The
Chemical Age

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Safety First

INDEX TO ADVERTISERS IN THIS ISSUE

	Page
Boots Pure Drug Co., Ltd.	469
Bowmans Chemicals, Ltd.	473
British Celanese, Ltd.	xi
British Tar Products, Ltd.	xii
Cannon (Holdings), Ltd.	471
Classified Advertisements	474, xiii, xiv, xv
Cole & Wilson, Ltd.	xv
Cruickshank, R., Ltd.	Cover ii
Derby Aviation, Ltd.	xv
Gas Council (The)	Cover iii
Geigy Co., Ltd. (The)	x
Girling, S., & Sons (Coopers), Ltd.	Front Cover
Guest Industrials, Ltd.	Cover ii, xv
Haughton's Metallic Co., Ltd.	ii
Jobling, James A., & Co., Ltd.	xvi
Kestner Evaporator & Eng. Co., Ltd.	ii, 473
Key Engineering Co., Ltd. (The)	Cover ii
Laporte Chemicals, Ltd.	471
Leigh & Sons Metal Works, Ltd.	xv
Marchon Products, Ltd.	vii
Markland Scowcroft, Ltd.	xii
Merthyr Tydfil Ceramics, Ltd.	ii
Metal Containers, Ltd.	Cover iv
Monsanto Chemicals, Ltd.	iv, v
Nu-Swift, Ltd.	ii
Potter, F. W., & Soar, Ltd.	ii
Shell Chemicals, Ltd.	ix
Simon, Richard, & Sons, Ltd.	iii
Stanton Instruments, Ltd.	viii
Todd Bros. (St. Helens & Widnes), Ltd.	vi
Towers, J. W., & Co., Ltd.	i
Wallach Bros., Ltd.	ii
Wilkinson, James, & Son, Ltd.	i

The
Chemical Age

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Chemistry Down Under

IT is perhaps timely in 1953 to remind ourselves that chemistry as well as cricket flourishes in Australia—for in a few weeks headlines such as 'Collapse of Australia' or 'Australia Flays England' will dominate all relationships between the Dominion and ourselves. However, we must borrow flagrantly from our contemporary, *Chemistry & Industry*, (1953, **10**, 204-210), for Australian chemistry can never have been more full-somely surveyed than by Mr. J. E. Cummins of the Australian Scientific Liaison Office in London. Even in a contracting world Australia is a long way off, and even in her distant setting she occupies an isolated position. Unlike Canada she has no powerful and stimulating neighbour to foster chemical enterprise by example or by co-operation. In Australia chemistry and chemical industry have had to arrive by the hard way, and that is fair enough comment without implying that in other dominions chemistry has had a spoon-fed journey.

There were for many years so few opportunities for chemists—and in so vast a territory a small band of kindred spirits is almost lost as soon as it is spread out. Agricultural development needed fertilisers. New South Wales' silver and lead and zinc needed assayers. Otherwise industrial needs were non-existent or unrecognised. Teaching and government services required a steady number of chemists, but until 1926 when the counterpart to our DSIR was wisely set up—the Council for Scientific and Industrial Research—there were hardly any research openings and Australian chemists with such lofty ambitions emigrated, mainly to Britain. But all the time the Dominion was nurturing her own chemical teachers and leaders, and the background of chemical progress was steadily laid in advance of real opportunities. Until the mid-twenties almost all chemicals required by Australian industry were imported, and it was not until the later 'thirties that the actual existence of a 'chemical industry' could be claimed.

In any world sense Australian chemistry's greatest triumph has been scored in the field of soil science. Unusually dry and leached soils—in the words of Leeper, one of Australia's eminent soil chemists of the present, soils of 'natural

chemical poverty'—had to be harnessed to food production. In the late nineteenth century Custance and then Lowrie showed that worth-while crops depended upon superphosphate, and the phosphatic fertiliser industry became the first chemical enterprise of Australia. Later as farming expanded, other plant-food deficiencies stood with unusual severity in the way. Australia might be called the world's paradise for the field investigation of trace element deficiencies. Zinc, a nutrient seldom in short supply anywhere else in the world, rifely proclaimed its absence down under; in animal nutrition cobalt and copper were widely unavailable. Australia's agricultural chemical research was 'modern' even when there was scarcely any chemical industry or other research established; its early achievements were made in spite of extreme isolation.

General advance in chemical industry was rapid during the second world war. Australia's geographical isolation made expansion imperative. There are now 242 heavy chemical or semi-heavy chemical producers, 216 specialised chemical manufacturers, 152 paint, pigment, or varnish factories, 25 vegetable oil producers, 91 soap and glycerine makers, and some 140 other chemical or mainly chemical concerns. Almost 30,000 people are engaged in the new chemical industry; though only about 70 factories as yet employ more than 100 persons. Research associations of much the same pattern as our DSIR-sponsored organisations are beginning to be set up. We might question the total wisdom of this. Small firms are helped by research associations when they cannot themselves undertake research, but this is a poor *modus operandi* for balancing the complete absence of chemical guidance on the spot. Individual chemists working as consultants to small firms in industrial centres would surely provide the better solution. Industrial research is not notably developed even in the larger organisations. Most research in Australia is conducted by the CSIR (CSIRO since 1949) and at the universities. Time and steady development must surely widen Australia's research activities.

In the last few years there have been growing misgivings about Australia's post-war industrialisation programme. Diversion of effort from primary production, especially from agriculture, has been criticised. But it seems very clear that what truth there may be in these generalised apprehensions does not apply to Australia's chemical industry. As elsewhere, a major key to sound national economics is a flexible chemical industry than can save imports and up-grade the value of native resources.

On Other Pages

Chlorophyll: A Reply to the Critics 443

Midlands Analytical Society Annual General Meeting . . 449

Temperature Measurement . . 454

Public Analysts Hold Annual Meeting 455

Air Pollution Abatement in the U.S.A. 457

Bulk Conveyance of Chemicals . . 461

Durham Barytes Project . . 462

Chemist's Bookshelf . . 463

Home News Items . . 465

Personal . . 466

Overseas News Items . . 467

Publications & Announcements . . 468

Law & Company News . . 470

Next Week's Events . . 472

Market Reports . . 473

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Notes & Comments

A Bi-Centenary

ONE of the few scientific anniversaries taking place in 1953 is the bi-centenary of Count Rumford's birth which occurs on 26 March, and as in life perhaps in remembrance Rumford can occupy the space of several men. Even for the eighteenth century this American-born but internationally-operating scientist was an eccentric character. Like other scientific personalities of that age he was more than a dabbler in politics, and suspicions that he was a British agent forced his hurried 'emigration' from America with the English army when Washington drove it out. The suspicions were far from unfounded. Rumford, or Benjamin Thompson as he then was, was able to give so useful a report on the state of America that he was quickly given an official position in England in connection with the further organisation of the American war. He used this opportunity to conduct research on naval cannon. At the age of 26 he was made a Fellow of the Royal Society. In those days reputation was speedily made! His next task was a commission from the Elector of Bavaria to reform the whole state's administration, and for some years he was Bavaria's 'professional' dictator. There his scientific diversions were in the fields of diet and the design of solid fuel appliances. The principles of science had not been genuinely used in designing stoves until Rumford introduced a kitchen range for cooking meals for a number of people. The end of his first Bavarian career brought him his title.

Founded Royal Institution

HIS return to England plunged Count Rumford into stove and fire-place design. He introduced a hospital oven with hot-air pipes, and he later designed the prototype of present-day domestic open fire-places. Even so, he foresaw the day when the open fire would disappear in this country! His criticisms of the open fire's efficiency were no less trenchant than those we hear from modern fuel scientists now. Then in the midst of success as a fuel expert he was recalled to Bavaria. There he used the opportunities in a new arsenal to conduct experiments on the nature of heat and his well-known cannon-boring tests proved that the work of friction was converted into heat, and that heat was not some 'spirit' released from substances under various stresses. Back in England again, Rumford founded the Royal Institution. He did not remain actively associated with it for long for he differed violently with most of his colleagues on the first committee; but he was there long enough to have appointed a young lecturer in chemistry, an unknown Mr. H. Davy.

Theories Ridiculed

IT is possible that Rumford's conception of the new centre of science might have served England better. He wanted it to develop as a more practical centre of technology—instead it fast became a socially popular centre for scientific discussion. Only two years after the founding of the Institution he left England to spend the rest of his life in France. He married Lavoisier's widow, but not very happily. His theories about heat, in advance of his time, were the object of ridicule rather than respect in France. In 1814 he died, disgruntled and disliked. But in the century most of his life was passed in, was any other man of scientific talent so ready to make practical applications of his knowledge and ideas? He was one of the first technologists.

Industrial Sodium

SODIUM—free elementary sodium—is already being used in U.S. industry at a rate of 300 million pounds a year. Liquid sodium has high thermal conductivity and it has considerable promise as a heat transfer medium, particularly in atomic power plants. It remains stable at high temperatures and the liquid state is maintained over a long range. As a chemical, sodium is highly reactive, and with the huge growth of

heavy organic chemical production sodium has several potentialities as an intermediate—e.g., reduction of natural esters. Sodium is already distributed in a remarkably varied range of unit weights and 'packs.' There are 1-25 pound bricks, steel drums, and 40-ton tank cars. Transfer from container to process involves heating, displacement of the molten metal with gaseous nitrogen or under vacuum, and the use of piston-type pumps working up to 1,000 p.s.i. and between 250-400° F. Water or steam must, of course, be kept out of sodium-handling or sodium-using systems; workers require gloves, goggles, and generally protective clothing. Despite the fact that most chemists' knowledge of metallic sodium is of a fiery soft substance kept 'pickled' in oil in school or university laboratories, the accident rate in factories using large quantities of metallic sodium has been no higher than the normal accident-rate in everyday chemical handling.

The Duke of Edinburgh being greeted by Lord Falmouth, chairman of the governing body, when he visited the Imperial College of Science and Technology, South Kensington, on 10 March

Tallow Hits Back

ONE of the new industrial uses of sodium in the U.S.A. may soon enable tallow to recover something of its former importance as a 'raw material for washing.' With the advent of detergents tallow has seen a sizeable portion of its long-established soap market fade and die. Now, however, tallow is to be developed as a base for detergents. Higher carbon fatty alcohol sulphates are likely to be superior detergents to lower carbon sulphonates. They may be particularly suitable for developing better solid detergents of the 'soap tablet' type. The role of sodium is that of a reducing agent for converting the glycerides in tallow into fatty alcohols. 85-90 per cent yields are anticipated. Corrosion problems are insignificant. Various fatty alcohols may be obtained and can be separated by ordinary distillation methods. Stearyl, cetyl, and oleyl alcohols are the main products and myristyl alcohol is usually present to a small extent. Besides uses as detergent bases, these alcohols may find favour as plasticisers, oil additives, resin materials, and possibly for preparing mercaptans for the synthetic rubber industry. Tallow may be about to hit back with a force that vegetable oils and petro-chemicals will be unable to ignore.

No Shortage Expected

In a written question in the House of Commons recently, Mr. Cyril Osborne, Member for Lincoln, asked the Minister of Materials what percentage of industrial sulphur requirements he expects to be available during the coming year, how much short-time working would be involved and what steps he is taking to increase sulphur supplies. Sir Arthur Salter, the Parliamentary Secretary, replied that he expected the needs of industry to be fully met except for sulphuric acid manufacture. Sulphur would only be available for acid making to the extent that the acid required could not be made from other materials.

Chlorophyll : A Reply to the Critics*

by WM. MITCHELL, B.Sc., Ph.D., F.R.I.C.
(Chief Chemist, The Allen Chlorophyll Co., Ltd., England)

LET us first of all get our minds clear as to what we mean by 'Chlorophyl.' The pure chlorophylls *a* and *b* were first isolated by Willstatter.[1] They are neutral, oil-soluble substances containing magnesium. However, even these almost certainly are not free as such in the living plant. There the chlorophylls are probably combined with proteins in the living protoplast—just as haem of the blood is combined with the protein globulin to form the haemoglobin of the blood. Thus, even the pure chlorophylls *a* and *b* are not 'Nature's green pigment,' and capable of performing photosynthesis of sugars from carbon dioxide and water with energy absorbed from sunlight.

Still less does the natural pigment correspond to the 'chlorophylls' produced and used in technology and medicine. These generally contain only chlorophyll derivatives. Those that are oil-soluble have lost much or all of their magnesium and consist mainly of phaeophytins associated with a complex mixture of carotenoids, fatty esters, phospholipids, sterols, etc. When 'fixed' with copper to develop their colour and light fastness, the main chlorophyll derivatives present are copper phaeophytins.

The 'water-soluble chlorophylls' contain alkali salts of the chlorins and rhodins produced by hydrolysis of the phaeophytins of oil-soluble cholorophyll. When copper has been introduced, they contain the alkali salts of the copper derivatives of these chlorins and rhodins termed conveniently, though rather erroneously, copper chlorophyllins.

It is these water-soluble derivatives, especially those containing copper, that are mainly used as deodorising and therapeutic agents, the oil-soluble derivatives being less effective for such purposes. Since the water-soluble derivatives are not known to occur in plants, we have at once the complete answer to the sceptics who say that herbivorous animals such as the goat should be odourless, since they ingest chlorophyll all the time! As Dr. Westcott pointed out at a recent meeting in New York, it would be just as logical to say, since aspirin is derived from coal, that coal miners should never suffer from headaches!

In a lecture[2] I delivered in Paris last year, I gave a fairly full account of the natural functions of chlorophyll, its chemistry, the nature and properties of the oil-soluble and water-soluble derivatives produced commercially, and the medicinal and other uses of these products. Time does not now permit me to cover all this ground again, but reprints of this lecture are available here for those interested.

In the remaining time at my disposal I propose to refer to some of the recent criticism that has appeared. This has found the clearest expression, as some of you may know, in a lecture[3] given last December to the American Chemical Society by Dr. Alsoph H. Corwin, of Johns Hopkins University. This has received very wide publicity—unfortunately much wider than that given to his subsequent statement in which he retracted much of his criticism. I shall return to this withdrawal later in my talk.

Some Degree of Agreement

With some of what Dr. Corwin said I am in agreement. Thus, he criticised the quality of much of the published work on the use of chlorophyll derivatives and, in particular, the frequent failure adequately to define the nature of the derivatives used. I referred to this in my Paris lecture and also to the extravagant, even absurd, claims made by certain commercial advertisers, such claims only tending to ridicule the subject and possibly to obscure those uses that are of real value.

I am with Dr. Corwin entirely when he says that more research work on the whole subject is needed. I should like to see really carefully planned and controlled scientific trials of the therapeutic and deodorising properties carried out, with assessment of the results on a proper statistical basis, and preferably performed by an independent and impartial body. I agree with him again when he condemns as false the suggestion that isolated chlorophyll derivatives owe their bacteriostatic and deodorant properties to the inhibition of anaerobic bacteria by

* A paper read at a meeting of Svenska Teknologföreningen at Stockholm on 13 March.

oxygen produced in the course of photosynthesis. It is clear that photosynthesis can be conducted only by the natural pigment-protein complex in the living chloroplast.

Forgot to be Scientific

However, Dr. Corwin's scepticism led him on into a serious error. In criticising the unscientific basis on which some of the claims are made he forgot to be scientific himself. He appears to have selected out of their context only those facts and quotations that suited his arguments against chlorophyll, and to have conveniently overlooked those in its favour. For example, he dismisses the bacteriostatic action of water-soluble chlorophyllins as negligible, yet omits to mention the careful work of Killian[4] who found it to inhibit almost entirely the growth of bacteria in perspiration. Similarly he quotes Weaver, of the United States National Bureau of Standards, as saying: 'in answer to a question frequently asked, we have no reason whatever to believe that chlorophyll ever has anything to do with deodorisation.' He fails to make it clear that this comment referred only to space deodorisation using the wick type of vaporiser. His only other direct references to deodorisation refer to perspiration and similar odours. He conveniently forgets to mention breath deodorisation.

Further, he made a number of assertions about the possible dangers in the administration of chlorophyll derivatives to humans. Finally, he stated quite categorically that they had no therapeutic or deodorising powers. Apparently he had no real proof of such dangers or lack of activity, or else he would not have felt obliged, twelve days later, to retract much of his criticism in a public statement to the Press which read as follows:—

'As a result of a technical report presented by me before the New York section of the American Chemical Society on 5 December, 1952, on the subject of chlorophyll, certain misconceptions have arisen which I wish to correct.

'I did not state chlorophyll is toxic. Such a statement would be at variance with the experience of the human race over thousands of years. Neither did I state that the commercial products containing copper or other metal derivatives of chlorophyll now on the market are toxic. I know of no experimental evidence which would provide a basis for a statement that these chlorophyll derivatives are unsafe.

'While acknowledging the existence of numerous published scientific reports on the effectiveness of chlorophyll for healing and deodorisation, the point I made was that, in my opinion, many phases of the use of chlorophyll need further statistically controlled investigation.'

Let us consider his main criticisms in more detail. First, he feared toxicity due to liver damage by copper present in the water-soluble copper chlorophyllin preparations. Chlorophyll and its derivatives have the power to combine with copper. They hold the metal (in a non-ionic and non-toxic form) so tenaciously that it is quite difficult to remove it by chemical means. I am not aware of any reliable evidence that the human body is capable of releasing ionic copper from such compounds during metabolism. There is, of course, the possibility, suggested by Dr. Corwin, that copper might be present in amount greater than could be absorbed by the chlorophyll derivatives present, i.e., that ionic copper would be available. In fact, reputable makers of these preparations take particular care to see that this does not happen. Minute traces may be present, but the amounts of available copper so absorbed from normal (or even very excessive) doses of the preparations would still be vastly less than that present in the normal daily intake of foodstuffs.

No Adverse Symptoms

Dr. Corwin has now admitted that this danger does not arise, but it is none the less of interest to quote some figures. Our own tests have shown that rats or mice, fed with medicinal sodium copper chlorophyllin 90 per cent at the rate of 2 g. per kg. bodyweight, showed no adverse symptoms nor signs of pathological changes in organs. Similar tests in other laboratories have shown that the L.D.50 for rats is at least 5 g. per kg. bodyweight. These are, of course, enormous doses and would correspond to more than 250 g. for a normal human subject. Such a consumer would indeed be a chlorophyll addict! I personally took 2 g. per day of medicinal sodium copper chlorophyllin 90 per cent for seven successive days without adverse symptoms of any sort—and I am still here to tell the tale!

Dr. Corwin's remarks on the possible dangers of photo-sensitisation were, in my opinion, so absurd as hardly to merit serious comment or criticism. He based them on the fact that mice (and note that they were albino mice and hence especially light sensitive) that had been injected with massive doses of water-soluble porphyrins died instantly when exposed to the light of a photographic flash bulb. Assuming that they did not die simply of fright, one is still left with the facts that they were injected with substances related to, but possibly different from, those we are considering; that the dosage of these substances was relatively enormous when compared with the amounts of chlorophyll derivatives that one could expect even the most enthusiastic human chlorophyll user ever to swallow; that human usage is normally oral or by tropical application; and that there is no evidence, as Dr Corwin himself asserts, that such administration results in chlorophyll derivatives or breakdown products appearing in the blood stream in appreciable amounts. In attempting to be sensational Dr. Corwin was at his least scientific!

Not being a medical man nor a pharmacologist, I do not feel competent to discuss the therapeutic value of chlorophyll in the treatment of wounds, etc. I prefer to leave discussion of these aspects to those better qualified by experience. There is, however, a large volume of medical evidence in this field available to those interested. Much of this is conveniently summarised in a booklet[5] published by the Rystan Company Inc. Further, the facts that preparations for therapeutic use containing high purity sodium copper chlorophyllin have been recognised by the American Medical Association in 'New and Non-Official Remedies'[6] and that such chlorophyll dressings are now standard issues as U.S. Army field dressings, seem not without significance.

Deodorising Claims

However, I can discuss the deodorising claims. Let me say at once that I started by being the complete sceptic! I did not believe a word of the claims, and nor did my company. For a long time we took the position that we made no such claims. We were manufacturers of high grade chlorophyll derivatives. We would make those required and leave the users to make such claims as they felt they could justify. Broadly speaking, this is still our attitude, but we have now modified it to the extent justified by our own experience and that of certain of our friends.

Our first steps to partial belief was based on a very practical observation. As distillers of essential oils, we periodically make large quantities of oil of garlic. After this operation it normally took us anything up to two weeks to render the plant, particularly the condensers, fit for the distillation of any other essential oil. However, a works chemist, in a jocular mood, decided to leave the condensers filled up overnight with a dilute solution of sodium copper chlorophyllin fully expecting no deodorisation to occur. To his and our surprise the condensers, after a wash and a brief period of steaming, were completely free from garlic odour, and fit for immediate use for other work.

Series of Laboratory Tests

This led to an intensive series of *in vitro* laboratory tests. These tests disclosed that water-soluble chlorophyll derivatives had little or no deodorising effect on the majority of the substances tested, including most of the materials normally used in perfume and flavour compositions. They also disclosed the important fact that these chlorophyll derivatives did have a very distinct deodorising effect on numerous sulphur-containing, odorous compounds such as inorganic and organic sulphides and di-sulphides, thioglycollic acid and its salts, mercaptans such as benzyl mercaptan, and oils such as those of onion and garlic. In fact, it is only in this class of compounds that we are so far satisfied that there is a real effect, though of course this does not exclude the possibility that it may apply to other types of compounds that we have not yet tested. Hence it is evident that the deodorising action of water-soluble chlorophyllins is selective. In this connection it is interesting to note that whereas Westcott[7] claimed that his undefined water-soluble chlorophyll preparation deodorised benzyl mercaptan, thioglycollic acid or trimethylamine *in vitro*, Dr. Corwin conveniently selected only trimethylamine for his own tests. I believe he was correct in contradicting Westcott's results with trimethylamine, but it is curious that he did not test—or at least report on any tests—on the other two substances which certainly are deodorised

by water-soluble chlorophyllin. Further, it is difficult to follow Dr. Corwin's condemnation of the nose as a smell detector. Perhaps he knows of a better instrument for detecting smell! It is, to say the least, dangerous to rely on physical measurements such as he describes. When an odorous substance is truly deodorised it must be changed into a different substance that is odourless. Such a chemical change may be so small as not significantly to alter the other physical properties, as measured by spectrophotometric absorption, basicity, etc. The nose, aided or unaided, is the best test.

Removal of Odours

Since water-soluble chlorophyllin has a specific action on certain odorous sulphur compounds, and since it is very likely that many offensive mouth and breath odours may be due to the presence of sulphur compounds derived from the breakdown of sulphur-containing proteins, it does not seem unreasonable to suppose that the oral administration of water-soluble chlorophyll derivatives would remove or control such odours. A recent, and very carefully planned, study[8] on the control of breath odours by the use of water-soluble copper chlorophyllin in chewing gum certainly lends strong support to the claims that it is effective for this purpose. The same reasoning could well apply in the topical application of such derivatives to deodorise foul smelling wounds, perspiration odours, etc.

It seems less likely that the oral administration of water-soluble chlorophyll derivatives can act systematically and remove perspiration and similar odours since it is improbable that the materials are absorbed from the alimentary tract into the blood stream in any quantity. Even if they were, it is to be remembered that perspiration odours are produced in the main by the secondary action of the bacterial flora on the surface of the skin and hence not in direct contact with the blood stream.

Equally it seems unlikely that chlorophyll plays any essential rôle in air deodorisers of the wick type. Contact between the water-soluble chlorophyll derivatives and the substance to be deodorised seems to be essential and could, of course, be attained by atomising such a solution into the air. Since such chlorophyll derivatives are non-volatile, evaporation of an aqueous solution of them from a wick presumably cannot disperse the water-soluble chlorophyll into the air. As Dr. Corwin suggests, it seems more likely that the odours are simply masked by the formaldehyde and the odorous materials also usually present; though his fears as to deleterious action on the human nose seem exaggerated, and certainly cannot be blamed on the chlorophyll derivatives present!

If one accepts that the deodorising action of water-soluble chlorophyllin is limited to sulphur compounds, one can of course attain this effect by other, purely chemical methods. However, these would not generally be suitable for application within the human body. If chlorophyll can, by virtue of this action, deodorise certain offensive body odours—and it seems that it can—it evidently has a very useful rôle; and there is no evidence to suggest that such use is accompanied by any dangers or risks to health. In fact, when compared with some of the curious molecules that organic chemists and pharmacologists are jointly introducing for clinical use in human therapy, the risks seem negligible. Some of these compounds appear to be widely used on humans after rather brief periods of laboratory tests on animals, and the results have tended to be rather alarming in some cases. I am not aware that any untoward effects have yet been reported as arising from the normal use of chlorophyll derivatives.

Water-Soluble Derivatives

Little is known about the mechanism of the deodorising action of water-soluble chlorophyll derivatives. I have done a considerable amount of research in this field and can now advance a partial explanation. I have observed that when a suspension of benzyl mercaptan in water is mixed with an aqueous solution of sodium chlorophyllin, or of sodium copper chlorophyllin, and allowed to stand for 24 hours, the mercaptan odour completely disappears. The green mixture now contains a suspension of colourless, odourless crystals which I have proved to be dibenzyl disulphide, melting point 71°C. As is well known, benzyl mercaptan readily undergoes this change simply by aerial oxidation. However, in control experiments, at the same alkaline *p*H (9.5), but without the water-soluble chlorophyll, the benzyl mercaptan gradually became odourless and completely converted into diphenyl disulphide, but only after standing for 10 days or more. Further, in parallel experi-

ments, where the air had been completely displaced from the vessels by nitrogen, little or no change occurred even after 21 days or more, whether water-soluble chlorophyll was present or not. These results suggest quite clearly that, in this case at least, my previous suggestion[2] that chlorophyllin acts as an oxygen carrier is correct. The deodorisation thus appears to be in aerial exidation greatly accelerated by the presence of the chlorophyllin. It is not a true catalytic action, since the amount of mercaptan that can be deodorised is limited. I have found that 1 gr. of 100 per cent sodium copper chlorophyllin can deodorise no more than about 0.5 g. of benzyl mercaptan under these conditions.

How the chlorophyllin performs this function remains to be explained. On recovery from the reaction mixture, it appears to be virtually unchanged in its chemical behaviour, colour, and spectro-photometric properties. However, it no longer has the power to deodorise any further quantity of benzyl mercaptan, so that a change has occurred. This also confirms that the chlorophyllin does not act simply as a catalyst, but has become altered in the process. Other work in hand suggests to me that the deodorisation of garlic depends on a similar mechanism, but the products of deodorisation have not yet been identified in this case. This work is being continued, and I hope to publish fuller details at a later date. It is to be remembered that absolutely pure chlorophyllin salts are not so far commercially available. The presently-accepted spectrophotometric assay rates at 100 per cent material which actually is well below this purity.[2] Thus, the possibility remains that the deodorising effect may be due to the presence of some other substance or substances associated with the chlorophyllins. Questions such as this remain to be settled by further research.

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Editor's note:—The above paper, which is the text of a lecture Dr. Mitchell gave to the Svenska Teknologföreningen in Stockholm on 13 March, is a reply to the lecture given by Dr. Corwin (see CHEMICAL AGE, **68**, 123) and no mention is made of Dr. Brocklehurst's work. (See CHEMICAL AGE, **68**, 415). In a letter published in the ***British Medical Journal*** of 14 March Dr. Mitchell offers strong criticism of the conditions of the tests described. He points out that Dr. Brocklehurst has failed to define his materials accurately. 'One would want to know,' writes Dr. Mitchell, 'the values based on spectro-photometric assay, in order to assess the worth of his results.' He also states: 'Dr. Brocklehurst appears to have discovered an entirely novel, not to say amazing, method for the preparation of methyl mercaptan. Perhaps this accounts for the fact that his product also had novel properties in that 30 mg. had a gaseous volume of 130 ml.— instead of the 14 ml. that one would expect on the usual assumption that a gramme molecule has a volume of 22.4 litres at S.T.P.'

Insufficient Contact

Dr. Mitchell further states that the first two experiments carried out by Dr. Brocklehurst failed to comply with the requirements that the water soluble chlorophyllin and mercaptan should be in intimate contact for a sufficient period of time and that there was no means of knowing whether the amount of mercaptan was more than could, under the circumstances, have been deodorised. The failure to deodorise garlic in the fourth experiment, Dr. Mitchell believes, could only arise from the use of insufficient chlorophyllin. Substances such as ether and perfume are not, in his experience, deodorised by chorophyllin in any circumstances. He is not prepared to discuss the clinical tests made by Dr. Brocklehurst but states that they constitute only an isolated set of unfavourable subjective results to be set against a much larger amount of positive results obtained elsewhere.

In the same issue of the *British Medical Journal*, L. Deadman, chief chemist for Ashe Laboratories Limited, also criticises Dr. Brocklehurst. He first states that Brocklehurst gave the formula of chlorophyll incorrectly and then attacks him for not giving the chemical composition or purity of the types of chlorophyll used. He also

states that the time of contact in experiments 1 and 2 was too short, that ether has no relation to body odours, that it has never been claimed that chlorophyll deodorises perfume, and that it is not reasonable to suppose that chlorophyll would penetrate the cell tissue of a slice of onion in sufficient quantity to react with the odorous substances present. Referring to the clinical tests of Dr. Brocklehurst, Mr. Deadman states that the amounts of chlorophyll given were inadequate. In conclusion he says: 'Though chlorophyll is not a panacea for all kinds of odours, work about to be published will show beyond any doubt that in certain specific cases chemical proof is forthcoming that odorous substances can be changed into odourless compounds.'

Norwegian Research

Progress Reported to Government

ACTIVITIES and progress of the Norwegian Technical Research Council established in Norway after the war have been summarised in a report recently submitted to the Norwegian Parliament.

The council, which is partly financed from profits of the State Football Pool, states in its report that during the period 1946-1952, the number of technical research workers in Norway was doubled. However, as the initial position in 1946 was very weak, this increase during the six years is not considered great in comparison with the achievements of some other countries.

Some 18 committees of specialists in particular fields of research have been appointed and a number of separate research institutes have been established to carry on some of their work. Since its creation the council has given grants for study abroad to more than 100 promising research students. A classified list of about 1,000 scientists available for particular research projects has been drawn up.

Co-ordination of research activities has been one of the main aims of the council. As part of this work an industrial research centre is to be built at Blindern, near Oslo, where about 17 different research institutes will be concentrated.

The biggest prize so far paid by the Norwegian State Football Pool was recently won by an Oslo office-worker who received £7,500. Half the amount staked is returned in prizes, while the remainder, after deducting expenses, is returned in the promotion of sport and scientific research.

The Pool began operating in 1948, and in its first four years a net surplus of £2,150,000 has been made available for distribution to sport and science.

Safety Regulations

Designed to Protect Farm Workers

REGULATIONS under the Agriculture (Poisonous Substances) Act, 1952, have been made by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland for the purpose of protecting employees against risks of poisoning from the dinitro and organo-phosphorus compounds which are now extensively used in agriculture and horticulture for the control of weeds and pests. The Regulations are the Agriculture (Poisonous Substances) Regulations, 1953, and come into operation on 31 March, 1953. They apply to DNC, dinoseb; parathion, schradan, dimefox, mipafox and TEPP (HETP).

The Regulations have been made after consultation with the representative organisations concerned and many of the requirements are based on experience obtained during 1951 and 1952 when schemes of voluntary precautions were operated by the Agricultural Departments with the full co-operation of these organisations.

The Regulations prohibit the use of dinitro and organo-phosphorus compounds in agriculture and horticulture unless the employees working with them are wearing protective clothing. The protective clothing to be worn varies according to the particular operation being carried out. For example, the protective clothing to be worn when mixing consists of rubber gloves, rubber boots, faceshield and either an overall and rubber apron or a mackintosh; spraying ground crops in the open requires overall, hood, rubber gloves, rubber boots and faceshield; and wet spraying in a greenhouse requires rubber gloves, rubber boots, hood, faceshield and either an overall or a mackintosh. The Regulations restrict the number of hours workers can be employed on work with poisonous substances.

MIDLANDS SOCIETY FOR ANALYTICAL CHEMISTRY

Annual General Meeting

THE third annual general meeting of the Midlands Society for Analytical Chemistry was held in the Mason Theatre of Birmingham University, Edmund Street, Birmingham, on Thursday, 5 February. After the preliminary remarks of the retiring chairman, Mr. J. R. Leech, J.P., the secretary, Mr. W. T. Edwards, F.R.I.C., A.I.M., presented his report for 1952. During the year, he said, seven ordinary discussion meetings were held with an average attendance of 50 members. This attendance was slightly less than that during 1951, although this decrease by no means jeopardised the continuance of the Society; the highest attendance was 75, on the occasion of Dr. C. L. Wilson's lecture on 'Ultramicro-Analysis.' It was unfortunate that two meetings coincided with particularly poor weather conditions, thus reducing the average attendance figures. It was, however, noted that, in general, the meetings in which the subjects for discussion had wide applications attracted higher attendances than those relating to specialised topics.

Remarking on the symposium on analytical chemistry held in the Chemistry Department of the University, the secretary said that many distinguished foreign visitors attended either as visitors or speakers; the standard of the papers which were presented was very good and many original contributions to analytical chemistry were read. The Society was honoured by a civic reception given by the Rt. Worshipful, the Lord Mayor of Birmingham at the Council House. Many delegates took advantage of the most enjoyable dinner. After the symposium, nine chemists of international repute who had participated in the proceedings, were invited to become honorary members of the Society, an invitation which they all accepted.

Advance Programme Arranged

The secretary intimated that the programme for 1953-54 had already been arranged and that he was concluding the necessary arrangements regarding dates and speakers. The arrangements were to follow those of previous meetings, with at least one meeting to be held at Edgbaston. It was hoped that a completed programme for next session would be published before the end of the present session. Members were reminded that the Committee always welcomed suggestions for topics of general interest.

On behalf of the Society, the secretary acknowledged the facilities granted to the Society by the Chemistry Department of Birmingham University and the help of Dr. R. Belcher and his staff for the smooth running of the symposium arrangements. During the year, Mr. A. H. Coombes had to resign from the Committee owing to the pressure of other business. Mr. Coombes was thanked for his valuable assistance during his period of service.

Effort to Increase Membership

The secretary concluded his report by calling on members to do their utmost to increase the membership of the Society. In an industrial community such as the Midlands, it was desirable to draw attention to the activities of the Society and this could best be done by personal contact.

Calling for the adoption of this report, the chairman paid tribute to the work of the secretary throughout the year. In particular, attention was drawn to the greatly increased secretarial work brought about by the symposium. Mr. Edwards was warmly thanked for carrying out his arduous duties, successfully and conscientiously. His report was unanimously adopted.

The treasurer, Mr. F. C. J. Poulton, B.Sc., gave his account of the Society's finances and again emphasised the need for increased membership if the present six-shilling membership fee was to be maintained. After some discussion in which attention was drawn to the negligible deficit on the symposium accounts, the report was unanimously approved. The deficit on the symposium account was made all the more remarkable in view of the quite extensive hospitality the Society accorded to the distinguished visitors and speakers. Mr. Poulton was warmly thanked for his able administration of the finances and for his additional work on the symposium accounts.

The election of officers for the new

session was then held. The secretary had received no nominations prior to the meeting and none was forthcoming during the election. Instead, a proposal that the retiring officers be re-elected was unanimously carried. The three retiring Committee members were also re-elected. The new session's Officers and Committee are as follows:—Chairman, J. R. Leech, J.P.; secretary, W. T. Edwards, F.R.I.C., A.I.M.; treasurer, F. C. J. Poulton, B.Sc. Committee: Miss J. L. Pailing, B.Sc.; R. Adkins, B.Sc. (Met.); R. Belcher, Ph.D., F.R.I.C., F.Inst.F.; F. T. Everett; S. H. Jenkins, Ph.D., D.Sc., F.R.I.C., F.Inst.S.P.; W. M. Lewis, F.R.I.C.; A. J. Nutten, Ph.D., A.R.I.C.; J. Rowlands, B.Sc. and H. C. Smith, Ph.D., F.R.I.C.

Resolutions Discussed

After the election of officers and committee the chairman announced that several resolutions had reached the secretary and according to the rules of the society were valid for discussion by the meeting. One, referring to the holding of a symposium on analytical chemistry in 1954, was submitted on the recommendation of the committee. The resolution was adopted without dissent and the committee was instructed to proceed further with its proposals. The second resolution proposed that the Society apply for membership of the Midlands Chemists' Committee. After much discussion for and against this proposal the meeting voted that this matter be returned to the committee for further consideration.

Another resolution concerning the symposium arrangements called for the publication of the lectures in pre-print form. This was rejected by a large majority vote, it being considered undesirable and a detraction to the value of the lectures.

The possibility of works visits was considered in a further proposal. The committee were instructed to look into this matter, as several organisations in the Midlands had intimated their willingness to participate in this activity.

At the close of the business of the meeting, Dr. G. F. Hodsman, of the Research Department of Messrs. Oertling, Ltd., delivered an excellently illustrated lecture on 'The Historical Development of the Chemical Balance.'

Tracing the origin of the fulcrum principle from very early Persian and Egyptian records, Dr. Hodsman described the stonebeam balances used about 5000 B.C. and continued as follows:—

The origin of weighing is unknown, but apparently involved the principle of 'hefting'—the simultaneous comparison of weights by lifting—a principle still used in the 'guess the weight of the cake' competitions.

There is little doubt that weighing devices originated in Egypt. The idea of a beam arose as a development from the yoke which was used across the shoulders for carrying two loads. The wearer found it necessary for his own comfort to equate the two loads, and the idea of replacing the human body by a fixed fulcrum must have been an obvious step. Our knowledge of these early instruments stems almost entirely from the remarkable work and research of the Egyptologist, Sir William Flinders Petrie. He has established the existence of balances in Egypt as early as about 5000 B.C. The design of these balances was subject to serious arm-length errors and adjustment of the arm-length was virtually impossible. Errors could be eliminated by interchanging weights and carrying out double weighings, although the Egyptian mathematician would have made the evaluation of the answer a laborious task. The earliest preserved example is a limestone beam about $3\frac{1}{2}$ in. long, which Petrie dates at about 5000 B.C., together with some limestone weights of the same period. Some weights are dated even earlier than 5000 B.C. and weighing instruments must certainly date from at least 7000 B.C. Pans were not provided in the early balances; they were a later introduction.

'Through Cord Pivot'

Somewhere about 1500 B.C., the first major improvement in design took place—the introduction of the 'through cord pivot.' The arm-length error had evidently been recognised and could be adjusted by removing material from the ends of the beam. The beam in this balance was made of wood, the cord pivots being situated one at either end and in the centre of the beam. Bronze weights were in use during this period. The through-pivot design was the outstanding contribution made by the Egyptians. Its significance can be appreciated when it is realised that this design was not improved for about 3000 years. It was not until 1500 A.D. that any major change in design was

apparent. In fact, balances in the intervening period were often less accurate than the Egyptian pattern—in particular, Roman and Anglo-Saxon balances using ring-pivots were often inferior. An example of a Roman balance still extant shows clearly that its design is inferior to the Egyptian types. The balance, found in Pompei, has a bronze beam and dates from 80 A.D. It is, therefore, possible to recognise the Egyptian through-pivot design as the first landmark in the development of the balance.

Up to the end of the 15th century, balances were still of this classical design, the only improvements having been the introduction of the centre-pin on the beam working in a shackle and the provision of pointers for indicating poise.

In the early 16th century the second advance in design took place. This was the introduction of knife-edges and for the first time a really precise location of loads and equality of arm-length became possible. This was the break-away from ring, hole or cord pivots, and it laid the foundation for the development of all modern balances. The inventor of this design is not known but the earliest record is from a painting of about 1550 depicting the Hanseatic merchant, Gisze. The painting is so detailed that the design of the balance can be clearly distinguished and the use of knife-edges is evident. It is interesting to reflect that the equal arm balance had been in use for literally thousands of years before the idea of positioning loads on a sharp edge was adopted. It now appears an obvious and simple step, but it was a fundamental development which has had a very wide influence on design.

Need for Weighing Instruments

During the 16th century, the need for weighing instruments increased enormously and at this point weighing instrument design began to diverge along two quite distinct paths. On the one hand, the growth of trade and the Mercantilism era called for increasing numbers of scales for trade purposes. Along this path, lay the development of the industrial scale, in all its forms —counter scales, platform machines, weighbridges, etc.

On the other hand, the imports of gold and silver to Europe by the Spaniards from their acquisitions in the Americas led to the need for more refined weighing instruments and the development of the metallurgical assay balance which was the forerunner of the chemical balance.

In 1556 the metallurgist Agricola published his treatise, 'De Re Metallica,' in which he gave this description of his balances:

'There are three small balances by which we weigh ore, metal, and fluxes. The first is large, the second more delicate and the third most delicate. But if anyone weighs lead in the second balance or an ore in the third, he will do them much injury.'

This warning is still in operaton at the present time. Agricola evidently had his troubles, 400 years ago.

Sword Blades Used

In 1574, the German metallurgist Ercker published a book in which he described how to construct an assay balance. He said the beam should be 'forged from the blade of an old sword' and there should be a glass-panelled wooden case to 'protect the balance from dust and draughts.' Green glass is recommended as being 'restful to the eyes after the heat and glare of fiery furnace.' An interesting thought, for many of the modern projection balances use green screens which are considered restful to the eyes.

The chemical balance, as it is known today, evolved from the assay balance after *ca.* 1750. It was, in fact, the ability of these early chemists, particularly Lavoisier, to make quantitative experiments on reliable weighing instruments, which laid the foundations of modern chemistry. Up to the time of his execution, Lavoisier was engaged in work on the standardisation of weights and measures, and his contributions to the development of the metric system was great.

Lavoisier, was greatly influenced by the work of the eminent Scots chemist, Joseph Black, and indeed, on sending a copy of his 'Traite Elémentaire de Chimie' to Black in the year 1789, wrote that 'you will find in it some of the ideas of which you sowed the first seed. . . . It is, however, only with trepidation that I submit it to the foremost of my judges, whose approbation I seek above that of all others.'

Professor Black is accorded the distinction of constructing one of the first-known purely chemical balances in Edinburgh *ca.* 1755. The beam was 17 in. long and was made of iron. It should be noted that Black had evidently appreciated the neces-

sity for aligning the three pivots as he used a Swan-neck beam to get the end-pivots approximately in line with the centre in order to avoid a large sensitivity variation with load. He later built another balance, which is believed to be the first to use the rider principle to obtain fine weights.

Henry Cavendish designed a balance about 1780 which he used for his researches on the composition of water. The beam was 19 in. long and it was interesting in that it showed for the first time the use of steel knife-edges and planes with an arrestment mechanism to relieve the knives when not in use.

The First Agate Planes

In 1789, Ramsden built a balance of unusual design where the beam (24 in. long) was formed by two hollow cones united at their bases. This balance was used by Ramsden for a series of specific gravity determinations for the Excise authorities to enable them to 'apportion duties on spirits' of various densities. This balance is notable for its sensitivity which is better than 1 mg., and as being the earliest example of a balance fitted with agate planes.

The balance of Troughton had a 24 in. mahogany beam and provision was made for adjusting the sensitivity by means of a gravity ball on the beam. In these early balances of the 1750-1800 period is seen the origins of design which is accepted today. The bearing alignment in Black's balance, the use of knives and planes by Cavendish, together with an arrestment mechanism, the use of agate by Ramsden for the planes and the idea of a gravity ball for sensitivity adjustment by Troughton, these are all fundamental steps in balance design.

The early 19th century saw the science of chemistry developing more rapidly both in England and on the continent. The need for precision balances was growing and chemists had neither the time—nor in some cases, the skill—to construct balances with the sensitivity required for chemical work. It was obvious that to meet this demand, instrument makers would have to specialise more and more in precision balance construction.

On the continent about the middle of the 19th century, August Sautar, Herr Sartorius and Paul Bunge established themselves in this work while somewhat earlier, Mr. Ludwig Oertling had started to make balances in London. The earliest records of Mr. Oertling go back to 1847, but he was evidently well-established at this time. An entry in the records of the Royal Society records: 'Received this day from Mr. Oertling, a packet of wire weights being a grain, 1/10 grain and 1/100 grain.'

From 1850, the chemical balance, as accepted today, continued its evolution in this country, principally under the stimulus of Mr. Oertling in London. All the early balances had one serious disadvantage. The beams used were invariably long and consequently the instruments were slow in operation. It was thought that a long beam gave a higher sensitivity whereas in fact it is the ratio of length to weight which governs sensitivity. As this came to be realised, balance beams became progressively shorter and lighter, without a sacrifice of sensitivity, and today the chemical balance generally has a 5 in. beam which is as efficient as the old 20 in. beams and, of course, very much quicker in operation. This reduction in beam length is, the third significant and important trend in balance design for it enabled the chemist to make quicker weighings without sacrificing accuracy.

A balance constructed by Oertling shortly after 1900 typified this trend towards the shorter beam. It was designed with an 8 in. beam for weighing *in vacuo* and was accurate to 1 part in 2,000,000.

In 1906, Kuhlmann, who worked for Paul Bunge, was invited by Emich to produce a balance with a sensitivity of 0.01 mg. and capable to carrying a load of up to 20 g. He achieved this performance by refining the assay balance. It was, of course, the work of Emich and Pregl using this Kuhlmann balance which did so much for the development of microchemistry.

Improved Speed and Accuracy

And so to the last fifty years; a succession of refinements in balance design have taken place aimed mainly at improved weighing speed and accuracy, and including the final development of the 5 in. beam. The projection reading balance and the fitting of air-dampers were introduced by Oertling in England during the 1930's, and these developments were soon followed by methods of automatic weight loading. During the recent war the balance industry, both in this country and in Germany, was geared substantially to the war effort and there was little time for consideration of

design. Since the war there have been three features of note. The first is the introduction of the single-pan constant load balance. This controversial design has both advantages and disadvantages over equal arm weighing, and balance manufacturers in general have not yet been convinced of the future for this design. It is as yet too early to say whether or not it will find general favour.

The second feature was the introduction last year of automatic beam release in the new 'Releas-o-Matic' balance. For the first time a means is provided of controlling the set-off of the balance independently of the operator. We are certainly too close to this new development to be able to assess its place in the development of the history of the chemical balance, but it illustrates yet another move towards increased accuracy of weighing. Thirdly, the replacement of agate planes by corundum is again a new feature contributing to increased accuracy.

And so we have come the whole way from the Egypt of 5000 B.C., through 7000 years in the space of a few minutes. Much has obviously been omitted and only the more important developments have been highlighted. One fact must obviously leave an impression. The modern chemical balance is the work of no one man—no one can claim to have been its 'inventor.' The best men in every age have made their contributions; we have the Egyptian through-pivot beam, the introduction of knife-edges in the Middle Ages, the early assayers, the pioneer chemists, the first manufacturers and the post-war technicians, each writing a chapter in the story.

The story is not yet complete and never will be. The requirements of the chemist will always change and will always become more exacting. The manufacturers who serve them must be ready to meet the challenge with new designs, new ideas, and new techniques.

Leather Chemists' Conference

SPAIN will be the setting for the third international conference of the International Union of Leather Chemists' Societies which will be held this year in Barcelona from 13-18 September.

A provisional programme has now been issued, and a registration fee of Pts.300 is payable by all members and guests participating in any part of the conference.

On Sunday evening (13 September), there will be a meeting of the executive committee at 6 p.m. at the offices of the Spanish Leather Syndicate, followed at 7 p.m. by a reception of delegates, visitors and guests at the Avenida Palace Hotel.

The official opening of the conference will be at 10.30 a.m. on Monday (14 September), in the Town Hall. In the afternoon at 4.30 p.m. the scientific session will begin at the Aula Magna, the University, with the reading of papers. There will be a Folklore Festival at the Spanish village of Montjuich Park at 11 p.m.

Tuesday morning (15 September), will be devoted to the opening of the Artistic Leather Exhibition, Tinell Hall, Plaza del Rey (11 a.m.) and in the afternoon (4 p.m.) there will be another scientific session.

A busy day on Wednesday (16 September) begins with a visit to the Tanning School at Igualada, and includes a visit to and banquet at the Monastery of Monsterrat restaurant.

Thursday and Friday (17 and 18 September) are again devoted to scientific papers, the conference being brought to a close at 10 p.m. on the latter day with an official banquet by invitation of the President and members of the Spanish Association of Leather Chemists.

OEEC Team Visit Elliotts

A TEAM of 12 experts of the OEEC Intra-European Mission on 10 March paid an all-day visit to the Lewisham and Rochester factories of Elliott Brothers (London), Ltd., and Fisher-Governor Co., Ltd. They were all experts from Government Departments and leading industrial organisations of European countries who are touring OEEC member countries to compare methods employed in those countries for the manufacture of specialised equipment for the petroleum industry and to compile reports.

According to an OEEC official it is hoped that this will bring about closer co-operation between European manufacturers and provide consulting engineers, buyers and users with a picture of what European makers can produce.

A representative of the company stated that before leaving the works, the members unanimously expressed their appreciation of the contribution these companies are making to the instrument and control equipment needs of the petroleum industry.

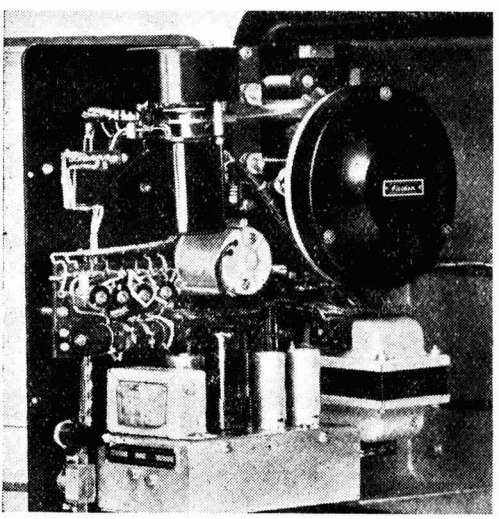
Temperature Control

Use of Electronic Methods

NUMEROUS systems have been evolved in the past for the indicating, recording and control of temperature. The many limitations and disadvantages inherent in other systems have led, in recent years, to the use of electronic methods which, it is now widely acknowledged, are both more accurate and more flexible in application than those which they replace. Control of temperature, in particular, is much more readily achieved, as ample power can be made available with no loading of the measuring system.

It is almost an axiom of scientific and technological research that the best method is usually the simplest, and the field of temperature measurement is no exception. Fielden instrument engineers from their wide experience in industrial electronics, have produced a range of simple robust instruments which are reliable, accurate and easy to operate.

Many advantages over other methods of temperature measurement are claimed for the Fielden electronic resistance bulb multi-point thermometer, including:—long term, high accuracy and reliability; simple design; no galvanometers or fragile mechanisms; interchangeability of resistance bulbs to standard—without recalibration; cold-end compensation eliminated; power operated recording mechanism; rapid pen response; reduced thermal lag; distant indication; continuous balancing; no batteries required; and low capital cost.



Inside mechanism of Fielden electronic thermometer

A four-volt turret pen ensures that the appropriate coloured ink, carried in separate reservoirs, is selected for each trace. The pen is positioned radially by the bridge-balancing servo-motor. An important feature is that, at any time, the rotating turret mechanism may be arrested in any one of its four positions by means of a switch on the front panel. The unit then becomes a single-point continuous recorder of the temperature at the selected point.

As the temperature sensitive element a Sangamo-Weston resistance bulb is used. These bulbs cover a range of −200°C. to +500°C. and can be supplied in lengths of 3 in. to 36 in. Circular charts 11 in. in diameter are available to cover ranges within the limits of the resistance bulbs.

An 8-in. dial panel mounting instrument provides single or multi-point indication. Standard multi-way switches can be supplied for up to 20 measuring points or to required specifications.

Full technical details of the electronic thermometer together with information about its single-point recorder or recorder controller, and pneumatic controller, are contained in Publication No. 209/FE, a 22-page illustrated booklet, available on request. from Fielden (Electronics), Ltd., Wynthenshawe, Manchester.

Production of Pharmaceuticals

PRODUCTION in Canada in 1951 of patent and proprietary medicines, pharmaceuticals and biologicals rose in value to $82,131,000, a new high figure as compared with $69,325,000 in the preceding year, the Bureau of Statistics reports. Imports of these commodities were valued at $22,427,000 compared with $18,629,000, while the exports totalled $6,037,000 against $4,298,000.

There were 206 establishments in 1951 engaged chiefly in the manufacture of these items, four less than in 1950. Their employees numbered 7,481 as compared with 7,524 and salary and wage payments aggregated $18,918,000 against $16,638,000. Plants in Ontario and Quebec accounted for all but a small part of the total.

Society of Public Analysts

Annual General Meeting & Anniversary Dinner

THE 79th annual general meeting of the Society of Public Analysts and Other Analytical Chemists was held in London on 6 March, with the president, Dr. J. R. Nicholls, C.B.E., F.R.I.C., in the chair. The financial statement and report of the council for the past year were read and approved. Membership of the society was now 1,592, an increase of 14 compared with the corresponding figure of last year.

During the 12 months under review the society had held six ordinary meetings, five in London (one of which was organised by the Biological Methods Group), and one in Birmingham (organised by the Physical Methods Group); in additon 16 meetings were held by the society's Sections and Groups.

There was a record number of 1,032 pages in the 1952 volume of the society's journal *The Analyst,* which included 480 pages on the Proceedings of the First International Congress on Analytical Chemistry, held at Oxford in September. The proceedings of the congress were also to be published in book form and would be ready shortly.

Election of Officers

Officers and members of the council for the following year were elected as follows: *President*: Dr. D. W. Kent-Jones; *past-presidents* (serving on the council): Lewis Eynon, G. W. Monier-Williams, J. R. Nicholls and George Taylor; *vice-president*: A. J. Amos, T. McLachlan and Eric Voelcker; *honorary treasurer*: J. H. Hamence; *honorary secretary*: K. A. Williams; *other members of council*: C. A. Adams, N. L. Allport, A. L. Bacharach, R. C. Chirnside, B. S. Cooper, Miss M. Corner, D. C. Garratt, N. Heron, H. W. Hodgson, H. M. N. H. Irving, H. E. Monk, and H. C. S. de Whalley; *ex officio members*: T. W. Lovett (chairman of the North of England Section), R. S. Watson (chairman of the Scottish Section), A. M. Ward (chairman, Microchemistry Group), J. Haslam (chairman, Physical Methods Group), and H. O. J. Collier (chairman, Biological Methods Group).

In installing the president-elect in the chair, Dr. J. R. Nicholls congratulated the members on their choice of one whose services to chemistry were so well known by his connection with the Royal Institute of Chemistry, as well as by his past services to the society in many capacities.

The new president, Dr. Kent-Jones, then called upon the retiring president to deliver his presidential address.

Review of Progress

Dr. Nicholls first briefly reviewed the progress of the society. Referring to the inclusion in *The Analyst* of the Proceedings of the First International Congress on Analytical Chemistry held at Oxford last September, he said that credit for the record speed of publication was due to Mr. R. C. Chirnside, the honorary secretary of the congress, and the editorial staff of the society.

For his address the president spoke on the subject of 'Public Health Hazards and the Analytical Chemist.' While any legislative control to minimise such hazards must be founded on medical and pharmacological advice, he began, it was the chemist who gave evidence to enforce such control. He summarised the conclusions given in the Fourth Annual Report of the Advisory Council (1950-1951, HMSO, Cmd. 8299) and put forward his views on implementing the policy there expressed.

Public health hazards arose from pollution of the air with carbon dioxide and dust leading to the formation of fogs; water hazards arising from the presence of trace elements; food hazards; clothing, cosmetic and household hazards.

Food hazards could be divided into metallic contamination, bacterial contamination, extraneous matter, wrapping materials, insecticidal residues, and chemicals in food. While there was no foreseeable difficulty with such relatively pure substances as antioxidants, emulsifying agents, anti-staling agents and preservatives, the use of food colours was a problem.

A list of prohibited colours had been composed more than 25 years ago, and it must be admitted that not all the harmful ones were included. Synthetic colours were usually made by coupling intermediates,

some of which were known to be toxic. The effect of the possible breakdown of the colours in the body was not known.

Another problem of recent development was the possible effect on the consumer of the use of drugs such as stilboestrol and antibiotics in the production of meat.

Clothing hazards included the effect on the skin of dyes, and moth-proofing and bleaching agents. Cosmetic hazards might arise through lack of control over their constituents, such as dyes.

Use of Detergents

Household hazards arose from the use of detergents that were so efficient that little rinsing appeared necessary. The effect of these detergents, discharged with sewage to rivers, on water subsequently drawn for household use had also to be considered.

Control of public health hazards could be directed to the prevention of (1) hazards due to the lack or hygiene; (2) hazards due to contamination; and (3) hazards due to 'chemicals' in the widest sense.

In the first case there was adequate legislation to ensure proper hygiene in the realm of public health; reputable manufacturers' standards were generally higher than the prescribed minima, and education and common sense were sufficient safeguard in the household.

Hazards due to contamination arose from the presence of traces unavoidable even in the best commercial practice. Statutory tolerances were appropriate and existed for food. In this connection the society played an important part, as permissive tolerances had to be enforced and it was the chemist who developed methods of determining contaminants.

In the last case, hazards due to chemicals could not be appropriately controlled by statutory tolerances; a chemical should either be permitted or forbidden.

It was necessary to review periodically any such control. This could only be achieved by a permanent body; the Poisons Board, in its field, was an example of such a body. An important problem was the hazard arising from the use of chemicals whose harmlessness had not been proved.

The standing committee should review the evidence for the use in food of any new chemical. The use of artificial sweeteners illustrated this point. Two such chemicals found favour in this country, saccharin and dulcin. Recent toxicological tests had shown saccharin to be completely harmless, but dulcin had harmful effects on different species of animals at certain concentrations and under specified conditions. This would justify such a standing committee banning the use of dulcin.

Another example was that of food colours. A sub-committee of the Food Standards Committee was considering this subject, but had not yet reported, and its conclusions could not be presumed. However, it was carrying out in a limited field the functions that the suggested standing committee should perform over the whole field.

If such a committee prepared a list of permitted colours, it was important that chemical specifications should be given, as colours of lesser purity than that required for food colouring were often made for other purposes. Should it be thought proper to protect the public more fully from the hazards that might arise from the use of harmful colours, a permitted list should be compiled from those colours now in use that have been adequately tested pharmacologically, and no new colour should be added until so tested and found satisfactory. Any colour on the list found harmful should be withdrawn at once, or after a specified time, according to the risk involved.

The Annual Dinner

In the evening at the dinner held in the Hall of the Worshipful Society of Apothecaries of London, the president, Dr. J. R. Nicholls, presented Bernard Dyer Memorial Medals to the first two Bernard Dyer Memorial Lecturers to the society who were present as guests. He recalled that Bernard Dyer had been one of the original members of the society, remaining one for 73 years until his death in 1948. Dyer was an agricultural chemist and it was therefore most appropriate that the first memorial lecturer should have been Sir E. John Russell, who was also an agricultural chemist.

The second medal was presented to Mr. Justice Lloyd-Jacob, of whom the president said that it was only chance that had turned him from chemistry to the legal profession.

Mr. H. W. Cremer, president of the Royal Institute of Chemistry, proposed the toast of the society. 'The Guests' was proposed by Dr. A. J. Amos, and replied to by Dr. Charles Hill.

Air Pollution Abatement in the U.S.A.

Chemical Industries Set Good Example

PROGRESS that is being made in the reduction of air pollution in the U.S.A. was discussed by scientists, engineers, and control officials at the two-day meeting of the Ninth Air Pollution Abatement Conference sponsored by the Manufacturing Chemists' Association, which was held in Detroit, Michigan, on 26 and 27 February, 1953.

Opening the conference, which was devoted particularly to reviewing the regional problems in Detroit, Louisville, Houston, and Chicago, Dr. R. H. Boundy, research director of Dow Chemical Company, said that air pollution was an old problem for industry, but that during the last five or six years it had assumed conspicuous importance. While good progress had been made, the present was a desirable time to re-examine, re-evaluate and make plans for better control in the future.

Chemical industry must take the initiative and assume its share of responsibility. There had been a good start. Much had been done by individual companies, by trade groups, and by associations, such as the Manufacturing Chemists' Association, the American Petroleum Institute, and the American Society of Mechanical Engineers. Before most new chemical plants were built today control devices were planned to minimise the escape of wastes and control the contamination of air or water.

Public Relations in Industry

Industry, continued Dr. Boundy, must also take the initiative in public relations. If industry failed to tell the public its story of improved pollution control, it was most unlikely that anyone else would. The public still held many unjustified fears and apprehensions about chemicals that could be alleviated only by good public relations. Not enough had been done by industry to inform the public of the effort made and dollars expended to fight pollution in the past, and public concern would not lessen until such reports were made to the public at large.

Co-operative effort, particularly in the exchange of technical information must be continued and extended, and an active interest taken in legislation to assure that it was effective and equitable.

Activities of the Air Pollution Abatement Committee of the Manufacturing Chemists' Association were then outlined by William I. Burt (B. F. Goodrich Chemical Co.) who said that its original purpose was to study the problem of air pollution as it applied to the chemical industry. It was soon realised that this involved a number of different subjects such as legislation, including those laws and ordinances which were already on the statute book and also proposed new legislation.

Air Pollution Literature

Much information had been published on air pollution but it proved to be widely scattered and hard to find. In order to determine the sources of pollution and to measure its quantities and effects much scientific and technical study was involved, including special measuring equipment, the study of meteorology and the interpretation of results.

The committee, considering all these facts, soon came to the conclusion that an air pollution abatement manual was needed, and that this task should be one of its major projects. This work had proceeded well and was now nearing completion, and those parts of the manual so far distributed had been well received.

Opening the discussion on current developments in regional problems, Benjamin Linsky, chief smoke inspector, Detroit, stated that the city was reducing local nuisances through co-operation with industries in the area. No serious area-wide detrimental effects of air pollution had been experienced, he said.

Steps taken by industry to deal with air pollution which had been a problem in Louisville, Kentucky, since 1873, were described by E. Neil Helmers, of the engineering department, E.I. du Pont de Nemours & Co., Inc. Nine out of 11 industries in the area known as Rubbertown had contributed $50.000 for a detailed survey which was being carried out by the Batelle Memorial Institute in co-operation with the Jefferson County Air Pollution Control officials.

Many types of control devices were either being installed or were in the design stages. This willingness of industry to do everything scientifically possible to abate pollution had not calmed the public demand for drastic action. The problem was complex, and it was only with patience and the understanding that industry was a good neighbour co-operating in a community-wide problem that progress would be made.

Referring to the Houston area, Don Wynn, manager of the industrial department, Houston Chamber of Commerce, said that the concentration of industrial plants, oil refineries, ship wharves, steel, cement, chemical and fertiliser factories along the Houston ship channel in recent years had created an air pollution problem.

Anti-Pollution Devices

A recent survey showed that since 1947 more than $8,000,000 had been spent on devices to reduce air pollution in Harris County, and another $4,000,000 of equipment had been authorised. Although less than 26,000 of the 900,000 people in Harris County were effected by air pollution there had been increasing public protests since 1951 and work on the problem by industry had been intensified.

Leaders of industry had travelled and studied methods used in pollution abatement in other areas with similar problems. It was clear that there was an imperative need for a country-wide sewage treatment and elimination system, which would largely solve existing stream pollution.

Problems in the Chicago area were discussed by Dr. W. C. McCrone, of the Armour Research Foundation.

Outlining the history of the Air Pollution Control Association, its executive secretary, Robert T. Griebling, said that industry was now spending $120,000,000 a year to make the air over urban areas cleaner. The notable progress and engineering achievements in the chemical industry served as an example to other industries.

Emphasis was laid on the prevention rather than the complete elimination of air pollution. An important aspect of the problem was to bring forward technically trained men for positions of control and to spread knowledge of results of experiments and information on the operation of devices.

The Air Pollution Control Association, now housed with the Mellon Institute, recognised the importance of technical assistance for the effective operation of its staff and committees, which included all industries and reached out beyond Canada and the U.S.A. to include Italy, the Argentine and Sweden.

'Air Pollution and Human Tolerance' was the subject of a paper delivered to the conference by Dr. John H. Phair, professor of preventive medicine and industrial health, College of Medicine, University of Cincinatti, who began by saying that man must continuously contend with various forces in his environment which menace his health and well being. One of these was the pollution of the atmosphere by various irritant or toxic materials derived from the combustion of fuels or certain industrial processes.

This problem had grown enormously during the last two or three decades because of the tremendous expansion of industrial potential in the U.S.A. The control of these wastes discharged into the air was not simple, since limitation frequently could be justified only on aesthetic grounds. Demonstration of the danger to human health was not easy because the concentrations of the common contaminants were usually far below the maximum allowable concentrations employed in protecting the plant employee. The three sources of evidence which might be used—(1) the reaction of the workers to much higher amounts, (2) the careful study of unusual instances of extraordinary exposure in the plant or the community, and (3) attempts at correlation with the morbidity and mortality rates of reportable diseases as gathered by the health departments—were discussed in detail.

Anticipating Pollution

Describing 'A Positive Approach to Air Pollution Control' Dr. L. M. Smylie, of the Ethyl Corporation, declared in his paper that industry in many areas was going beyond what the law required, and was anticipating pollution possibilities from new industrial processes. The interaction of vapours from many different industrial operations rather than the volume of any one contaminant was cited as a big obstacle in finding methods to abate 'smog.'

'Stack Sampling Procedures Used to Evaluate Emissions' were dealt with in a paper by J. Brennan Gisclard, of the American Cyanamid Company.

With certain exceptions, he said, there were no standard procedures to use and most of the time industrial hygienists had to rely on their own ingenuity in carrying out this work. Yet sampling procedures should make it possible to take numerous samples during a stack emission if peak concentrations were to be noted.

Complicated and heavy sampling equipment discouraged stack sampling so that recourse had to be made to simple, portable apparatus. The use was described of glass syringes and small electrically driven apparatus which had facilitated the taking of as many as 50 samples during one period of stack emission.

Application of sensitive colour reactions and simple titrations which could be done on the spot were further aids to stack sampling and analysis.

Complaints of air pollution were frequently the result of momentary heavy emissions. Charts were presented showing the type of information obtainable by 'spot sampling' techniques. The sampling data included the peak and average concentrations so that engineering design could satisfactorily size the control equipment to be provided.

Additional benefits could also be derived from stack sampling. Information on reactions and reaction products which might have never been known was frequently revealed by stack sampling data. For example, it helped plant management to decide on the feasibility of salvaging valuable by-products or changing operating procedures to ensure greater yields of the final product.

Pollution and Sulphuric Acid

N. W. Clauss, of the Union Carbide and Carbon Corporation, gave a paper on 'The Reduction of Atmospheric Pollution from Sulphuric Acid Recovery Processes.' The concentration of sulphuric acid used in many chemical processes, said the speaker, was often accomplished in air-blown concentrators. The resulting air pollution problem was becoming more and more acute and even though the comparatively low concentration cost made it desirable to use this type of equipment, its use might of necessity become restricted.

Based on a pilot unit study of many methods of sulphuric acid mist removal from concentrator effluent gases, the most practical of these methods had been adapted to plant scale use.

The method used consisted of the bombardment of sulphuric acid mist with water droplets at high velocities, which satisfactorily eliminated the acid mist from the concentrator effluent gases, rendering them invisible. The effluent gases were sprayed with process water discharged through fog nozzles at pressures from 400 to 700 p.s.i., and the water containing the sulphuric acid recovered in the spray system was then recycled to the manufacturing process.

Efficiency of Mist Removal

Data were presented concerning the pilot unit and plant scale formation and character of sulphuric acid mist, the efficiency of mist removal as effected by operating variables, water and power consumption, use of wetting agents, effect of atmospheric humidity and temperature on stack appearance, corrosion problems, methods of analysis and the recovery of the sulphuric acid removed from the concentrator effluent gases.

When only a few parts per billion of certain chemicals used in some manufacturing processes got into the atmosphere and interacted, they made the eyes water, Dr. E. M. Adams and Dr. E. J. Schneider told the conference. In their paper 'Eye Irritants Formed by the Interaction of Styrene and Halogens in the Atmosphere' it was shown that in a large chemical plant difficulties due to eye irritation had been traced to a lachrymator formed by the interaction of styrene with chlorine and bromine in the atmosphere.

Effective concentrations of these halogens might be much less than 0.01 p.p.m. (by volume) depending upon the concentration of styrene. The formation of the irritant in laboratory experiments was catalysed by ultra-violet radiation, and in practical circumstances seemed to be dependent upon the presence of sunlight.

'Control of Styrene Emissions from a Styrene Plant,' was discussed by R. S. McClurg, A. F. Strauble, C. Sercu, L. Olsen and E. E. Guilford, of the Dow Chemical Company.

In the final paper of the conference 'Fume Problems and Control in Aluminium Melting Operations,' Roy E. Paine, A. E. Huotari, Paul D. Hess and Vernon Works of the Aluminum Company of America, presented a case history of the solution of

an air pollution control problem arising from the re-smelting of aluminium for the production of ingots.

First, the operations were surveyed to determine the nature of the emissions and the factors responsible for their occurrence. Metallurgical studies were then made on the processes to determine the feasibility of changes to eliminate or reduce the emissions. Such changes were found to be practical for the operations of charging, melting, fluxing and skimming.

The method used for reclamation of metallic aluminium from furnace skimmings was of such a nature that it could not be operated efficiently without the generation of fumes. Therefore, collecting equipment was required for this process.

A series of pilot plant tests was carried out to obtain information that would enable the design of air pollution control equipment. These tests were designed to obtain detailed information on the nature of the fume, and to determine the method of collection that would be the most desirable from the standpoints of efficiency, engineering and economy for the particular emissions involved.

The type of equipment finally selected for a production unit for collecting the emissions from the reclamation of metallic aluminium from furnace skimmings was a combination scrubber-electrostatic precipitator. The preliminary wet scrubbing collects large particles and soluble gases and by humidification conditions the gas for efficient electrostatic precipitation of the smaller particles.

After final adjustment, all test results on the production unit were above 95 per cent efficiency, with an average of 97 per cent.

Carbon Dioxide Removal

Raschig and Lessing Ring Experiments

REMOVAL of carbon dioxide from atmospheric air by scrubbing with caustic soda in packed towers was the subject of a paper presented by K. Greenwood, B.Sc., and M. Pearce, Ph.D., to a meeting of the North Western Branch of the Institution of Chemical Engineers held in Manchester on 7 March. Mr. P. K. Standring, chairman of the branch, presided.

Atmospheric air contains 0.03 per cent by volume of carbon dioxide which must be removed to prevent a decrease in the efficiency of the heat exchangers in low temperature plants for the separation of air. A scrubber using eight to ten per cent caustic soda solution reduces the carbon dioxide concentration to one p.p.m. The air is treated after the first or second stage of compression.

Scrubber under Pressure

Experiments were made by the authors on a scrubber under pressure with eight per cent caustic soda solution flowing over 1 in. or $\frac{1}{2}$ in. Raschig rings or $\frac{3}{4}$ in. Lessing rings. The scrubber was made of lengths of 8 in. diameter steel pipe containing 33 in. to 48 in. heights of packing and the liquor was distributed over the packing by a perforated spray rose. Air and liquor flows were measured by orifice plates; the gas rate was varied while the liquor rate was maintained constant and the liquor rate was varied while the gas rate was kept constant.

Changes in the electrical conductivity corresponding to changes in the concentration of a solution of carbon dioxide in liquid ammonia were used to measure the carbon dioxide content of the air and details of this reliable and sensitive method were described. The experimental results of the absorption were compared with those of previous workers on a similar problem.

Results showed the superiority of 1 in. over $\frac{1}{2}$ in. Raschig rings and $\frac{3}{4}$ in. Lessing rings gave the best results. The end effects were equivalent to only 3 in. depth of packing. K_Ga, the capacity coefficient, was constant throughout the depth of packing and this coefficient had higher values than were obtained by previous workers on different packings; the equilibrium concentration of carbon dioxide was zero. The resistance of the gas film controlled the absorption whereas previous workers found the resistances of both gas and liquor films significant.

The authors offered a theory on a transition of the control from the gas film to the liquor film according to the concentration of carbon dioxide in the gas. This transitional concentration of carbon dioxide is directly proportional to the concentration of caustic soda in the liquor and to the diffusional coefficients of the materials in the aqueous solution. Calculations of the film thicknesses of gas and liquor were made and the relative thicknesses of the films were deduced from hydraulic considerations.

Bulk Conveyance of Chemicals

Railways Produce Standard Wagon

TRANSPORTATION of chemicals, which may often be of a corrosive or hazardous nature, provides problems as to their best methods of handling and conveyance. Despite the need to provide a variety of types of wagon for the need of individual traffics, British Railways is gradually reducing the wide variety of designs by the introduction of standard wagons to meet specific requirements.

Among the new standard wagons now being produced by British Railways is a 24-ton covered hopper van for the bulk conveyance of chemicals such as soda ash, sodium tripolyphosphates or catalysts.

Designed at Derby, the maximum capacity within a total gross load of 35 tons may be obtained from the wagon; the body takes full advantage of the loading gauge. The length of the vehicle over the buffers is 24 ft. 6 in., and the wheelbase is 10 ft. 6 in.

The underframe is of special design to accommodate the hoppers through which the load is ejected between the frames. It is of all-welded construction and is 21 ft. 6 in. long with standard buffing and drawgear with three link couplings. The wheel diameter is 3 ft. 1½ in. with 10 in by 5 in. journals and fabricated steel axleboxes. Standard laminated springs 3 ft. 6 in. long are fitted with standard spring shoes.

New Type of Brake

A brake of most recent design is used which can be applied from either side of the van and operates one block on each wheel of one axle.

Of welded construction, the body is built up of $\frac{1}{8}$ in. mild steel plates for the roof and sides while $\frac{1}{4}$ in. thick plates are used for the ends and the hoppered portion of the body. Tee sections and gusset plates stiffen the body and are welded to the underframe; the combined body and underframe giving adequate strength and stiffness. A $\frac{1}{4}$ in. thick partition divides the body into two compartments and two 2-hinged doors 6 ft. 11 in. long and 2 ft. 5 in. wide are provided in the roof, fitted with rubber weather seals and secured by screwed eyebolts.

A roof vent is used with or without valve, according to traffic and a cat walk is also provided to give ready access to the filling doors. The interior is completely flush and the hoppers can be completely discharged by gravity through two sliding doors per compartment. The opening mechanism for each door is a rack and pinion operated from either side of wagon by a removable handle. The doors can be sealed by wire seals.

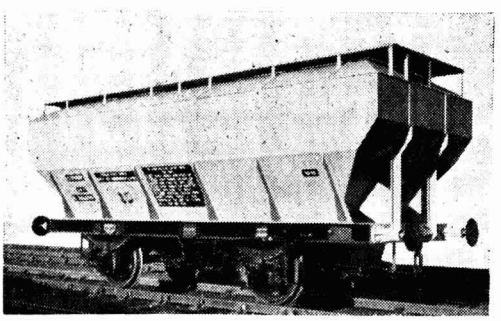
To Assist Unloading

In the case of soda ash or sodium tripolyphosphate, a coupling of a quick detachable vibrator is welded to the sides of the hoppers to assist unloading. The vehicle will negotiate a 1 chain curve.

Another new standard vehicle designed at Derby is a 27-ton all-steel wagon for the conveyance of iron ore and constructed for discharging by tipplers. The length of the wagon is 19 ft. 6 in. over the buffers and it has a wheelbase of 9 ft. 10 in.

The body is made of high tensile low alloy steel. No doors are provided, thus giving a flush interior, and the body is strengthened by pressed steel side and end stanchions, the former being stiffened to accommodate tippler beams.

Both these types of wagon were on view at Freight Rolling Stock Exhibition held by British Railways at Battersea towards the end of last year. (THE CHEMICAL AGE, **67**, 435.)



A 24-ton covered hopper van for the conveyance of bulk chemicals

Durham Barytes Project

Need for Proper Perspective of Problems

FOLLOWING the question raised in the House of Commons recently regarding its barytes plant project at Littleburn, County Durham (reported in THE CHEMICAL AGE, **68**, 320), the following letter has been forwarded to the Ministry of Materials by Athole G. Allen (Stockton), Ltd:—

SIR,—As advised by the President of the Board of Trade (Mr. Peter Thorneycroft) when answering a question to you by Mr. J. D. Murray (Durham N.W.) on the above matter in the Commons on 5 February last we beg to make our difficulties known to you.

First, we would like to say that until we read of it in the Press we were not aware that any question was to be put.

Presumably the question arose from our letter of 24 November, 1952, to the Brandon & Byshottles Urban District Council acknowledging the help and encouragement given to us by that authority, and explaining that the reason for our decision not to proceed with our plans was due to the frustration and lack of encouragement by certain Government Departments, particularly the Board of Trade, by reason of the preferential treatment given by those Departments to trade associations, of which we are not members.

It is here our difficulties lie, not only with regard to the Littleburn project, but with the stoppage of production of barytes at our mine in Middleton-in-Teesdale previously, and at our explosives and chemical works at Stockton-on-Tees in 1948.

Much correspondence exists with the Board of Trade, and other Departments, complaining of the 'Closed Shop' policy practised to our disadvantage. The President of the Board of Trade may recollect correspondence with him, and particularly our letter of 19 October, 1949, about our being ignored by the Committee of Inquiry into the Resources of Minerals in the United Kingdom.

In our letters of 26 June and 30 July, 1952, we warned the Board of Trade about Littleburn, and subsequent events proved our fears to be wellfounded.

With respect, we submit that it is untrue to say we decided not to proceed with the Littleburn plant on account of the fall in demand for barytes. We cannot recollect having had any communication with the Ministry of Materials. Consequently it may well be that any information you may have is from a third party, and not reliable.

The fact is, that when we purchased the freehold of the 47 acres Littleburn Colliery site at the beginning of 1952 we were already aware of the falling off in demand. The objective then was to endeavour to counter this and to meet foreign competition by establishing a central plant nearer to the sources of the mineral, especially as the chemical processing plant we had previously erected at Stockton-on-Tees was no longer available.

In view of the publicity already given, we are sending a copy of this letter to Mr. Murray; the Brandon & Byshottles Urban District Council; and the Press, in order that the matter may be viewed in its proper perspective.—Yours faithfully,

for ATHOLE G. ALLEN (STOCKTON), LTD.,
(signed) ATHOLE G. ALLEN.
Chairman and Governing Director.
24 February, 1953.

Chemical Engineers' Meeting

THE 31st annual corporate meeting of the Institution of Chemical Engineers will be held at the May Fair Hotel, London, on 23 April, 1953.

Proceedings will begin at 11 a.m., with a business session for corporate members only, at which the presentations of the Moulton Medal and the Junior Moulton Medal will be made. This will be followed at 12 noon by the president's address on 'Changes in Roasting Practice and Furnace Design.'

In the evening the annual dinner will be held at 7.30 p.m., preceded by a reception by the president, Mr. Stanley Robson.

During the afternoon a showing of the film 'The Stanlow Story,' will be given at 3 p.m., at the British Council Film Theatre, Hanover Street, W.1, introduced by Mr. E. Le Q. Herbert (Member). Admission will be by ticket only. Applications should be made to the secretary, the Institution of Chemical Engineers.

Members wishing to attend the annual dinner should apply not later than Monday, 13 April. The total number of places is 350 and guests are limited to three per member. Price of tickets is 30s. each.

The Chemist's Bookshelf

REVIEW OF TEXTILE PROGRESS. Volume III. Published by The Textile Institute, Manchester, and The Society of Dyers and Colourists, Bradford. 1952. Pp. 590. 35s.

This third volume of the review lives up to its name. It reviews the progress that has been made in the various textile fields throughout the year 1951, and it is satisfactory that it should have been published no later than November, 1952. The book is full of meat; it consists of a collection of thirty papers each written by a specialist in his own field. Needless to say there is some variation in quality; a few of the papers are masterly and many of them are good. Variation is also evident in the depth of detail that is given in the separate papers.

The book is suitably divided into eleven sections dealing with (a) physics and chemistry of fibrous material, (b) fibre production, (c) the conversion of fibres into finished yarns, (d) fabric production, (e) colouring matters, (f) colouring of textiles, (g) finishing, (h) analysis, testing, grading and defects, (i) laundering and dry cleaning, (j) building and engineering, (k) industrial applications of textiles. A survey such as this, by a specialist, of the work published in one year could not fail to be informative and often illuminating. For example, of recent years there has been among the dye research workers a shift in emphasis away from the synthesis of new organic dyestuffs towards the development of new techniques for the application of such dyestuffs. This change, which is all to the good and perhaps a little overdue, is vividly appreciated when one reads Marshall's paper on 'Colouring of Textiles.' The sifting of a year's work often reveals such trends and it is extremely valuable to have them pointed out to us. The effect of reading some of the papers may be compared to that of reading what the critic has had to say about a play one has seen; thoughts that were hitherto vague and unformed become sharply crystallised and clear.

The Standfast molten metal process of dyeing vats on to cellulosic material rightly comes in for a good deal of attention; as does also the general tendency (of which the Standfast process is the outstanding example) to conduct the dyeing operation in a matter of a few minutes or even seconds instead of in the times of hours more usual in the traditional processes.

The importance of smartness of elastic recovery is well discussed by Loasby and Munden who point out that although when given sufficient time nylon makes a more nearly perfect recovery from extension than do Dacron and Orlon, yet the immediate elastic recovery expressed as a percentage of the total recovery is higher in Dacron and in Orlon than in nylon. The time factor will have increasingly to be considered with reference to the recovery of synthetic fibres. Such fibres as Rhovyl, Thermovyl, Fibravyl and Vinylon received only scant mention, reference simply being made to reviews which concern them; this is perhaps regrettable.

The effect of the use of synthetic detergents on the problems of sewage disposal is one that will probably be with us for some time. It seems likely that housewives will still be encouraged by manufacturers through the medium of advertising to use more and more synthetic detergents. Such extended use may not be altogether desirable on account of the searching nature of the action of such detergents on the skin and because the claim sometimes made that fabrics so washed do not require rinsing (p. 487) is not generally acceptable. Nevertheless in the textile industry matters are very different, and the use of some of these synthetics has much to recommend it over the use of soap, and already the effects of such detergents in preventing the complete precipitation of suspended fat has resulted in trouble in the Yorkshire district, so that some local authorities have already had to restrict the use of such detergents. This subject is discussed not only by Perdue and Kirk in their

paper on 'Laundering and Dry Cleaning,' but also by Chamberlain in his paper on 'Building and Engineering;' some such overlapping is perhaps to be expected from a plurality of authorships but the editors might well have avoided it.

An important trend in the textile industry to which Cotterill pointedly draws attention is the significant increase in the interest which has been evinced in non-woven fabrics such as bonded-fibre fabrics, moulded cellulose acetate lace, Lacelon, and new types of carpets. This trend may conceivably be the beginning of tremendous changes in our textile industries.

In respect of indicating such important trends, the book serves a useful purpose, and in giving to the reader in a conveniently compact form the highlights of a year's progress the book is valuable. It is not in the ordnary sense of the term 'readable', the treatment of any particular subject is too sketchy and often consists of nothing more than a series of references to original papers. It is difficult to imagine that many of its readers will have the interest to read solidly through the book, but it is certain that a great many will refer to it for an outline of the developments that have ensued in a particular branch of textiles. There is not the least doubt that in the great majority of cases, such references will be rewarding, but there are nevertheless two adverse criticisms that should be made of the arrangement of the book.

Firstly, the review is incomplete; for example the paper on the chemistry of cotton and cellulose uncompromisingly states that it has 'been necessary to make some selection of material for this review.' There is a lot to be said for a review at least mentioning all of the relevant published material.

Secondly, the subject index, while adequate by ordinary book standards, is woefully deficient in a reference book which is probably the primary function of this book. As an example, 'dichroism,' which is discussed in its relation to orientation at some length on p. 95, is not to be found in the index. The method of indexing (both by author and subject) which is used in the (American) *Chemical Abstracts* has much to commend it to the reader who is making a search for some aspect of his subject, and might well be copied.

The book under review really falls between two stools; as a readable book it fails because the argument is seldom consecutive and because the treatment, although not failing to indicate where more detailed information can be gathered, is often superficial; as a reference book it is incomplete and inadequately indexed.

But despite the uncertainty of its intention, volume III of the 'Review of Textile Progress' contains a great deal of useful matter, and many of the contributors are to be congratulated on their contributions. It is a book to which all textile men who have any pretension to keeping abreast of the times should have access.—R. W. MONCRIEFF.

SOLUBLE SILICATES. Vol. 2. By James G. Vail. New York: Reinhold Publishing Corp. London: Chapman & Hall, Ltd. 1952. Pp. xxi + 669. 120s.

The second volume of the comprehensive monograph on 'Soluble Silicates' has now come to hand to replace the out-of-print 'Soluble Silicates in Industry.' These two volumes contain the only treatise giving a complete review of the known properties and industrial uses of soluble silicates.

This monograph was divided into two volumes to provide a rapid reference book for the working technician. Vol. 1 is devoted to theoretical considerations and contains details of past and present manufacturing processes, properties of homogeneous and heterogeneous systems of glasses, the formation of metallic silicates and other fundamental problems.

Vol. 2, somewhat larger in size, deals with practical questions, involving the applications of soluble silicates in various industries. Here the silicates are described one by one and the importance of the formation of silicate films is underlined. This fact is employed practically in many ways for almost all adhesives, for laminated materials, for fire protections, cements and plastics. The use of soluble silicates in the form of gels and their many properties as catalysts and their stabilising properties are described in all details.

Throughout the whole book emphasis is placed above all on principles. Properties rather than industrial applications are underlined. Looking through the book it is surprising to see that there is hardly an industrial field where soluble silicates are not employed. The index of authors and subject, covering 66 pages, illustrates this diversity very well.—FELIX SINGER.

HOME

Membership Examination

Application forms and particulars of the 29th Associate Membership Examination of the Institution of Chemical Engineers can now be obtained from the secretary of the Institution, at 56 Victoria Street, London, S.W.1. The application forms for sections C, D, E, and F, of the examination, which will be held in September 1953, must be returned by 1 June. The home paper, sections A and B will be issued at the end of September for return by 15 December.

Gypsum Not Suitable

In reply to a question in the House of Commons last week Mr. George Nugent, Joint Parliamentary Secretary to the Minister of Agriculture, said that on the basis of samples of by-product gypsum sent from Immingham this material had too high a moisture content to be suitable for spreading on land flooded by sea water.

U.K. Copper Statistics

Government stocks of refined copper in the United Kingdom rose during January by 1,439 tons to 73,501 tons, but consumers' stocks fell from 19,486 to 17,207 tons, according to the British Bureau of Non-Ferrous Metal Statistics. Consumption for the month was higher with a total of 42,740 tons, compared with 40,069 tons in December, 1952.

Textile Conference

Llandudno is to be this year's venue for one of the most important events in the international textile calendar, the Annual Conference of the Textile Institute, from 25-29 May. Visitors will discuss some 14 papers given by prominent British and American scientists and technologists on 'Structure and Purpose—Structural Design and Testing of Textile Materials for Specific Purposes.' These cover a wide range of subjects; man-made fibres, felt for paper-making, jute, furnishing and other fabrics used for industrial purposes. The emphasis is on fitness for purpose, from raw material to finished product.

Dunlop Donation

The Dunlop Rubber Company have sent £250 to the fund for the Liverpool meeting of the British Association for the Advancement of Science to be held in September

Oil Refinery Output

Anglo-Iranian Oil Company's refineries processed 6,788,000 tons of oil in 1952 an increase of 1,456,000 tons over the figures for 1951. Provisional throughput totals at the three refineries during 1952 (1951 totals in brackets) were Llandarcy 4,254,000 tons (3,671,000); Grangemouth 2,375,000 (1,512,000); Pumpherston 159,000 (149,000).

Banned Exports

On Monday, 16 March, the Minister of Transport made the Control of Trade by Sea (China and North Korea) Order, the effect of which will be that from 31 March no British ship of over 500 tons gross or more, may proceed to China or North Korea except under the authority of a licence granted under the new order. Licences will be granted only if the ship is not carrying strategic goods. Included on the list of prohibited cargoes are natural and synthetic rubber, ammonium nitrate, benzene, calcium carbide, carbon black, glycerine, nitric acid, phenol, phosphorus (except red), picric acid, sulphur, tetra-ethyl lead, and practically all metals and their alloys.

21 Years of Metal Finishing

The 'coming-of-age' of Metal Processes, Ltd., of Erdington, Birmingham, which was founded by its present managing director, Mr. W. J. Turner in 1932, will be celebrated in May this year. The company's 'deruster' process was the original phosphating treatment for iron and steel. Two new black finishes 'Turbla' and 'Brunette' will be shown at this year's British Industries Fair. Their application is similar to the company's Mk. II Black Finish for metal protection, but the price is much lower.

Ceramic Society's Meeting

The Spring meeting of the Refractory Materials Section of the British Ceramic Society will be held at Ashorne Hill, near Leamington Spa, from 13-15 April. Papers to be presented and discussed are: 'Silica Brick Manufacture at the Landore Works of Richard Thomas & Baldwins, Ltd.'; 'Some Chemical and Physical Properties of Spinel-Forming Oxides'; and 'The Geology of Fireclays.' There will also be a number of social activities and visits to works in the Stourbridge area.

• PERSONAL •

The following officers for 1953 have been elected by the Parliamentary and Scientific Committee:—*President*: VISCOUNT WAVERLEY; *vice-presidents*: VISCOUNT FALMOUTH, LORD HADEN-GUEST, the EARL OF HALSBURY, F. J. ERROLL, M. PHILIPS PRICE, SIR CHARLES GOODEVE, and DR. W. R. WOOLRIDGE (one vacancy); *chairman*: SIR WAVELL WAKEFIELD; *vice-chairman*: SIR HENRY TIZARD; *deputy-chairman*: SIR RALPH GLYN, and W. T. WELLS; *hon. treasurer*: DR. H. J. T. ELLINGHAM; *hon. secretaries*: HUGH LINSTEAD, AUSTEN ALBO and DR. S. WHITEHEAD; *administrative secretary*: LT. COMMANDER CHRISTOPHER POWELL, R.N. On a proposal from VISCOUNT CALVERLEY a vote of thanks to VISCOUNT SAMUEL for his work as president was recently placed on record and the title of President Emeritus was conferred on him on the proposal of PROFESSOR A. V. HILL.

DR. BRYCE NISBET, MOH Kilmarnock, sponsor of the first British scheme to check on the value of fluorine in dental care, will visit the U.S.A. in late March for a two-month tour of Canada and the U.S.A. He will study fluorine chemical treatment schemes in U.S. cities with his own plans in mind. Kilmarnock is now approaching completion of adoption of its scheme to use one section of the town against the other, to test the effect of fluorine additive in the town water supply. This will be the first large-scale extended test in Britain on this subject.

The board of directors of Associated British Engineering, Ltd., have announced the appointment of MR. FREDERICK HENRY HARRIS as group production adviser. Mr. Harris, a first class Honours graduate of London University, is a B.Sc. and a member of the Institution of Production Engineers. Towards the end of 1951 he served as a member and secretary of the Anglo-American Council Productivity Team on metal-working machine tools which visited the United States.

MR. THOMAS S. NICHOLS, president and chairman, Mathieson Chemical Corporation, recently announced the completion of a final plan of organisation required to conduct most effectively the corporation's rapidly growing and more diversified business. An executive committee has been established composed of the following officers: THOMAS S. NICHOLS, president; JOHN C. LEPPART, executive vice-president; STANLEY DE J. OSBORNE, financial vice-president; CARL F. PRUTTON, vice-president for research and engineering; RUSSELL HOPKINSON, vice-president for commercial development; and THEODORE WEICKER, JR., vice-president for all overseas activities. The executive vice-president of the corporation, JOHN C. LEPPART, has been appointed president of E. R. Squibb & Sons Division, the other officers of this division having been named previously.

MR. J. G. SANGER, a director of Sangers, Ltd., wholesale and manufacturing chemists, has been appointed chairman of the company in succession to the late Mr. F. J. Smith. MR. P. STANLEY and MR. LESLIE D. SMITH will continue as joint managing directors.

The appointment of MR. THOMAS C. KEELING, JR., as president of Mathieson Hydrocarbon Chemicals Division of Mathieson Chemical Corporation, was recently announced by Thomas S. Nichols, president of Mathieson Chemical Corporation. Prior to his Mathieson appointment, Mr. Keeling was assistant vice-president and sales manager of the chemical division of Koppers Company, Inc., and served as a director of the chemical division, National Production Authority from September, 1952, to March, 1953. He is a native of Nashville, Tennessee, where he received his primary and high school education. He graduated from Massachusetts Institute of Technology in 1935 with a Bachelor of Science degree in Chemical Engineering and Business Administration. As president of the Mathieson Hydrocarbon Chemicals Division, with headquarters in Baltimore, Mr. Keeling will be responsible for the domestic and Canadian sales of all organic chemicals and for the operation of Mathieson's plants at Doe Run, Kentucky; Morgantown, West Virginia; and Niagara Falls, New York.

OVERSEAS

Soil Deficiency in South Africa

A deficiency of copper and cobalt in the soils of the coastal areas from St. Helena Bay to Mossel Bay, was referred to by Dr. I. S. Perold, head of the biological chemistry department, Stellenbosch University, in his address to the Winter Rainfall area regional congress held at Stellenbosch last month. Dr. Perold advised farmers in these areas to introduce small quantities of copper and cobalt into the fodder of their sheep and cattle. He also said that he was working on a method of introducing copper and cobalt into drinking water.

Norway's Steel Plant

The £20,000,000 steel plant which the Norwegian Government is buildng at Moi Rana is now in an advanced stage of construction according to a report published by the Ministry of Industry. The pig iron works are scheduled to come into operation at the end of this year. In the steel works installation of the electro-furnaces has begun, and production is expected to begin in the summer of 1954. The machinery for the rolling mills is being manufactured in Britain.

Brazilian Chemical Projects

A plant to manufacture DDT is being built by the Instituto Medicamentos Fontoura in association with the American Home Products Corporaton and W. R. Grace. The factory is scheduled to come into operation in 1954 with an initial output of 4,000 lb. of DDT annually and 10 tons of chlorate and caustic soda a day. Other developments in Brazil include the start of production of BHC by the Industrias Quimicas Eletro Cloro and a proposal received by the Commission for Industrial Development from a German firm to install plant and manufacture chemical fertilisers.

New Soil Conditioner

It has been reported from Boston, U.S.A., that a leading carbon black producer there is experimenting with this material as a soil conditioner. It has been found that the carbon black increases the soil's ability to absorb moisture and energy from the sun.

Austrian Aluminium Production

The Vereinigte Aluminiumwerke of Ranshofen in Austria turned out 31,000 tons of aluminium in 1952 which was an increase of 45 per cent over the 1951 figure. Two-thirds of the semi-finished products went to the home trade, the rest was exported to 38 countries. Exports were up by 20 per cent against 1951. In the course of the year this undertaking was able to increase its productivity by 9 per cent.

Extension to Oil Refinery

A second distilling and refining unit has recently been acquired by the Koppartrans oil refinery at Gothenburg, Sweden, owned jointly by Stora Kopparbergs Bergslags AB, of Falun, and the Transatlantic Company of Gothenburg. This extension to the plant will double its production for 1953 to 42,000,000 cu. ft. and an increase to 49,000,000 cu. ft. is expected in 1954. When this is achieved Koppartrans, which so far has invested £5,500,000 in this plant, will be supplying one-fifth of Sweden's consumption of oil.

Superphosphate Production

According to an announcement by Jean de Cornec, president of the 'Comptoir des Phosphates de l'Afrique du Nord' some 75,000 tons of superphosphates will be produced annually in factories located in Rio Grande do Sul and Sao Paulo. These two factories will be built at a cost of Cr.$20,000,000 each and are the first of their kind in South America.

Italian Industry Hit

The serious effect on the Italian chemical industry of the greatly increased imports of chemical products was referred to by Professor Baruchello, vice-president of the National Association of Chemical Industry, in a lecture delivered recently in Rome. Lack of a stable customs tariff has been mentioned as one of the main causes of the increased imports which have brought about a reduction of output in chemical works and in some cases even a complete stoppage. The attention of the Government has been called to the seriousness of the situation and it is hoped that some protection may be afforded to the chemical industry.

Publications & Announcements

ACCURATE temperature measurement can be obtained from the new Fielden thermometer bridge, which is a robust industrial unit with no galvanometer or fragile moving parts. It consists of a Wheatstone bridge, designed to operate with standard Weston platinum resistance bulbs. An alternative voltage is applied to the bridge, the out of balance voltage of which is amplified and used to operate an electronic indicator (magic eye). Temperature is read directly from the calibrated dial when this has been rotated by hand until balance of the bridge is indicated by the magic eye. Another new Fielden instrument is an electronic thermostat which can be used to provide warning of deviation from a required temperature or, in those applications for which on/off control is satisfactory, to control the temperature at a preset level. A precision platinum resistance bulb is used which is connected in a Wheatstone bridge circuit. An alternating voltage is applied to the bridge and the out-of-balance voltage is amplified by a high gain, phase sensitive amplifier, the output from which operates a relay.

* * *

A NEW addition to its wide range of d.c. and a.c. solenoids is announced by Westool Ltd., St. Helen's Auckland, Co., Durham. The new d.c. solenoid, series L, one of the smaller types, is described in the company's leaflet No. 23/52. It has many industrial applications and will be exhibited at the Birmingham section of the forthcoming British Industries Fair.

* * *

THE effects of weather on air pollution are discussed in detail in a new publication 'The Meteorology of Air Pollution' issued by the Manufacturing Chemists' Association as Chapter 8 of its Air Pollution Abatement Manual. Prepared by E. Neil Helmers, air pollution consultant of the Du Pont Company, the brochure points out that for a given situation, severity of air pollution depends largely on weather conditions. Thus to ensure the most economical solution to an air pollution problem, the cost of reducing emission of the contaminant must be weighed against the cost of increased stack height or meteorological control of emission rates.

The publication discusses applications of meteorology to air pollution control engineering, the fundamentals of meteorology, the determination and effects of atmospheric diffusion and turbulence, stack meteorology, planning and interpreting air pollution surveys, plant site selection in relation to air pollution climatology, and methods and application of meteorological control. Copies are available from the Manufacturing Chemists' Association, 246 Woodward Building, Washington 5, D.C. at 75 cents each.

* * *

MERCURY is widely used in modern industry, and its vapour concentrations easily build up beyond toxic limits. There is therefore need for constant vigilance and wherever there are possibilities of exposure to toxic concentrations, the mercury content of the air should be determined at frequent intervals. The Hanovia mercury vapour detector for indicating the amount of mercury vapour in an enclosed atmosphere either continuously, or at intervals (THE CHEMICAL AGE, **66**, 149) has now been amended and includes a rheostat and voltmeter for mains stabilisation. The improved instrument, which can be operated at two ranges of sensitivity, is fully described in an illustrated leaflet which may be obtained on request from Hanovia Ltd., Slough, Bucks.

* * *

AN ILLUSTRATED guidebook, 'Cleaning and Maintenance of Clad Steel Equipment,' has recently been published by Lukens Steel Company, Coatesville, Pa., U.S.A. Lukens, early developer of clad steels, produces such well-known lines as stainless-clad, nickel-clad, Inconel-clad, Monel-clad and copper-clad. Pointing out the small amount of maintenance and low-cost cleaning necessary for stainless and nickel alloy equipment, the guidebook outlines for maintenance personnel recommended cleaning procedure for those types of surface contamination which are potentially harmful. It contains solution formulas for cleaning specific kinds of surfaces, and includes information on handling clad-steel equipment during relocations. Users of clad-steel equipment may obtain copies of this guidebook from fabricators who supply equipment of these materials.

Law & Company News

Commercial Intelligence

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

Satisfaction

LEA VALLEY CHEMICALS, LTD., London, W. (S., 14/3/53). Satisfaction, 3 February, of debenture registered 18 October, 1950.

New Registrations

Cooke's Chemicals Ltd.

Private company. (516,858). Capital £10,000. Manufacturers of chemicals, fine chemicals and chemical products. Subscribers: R. T. Cooke and D. R. Cooke. Solicitors: Criddle Ord and Muckle, Newcastle upon Tyne.

Swale Chemicals Ltd.

Private company. (516,782.) Capital £5,000. Manufacturers, exporters and importers of chemicals. Directors: T. F. J. Collins and A. M. Craig. Reg. office: 22a Winchester Street, Salisbury, Wilts.

W. Thomason & Sons Ltd.

Private company. (516,709.) Capital £2,500. Chemical plumbers and lead burners. Directors: N. Yates and S. Smith. Reg. office: Walton Works, Great Moore Street, Bolton.

Receivership

Sidney Chater, of 35 Windsor Place, Cardiff, ceased to act as Receiver and Manager on 8 January, 1953, to NOSO PRODUCTS, LTD.

Company News

African Explosives & Chemical Industries Ltd.

Consolidated manufacturing and trading profits of African Explosives & Chemical Industries Ltd. for the year ended 30 September, 1952, rose by £420,212 to £2,663,937. A final dividend is recommended of 7 per cent making a total for the year of 10 per cent on the £10,500,000 ordinary capital which is jointly held by De Beers Industrial Corporation and Imperial Chemical Industries (South Africa) Ltd. A year ago 2,500,000 ordinary shares were issued at 32s. a share. A similar rate of dividend (10 per cent) was paid on the £8,000,000 capital for the previous 12 months. The chairman is Sir Ernest Oppenheimer.

Bradford Dyers' Association

Consolidated trading profits of the Bradford Dyers' Association Ltd. fell last year from £2,812,000 to £2,117,000. No bonus is being paid and the total dividend on ordinary stock is 10 per cent or 2½ per cent less than 1951 which included a bonus of 2½ per cent. In spite of the reduction profits provide a comfortable margin for the dividends, which absorb only £185,000 including £67,000 for the preference payment, but the association is susceptible to Japanese and other foreign competition.

British Industrial Plastics Ltd.

Improvement in its trading position is shown in the report of British Industrial Plastics Ltd. for the year ended 30 September, 1952. Reserves totalling £1,188,000 exceeded the issued equity of £831,000. Net profit after tax £33,489. A dividend of 12½ per cent on ordinary shares is announced. Meeting, Winchester House, London, E.C., at noon, 26 March, 1953.

Fina Petroleum Merger

Fina Petroleum Products, Ltd., with its associated companies has acquired the Universe Petroleum Company of Broad Street Place, London, E.C. The price paid by Fina is understood to be in the region of £500,000. The Universe board has resigned and is replaced by F. Noble and C. E. Steed (Fina) and Mr. H. W. Smith (Universe).

Howards & Sons Ltd.

The extraordinary meeting of debenture stockholders of Howards & Sons, Ltd., of Ilford, chemical manufacturers, in connection with the recently announced reconstruction of the company will be held on Thursday, 2 April. The importance of there being a quorum at the meeting is emphasised by the directors as otherwise it would not be possible to carry through the proposed reconstruction before 5 April next, and thus the anticipated benefit to be obtained therefrom would be lost.

Next Week's Events

MONDAY 23 MARCH

Royal Institute of Chemistry

Dartford: The County Technical College, Lowfield Street, 7 p.m. Joint meeting with the Dartford branch of the Pharmaceutical Society. A symposium on 'Insulin,' illustrated by a film. Speakers: R. N. Fox, Dr. G. E. Foster, and F. M. Simons.

Institute of Metals

London: The Royal Institution, Albemarle Street, W.1, 6 p.m. Annual May Lecture. Sir Christopher Hinton: 'The Present and Future Requirements of the Chemical Engineer.'

TUESDAY 24 MARCH

Royal Institute of Chemistry

Leatherhead, Surrey: 2.30 p.m. Visit to the laboratories of BCURA, PATRA and BFMIRA; 6 p.m. in the BCURA canteen, Dr. J. M. Fletcher: 'Chemical Problems Associated with Nuclear Reactors.'

Hull Chemical & Engineering Society

Hull: The Church Institute, Albion Street, 7.30 p.m. G. E. Pears: 'Cosmetics.'

British Ceramic Society

Leeds: Spring meeting (two days) of the Building Materials Section. Programme includes: visits to the ceramics and heavy clay department of Leeds University and to the works of B. Whitaker & Sons, Ltd. A short series of papers will be given in the Metropole Hotel.

Institute of Metals

London: Park Lane Hotel, Piccadilly, S.W.1. Annual general meeting, presidential address and luncheon .Evening: dinner-dance.

WEDNESDAY 25 MARCH

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.15 p.m. Nutrition Panel of the Food Group. 'Food and the Future.' third meeting of a series. N. W. Pirie and Dr. A. C. Thaysen: 'Newer Sources of Foodstuffs.'

Manchester Literary & Philosophical Society

Manchester: Portico Library, Mosley Street, 5.45 p.m. Chemical Section. Dr. W. R. Boon (I.C.I. Ltd.): 'The Chemist Looks at Insecticides.'

Institute of Metals

London: Park Lane Hotel, Piccadilly, S.W.1. Annual general meeting. All-day symposium: 'Control of Quality in the Production of Wrought Non-Ferrous Metals, 1—The Control of Quality in Metal Casting.' 8 p.m. Conversazione at 4 Grosvenor Gardens, S.W.1.

THURSDAY 26 MARCH

The Chemical Society

Aberdeen: Robert Gordon's Technical College, 7.30 p.m. Joint meeting with the RIC and SCI. Dr. J. A. Lovern: 'Some Recent Developments in the Field of Lipids.'

Institution of Engineering Inspection

Manchester: Engineers' Club, Albert Square, 7.30 p.m. Dr. P. Cranston: 'A Rational System of Nomenclature in Ferrous Metallography.'

Manchester Microscopical Society

Manchester: 16 St. Mary's Parsonage, Deansgate, 6.30 p.m. G. H. Davies: 'Some Parasites.'

Institute of Metals

London: Park Lane Hotel, Piccadilly, S.W.1. Annual general meeting. Discussion of papers. Visits to works and laboratories.

Institute of Welding

Slough, Bucks: The Community Centre Hall, 7.30 p.m. North London Branch. C. E. Durant: 'Under Water Welding and Cutting.'

FRIDAY 27 MARCH

The Chemical Society

Manchester: The University, one-day symposium (three sessions). Joint meeting with the RIC, the Corrosion Group of the SCI, and the Institute of Petroleum. 'Corrosion Inhibitors.' Speakers: Dr. U. R. Evans, Dr. T. P. Hoar, Dr. W. S. Patterson, A. T. B. P. Squires, S. M. Todd, and Dr. F. Wormwell.

Institution of Electronics

Manchester: Reynolds Hall, College of Technology, 7 p.m. J. Blears (Metropolitan-Vickers Electrical Co., Ltd.): 'Modern Developments in the Technique of High Vacuum Measurements.'

Plastics Institute

St. Helens: Afternoon visit to the works of Fibreglass Ltd.

Manchester: Engineers' Club, Albert Square, 6.45 p.m. A. M. Dobson (Fibre-

glass Ltd.): 'The Use of Glass Fibres with Plastics.'

Institute of Metal Finishing

Sheffield: Grand Hotel, 6.30 p.m. A. R. Knowlson: 'Preparation and Deposition of Silver upon Ferrous and Non-Ferrous Metals.'

The Royal Institution

London: 21 Albermarle Street, W.1, 9 p.m. Sir Eric Rideal (professor of physical chemistry, King's College, London): 'Count Rumford and the Royal Institution.'

Market Reports

LONDON.—The industrial chemicals market has continued on steady lines during the past week with a moderate weight of new business reported. Export trade has been fairly good but competition is keen on an easier supply position. The general run of the soda products has been in good call against contracts, and the potash chemicals remain in strong request at firm rates. In the coal tar products market pitch has been moving well and there has been an active interest in creosote oil and the light distillates. A.D.F. cresylic acid is now quoted at 71 cents per gallon in bulk.

MANCHESTER.—While contract deliveries of the alkalis and most other leading heavy chemicals during the past week has been on a fair scale in the aggregate, new bookings on the Manchester market are described as only moderate, with a number of users still inclined to limit fresh commitments to prompt or near deliveries. Export movements have been on about the scale of recent weeks. Little change in the general price position falls to be recorded. In the fertiliser market there is a steady demand for superphosphates and the compounds, and in the tar products there has been fair activity in pitch, creosote oil and one or two other lines.

Satisfaction

EAST ANGLIA CHEMICAL CO., LTD., London, W.C. (M.S., 21/3/53.) Satisfaction, 13 February, of debentures registered 9 November, 1949.

Epikote Resins Available

HITHERTO obtainable in development quantities only, from United States production, the Epikote of Shell Chemicals, Limited, are now being manufactured at a new plant which has just come into operation at Shell's Pernis refinery in Holland.

It is stated that production at Pernis will be in the region of 1,000 tons per annum and represents the first stage in the programme for the manufacture of these resins on this side of the Atlantic.

Marketed in the United States as Epon resins, these products are reported to have established themselves, particularly in the surface coating and plastics fields where their unique combination of properties such as adhesion, flexibility, toughness and chemical resistance are of particular value.

It is claimed that the epoxide resins, which the Epikote range typifies, represent a major advance in the synthetic resin field comparable to that made by the alkyds and vinyls.

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.

ASSISTANT CORROSION ENGINEER required by **KUWAIT OIL COMPANY** for service in Kuwait. Should possess a Degree in Electrical or Chemical Engineering or Metallurgy, but Higher National Certificate in any of these subjects plus a full recognised engineering apprenticeship would be acceptable. Experience in Corrosion Engineering an advantage but not essential, as successful candidate will undergo some training in the U.K. Age 22-30. Overseas salary, starting £790 per annum clear, plus generous allowances, Pension Scheme and kit allowance. Write for application form, giving personal details and quoting K.1676 to **BOX W/18, c/o 191, GRESHAM HOUSE, E.C.2.**

CHEMISTS are required at **MINISTRY OF SUPPLY** Establishment, Aldermaston, Berks., and at Research Establishments in Southern England. Duties call for experience or interest in physical, inorganic or radio chemistry, or development work on various applications of plastics and rubber. Quals.: Higher School Cert. (Science) or equiv. Further training in chemistry to standard of H.N.C. or degree may be an advantage. Salary according to age, experience and location. Experimental Officer (min. age 26) £597-£786, or Assistant E.O., £264 (age 18)—£586. Women somewhat less. Posts unestablished. Application forms from **M.L. & N.S., TECHNICAL AND SCIENTIFIC REGISTER (K), ALMACK HOUSE, 26, KING STREET, LONDON, S.W.1,** quoting F.85/53A. Closing date 18th April, 1953.

LABORATORY ASSISTANTS are required by **NORTH THAMES GAS BOARD** in the laboratories at **FULHAM, S.W.6, BECKTON, E.6, ROMFORD, BOW COMMON, E.3,** and **NINE ELMS, S.W.8.**

Candidates should be from 20 to 25 years of age and have matriculated, or obtained exemption therefrom, or hold Intermediate B.Sc. qualification. Starting salary will be within the range £335 to £430 per annum, according to age and qualifications.

Applications, giving age and full particulars, should be sent to the **STAFF CONTROLLER, NORTH THAMES GAS BOARD, 30, KENSINGTON CHURCH STREET, LONDON, W.8,** quoting reference 666/64.

FOR SALE

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

FOR SALE, a regular supply of good quality **LUSTRE WHITE MICA,** 150 and 200 mesh, from our own factory. We will pay commission to a Salesman negotiating an outlet for this. Quantity up to 20 tons a month. **BOX No. C.A. 3211, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

FORGED STEEL PRESSURE VESSEL, 44 ft. long by 4 ft. 3 in. i.d. by 4 in. thick. **WORKING PRESSURE,** 2,000 lb. p.s.i. **C. W. HOGG, 42, BUSHEY WOOD ROAD, SHEFFIELD.** Telephone: 72777.

FOR SALE

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

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

FIVE new **FURNACE RETORTS,** 8 ft. diam., 6 ft. 8 in. deep, approx. 8 tons each. Welded Steel.

FIVE Dish-ended **NAPHTHA TANKS,** 18 ft. 6 in. long by 4 ft. 4 in. diam., two having agitators.

TWO 35 ft. long by 9 ft. diam. Lead-lined **TANKS.**

Stainless Steel **FILTER TANK, 3 ft. 6 in. diam.**

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

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

FOUR Papier-mache O.T. **TANKS,** 8 ft. 3 in. diam., 9 ft. deep. (Unused.)

SIX O.T. **TANKS,** 7 ft. diam. 14ft. deep, lined inside with acid-resisting bricks.

SIX Aluminium **CONDENSERS,** 14 ft. long by 2 ft. 6 in. diam. 386 Tubes, ¾ in. o.d.

ONE Rectangular Lead-lined **TANK,** 8 ft. by 4 ft. 6 in. by 2 ft. 6 in.

FORTY Riveted **RECEIVERS,** 8 ft. 6 in. long, 5 ft. 6 in. diam., 75 lbs. w.p.

CAST-IRON PIPES, 5000 ft. Each 6 in. and 8 in. **NEW VALVES** in Stainless, Gunmetal, Enamel Lined.

Free Catalogue, "Watkins Machinery Record," available

FRED WATKINS, COLEFORD, GLOS.

MORTON, SON AND WARD LIMITED

Offer

MIXING PLANT

ONE Stainless Steel Tilting **TROUGH MIXER** by **CHALMERS,** 3 cwt. capacity, motorised.

One **TROUGH MIXER** by **GARDNER,** 3 cwt. stainless steel lined trough and twin chrome-plated scroll blades, mounted on stainless steel shaft, fast and loose pulley.

One, as above, motorised. Single scroll blade, with sifter.

"MORWARD" "U"-SHAPED TROUGH MIXER, constructed to **REQUIREMENTS.** Varying sizes to 3 tons. Scroll or paddle mixing gear. Jacketed or unjacketed.

One Revolving-type **CHURN MIXER,** 7 ft. by 3 ft. 6 in.; motorised.

ONE 500g. **JACKETED AUTOCLAVE,** arranged with detachable cover, 150 lb. p.s.i. in jacket, 100 lb. internally.

JACKETED PANS

100g., 150g. and 200g. New **JACKETED PANS,** all welded, on three legs; with or without mixing gear.

SEVERAL Second-hand **JACKETED PANS** in stock, 40g. to 200g.

LEAD-LINED VESSELS

Two 100g. and One 75g. Totally Enclosed, Cylindrical. As new.

One 300g. Cylindrical, open top.

HYDRO EXTRACTORS

A large selection available—72 in., 60 in., 48 in. and 42 in., by **BROADBENT** and **WATSON LAIDLAW.**

PUMPS

Various **MONO** and other **PUMPS** in stock—2 in. to 6 in., new and second-hand, in stainless steel, gunmetal and cast iron.

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FOR SALE

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

1—Baker Perkins **MIXER** as above, not steam jacketed, single geared, complete with 25 h.p. A.C. motor.

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

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

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

1—Simon Horizontal Tubular **DRIER,** 12 ft. long, 100 lb. steam pressure, size 3B, requiring 12 b.h.p.

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

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

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

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

1—Johnson **FILTER PRESS,** 42 C.I. plates, 32 in. square, centre feed.

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

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

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

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

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

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

Douglas **ROTARY PUMP** for oil, soap, etc., belt driven.

6 Various Horizontal Duplex **STEAM PUMPS,** Worthington and Tangye pattern, 1 in. to 2½ in. suction and delivery.

" U "-shaped Horizontal **MIXER,** 8 ft. long, 3 ft. wide, 3 ft. 3 in. deep, belt and gear driven, end outlet, square horizontal centre shaft with cast radial type mixing arms, last used for lineoleum paste.

1—" U "-shaped **MIXER,** as above, but 7 ft. long.

4—5-roll **REFINERS,** fitted chilled iron, water-cooled rolls, 40 in. long, 16 in. diam., belt and gear driven, with clutch drive suitable for motor, by Baker Perkins, Ltd.

No. 2HS Hammamac **HAMMER MILL,** No. 1 size, Standard Miracle Mill, No. 2 size Standard Miracle Mill and a No. 3 Super Miracle Mill, with fans, piping and cyclones.

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