *Nil. 11 November, 1953.

Satisfaction

MATTHEW TURNBILL LTD., Sunderland; glass manufacturers. Satisfaction 1 July, of two charges registered 9 July, 1952 (re 16 Park Terrace and Cornhill Glassworks and 33 and 35 Cornhill Road, all Southwick).

Increase in Capital

The following increase of capital is announced: GAS PURIFICATION & CHEMICAL COMPANY LTD., from £57,000 to £100,000.

New Registrations

Fawkham Developments Ltd.
Private company. (535,090.) Capital £100. To acquire certain inventions and rights of application from Norman V. S. Knibbs and Edward G. S. Thyer, and to carry on the business of manufacturers of and dealers in chemicals, gases, drugs, medicines, plasters, disinfectants, fertilisers, salts, acids, foodstuffs, oils, isinglass, colours, glues, gums, pigments, varnishes, etc. Directors: Norman V. S. Knibbs and Edward G. S. Thyer. Reg. office: 17 Bedford Row, London, W.C.1.

Chemical Processing Ltd.
Private company. (535,611.) Capital £200. International newspaper, news gathering and statistical agency and that of magazine and directory proprietors, etc. Directors: Blake Ozias, Robt. H. Irvine, and Dr. Edwd. L. Lloyd. Reg. office: 19 Seymour Street, London, W.1.

House of Brummer (Import & Export) Ltd.
Private company. (535,670.) Capital £100. Importers, exporters, manufacturers of and dealers in chemicals, oils, glues, gums, waxes, disinfectants, fertilisers, salts, acids, isinglass, dyes, colours, pigments, varnishes, plastics, etc. Directors: Maurice I. Brummer and Harry Brummer. Reg. office: 35 Copthall Avenue, London, E.C.2.

Pyroplast Ltd.
Private company. (535,777.) Capital £500. Manufacturers and vendors of adhesives, mastics, cements, caulking compounds, sealing compounds, jointing materials, etc. Directors: Reuben Sperling, Regina Sperling and Joseph Freedman. Reg. office: 23 Fulready Road, Leyton, London, E.10.

S. S. Keel & Co. Ltd.
Private company. (535,819.) Capital £1,000. To acquire the business of an explosives agent carried on by Stanley S. Keel at Grainger House, Blackett Street, Newcastle-on-Tyne; and to carry on the business of manufacturers of and dealers in explosives, gunpowder, ammunition and chemicals, etc. Directors: Stanley S. Keel, Charles W. Keel and Lancelot T. Keel. Reg. office: Grainger House, Blackett Street, Newcastle-on-Tyne.

Udenum Products Ltd.
Private company. (536,009.) Capital £100. Wholesale, retail and manufacturing chemists, druggists and opticians, etc. The first directors are to be appointed by the subscribers. Reg. office: 2 & 3 Exchange Buildings, Rutland Street, Leicester.

Glasgow Chemical Co. (1954) Ltd.
Private company. (30,161.) Registered in Edinburgh. Capital £5,000. Manufacturers, importers, exporters and merchants of chemical products, etc. The first directors are to be appointed by the subscribers.

Abisch Conveyor & Furnace Co. Ltd.
Private company. (535,849.) Capital £5,000. Electrical, mining, chemical, civil, mechanical and general engineers and contractors, designers and manufacturers of electrical, chemical, coal, coke, fuel, mineral and other plant, mechanical handling equipment, manufacturers of furnaces and furnace equipment, etc. The first directors are to

be appointed by the subscribers. Solicitors: Stoneham & Sons, 108a Cannon Street, London, E.C.4.

Company News

E. J. & J. Pearson Ltd.

A final dividend on the ordinary stock of 7.2d. per share, making 10.8d. per 5s. share (the same as the previous year) is announced by E. J. & J. Pearson Ltd., manufacturers of fireclay, firebricks and refractory materials. Net profits for the year to 31 March, 1954, were £40,049 (against £55,017), after charging UK taxation.

Anglo-Greek Magnesite Ltd.

The group profit of Anglo-Greek Magnesite Ltd. for the year to 31 March, 1954, was £33,773 (against £20,218 for the previous year), including £32,446 (£18,814) from operations in Greece. The net profit was £13,532 (£5,148). It is stated that wage increases in Greece have hit production costs, but there is a 'steady demand' for the company's products.

James Laing, Son & Co. (M/cr.) Ltd.

The accounts of James Laing, Son and Co. (Manchester) Ltd., manufacturers of dextrines, for the year to 31 March, 1954, show that, after all charges, including tax, the group profit was £23,933 (against £21,218 for the previous year), UK tax taking £39,172 (£31,086), while there was attributable to members of the holding company £22,447 (£19,353). The carry forward is £30,838 (£28,289).

Market Reports

LONDON.—A restricted demand due to holiday influences characterises conditions in most sections of the industrial chemicals market. Nevertheless, a good volume of overseas inquiry continues. A reduction has been reported in the prices of white lead, red lead and litharge as from 4 August, basis prices now being: dry white lead £128 per ton; dry red lead £121 10s. per ton; and litharge £123 10s. per ton. The only other price change that has been notified is a reduction in the prices of BISOL aectoacetanilide, acetoacet-*o*-chloranilide and acetoacet-*o*-toluidide. In common with other markets the demand for coal tar products is quiet and is likely to remain so until after the holiday period.

MANCHESTER.—Only moderate activity has been reported during the past week on the Manchester market for heavy chemical products, due largely to holiday stoppages at consuming works. Reduced order-books, however, are also reported from some cotton mills in the Lancashire area and unless there is a recovery in the near future this will probably react on the demand for a fairly wide range of chemicals. Prices continue on a steady to firm basis. A quiet trade continues to be done in fertilisers, but in the tar products market a fairly steady business is being done in most of the light and heavy materials.

GLASGOW.—The annual holidays continue to affect the general business outlook, although some outlying towns are still drawing regular supplies. In general, business is quiet.

Oil & Colour Chemists' Exhibition

The seventh technical exhibition of raw materials and equipment used in the paint, varnish and printing ink industries is to be held on 15, 16 and 17 March of next year at the Royal Horticultural Society's Old Hall, Vincent Square, London, S.W.1. Although the closing date for receipt of applications is not until 6 September, applications for more than 50 per cent of the available space had been received by the end of July, and companies wishing to exhibit are urged to send in their completed forms as soon as possible to the General Secretary, Oil and Colour Chemists' Association, Memorial Hall, Farringdon Street, London, E.C.4.

Thomas Hedley Acquire New Site

A 45-acre site at Longbenton, near Newcastle, has been acquired by Thomas Hedley and Co. Ltd., soap and synthetic detergent makers and the British subsidiary of Procter and Gamble, of America. It will be used initially to expand the company's research division, but will also, if necessary, allow production to be expanded to supplement the present Newcastle factory. The first building on the site will cost about £350,000 and will house, in a floor area of 44,000 square feet, research laboratories, pilot plant and office accommodation.

CLASSIFIED ADVERTISEMENTS

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.

BOAKE, ROBERTS & CO., LTD., LONDON, E.15, require **SENIOR CHEMISTS** for their Process Development Department. These apppointments would appeal to qualified men with some years of experience of Organic Chemistry, seeking the opportunity to lead a team in developing new projects from laboratory to plant scale, so as to provide new or improved products. The minimum salary envisaged is £800 per annum.

The Company also requires **ASSISTANT CHEMISTS** to participate in these projects. Industrial chemical experience is desirable in these appointments. Minimum salary is £550 per annum. Applications in detail to **PERSONNEL MANAGER.**

CHEMIST/TECHNOLOGIST, with experience of Rubber Latices Dispersions, Adhesives and allied products, is required by a public company in the Manchester area manufacturing for the rubber and associated industries. This is a completely new appointment and the successful candidate, who should be of approximately B.Sc. standard, will be required for technical development work in our laboratories and complete liaison with customers. The position provides excellent prospects for someone possessing the necessary experience and personality. Good commencing salary and participation in Staff Bonus and Pension Schemes. Full details should be given of age, education, experience and salary required. Our present staff is aware of vacancy. **BOX NO. C.A. 3345, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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RUBBER TECHNOLOGIST (male), age 20-25, required by important manufacturing company in the Manchester area. Applications are particularly invited from persons studying for or having attained A.I.R.I. or L.I.R.I. standard, who can progress with the development of the Industry and Company. Five-day week. Bonus and Pension Schemes. State age, qualifications and salary required, to **BOX NO. C.A. 3343, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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SEVERAL NEW FILTER PRESSES by Krupp—50 chambers, 40 in. sq. plates and frames, hydraulic closing gear, fully washing, individual tap discharge and collecting troughs.
FILTER PRESS by S. H. Johnson—Cast-iron plate and frame type with pyramid surface plates and 36 frames forming cakes 24½ in. sq. by 11/16 in. thick, 1¼ in. diam. bottom side feed and enclosed discharge, 1¼ in. diam. top side air discharge. Hand ratchet screw closing.
VERTICAL CAKE MIXER by Peerless—100 qt. capacity, 4-speed machine with three bowls, beater, whisk, and hook. Direct driven by 5 h.p. motor.
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JOHNSON LABORATORY FILTER PRESS—plates 9 in. square.
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100 Braithwaite 4 ft. sq. **TANK PLATES.**
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