

THE ANALYST

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS AND OTHER ANALYTICAL CHEMISTS.

ANNUAL GENERAL MEETING AND ORDINARY MEETING, HELD
FEBRUARY 4, 1925.

THE Annual General Meeting of the Society was held at the Chemical Society's Rooms, Burlington House, on Wednesday, February 4th. The President, Mr. G. Rudd Thompson, F.I.C., was in the chair.

The Hon. Treasurer presented the accounts of the Society for 1924, which were adopted, and votes of thanks were passed to the Hon. Treasurer and the Hon. Secretaries.

Messrs. Marreco, Houseman and Brandon, chartered accountants, were appointed auditors of the Society's accounts for 1925.

The President delivered his Annual Address. Dr. Dyer proposed that a hearty vote of thanks be accorded to the President for his address and for his services in the chair, and that his permission be asked to print the address in *THE ANALYST*. This was seconded by Mr. R. L. Collett, and the motion was carried.

The following were elected as Officers and Council for the ensuing year:—

President.—G. Rudd Thompson.

Past-Presidents serving on the Council (limited by the Society's Articles of Association to 8 in number).—Leonard Archbutt, A. Chaston Chapman, Bernard Dyer, P. A. Ellis Richards, Alfred Smetham, E. W. Voelcker, and J. Augustus Voelcker.

Vice-Presidents.—S. F. Burford, E. M. Hawkins and A. More.

Hon. Treasurer.—Edward Hinks.

Hon. Secretary.—E. Richards Bolton.

Assistant Hon. Secretary.—R. G. Pelly.

Other Members of Council.—F. W. F. Arnaud, E. T. Brewis, R. T. Colgate, R. L. Collett, J. C. Drummond, C. A. Hill, L. H. Lampitt, T. Macara, S. E. Melling, J. Sorley, A. R. Tankard, and J. White.

An Ordinary Meeting followed the Annual Meeting, the re-elected President, Mr. G. Rudd Thompson, being in the chair.

Certificates were read for the first time in favour of:—Messrs. Douglas James Talbot Bagnall, A.C.G.F.C., A.I.C., Reginald Henry Coysh, M.Sc., A.I.C., George Van Barneveld Gilmour, B.Sc., A.R.C.Sc.I., A.I.C., Percy May, D.Sc., F.I.C., John Parry, Wilfrid Smith, B.Sc., A.I.C., and Winifred Wright, B.Sc., A.I.C.

A Certificate was read for the second time in favour of Mr. Thomas Mann.

The following were elected Members of the Society:—Messrs. Arthur Chapman Barnes, B.Sc., F.I.C., John Jacob Fox, D.Sc. (Lond.), F.I.C., Thomas Congalton Hay, and Harold Rupert Jensen, M.Sc. (Liv.), A.I.C.

The following papers were read:—"Cinchonine as a Tannin Precipitant, with Special Reference to the Analysis of Cutch and Gambier," by David Hooper, LL.D., F.I.C. (work carried out under the Analytical Investigation Scheme); "The Examination of Charred Documents," by C. Ainsworth Mitchell, M.A., F.I.C.; and "The Absorption of Carbon Monoxide in Gas Analysis," by H. R. Ambler, B.Sc., A.I.C.

Annual Address of the Retiring President.

ON my retirement from office as your President it becomes my duty to render an account of my stewardship to you for the year 1924, and to give you at the same time a general resumé of what we as a Council have done and how we as a Society have fared during the period.

I think I can safely say that as a Society we are flourishing; we have been able to welcome some 45 new members, and there has not been a single meeting of the Society without a list of additions to our membership roll having been made.

We now stand with 495 members: 3 resignations have been received and 3 members have been removed: two for failure to pay subscriptions and one for having committed what in the opinion of the Council were acts "derogatory to the interests of the profession of analytical chemistry."

It is quite needless for me to remark that a society such as ours can only be carried on in a satisfactory manner by a rigid adherence to our constitution, by-laws and regulations, but I assure you the step was only taken after very mature and most careful consideration of the points at issue, and having full regard to the upholding of the dignity and traditions of our Society.

I regret, however, to report that we have lost 12 members by death, including Sir G. T. Beilby, Sir Charles Cameron and Sir J. J. Dobbie from the ranks of our Honorary Members, whilst of our Ordinary Members, Messrs. G. H. Allibon, M. K. Bamber, F. J. Bolt, L. Briant, C. B. Gall, L. Gowing Scopes, Otto Hehner, R. Hellon, and E. Richards have left us for the Great Beyond, and the Society is poorer for their loss.

It is possibly not out of place for me to refer once more to our dear old friend Hehner, whose absence for ever will be felt by one and all. As one of those who from the very inception of the Society put into it of his best, who filled the various offices through which he passed with eminence and distinction, whose contributions to chemistry and particularly to our own organ, *THE ANALYST*, were of the highest possible interest and value, and in many instances unique, whose kindly interest and assistance to everyone who ever approached him were always readily and generously accorded, and finally whose name as a scientist will ever remain, we have indeed sustained a loss which cannot be over-estimated.

To me, when in my early days help and advice were badly needed, his ever ready sympathy and help were given with no sparing hand. His kindly restraining influence, and sometimes very outspoken criticisms, will be ever remembered, and, above all, stood out his absolute honesty of purpose in all that he said and did.

One thing I recall from one of my earliest meetings with him when he came forward to offer evidence on the opposing side in a police court case (when, needless to say, I went down badly), was his telling me afterwards always to have in view that fairness to everyone was essential, to oneself included; but, said he, "Get your facts, stick to them through thick and thin, and never be tempted to think how much do I get out of the job, but how did I do it? Did I do it to my own perfect satisfaction? If not, it was badly done." This was typical of Otto Hehner, who never feared to say, "I do not know," if he did not know, but if he felt he knew he would say he *did* know, and then would proceed to *prove* that he did know.

The world is the poorer for the loss of such a man, and if I were asked by one of the younger generation to whom I would point as a perfect example of one of the fine school of pioneers in analytical chemistry, I should unhesitatingly indicate Otto Hehner.

Our resignations and removals are remarkably few, being only 8 in number, so that, from all points of view, our Society is more than holding its own and extending its sphere of action. The new members coming forward represent almost every branch of chemistry. Doubtless there are very many others who might join us were it not for the fact that a constant increase in the number of subscriptions becomes a real tax, and, moreover, in the case of provincial chemists, actual attendance is often difficult.

At this stage I propose to furnish a brief outline of the ground covered by our official publication during the last twelve months. You will observe from the following list of 36 original papers and notes that a very wide field has been traversed.

During the year 1924, 28 papers have been read at the meetings, and the following have been published in the pages of *THE ANALYST*:—

"The Application of the Iodimetric Method to the Analysis of Sugar Products."

By C. L. Hinton, F.I.C., and T. Macara, F.I.C.

"The Gold-Beater's Skin Test for Tannins. By Phyllis H. Price, B.Sc.

"The Corrosion of Aluminium Cooking Utensils." By C. K. Tinkler, D.Sc., F.I.C., and Helen Masters, B.Sc.

- "The Estimation of Nitrogen in Coal." By W. Donovan, M.Sc.
- "Effects of Storage on Artificially Polluted Waters. By Robert C. Frederick.
- "The Crystalline Bromides of Linseed Oil." By Harold Toms, M.Sc., A.I.C.
- "The Estimation of Lead in Potable Waters, and in Urine." By John C. Thresh, M.D., D.Sc., F.I.C.
- "The Colorimetric Estimation of Lead in Cream of Tartar. By R. L. Andrew.
- "Notes on the Estimation of Chromium." By H. T. S. Britton, M.Sc., F.I.C.
- "Osmium Tetroxide as a Reagent for the Estimation of Tannins and their Derivatives." By C. Ainsworth Mitchell, M.A., F.I.C.
- "The Plea for Standardisation." By M. S. Salamon, B.Sc.
- "The Composition of Beef and Malt Wine." By G. D. Elsdon, B.Sc., F.I.C.
- "The Volumetric Estimation of Columbium." By W. R. Schoeller, Ph.D., and E. F. Waterhouse.
- "Apparatus for Extraction and Solvent Recovery." By S. A. de Lacy, A.I.C.
- "Report on the World's Dairy Congress." By John Golding, D.S.O., F.I.C.
- "Cream Cheese." By T. R. Hodgson, M.A., F.I.C.
- "What is Bondon Cheese?" By G. D. Elsdon, B.Sc., F.I.C.
- "The Estimation of the Inorganic Impurities in Gelatin." By S. R. Trotman, M.A., F.I.C., and R. W. Sutton, B.Sc., A.I.C.
- "The Effect of Giving Certain Oils in the Daily Diet of Cows, on the Composition of Butter Fat." By H. J. Channon, B.A., B.Sc., J. C. Drummond, D.Sc., F.I.C., and J. Golding, D.S.O., F.I.C.
- "The Composition and Decomposition of Eggs." By R. T. Thomson and James Sorley.
- "Simple, Useful Forms of Hydrogen Electrode." By F. J. Considine.
- "An Attempt to Extend Mitchell's Colorimetric Method to the Estimation of Catechol Tannins." By Phyllis H. Price, B.Sc.
- "Estimation of Sugar in Urine by Means of Fehling's Solution with Methylene Blue as Internal Indicator." By J. H. Lane, B.Sc., F.I.C., and Lewis Eynon, B.Sc., F.I.C.
- "The Estimation of Copper and Tin in Copper-Tin Alloys." By A. T. Etheridge, M.B.E., B.Sc., F.I.C.
- "The Estimation of Ammonia by Means of Sodium Hypobromite." By M. B. Donald, M.Sc., A.R.C.Sc., A.I.C.
- "The Routine Examination of Dairy Products with Special Reference to the Mojonnier Tester." By L. H. Lampitt, D.Sc., F.I.C., E. B. Hughes, M.Sc., F.I.C., and M. Bogod, B.Sc., A.I.C.
- "The Freezing Point of Sudan Milk." By A. F. Joseph, D.Sc., F.I.C., and F. J. Martin, M.A., Ph.D., F.I.C.
- "Alcoholysis and the Composition of Oil and Fats." By G. D. Elsdon, B.Sc., F.I.C.
- "The Recognition of Hydrogenated Oils." By K. A. Williams, B.Sc., and E. R. Bolton, F.I.C.
- "The Citric Acid Content of Milk Powder." By Dan W. Steuart, B.Sc.
- "An Apparently Specific Test for Tannins." By Alan H. Ware.
- "The Quantitative Estimation of the Degree of Hydrolysis of Gallotannin by Tannase." By Winifred N. Nicholson, B.Sc., and Donald Rhind, B.Sc.
- "Preliminary Notes on the Composition of the Fat of Goats' Butter." By Frank Knowles and John C. Urquhart.
- "Application of 'Formol Titration' to the Kjeldahl Method of Estimating Nitrogen." By W. S. Shaw, M.Sc., A.I.C.
- "The Pemberton-Neumann Method for the Estimation of Phosphorus." By Marion B. Richards and W. Goddon.

“The Estimation of Cadmium in Brass.” By A. Y. Etheridge, M.B.E., B.Sc., F.I.C.

An analysis of these contributions shows that our journal has continued to fulfil the aims of our Society, which include the discovery of new methods, the improvement of old methods of analysis, and the development of methods dealing with the prevention of the adulteration of foods and drugs.

Twelve of the papers were concerned specifically with various foods and drugs and included six on milk and dairy products, to which should be added the interesting report of our representative at the World's Dairy Congress. There were two papers on water analysis, five on new methods of determining tannins, three on the analysis of oils and fats, and eight on inorganic analysis.

Two of these papers were the outcome of work done under our Analytical Investigation Scheme, which has now recovered its pre-war activity.

In addition to the papers, there were published 33 notes on matters relating to analysis and analytical practice. As these Notes frequently deal with points arising out of papers read before the Society, they fulfil the special function of enabling members who cannot be present at the meetings and take part in the discussions to express their views. More of such notes would be welcomed.

The sections on Legal Notes and on Ministerial Orders have been considerably enlarged, and all cases brought to the notice of the Editor presenting any novel scientific or legal feature have been abstracted. The Ministry of Health now sends us all Orders affecting Public Analysts, as issued, and these are published in our journal as soon as possible.

There have been 483 abstracts of papers published in other journals and 60 reviews of books, and it is pleasing to note that many more publishers are now finding that the reviews in our journal are profitable to them.

From the above it will be noted that THE ANALYST during the last twelve months has maintained a commendably high standard in original papers. This is particularly gratifying as being coincident with the marked expansion of our membership.

It may be of interest to remark, in passing, that whereas in the earlier years of the Society scientific matter peculiar to the profession of the Public Analyst was of predominating interest, at a later date in the history of the Society the Council wisely decided to extend their membership and outlook, so that to-day we have a vigorous growth, not only in numbers, but also in the character and variety of papers submitted for publication. This alone is a decisive proof that the Society can claim to be moving with the times and justifying a place in the scheme of chemical affairs.

It would be perhaps invidious to point out any paper or papers as outstanding, but we were all extremely gratified to hear that most excellent description of the Mojonner Apparatus by Messrs. Lampitt, Hughes and Bogod, demonstrating the rapidity and accuracy with which analyses of dairy products can be carried out; we seem to be rapidly approaching the days when our routine examinations will all be done by machinery or by more or less automatic apparatus, and then

we can look forward to having a little more spare time in which we can enjoy the more interesting parts of our lives.

We have also published in our journal an extremely important official method for the analysis of pyrites as approved by the Swedish Testing Institute and Norwegian Government Analysis Committee, and, having regard to the huge quantities of Scandinavian pyrites coming forward for the manufacture of sulphuric acid, not only to this country, but over the world generally, the importance of such an official publication is apparent.

In addition, we have the Report of the Swedish Commission on Arsenical Poisoning, with critical methods for the determination of arsenic, and the information thus given to us as to the occurrence of arsenic in fish is in many respects of a somewhat staggering nature and will undoubtedly prove most valuable to those of us who may, from time to time, be engaged upon the determination of minute quantities of arsenic in chemicolegal cases.

I should like at this stage to offer my personal thanks to our Editor, Mr. C. Ainsworth Mitchell, together with my warmest appreciation of the unstinted time and care expended upon his editorial duties. Come what may, it is up to him, when the time arrives for the next monthly issue, to find something to fill it, and we can only say that, whilst we have reason to believe that good and energetic editors do exist, and are to be found, we know at any rate that *we* have one, and so far he has managed to bring out *THE ANALYST* without having recourse to fill up space with a "Cross-word Puzzle."

Our Council and Publication Committee also deserve the most hearty commendation at our hands for the very important work they have done, with special reference to those occasions where they have eliminated personal considerations and taken the detached view.

Our thanks are due to the large staff of Abstractors, who are ever on the lookout for matter of interest to us, and to all those who have contributed Notes, Reviews and Articles to our journal.

During my year of office, a thought has occurred to me in connection with our Society which may perhaps be worthy of mention: I refer to the position of our own Officers.

When a Committee or Council meet, there are scores of things which crop up for deliberation which cannot be dealt with, and are therefore passed on to the Secretary as a matter of course. Until it was my good fortune to have to take an active interest in the affairs of this Society, I had not the least conception of the scores of things which had been passed on to our Secretary—to say nothing of the many matters of detail and correspondence all requiring attention by a given date, notwithstanding the fact that he has also his own work to do. In spite of all this, whatever we do and must think, at, after and before every meeting, we content ourselves with an annual vote of thanks for valuable services rendered, although, as I say, every one of us, whilst not expressing at the time our full sense of gratitude, is most deeply sensible of all that the Secretary does.

Personally I can only say that my year of office would have been impossible

without him and his help, and no matter when or how I may bother and worry him in wanting to know something of what is going on inside, he has always most readily put his own affairs on one side to help me in matters regarding the Society.

Well, there is a limit even to this sort of thing (at least, if we changed places I should say there was a limit), and after this preamble I come to the idea which has been in my mind for some considerable period, and it is simply that with a Society like ours, with all our members, all the thousand and one things which really are in the province of the Secretary and Secretary alone, the time has come when we should consider seriously the question of supplementing the office of Honorary Secretary by one carrying some remuneration, whereby the Secretary could devote himself to the work of our Society without prejudice to his own duties, and simply relieve the Honorary Secretary of a vast amount of work without unduly interfering with his private work.

Believe me, this is not with the least idea of belittling what Mr. Bolton has done—far from it—neither have I ever known him express any complaint, but in my opinion, at any rate, we should consider this matter in common justice. We have a most admirable man in our Editor, who is paid (inadequately, I admit) for his work, but his salary, at any rate, allows him to make arrangements for clerical work, although after that, I fear, little margin remains for himself, and it seems to me that our position as a scientific society is now such that we should consider the question of a paid secretary, or, at any rate, making a payment in recompense for the immense amount of time spent on our behalf.

I say unhesitatingly that no man, paid or not, could possibly have served us better than our esteemed Honorary Secretary, but I really think that we are asking him to do more than we have any reason to expect to be done without recompense.

I make this suggestion, as this is one of the points which has struck me during my Presidency, which I honestly believe would be to the advantage of the Society, and would moreover only be fair, considering the continual increase in the secretarial work.

As regards my personal work connected with the Society over the year I can only say that it has been one continued round of extremely pleasurable duties.

It has been my fortune to have been able to attend the whole of the meetings of Council and General Meetings of the Society, and the kindness and support which I have received from the officers and members is beyond my powers of expression, as you have, one and all, shewn your sympathy towards me and given great toleration to my many shortcomings.

Many invitations have been extended to the Society through me to various functions, included in which have been, the dinners of the Metropolitan Police C.I. Department, The Institute of Brewing, The Coroners' Society, The Society of Clerks of Peace to Counties, Society of Chemical Industry and Chemical Club, The National Physical Laboratory, with invitations to attend the meetings of many of the kindred societies.

It has also fallen to my lot to preside at an Extraordinary General Meeting of our Society which was held in Manchester, November 7th, 1924, when I was honoured by the support of many of our officers and members who specially travelled north for the purpose.

Here the proposal that a Northern Section of our Society be formed was formally discussed and decided upon, and I look forward with pleasurable anticipation to the beneficial results from the formation of other provincial sections.

It is always a matter of inconvenience and expense for country members to take part in our meetings and deliberations in London, and a good case has been made out for the formation of "feeders," when we shall have the benefit of increased membership, and I feel sure a greater number of papers will be forthcoming for *THE ANALYST*, thereby increasing our sphere of action and usefulness, to say nothing of bringing chemists in all branches of work into closer contact with one another.

This Northern Section is the first off-shoot from the parent body, and a further one is under consideration, but the details of formation, etc., of this have been somewhat delayed owing to the distance from London and the difficulty experienced by those interested in meeting to discuss the matter.

A question which has been very much to the fore during the past year has been that of standardisation, and in this connection mention must first be made of the first report of the Joint Committee for the Standardisation of Scientific Glassware, on which we are represented by our Honorary Secretary.

The first report deals with the fundamental question of units of volume, and the main recommendation is to the effect that units of volume shall be the litre and the millilitre instead of the cubic centimetre as hitherto.

In view of the very small differences between the millilitre and the cubic centimetre (only three parts in the fifth decimal place), it, at first sight, seems a little difficult to understand why we should be asked to throw over the familiar "c.c." in favour of the somewhat strange "ml." The report, however, makes it clear that, owing to the prevalence of the Mohr system, great confusion has arisen in the use of the term "c.c.," and that it is highly desirable that a uniform standard of volume should be adopted.

This report was published in August, 1924, and almost at the same time a letter was addressed to education authorities and teachers of chemistry throughout the country on behalf of the Joint Committee, pointing out that, after consultation with the National Physical Laboratory, the laboratory had issued its new Test Pamphlet which defined two grades, and two grades only, of volumetric glassware.

Class A is of the highest accuracy reasonably obtainable, and each vessel has been tested by the National Physical Laboratory.

Class B, which is for general use, still conforms to certain rigid requirements as to accuracy, but is capable of commercial production on a large scale and, therefore, can be sold at a reasonable price.

In actual practice the manufacturers will aim at producing Class A apparatus, so that the great majority of the apparatus will be well within the limits of the Class B regulations.

The object of thus addressing the education authorities and teachers of chemistry was, of course, to approach those who are the greatest users—owing to the frailty of adolescent human nature—but it cannot be too widely known that this good British apparatus is available for all. Arising from this report an interesting discussion was held by the London Section of the Institute of Chemistry in November, in which chemists opened their hearts a little on the question of units of volume.

Perhaps the most interesting fact that was brought out in the discussion was an explanation of the errors into which we are liable to be brought if we are too impatient in the use of volumetric apparatus.

There is a great temptation, when a burette runs slowly and life is hurried, to nip off the end and make the liquid flow more freely, and some of us may have felt that by waiting a minute or so for the liquid to settle after the rapid flow, we should have made sufficient allowance. It was, therefore, somewhat startling when a physicist present at that meeting gave figures to show that the result of rapidly breaking the comparatively small surface at the top of the burette column, and leaving a large but thin film of liquid all the way down the burette was to set up such considerable surface tension effects that it would take fifteen or twenty minutes for sufficient drainage to ensure a stable result within the ordinary limits of error.

It is, perhaps, in these little matters that what appears, at first sight, to be the pedantic outlook of the pure physicist is of such service to the chemist, who overlooks such simple physical phenomena.

The question of standardisation has received attention in other directions, and I would refer briefly to progress which has been made in the standardisation of methods of chemical analysis.

Under the auspices of the Department of Scientific and Industrial Research, the Fuel Research Board has published an important interim Report on Methods of Analysis of Coal; the range of work done here is very comprehensive, and chemists will look forward with anticipation to the fuller report promised at a later date.

Our own Society is represented on the Committee which is now dealing with proposed standardisation of Methods dealing with Sewage Analysis, and we have formed a Joint Committee with the Institute of Chemistry to define standards for hydrochloric acid, zinc, and sodium chloride, the work apportioned to Great Britain by the Union Internationale de Chimie Pure et Appliquée, who presented their report which was unanimously accepted and recommended for adoption.

Mention has already been made of the Official Methods for the Analysis of Pyrites adopted by the Swedish and Norwegian Governments, to whose courtesy we are indebted for permission to publish this matter.

Within our own circle discussions have been held, and we have had various and numerous suggestions made as to the substances or materials which were most urgently in need of methods of analysis, leaving the least possible room for differences between the various chemists concerned. Whilst we all more or less agree

that such methods would be highly desirable, we are up against the difficulty, first of all, that we may each have our own ideas of urgency as to the substance or article to be investigated, and secondly, even if we agree upon the particular substance or article, we each have our own pet methods and naturally rely upon these, and are not willing to have them forcibly supplanted by any other method.

However, we have made a start, and a most excellent Committee has been appointed to investigate and report upon Methods for Condensed and Dried Milk and Essential Oils, and it would not be fair to anticipate what they may do or may find or how they may set to work, but if they can, by any means at their disposal, bring up recommendations introducing uniformity into these somewhat controversial methods, we shall feel that they have done much.

We are all agreed that the question of standardisation of analytical methods is a vexed one, and bristles with difficulties; it would be very useful and valuable to have standard methods for many analytical determinations, but I foresee a danger if this be carried too far, especially as it would tend to destroy individuality and so reduce much of our work to mere mechanical routine.

One must admit that good work has been done in certain directions by standardisation of methods, and I believe that much of the good which has resulted is due to the clearing up of matters of detail in the operations involved.

I should, however, be loth to accept *any* standardised method in preference to one which had stood the test of time and experience in my own laboratory, simply because it had been laid down as *the* method which was supposed to be the only accurate one.

If this were carried to the extreme, it would bid fair to wipe out the specialist who has attained his knowledge by dint of tedious investigation and expenditure of time and thought.

Personally, I would rather see such efforts directed towards the elimination of discrepancies in the determination of particular constituents when experience has shown that these occur, even when in the hands of capable chemists.

In such cases I would strongly support a concerted effort towards removing the fundamental causes of such differences, and this can only be done by frank discussion and a united desire to overcome the difficulty.

Having outlined the position of the chemist with regard to standardisation of analytical methods, I propose to touch briefly on the very much wider aspect of this question with which we are confronted, I refer to the legal definition of many products which come under the heading of "Food and Drugs."

Here, custom, manufacture, the law, and scattered differences of opinion from chemical advisers have, together over a period of years, produced a state of things which in some instances can only be described as chaotic. Public opinion, initiated by newspaper campaigns, is gradually being focussed upon this problem, and it behoves chemists to be prepared not only to assist legislation, but also to keep any proposed changes within due bounds.

It is obviously impossible for one man to treat of this matter seriatim, and at this time I can only submit a broad outline of the position. Many varying

interests have to be served and considered, but I submit that to-day the Public Analyst has quite enough to do to make the analyses of articles under the adulteration of food acts without having to make his own standards, or at least try to do so, according to his own experience and ideas of what these articles should contain or should not contain.

We have all heard of the great question, "What is brandy?" "What is a sausage?" etc. We have asked these questions for a long time, and are still waiting an authoritative answer, and there are still many such questions which we are directly or indirectly asked during the course of our public work and are, moreover, expected to be able to answer. Take recent happenings: which of us can, and is really able to say, what chocolate is according to its composition as we know it—variable to a degree as to content of cocoa pure and simple and sugar pure and simple, to say nothing of having first of all to define what is meant by cocoa or even sugar taken as bases!

Custard powder, again: we all know that common usage has allowed dyed starch suitably flavoured to be sold as custard powder, but we have knowledge that this same stuff when sold as custard, without the qualifying word powder, is brought into the limelight, one tribunal says it is not custard because it does not contain milk, eggs, etc., but another tribunal, when the case is put before them under another limelight of different tint or from a different angle, says, "Of course this is custard right enough"; and all this because we have no definite standard as to the composition of custard or custard powder. One could bring scores of instances wherein from the analysis by different men there is no difference of opinion as to actual analytical findings, but only of interpretation according to experience or ideas of the individual chemists.

If chemists could agree amongst themselves on questions of this kind an advance would have been made, but even then we are liable to be upset by commercial aspects.

It therefore seems that until such time as a possible rapprochement can be arranged between the scientific and commercial interests, the questions will still remain unanswered, and the public will remain in a state of bewilderment.

Much good has been done by the Public Analyst in pioneer work towards obtaining some sort of generally accepted standard of composition in many articles.

The problem is now receiving attention at the hands of our legislators, and two reports of great interest to chemists have appeared during the year in connection with Fertilisers and Feeding Stuffs and Preservatives and Colouring Matters in Food, as the result of the deliberations of Departmental Committees.

Although these two reports are doubtless in the hands of us all, and general findings were duly reported in our journal of August and November respectively, yet they are of such importance that I am tempted to make mention of them.

My respected predecessor in this chair was one of the members of the Committee upon the Food and Drugs Committee, and he is to be congratulated on the publication of such a comprehensive and outspoken Report, as is now before the

country, and it is the earnest hope of everyone connected with the administration of these Acts that the extremely clear recommendations made will, at the earliest moment, be adopted and established beyond question.

As we know, possibly the most important recommendations are that preservatives should be prohibited in all articles of food and drugs exposed for sale, whether manufactured or produced in this country or abroad, except that in certain specified instances, sulphur dioxide may be employed or permitted and benzoic acid in certain others. With regard to boric acid, the Report states in very definite terms that this preservative is highly objectionable.

Then, again, the recommendations as to the use of colouring matters are quite clear and definite, so that if colours are to be employed at all, they must be strictly according to a schedule to be issued by the Ministry of Health.

The final important point in the recommendations of the Committee is that the regulations or statute prohibiting or limiting the use of preservatives and colouring matter should *bind* the Courts in all proceedings taken under the Food and Drugs Acts.

It is most gratifying that this report attracted considerable attention in the Press, and at a later date His Majesty, in opening Parliament, stated through the Cabinet that the Government would proceed with the necessary legislation to give effect to these recommendations.

I assure you that your Council sincerely hopes to be given the opportunity of consulting with the Ministry of Health when this Bill comes before Parliament.

Speaking as a Public Analyst, it certainly does seem somewhat ridiculous that our country should, up to now, have been lacking in legal protection as regards the quantities and nature of preservatives permitted in foods, and the adoption of the recommendations of this Report would afford a necessary protection to the whole of the community, and it is sincerely to be hoped that there will be no undue delay in acting upon these well-considered findings.

It has been my own lot when bringing forward cases of what I honestly considered excessive or improper use of preservatives based upon the law of average derived from past experience, that by sheer weight of numbers of witnesses by whom the Bench hearing the case must of necessity be guided, the case has been thrown out—and again when a case has been successfully proved, an appeal results when the decision is reversed. All this causes huge expense to the local authority merely because we lack a simple standard of quality and nature.

It is unfair to expect the individual analyst to set up standards on his own responsibility, as when asked if he has anything of an official nature to support his contentions, he has to admit that he has none, and that what he says is after all purely a matter of opinion.

I submit, therefore, that, speaking on behalf of those members of our Society who are Public Analysts, the sooner a fresh Act of Parliament, or even regulations embodying these recommendations are made effective, the easier will be our official work; local authorities will be in a better position to deal with food questions as a whole, and the general public will benefit and derive that protection which at

present is withheld from them in not knowing what they may be called upon to consume, even if not to their injury, at any rate distinctly to their prejudice.

The Report of the Committee to enquire into the working of the Fertilisers and Feeding Stuffs Acts, which was summarised in our journal in August, differs from that dealing with foods, inasmuch as the Feeding Stuffs Committee make recommendations of such character that they would hardly appear capable of being met by amending the Act of 1906.

Hence a new Bill will be necessary, which is practically promised, for a further Committee has now been appointed to report upon these recommendations and as to how they may best be carried into effect, and once more your Council sincerely trusts the Society may be given an opportunity of consulting with the Ministry whilst the Bill is under discussion.

There is one legal case of very great interest to the Public Analyst which has been reported in the December ANALYST, in regard to the sale of diluted spirits: I refer to "*Preston v. Grant*," wherein a sample of whiskey 42.26° U.P. was the subject of a prosecution, when the defence relied upon the usual "Notice," and the justices dismissed the case, holding that the mere fact of such "Notice" being exhibited or on the premises, even though unseen by the purchaser, was a protection. The case was taken to the Court of Appeal, when it was held that the mere fact of the "Notice" being exhibited on the premises was *not* sufficient unless the attention of the purchaser was actually drawn to it and that *he understood it*, otherwise no protection would be afforded; the appeal was therefore dismissed, and the case remitted to the original justices to convict.

This, of course, is a most important judgment, and I observe from the *Daily Telegraph* of January 17th, that the London Central Board of Licensed Victuallers have practically unanimously recommended to license holders that it is not desirable for them to sell spirits diluted anything below the limit of 35° U.P., as they realise "the extreme difficulty of framing a notice which will at once afford a reasonable measure of security and prove acceptable to the licensed trade."

It is to be noted, however, that a test case followed almost immediately at Bow Street, January 30th, when the result of the Divisional Court just quoted was put forward.

The solicitor for the defence contended that the printed notice given was sufficient protection to the seller, but Sir Chartres Biron said that there was a considerable distinction between the notice relied upon in that case and the one considered by the Divisional Court. He thought the former was good, provided the dilution was not unreasonable, and having regard to the price charged, he could not hold that there had been unreasonable dilution to the prejudice of the purchaser. The summons was therefore dismissed.

A suggestion has been made by our Publication Committee that it would be desirable to have uniformity of expression with regard to the use of the words "determination" and "estimation," as, whilst we as analysts know precisely the application of the terms, it has been my own experience to be asked if estimation means more or less guess work. Hence uniformity in this matter is desirable, as misunderstanding in the lay mind is always to be avoided, if possible.

It would be impossible and out of place for me to attempt in this address to outline the progress of chemistry as a whole during the year, but I am tempted to ask your indulgence whilst I make passing reference to advances which have been made in the elucidation of problems of supreme interest to chemists in general. The year has produced no new discovery or theory of a sensational character, but much progress has been made in the solution of outstanding problems, and the year has been a fruitful one in the general development of our science.

Investigations continue to be made at Copenhagen on the properties of hafnium, and we are now gaining some degree of familiarity with this new element.

Our knowledge of the constitution of the atom advances, and the information placed at our disposal is being applied with increasing success to the elucidation of valency, and to the explanation of the infinitely varied characteristics of the vast array of carbon compounds in the domain of organic chemistry.

The study of crystal structure by the aid of X-rays is no longer novel, but one cannot refrain from making a brief reference to the extraordinary ingenuity of the work done in this field, and to the beautiful simplicity of the results obtained, whereby we are enabled to form a mental picture of the ordered arrangement in space of the atoms constituting a great number of crystalline compounds.

The methods of X-ray examination of crystal structure have recently been applied to organic compounds, and the results obtained would appear to verify the theories advanced by the pioneers of organic chemistry on the spatial arrangements of the carbon atoms.

A very large amount of work has been performed during 1924 in organic chemistry, and especially noteworthy features from the great mass of published investigations are the researches on the constitution of the carbohydrates, the proteins, and the alkaloids.

The great importance of these classes of compounds fully justifies the continuous and untiring efforts which are being made to obtain a complete understanding of their complicated structure, and, although a great deal has already been done, the investigation in these fields promises to supply organic chemists with ample material for work for many years to come.

The synthesis of carbohydrates, proteins, and alkaloids is being examined from a different angle by workers in photosynthesis, who strive to arrive at the mechanism of the process whereby these complex compounds are formed from atmospheric carbon dioxide, water, and nitrates in Nature's simple and efficient laboratory. The mystery of the reactions taking place in the plant cell are being slowly probed, and one may venture to hope that knowledge gained will enable chemists of a future generation to effect their syntheses by less cumbersome methods than those now in use.

The constant stream of new compounds prepared for the purpose of combating disease proceeds unchecked, and mention should be made of the more efficient methods evolved in 1924 for the extraction of insulin, whereby higher yields are obtained and the cost of the preparation correspondingly reduced.

Researches continue on the properties of vitamins and of the occurrences of

the different classes of these auxiliary food factors in the animal and vegetable kingdoms.

The vitamins are of special interest to chemists engaged in the investigation of food stuffs, and it is satisfactory to note that manufacturers of foods have not been slow to realise their importance from the dietetic point of view.

A glance at the progress of industrial chemistry during the year shows that important advances have been made in several directions. The scientific control of combustion continues to effect economies in the consumption of coal in steam generation, and the increased efficiency thus obtained should have an appreciable effect in the conservation of our available supplies of this great national asset. During the past year increasing use has been made of water power for conversion into energy for industrial purposes, and the great scheme now in progress at Lochaber promises to yield an abundant supply of energy at a reasonable cost.

The war has taught us the supreme importance of an abundant supply of available nitrogen, and this country is no longer dependant for this commodity on the Chile deposits; full details of the new plant at Billingham for the manufacture of sulphate of ammonia are not yet available, but we are informed that no sulphuric acid, as such, is used in the process, advantage being taken of the neighbouring deposits of calcium sulphate; the reaction between this compound and free ammonia being effected by the aid of carbon dioxide from the flue gases. After many vicissitudes the dye industry in England would appear to be making more satisfactory progress, and special reference must be made to the great advances in the preparation of dyestuffs suitable for application to artificial silk. The manufacture of the latter commodity has now attained very considerable importance, and its future success is intimately connected with that of the dye industry. Brief mention may be made of the continued development of the home beet sugar industry, a number of new factories now being in course of construction for the manufacture of sugar from locally grown beet.

Having made this mention of the work of chemists, I am tempted to ask how does the chemist himself fare in these days? It is many years since Alexander Blair wrote of chemists being a class "To whom often very little is given, and of whom very much is required," and to-day it cannot be denied that all is not well with the profession.

As one now getting on in the service, I have observed many changes, not all of which have been for the better either for the public or the private analyst; as for the Public Analyst I am indeed somewhat pessimistic, for not only has it happened that he is expected to do very much more work, to have an intimate knowledge of a much more extended nature than ever, but against this I do not see that fair remuneration or recognition commensurate with the increase of work and knowledge demanded.

Too often, I fear, the Public Analyst to-day is looked upon as a sort of necessary evil and, although so much is expected from him as regards his knowledge and experience, expensive training and, in the case of the part-time man, his heavy expenses for premises, rates, taxes, materials and assistance, etc., yet recent

experiences have proved that there is no balancing factor, or even at times adequate remuneration.

In the case of the whole-time man perhaps things are slightly better in some cases, but these are rare, and with too many appointments now offered there is but little incentive for really good men to apply except for the plain solution of the "bread and butter" problem. Even in the case of Government positions the same thing prevails, and I can but refer to a letter published in a leading daily paper within the last few weeks, drawing attention to the grossly inadequate remuneration paid to men and women of high scientific attainments in the Government service.

The case of the analyst who does not take up public work is, again, one which, to me at any rate, shows cause for alarm; miserably small salaries are the rule, little or no recognition or differentiation between rule-of-thumb men and trained chemists, too much drudgery in many cases, too little scope for originality, too much curbing of energies in the direction of research, even if any opportunity be given for such, and, above all, little or no prospect of advancement.

These things seem to me to shew poor prospects for the younger generation in particular, and, although much has been written and said upon this subject of late, I believe that this feature should be stressed.

In my own laboratory hardly a week goes by without my receiving offers from men of the highest capability and qualifications (I do not mean of necessity academic qualifications, but qualifications of experience of the world and its work), who are forced to offer themselves at salaries which would not be permitted by trades unions for labourers in certain cases.

I appeal, therefore, to those already engaged in analytical chemistry, and especially to teachers of chemistry, to discourage all students who contemplate chemistry as a profession, other than that minority who shew an exceptional aptitude for this type of work and who are, in addition, convinced that the satisfaction of chemistry for its own sake can outweigh the very limited prospect of material success which now obtains.

I would not for one moment suggest that less chemistry should be taught, but rather that students should also be instructed to realise that their training in chemistry will help in very many other walks of life.

Would that I felt I were wrong and had taken a view unduly pessimistic; may be I *am* wrong, but I speak from the experience I have gained in the battle of life and from the commercialism with which I am of necessity more or less imbued from my contact with commercial life as I have found it.

People grumble at fees, expect reports to be given after possibly a glance or sniff at a sample, do not appreciate what has to be done by the analyst before any report of value can be given, and in cases where really valuable information has been furnished, valuable in the sense of what can be made out of it by the client, it is the exception rather than the rule to find even common gratitude. There are, I admit, however, instances to the contrary, and it *has* been my lot to encounter them; the remembrance of them is sweet and refreshing.

The older I get the more sympathetic and possibly pessimistic do I become in regard to this question of the failure of recognition of merit and knowledge, acquired after many years of hard work and honest intention. As a Society, as a Council, as individual members, we can do but very little to remedy this, for we are all more or less in the same boat; a change for the better may come, probably will come in time, but how is not for me to suggest, nor do I see a means of improvement other than that mentioned. Certainly it is not the fault of the training, and certainly, in the vast majority of cases, it is not the fault of the individual chemist, young or old, but the fact remains that the outlook is serious, and my fear is that possibly whilst waiting for a betterment the young chemist may lose heart, even as I myself, one of the older school, am tempted to do.

The Analytical Value of the Melting Point of the Insoluble Volatile Acids from Fats.

BY G. VAN B. GILMOUR, B.Sc. (LOND.), A.R.C.Sc.I., A.I.C.

(*Read at the Meeting, December 1, 1924.*)

IN the analysis of margarines or of adulterated butters it is often desirable to determine the amounts present respectively of coconut and palm kernel fats. Text-books fail to give any quantitative method of determining them when occurring together, with the result that the figure for the insoluble volatile acids obtained by distillation is often considered for calculation purposes as due to coconut fat alone, and, as there is a big difference between the distillation figures of coconut and palm kernel fat, results therefore can be considerably in error, unless a method is used for differentiating between them. Such a method has been published (Blichfeldt, *J. Soc. Chem. Ind.*, 1919, **38**, 150T), but its actual value has never been investigated. Blichfeldt suggested that by taking into consideration the melting point of the insoluble volatile acids from a fat mixture, together with its distillation figures, the amounts of coconut and palm kernel fats could each be calculated. Stokoe (*J. Soc. Chem. Ind.*, 1921, **40**, 57T) has modified Blichfeldt's method somewhat by determining the seeding-point or setting point of the acids instead of the melting point. Both methods, which seem to give very similar results, are based on a linear relationship existing between the melting points or seeding points and the relative percentages present of coconut and palm kernel fats. Neither Blichfeldt nor Stokoe claims for his method a fine degree of accuracy, but their figures seem to indicate that satisfactory results can be obtained. After considerable experience in the use of Blichfeldt's method the author came to the conclusion that its value was limited, and the present investigation was undertaken primarily to determine its worth. In this communication the Blichfeldt procedure, which is

the simpler and less expensive of the two, was followed, and doubtless the defects pointed out below will equally apply to the method of Stokoe.

A considerable number of melting point determinations was made for both pure fats and mixtures, and these are shown in Tables I.-XII.

The insoluble volatile acids in each case were obtained from 5 grms. of fat saponified and distilled according to the method of Blichfeldt (*loc. cit.*) and Gilmour (ANALYST, 1921, 41, 183). The acids were allowed to solidify in capillary tubes for 24 hours at a temperature of about 3° C., and the melting points were then determined by means of Blichfeldt and Thornley's apparatus (ANALYST, 1921, 46, 180). The melting point of the acids from coconut fat varies from 8 to 11° C., and for palm kernel from 21 to 24° C.

The average total distillation figure for coconut fat by Blichfeldt's method is 21.0, and 13.5 for palm kernel fat. The total distillation figures for the mixtures shown in Table I to IX were calculated, whilst those in Tables X and XI were determined.

TABLE I.

MIXTURES OF COCONUT AND PALM KERNEL FATS.

| Coconut fat Per Cent. | Palm kernel fat. Per Cent. | Total Distillation Figure. | Melting Point of Insoluble Volatile Acids. °C. |
|--------------------------|----------------------------------|----------------------------------|---|
| 100 | 0 | 21.0 | 9.6 |
| 90 | 10 | 20.2 | 9.7 |
| 80 | 20 | 19.5 | 11.1 |
| 70 | 30 | 18.7 | 12.5 |
| 60 | 40 | 18.0 | 14.2 |
| 50 | 50 | 17.2 | 15.0 |
| 40 | 60 | 16.5 | 16.6 |
| 30 | 70 | 15.7 | 17.5 |
| 20 | 80 | 15.0 | 20.0 |
| 10 | 90 | 14.2 | 20.9 |
| 0 | 100 | 13.5 | 21.6 |

TABLE II.

MIXTURES OF COCONUT FAT AND ARACHIS OIL.

| Coconut fat, Per Cent. | Arachis oil. Per Cent. | Total Distillation Figure. | Melting Point of Insoluble Volatile Acids. °C. |
|---------------------------|---------------------------|----------------------------------|---|
| 100 | 0 | 21.0 | 10.0 |
| 80 | 20 | 16.9 | 10.1 |
| 60 | 40 | 12.8 | 11.0 |
| 40 | 60 | 8.7 | 14.5 |
| 20 | 80 | 4.6 | 17.8 |
| 10 | 90 | 2.6 | 17.8 |
| 0 | 100 | 0.5 | 32.1 |

TABLE III.

MIXTURES OF COCONUT FAT AND COTTON SEED OIL.

| Coconut fat Per Cent. | Cotton seed oil Per Cent. | Total Distillation Figure | Melting Point of Insoluble Volatile Acids. °C. |
|--------------------------|---------------------------------|---------------------------------|---|
| 100 | 0 | 21.0 | 10.0 |
| 80 | 20 | 17.1 | 10.0 |
| 60 | 40 | 13.2 | 12.2 |
| 40 | 60 | 9.4 | 15.0 |
| 20 | 80 | 5.5 | 15.0 |
| 10 | 90 | 3.5 | 18.1 |
| 0 | 100 | 1.6 | 32.5 |

TABLE IV.

MIXTURES OF COCONUT FAT AND JUS.

| Coconut fat. Per Cent. | Jus. Per Cent. | Total Distillation Figure. | Melting Point of Insoluble Volatile Acids. °C. |
|---------------------------|-------------------|----------------------------------|---|
| 100 | 0 | 21.0 | 10.0 |
| 80 | 20 | 16.9 | 10.0 |
| 60 | 40 | 12.9 | 12.0 |
| 40 | 60 | 8.8 | 14.0 |
| 20 | 80 | 4.8 | 16.0 |
| 10 | 90 | 2.7 | 26.0 |
| 0 | 100 | 0.7 | 42.0 |

TABLE V.

MIXTURES OF COCONUT FAT AND LARD.

| Coconut fat. Per Cent. | Lard. Per Cent. | Total Distillation Figure. | Melting Point of Insoluble Volatile Acids. °C. |
|---------------------------|--------------------|----------------------------------|---|
| 100 | 0 | 21.0 | 10.0 |
| 80 | 20 | 16.9 | 10.3 |
| 60 | 40 | 12.8 | 12.0 |
| 40 | 60 | 8.8 | 14.8 |
| 20 | 80 | 4.7 | 19.0 |
| 10 | 90 | 2.6 | 26.1 |
| 0 | 100 | 0.6 | 45.1 |

TABLE VI.

MIXTURES OF PALM KERNEL FAT AND ARACHIS OIL.

| Palm kernel fat. Per Cent. | Arachis oil. Per Cent. | Total Distillation Figure | Melting Point of Insoluble Volatile Acids. °C. |
|-------------------------------|---------------------------|---------------------------------|---|
| 100 | 0 | 13.5 | 21.4 |
| 80 | 20 | 10.9 | 21.3 |
| 60 | 40 | 8.3 | 22.7 |
| 40 | 60 | 5.7 | 22.7 |
| 20 | 80 | 3.1 | 22.7 |
| 10 | 90 | 1.8 | 20.4 |
| 0 | 100 | 0.5 | 32.1 |

TABLE VII.

MIXTURES OF PALM KERNEL FAT AND COTTON SEED OIL.

| Palm kernel fat, Per Cent. | Cotton seed oil, Per Cent. | Total Distillation Figure. | Melting Point of Insoluble Volatile Acids, °C. |
|-------------------------------|----------------------------------|----------------------------------|---|
| 100 | 0 | 13.5 | 21.4 |
| 80 | 20 | 11.1 | 21.8 |
| 60 | 40 | 8.7 | 22.4 |
| 40 | 60 | 6.4 | 22.4 |
| 20 | 80 | 4.0 | 19.9 |
| 10 | 90 | 2.7 | 21.5 |
| 0 | 100 | 1.6 | 33.6 |

TABLE VIII.

MIXTURES OF PALM KERNEL FAT AND JUS.

| Palm kernel fat, Per Cent. | Jus. Per Cent. | Total Distillation Figure. | Melting Point of Insoluble Volatile Acids, °C. |
|-------------------------------|-------------------|----------------------------------|---|
| 100 | 0 | 13.5 | 21.2 |
| 80 | 20 | 10.9 | 21.7 |
| 60 | 40 | 8.4 | 21.7 |
| 40 | 60 | 5.8 | 21.0 |
| 20 | 80 | 3.3 | 21.0 |
| 10 | 90 | 2.0 | 28.0 |
| 0 | 100 | 0.7 | 42.0 |

TABLE IX.

MIXTURES OF PALM KERNEL FAT AND LARD.

| Palm kernel fat, Per Cent. | Lard, Per Cent. | Total Distillation Figure. | Melting Point of Insoluble Volatile Acids, °C. |
|-------------------------------|--------------------|----------------------------------|---|
| 100 | 0 | 13.5 | 21.4 |
| 80 | 20 | 10.9 | 22.2 |
| 60 | 40 | 8.3 | 22.2 |
| 40 | 60 | 5.8 | 22.2 |
| 20 | 80 | 3.2 | 22.1 |
| 10 | 90 | 1.9 | 26.3 |
| 0 | 100 | 0.6 | 45.1 |

For the effect of butter fat on the melting point of the insoluble volatile acids from coconut and palm kernel fats see Gilmour (*ANALYST, loc. cit.*).

MIXTURES OF COCONUT AND PALM KERNEL FATS.—Table I. gives the melting points and calculated total distillation figures for a series of mixtures of coconut and palm kernel fats. Each melting point is the mean of eight determinations. The repeats in no case agreed closely, and occasionally differed by as much as 2° C. An approximate linear relationship is obtained if the melting points are plotted

against increasing percentage additions of palm kernel to coconut fat or *vice versa*. When it is possible for the melting point to vary by 2° C. the corresponding error from such a graph will be 15 per cent. This error can be corrected to some extent by calculating the total distillation figure that the percentages read off the graph would give. Should the calculated figure be approximately the same as that actually determined, the percentages would be fairly correct, but, if they differed, the percentages must be altered until the calculated and observed total figures agree. By making this correction the error will not exceed 5 per cent.

The following is an example:—A mixture of coconut and palm kernel fats gave a total distillation figure of 17.2, and the melting point of the insoluble volatile acids was 14.2° C. The melting point 14.2° C., on the graph of Table I. results, indicates the mixture to contain 40 per cent. of palm kernel and 60 per cent. of coconut fat. The calculated total distillation figure for these percentages would be 18.0. This figure is higher than the observed one of 17.2, and to correct it the percentage of palm kernel fat will have to be increased and that of coconut fat decreased. A mixture of 50 per cent. of palm kernel fat and 50 per cent. of coconut fat would give a calculated total distillation figure of 17.2, and these are the percentages present.

MIXTURES OF COCONUT AND PALM KERNEL FATS WITH OTHER FATS.—Although the fats used in admixture with coconut and palm kernel fats in Tables II.–IX. give rise to very small amounts of volatile acids, the melting points of these acids are high, and this is true for nearly all the ordinary edible oils and fats other than those of the coconut group (see Table XII.) Accordingly when coconut and palm kernel fats are present in fat mixtures in large amounts, the volatile acids from the remaining fat should have little influence on the melting point, and *vice versa*. The tables bear this out, for when the concentration of the coconut fat is above 70 per cent., the influence is slight, but when the percentage drops the melting point steadily rises. In the case of palm kernel fat the melting point is influenced very little down to 20 per cent., but below this it can rise considerably. Blichfeldt ignored the effect of the volatile acids from fats other than those of the coconut group, assuming that the melting point would remain practically constant in each of the Tables II.–IX., and that therefore in a mixture containing coconut, palm kernel and other fats the melting point read off the graph of Table I. results gave him the relative proportions of coconut and palm kernel fat, and, knowing the total distillation figure, he calculated the percentage of each. It can be seen from the tables that this will only be approximately true when the sum of the percentages of coconut and palm kernel fats is large; when the sum is small, the palm kernel will be much over-estimated, as shown in the following example:—

A mixture was made up containing $22\frac{1}{2}$ per cent. of palm kernel fat, $7\frac{1}{2}$ per cent. of coconut fat, and 70 per cent. of lard. The melting point of the insoluble volatile acids was found to be 20.8° C. From the graph of Table I. results such a melting point indicates that the quantity of palm kernel fat in the mixture is about 9 times that of the coconut.

It is also possible that when coconut fat is present in small amounts and palm kernel is absent the former might be mistaken for the latter; instances are No. 6 in Tables IV. and V.

CONCLUSIONS.—The following were the conclusions arrived at as to the value of the Blichfeldt method:—

1. In mixtures containing only coconut and palm kernel fats the determination of the melting point of the insoluble volatile acids enables the quantity of either fat to be estimated to within 5 per cent. of the actual amount present.

2. In mixtures containing coconut or palm kernel fat or both, and at the same time other fats, (1) holds when the per cent. of coconut group fats is above 70. When the per cent. is below 70, the method is not sufficiently accurate to enable the coconut and palm kernel fats to be separately determined, but they can be estimated together as the percentage of coconut group fats with an accuracy of approximately 5 per cent. When mixtures come under this category the melting point will often indicate whether coconut or palm kernel fat or both fats are present, and also which of the two predominates.

To determine the percentage of coconut group fats the following method gives the best results:—If coconut fat predominates, calculate the total distillation figure as due to coconut and palm kernel in the proportions of 3 to 1 respectively, or as near to this proportion as the distillation figure will allow. Now add the two percentages arrived at and this sum will be the percentage of coconut group fats present. If palm kernel predominates calculate in a similar manner. If there should be uncertainty as to which is in excess or as to which is present, consider them in equal proportions.

DETECTION OF SMALL AMOUNTS OF COCONUT GROUP FATS.—The total distillation figures for most fats other than those of the coconut group are generally small. Occasionally abnormal figures are obtained. It has been pointed out that some of the higher figures published most likely have resulted from allowances not being made for the glycerin blank, but often, even when this is taken into account, abnormally high figures are met with. It is the author's opinion that in most of these cases contamination with coconut or palm kernel fat has taken place. In many instances it would be impossible to detect this by present analytical methods, because the physical and chemical constants of any fat are sufficiently variable not to indicate a slight adulteration of an average sample. It is fairly evident from results obtained that the melting point of the insoluble volatile acids from any fat, excluding hardened oils, is more or less constant, and that the addition to the fat of small amounts of coconut and palm kernel fats will have a pronounced effect upon the melting point. Examples illustrating this are shown in Tables X. and XI. It is considered that by determining the melting point of the insoluble volatile acids as little as 2 per cent. or even less, contamination with coconut or palm kernel fat can be detected.

TABLE X.

| Sesame oil. Per Cent. | Coconut fat. Per Cent. | Total Distillation Figure. | Melting Point of Insoluble Volatile Acids. °C. |
|--------------------------|---------------------------|----------------------------------|---|
| 100 | 0 | 0.3 | 31.3 |
| 99 | 1 | 0.5 | 30.2 |
| 98 | 2 | 0.6 | 26.0 |
| 97 | 3 | 0.9 | 23.5 |
| 96 | 4 | 1.1 | 19.0 |
| 95 | 5 | 1.4 | 18.5 |

TABLE XI.

| Sesame oil. Per Cent. | Palm kernel fat. Per Cent. | Total Distillation Figure. | Melting Point of Insoluble Volatile Acids. °C. |
|--------------------------|-------------------------------|----------------------------------|---|
| 100 | 0 | 0.3 | 31.3 |
| 99 | 1 | 0.5 | 31.0 |
| 98 | 2 | 0.7 | 28.3 |
| 97 | 3 | 0.8 | 28.0 |
| 96 | 4 | 0.9 | 23.5 |
| 95 | 5 | 1.1 | 22.0 |

The melting point of the insoluble volatile acids of a number of oils and fats are given in Table XII., also the melting points of the fats and of the fatty acids before distillation.

TABLE XII.

| Oil or Fat. | Melting Point of Insoluble Volatile Acids. °C. | Melting Point of Fatty Acids. °C. | Melting Point of Fat. °C. |
|---|---|---|---------------------------------|
| Arachis | 32.1 | 32.0 | Liquid at ord. temp. |
| Cotton | 33.0 | 34.9 | " " " |
| Sesame | 31.8 | 23.5 | " " " |
| Whale | 27.2 | 24.0 | " " " |
| Rape | 13.5 | 19.2 | " " " |
| Palm | 46.4 | 44.2 | 37.5 |
| Oleo | 40.0 | 41.9 | 35.7 |
| Jus | 41.8 | 46.8 | 48.1 |
| Stearine (beef) | 43.2 | 48.6 | 53.1 |
| Lard | 45.8 | 41.9 | 41.3 |
| Hardened arachis | 57.2 | 61.4 | 61.7 |
| Hardened Whale (1) | 36.0 | 38.2 | 41.2 |
| " " (2) | 37.3 | 42.7 | 44.0 |
| " " (3) | 48.2 | 54.5 | 53.5 |
| 10 per cent. Coconut + 90 per cent. hardened arachis | 21.0 | 35.4 | 37.3 |
| 2 per cent. Coconut + 98 per cent. hardened arachis | 27.2 | 40.7 | 42.9 |

The melting points are lower for liquid oils than for solid fats. In the case of hardened oils the melting point rises as the hardening increases; for instance, arachis oil gives insoluble volatile acids melting about $32\cdot0^{\circ}$ C., whereas those from the fully hardened product melt above $57\cdot0^{\circ}$ C. The effect of coconut fat on moderately hardened arachis was found to be quite appreciable.

COMPOSITION OF INSOLUBLE VOLATILE ACIDS.—No information in the chemical literature of oils and fats could be found as to the composition of the insoluble volatile acids from fats not containing acids of lower molecular weight than myristic acid. A reference in "Fatty Foods," by Bolton and Revis, states that "though the Polenske value is governed almost entirely by glycerides of the lower fatty acids, in practice such acids as myristic and palmitic play a small part." Why these acids should be referred to, and oleic, which forms such a large part of many fats, not mentioned confirms the view that little or no work has been done in this direction. In the course of the present investigation the low melting points of the insoluble volatile acids in the case of rape, whale, cotton, arachis, and sesame oils seemed to indicate that the unsaturated acids play as big a part as the saturated. This was confirmed by determining the iodine values of the insoluble volatile acids in a few cases. To obtain sufficient of the acids for an iodine value determination for cotton and arachis oils the acids had to be collected from about 20 distillations. The results were as follows:—

| Oil or Fat. | Iodine value of the Insoluble Volatile Acids. |
|--|---|
| Coconut | 1·2 |
| Palm kernel | 1·9 |
| Cotton | 71·1 |
| Arachis | 82·3 |
| Margarine mixture (containing coconut) | 9·9 |

The conclusion drawn is that in most distillations a certain amount of unsaturated acids comes over. In the case of fats that do not contain acids of lower molecular weight than myristic and have high iodine values, the greater portion of the insoluble volatile acids is unsaturated.

The author's thanks are due to the Maypole Margarine Works, Ltd., for the facilities given him to carry out this investigation.

The Use of Mitchell's Ferrous Tartrate Reagent in Qualitative Analysis.

By ALAN H. WARE.

(Read at the Meeting, December 1, 1924.)

GENERAL.—The author finds that the ferrous tartrate test, either as used by Mitchell (ANALYST, 48, 1923, 2) or in a new modification to be described, is of very great value in the qualitative analysis of vegetable substances.

It is preferable to use distilled water, both in making the vegetable extractive and for the reagent; and then, the reagent having been added to the extractive (not in excess), to use very dilute alkali (0.1 *N* or weaker) in sufficient quantity to give the maximum intensity of violet coloration. It will be found that fresh aqueous extractives containing pyrogallol tannin or hæmatoxylin (logwood) will give more or less colour without the addition of alkali, but that an intenser colour is given on the careful addition of very dilute alkali. This is particularly well seen if pharmaceutical extractives are diluted and tested. For example, tincture of hamamelis or a concentrated decoction of logwood give a very poor colour in the test, even with very many tap-waters, but a very good violet colour is yielded if distilled water and sufficient alkali are used.

With catechol derivatives alkali is absolutely essential. Judging by extractives containing them, these derivatives appear to require a greater addition of alkali than is necessary in the case of pyrogallol tannins; and if equivalent solutions of different alkalis are compared, it will be found that the amounts required to give a maximum intensity of violet colour differ in the case of different alkalis.

Both pyrogallol tannins and catechol tannins in extractives agree in showing with excess of alkali the change, described by Mitchell, from a blue-violet to an intense reddish coloration.

The following is a complete list of plant products which up to the present have been found to give a good violet colour reaction with the reagent, if tested in fresh aqueous solution or extractive: Gallic acid, hæmatoxylin (pure or in logwood extractive), brazilin (pure or in sappan-wood extractive), some anthocyanins in extractives free from tannins (*e.g.* scarlet poppies), all tannins (*i.e.* judged by the large number of extractives tested), the catechins (isolated), and ipecacuanhic acid (in ipecacuanha extractives). These are markedly distinguished from certain catechol compounds, which resemble the catechol tannins and catechins in giving a green colour reaction with ferric alum, but do not give the violet colour-reaction with Mitchell's reagent. Among such bodies are the iron-greening anthoxanthins (quercetrin and rutin tested isolated and others in the form of extractive), caffeotannic acid (judging by *nux-vomica* extractives), and the so-called tannins of hops

and *Viburnum prunifolium* bark (as tested in extractives of these bodies). These all give a deep-brown coloration in the test.

The difference between ipecacuanhic acid and caffee-tannic acid is very interesting, and seems to imply that the former is more closely allied to catechin and the tannins than the latter. Both bodies agree, however, in giving none of the more specific reactions of true tannins, for they give a negative result both in the goldbeater's skin test and in the ferric citrate precipitation test (ANALYST, 1924, 49, 467). Also, unlike the phlobatannins, they are not precipitated by boiling with formaldehyde and dilute hydrochloric acid. The violet coloration given by ipecacuanha extractives is of considerable pharmacognostic importance, as it may be readily obtained with the diluted and filtered pharmaceutical extract, even if this has been kept for some years. Unfortunately this is not the case with pharmaceutical extractives containing catechol-tannin. Unlike fresh extractives of the same drugs, and also unlike many pharmaceutical gallo-tannin extractives, they seldom give a good violet colour-reaction in the test. This is due, in part, to the dehydration which the catechol tannins undergo when alcoholic preparations or preparations concentrated by heat are made, and partly to the presence, in considerable quantity in some cases, of iron-browning phenols.

A METHOD OF DISTINGUISHING TRUE GALLOTANNINS FROM OTHER PYROGALLOL-TANNINS (NON-PHLOBATANNIN).

If aqueous extractives of vegetable substances containing tannins are boiled with Mitchell's reagent and dilute acetic acid (added after the reagent), two groups of such substances may be distinguished, giving quite different colour-reactions. The substances in one group give a very decided, and often very intense, violet to blue colour-reaction; whilst those in the other group may give either no colour or a green to green-brown, according to the nature of the substance, degree of dilution, etc. The author finds that certain ellagitannin compounds, which contain either very little or no gallotannin, tend to give varying results in this test, unless special precautions to be described are observed. With these precautions such compounds fall into the second group—that is, substances giving negative results.

METHOD OF TESTING.—The ferrous tartrate reagent should be made with ferrous sulphate and Rochelle salt, which at least answer the British Pharmacopœia requirements with respect to purity, and distilled water must be used both for the reagent and extractive. The reagent should not be added to the extractive in any considerable excess; the dilute acetic acid, on the contrary, is added in very distinct excess. In the first method adopted, the acetic acid is added after the reagent, and the mixture is then boiled and subsequently cooled under the tap. This method possesses the advantage that the colour given by the reagent before adding the acetic acid may be noted, and also the effect of the acid upon the colour before the liquid is boiled. It will be found that the substances which give a violet in the complete test, with acid, all give a decided violet colour with the reagent in neutral solution; that this colour very much lessens or

actually disappears on adding the acetic acid and shaking, but that the colour very markedly returns on boiling, and especially after cooling the boiled mixture. The disadvantage of this method is, that it is necessary thoroughly to rinse test-tubes, fingers, etc., and even the material to be extracted, with distilled water before commencing the test. Such strict precautions do not appear to be necessary if the process is to some extent reversed. That is, the solution or the extractive is made in the presence of the acetic acid. The extractive is then cooled, and the reagent added. If this method is used, there must be *no final* boiling, or else some degree of purple or violet coloration may be given by bodies which do not give it in the cold. Under these conditions the results are the same as in the first process, except that the colour given is blue rather than violet.

RESULTS.—By either process, certain pyrogallol tannin derivatives can be distinguished from all others by giving a violet (first method) or blue (second method) in the completed test. The colour, so given, is often much more intense than that given by the ordinary method of testing with the reagent (with the use of tap-water with no added acid or alkali). The substances so far included in this group are:—Commercially pure gallotannic acid, Turkish galls (Aleppo and Basra), Chinese galls, valonia, sumach (true), divi-divi, the kinos from *Eucalyptus microcorys* and *E. maculata*, and probably the tannin of red rose petals, but this last is uncertain, since some anthocyanins apparently give the same result in the test as the gallotannins.

To the second group, giving no definite blue or violet colour-reaction in the test, belong: Gallic acid (recrystallised pure), the bark and leaves of *Hamamelis virginica*, logwood, bearberry leaves (*Arctostaphylos uva-ursi*), and ordinary commercial cloves. Certain ellagitannin extractives, which contain either very little or no true gallotannin, are most properly included also in this group, although they may on occasions, with strong extractives, show a blackish colloidal precipitate with some tinge of purple or violet. These substances are Knopperrn galls, myrobolans, algarobilla, and pomegranate root-bark and fruit-rind. With extractives not too strong, and with the precautions described, the colour given by these, after the addition of acetic acid in the cold, is often a very distinct and definite green. This is particularly the case with myrobolans and pomegranate root-bark.

The quite negative results given by typical gallic acid tannin bodies, like hamamelis bark and hamamelis and bearberry leaves, make it fairly evident that there is a class of gallic-acid tannin bodies different in character from the typical digallic acid tannins of Chinese and Turkish galls. The author suggests that the term gallotannin be confined to those tannins which give the blue or violet colour-reaction in the new modification of Mitchell's test.

It is interesting to note that gallic acid, phlobatannins (even those which are iron-blueing), hæmatoxylin and brazilin give no purple, blue or violet coloration in the test; and that they yield, in fact, no distinctive result whatever.

The test affords a delicate method of detecting ordinary gallotannin in gallic acid. Probably very few commercial samples will completely satisfy the requirements of the test. The author has examined, however, a pure specimen of

the acid recrystallised by himself, which gave an absolutely negative result, a colourless solution being yielded, if all the precautions previously outlined were adopted. These precautions are necessary, or else pure gallic acid, like the ellagitannin extractives already referred to, may give a more or less pronounced violet coloration. With plant extractives, however, there does not, so far as the author's experience goes, appear to be the least danger of gallic acid simulating gallotannin. *Acacia decurrens* bark and bearberry leaves, e.g. each of which contains much gallic acid as well as iron-blueing tannin, give not the slightest positive indication in the test, even if no very special precautions are taken with respect to rinsing with distilled water.

It is obvious that the practical method of classifying pyrogallol tannin substances, indicated in this paper, will be of considerable service in the identification of tanning materials and drugs containing tannins, especially if they should be in crushed powdered or extractive form. In this connection I must thank Dr. Nierenstein for kindly sending me authentic samples of the kinos, catechins and most of the tanning materials used.

UNIVERSITY COLLEGE, EXETER.

Notes.

The Editor wishes to point out that the pages of the Journal are open for the inclusion of short notes dealing with analytical practice and kindred matters. Such notes are submitted to the Publication Committee in the usual manner.

THE SAFEGUARDING OF SEALS.

(Abridged from the paper read at the Meeting December 1, 1924.)

IN view of the fact that seals have been known to be forged, the following scheme is suggested for rendering it more difficult to tamper with them.

Taking the case of an inspector under the Food and Drugs Acts, he will be provided with, say, a dozen bottles of ink labelled merely with letters of the alphabet A-L; each of these inks will contain in solution some substance easily recognisable in minute quantity by a simple test; no two of the bottles being alike. To seal his sample, he will make the ordinary wax seal, but will allow it to cool without stamping it; he will then write his initials on the seal in ink from one of his bottles chosen at random, and will note down the letter distinguishing the bottle. If the sample is disputed, a specimen of the inspector's signature and the name of the key substance will be sent privately to the referee analyst, who, after comparing the initials, will wash the ink off the wax with a little water, and test for the substance of which he has been informed; its absence will denote forgery of the seal.

Minor points, such as the protection of the seals by capsules, will readily suggest themselves and the precise substances to be added to the ink are a matter for deliberation.

B. S. EVANS.

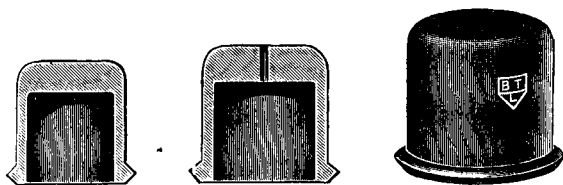
DYEING PROPERTY OF TOMATOES.

A REPUTABLE firm recently sent me a sample of a large parcel of tomato sauce which had been exported to the Argentine, but had been rejected by the Argentine authorities on account of the fact that it dyed wool, and in consequence they stated that it contained "tar dyes," which, I understand, are prohibited in food-stuffs in that country. The firm assured me that they had used no dye, and actually told me the ingredients used in making the preparation. I therefore examined the sauce for "tar" aniline dyes, and found that it gave a positive result in dyeing wool by the usual methods. Being once more assured by the firm that they had not used aniline dyes, I applied the test to fresh tomatoes, which I extracted under the same conditions; the extract also gave a positive result. It therefore seems probable that, if tomato sauce does not give a positive test in a wool-dyeing test, it contains no tomato pulp.

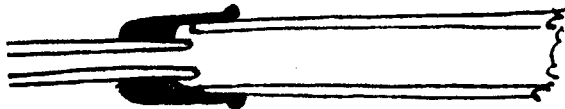
H. E. BURGESS.

RUBBER STOPCAPS.

THESE are designed to slip over the neck of a flask or bottle:—(1) A smaller range of sizes suffice, as the rubber is stretched and not compressed; (2) Stopcaps are more easily bored for taking tubes, as there is a smaller thickness of rubber to cut through; (3) They are more flexible than stoppers and allow of tubes passing into flasks or bottles to be deflected at a greater angle without risk of breakage; (4) They hold more firmly to the neck of the flask, and can easily be wired on or held with an elastic band, if necessary. The bead round the bottom edge facilitates this.



The smaller sizes are particularly useful for connecting tubes of different diameters. This is very difficult with ordinary stoppers when the tubes are small and of nearly the same diameter.



The stopcaps are made of red rubber, as this colour is usually preferred. Apparently chemists, as well as the general public, imagine that red rubber is better than gray, black or other colours. The red colour of rubber is usually obtained, as is well known, by incorporating sulphide of antimony, a substance which is attacked both by acids and alkalis, and is consequently not an ideal material for incorporating with rubber in the manufacture of rubber stoppers. Moreover, the ordinary rubber stopper is made up with a large proportion of sulphur which, after manufacture, "blooms" on the surface, covering the rubber with a white deposit. An ideal rubber stopper should not contain easily decomposable substances, such as antimony sulphide, or an excess of sulphur. Such stoppers can be obtained, as I have proved by experience, but the colour is a dull brown and unattractive. If desired, a small quantity of carbon black can be incorporated, or even a red pigment (not antimony sulphide).

HENRY P. STEVENS.

HALPHEN'S COTTON SEED OIL TEST.

ALTHOUGH most chemists now apply the Halphen test in hermetically sealed tubes, the British Pharmacopœia still directs that an open tube should be used. In comparative tests upon an oil said to contain 2 per cent. of cotton seed oil the B. P. method gave a result from which one would have hesitated to say that there was more than that amount present; but by the closed method, and on comparison with a mixture containing a known quantity, at least 10 per cent. of cotton seed was indicated.

F. F. SHELLEY.

APOTHECARIES HALL, BLACKFRIARS, E.C.4.

Legal Notes.

Under this heading will be published notes on cases in which points of special legal or chemical interest arise. The Editor would be glad to receive particulars of such cases.

ADULTERATION OF WHITE LEAD PAINT.

ON December 12, 1924, a London firm of paint manufacturers was summoned at the Guildhall, E.C., at the instance of the Secretary of the White Lead Makers' Section of the London Chamber of Commerce, under section 2 of the Merchandise Marks Act, 1887, for (a) applying a false trade description, namely, white lead, to a mixture of sulphate of barium and other substances, and (b) selling the goods under such description.

Mr. Trevor-Watson, on behalf of the complainant, said that the defendants had been placing upon the market an article labelled "Signpost Special White Lead Paint," the solid matter of which was composed mainly of sulphate of baryta and, indeed, contained only 21 per cent. of white lead. The London Chamber of Commerce had, for many years, been taking action where necessary in order to make sure that a paint containing an adulterant should not be sold as a white lead paint. Having, therefore, by bringing the case into the Court, drawn attention to the matter, they were willing to withdraw the prosecution, upon terms, the main articles of which were an undertaking by the defendants not to continue the practice, the payment of costs, the withdrawal of all labels at present in use, and the supply of new labels in their place bearing a description approved by the complainant.

Mr. Walter Frampton, for the defendants, said that their attention had been drawn to the matter by the London Chamber of Commerce in the previous January, when, on consulting their solicitors (not those subsequently employed), they were advised that the description was not incorrect from a legal point of view. There had since, however, been an important decision in the Divisional Court, in what was known as the Selfridge case, in regard to misdescription under the Merchandise Marks Act, 1887 (*cf.* ANALYST, 1925, 68), and the defendants, having taken further legal advice, approached the prosecutor and made the offer which had been mentioned by his friend. The last thing they wished to do was to mislead the public—the trade would not be misled.

The summons was then formally withdrawn by consent of the presiding magistrate.

SALE OF WHISKEY WITH NOTICE OF DILUTION.

ON January 30th a licensed victualler was summoned at Bow Street Police Court, under the Food and Drugs Acts, for the sale of whiskey that was found, on analysis, to be 48 deg. below proof. The price charged was lower than that usually charged for spirits 35 deg. below proof, and it was proved that a notice was displayed in the bars in the following terms:—"All spirits sold at this establishment are sold as diluted spirits, no alcoholic strength guaranteed."

Council for the Westminster City Council submitted that, although such a notice had always been regarded as sufficient protection, a recent High Court decision (*cf.* ANALYST, 1924, 49, 581) had shown that it could not be accepted as a protection.

The Magistrate (Sir C. Biron) pointed out that there was a distinct difference between the case decided in the High Court and the present case. Here the defendant had not sold the spirit at an unreasonable degree of dilution, as was shown by the price. Under such conditions he regarded the notice as affording protection, and dismissed the summons.

SALE OF CHLORODYNE.

ON February 12, a druggist was summoned at Bradford for 3 offences under the Dangerous Drugs Act.

Evidence was given that he had sold a 6 oz. bottle labelled "Chlorodyne," the contents of which contained 0.53 per cent. of morphine, whereas not more than 0.2 per cent. was allowed.

For the defence it was pointed out that the defendant had been selling this preparation for 38 years, and had not realised that he was infringing the Act.

He was fined £105, with £21 Is. costs.

Ministry of Health.

SOLUBILITY OF GLAZES AND ENAMELS USED IN COOKING UTENSILS.*

REPORTS ON PUBLIC HEALTH AND MEDICAL SUBJECTS.

By G. W. MONIER-WILLIAMS.

GLAZED WARE.—Leadless glazes are used by the great majority of English manufacturers, but cheap imported ware (which comes chiefly from France) and some ware produced by small local potteries is made with lead glaze, for the use of which, however, there appears to be no real necessity. Series of experiments were conducted with lead glazed vessels whereby the amount of lead going into solution on heating for definite times with 1 per cent. solutions of citric acid was determined. Results were uniformly high with French Alps (Vallauris) ware, reaching 26.5 mgrms. of lead per sq.dm. of exposed surface, lower with Lille ware (but considerable variations were found), lower still with Digoin ware (maximum 8.8 mgrms, per sq.dm.), and lowest with English ware (usually below 1 mgrm.). A maximum amount of lead going into solution is reached after a certain time, but

* Obtainable from Adrastal House, Kingsway, W.C.2. Price 6d. net.

successive digestions with new citric acid solutions cause further amounts to go into solution, sometimes even exceeding the first amount. Six successive treatments were carried out with two vessels, and the same proportion of lead was found in the solution after the first treatment and after the sixth. In order to approximate to domestic conditions more closely, typical food stuffs were cooked in some of the Alpes ware and the lead determined in the sulphated ash of representative samples before and after cooking. Results differed considerably in two series of experiments; in the first series the lead was in the neighbourhood of 0·3 and 0·4 part per 100,000 of foodstuff, and in the second between 0·01 and 0·04. The same casseroles were subsequently treated with 1 per cent. citric acid solutions, but the results did not bear out the difference between the series, and the difficulties of drawing conclusions from prolonged heating with citric acid are pointed out. Undoubtedly the glazes tested are fairly resistant to the solvent action of foodstuffs under ordinary conditions, but prolonged heating with acid solutions may entail decided and dangerous risks.

ENAMELLED HOLLOW-WARE VESSELS.—Seven vessels coated with enamels of different compositions were treated with 1 per cent. citric acid solutions for 4 hours at a temperature just below boiling point, and the solutions examined. In several cases the solutions were yellow, apparently due to penetration of the acid to the iron of the vessels through minute cracks. In most cases aluminium and iron formed the major part of the material dissolved. The highest amount of tin found was less than 0·2 grain per lb., and of antimony (only present in two enamels) 0·07 grain per lb. A noticeable result was the high proportion of boric acid that may be dissolved. In one case (a mottled grey enamelled frying pan) this reached 0·56 per cent. in the citric acid solution. On the whole, however, it is considered unlikely that undesirable constituents would be dissolved from enamelled hollow-ware during ordinary cooking operations.

D. G. H.

USE OF PRESERVATIVES AND COLOURING MATTERS IN FOOD.

THE Minister of Health, the Right Hon. Neville Chamberlain, M.P., who was accompanied by Sir Kingsley Wood, M.P., and officials of the Department, received on the 22nd January a deputation from the London Chamber of Commerce, introduced by Mr. W. Dawson-Warren, Deputy Chairman of the Provision Trades Section.

The deputation submitted to the Minister that the recommendations made by the Committee on the Use of Preservatives and Colouring Matter in Food went beyond what was contemplated by existing statutory provisions, and would require fresh legislation; that in connection with any new legislation the existing Acts should be consolidated; and that in deciding how and to what degree the recommendations of the Committee should be put into force, the Minister should be guided by the advice of an expert committee which should include representatives of the Trade interests.

Members of the Deputation, representing various sections of the food trade, submitted reasons for considering that in their particular sections the recommendations of the Committee could not be carried into effect without detriment both to the trade and to the general public on account of difficulties of the storage of food and of the price at which it would be possible to sell it under the changed conditions. It was also suggested that the Departmental Committee had not produced evidence to show that the public health was, in fact, prejudiced by the use of preservatives in any one food.

The Minister, in replying to the deputation, said that he welcomed the general recognition of the fact that the position could not be left as it was at present, and the offer of help in any necessary reforms. He agreed that to give full effect to the Committee's recommendations legislation would be necessary; and he stated that the consolidation of the existing legislation as to food and drugs was part of his programme. In the meantime he was advised that he had adequate powers to carry out many of the recommendations of the Committee, and he proposed shortly to circulate draft Regulations on which he would welcome the very fullest discussion between his own expert advisers and the members of the trade at which it would be possible to consider in detail the arguments put before him by the various branches of the trade that morning. Though it might be true that particular instances could not be given of damage to health due to the use of preservatives in any one food, the Deputation must remember that the public were now consuming many kinds of food containing preservatives, and the cumulative effect might be considerable. He also referred to the practical consideration that the Departmental Committee in recommending prohibition of preservatives had pointed out the large extent to which some sections of the trade in this country, or the whole of it in other countries, were now getting along without preservatives. He promised before any Regulations were brought into effect that he would give full and careful consideration to everything that had been put before him by the Deputation.

MINISTRY OF HEALTH, WHITEHALL, S.W.1.,
22nd January, 1925.

DRAFT RULES AND ORDERS, 1925.

PUBLIC HEALTH, ENGLAND.

Draft, dated February 17, 1925, of the Public Health (Preservatives, etc., in Food) Regulations, 1925, proposed to be made by the Minister of Health.

69755.

The Minister of Health, in the exercise of the powers conferred upon him by the Public Health Act, 1875, (a) the Public Health (London) Act, 1891, (b) the Public Health Act, 1896, (c) the Public Health (Regulations as to Food) Act, 1907, (d) and the Butter and Margarine Act, 1907, (e) and of every other power enabling him in that behalf, hereby makes the following Regulations, with the consent of the Commissioners of Customs and Excise, so far as they apply to the Officers of Customs and Excise, that is to say:—

PART I.

1. These Regulations may be cited as the Public Health (Preservatives, etc., in Food) Regulations, 1925, and shall come into operation on the day of

2. (1) In these Regulations unless the context otherwise requires—

“The Minister” means the Minister of Health;

“Local Authority” means any local authority authorised to appoint an analyst for the purposes of the Sale of Food and Drugs Acts, 1875 to 1907, and “public analyst” means an analyst so appointed;

“Officer of Customs and Excise” includes any person acting under the authority of the Commissioners of His Majesty's Customs and Excise;

“Food” means food intended for human consumption;

“Cream” means that portion of milk rich in milk-fat which has been separated by skimming or otherwise and is intended for human consumption;

(a) 38-9 V. c. 55.

(b) 54-5 V. c. 76.

(c) 59-60 V. c. 20.

(d) 7 E. 7. c. 32.

(e) 7 E. 7. c. 21.

“Preservative” means any substance which is capable of inhibiting, retarding or arresting the process of fermentation, acidification, or other decomposition of food or of masking any of the evidences of any such process or of neutralising the acid generated by any such process; but does not include common salt (sodium chloride), saltpetre (sodium or potassium nitrate), sugars, acetic acid or vinegar, alcohol or potable spirits, spices, essential oils or any substance added to food by the process of curing known as smoking;

“Thickening substance” means sucrate of lime, gelatine, starch paste or any other substance, which when added to cream is capable of increasing its viscosity, but does not include cane or beet sugar;

“Sulphur dioxide” includes sulphites, and “benzoic acid” includes benzoates;

“Sell” includes expose or offer for sale or deposit in any place for the purposes of sale, or despatch or deliver to any purchaser, broker or agent; and “sale” shall be construed accordingly.

“Importer” includes any person who, whether as owner, consignor or consignee, agent or broker, is in possession of or in anywise entitled to the custody or control of any article of food brought from a place situate outside Great Britain, Ireland, the Channel Islands and the Isle of Man; and “import” shall be construed accordingly;

(2) Percentages shall be calculated by weight.

(3) Sulphites shall be calculated as sulphur dioxide (SO_2) and benzoates as benzoic acid ($\text{C}_6\text{H}_5\text{COOH}$).

(4) The Interpretation Act, 1889, (a) applies to the interpretation of these Regulations as it applies to the interpretation of an Act of Parliament.

PART II.

3. The Local Authority shall enforce and execute this Part of these Regulations, and for this purpose shall make such enquiries and take such other steps as may seem to them to be necessary for securing the due observance of this Part of the Regulations in their district.

4. (1) No person shall manufacture for sale or sell any article of food which contains—
(a) any added preservative, except in the cases and in the proportions specified in Part I. of the First Schedule to these Regulations; or

(b) any of the colouring matters specified in Part II. of the said Schedule.

(2) No person shall sell any of the articles of food specified in paragraph (1) of the Second Schedule to these Regulations which contains any preservative unless such article is labelled in accordance with the Rules set out in that Schedule:

Provided that this provision shall not apply where the article of food is sold in a hotel, restaurant or other such place for consumption on the premises.

(3) No person shall sell cream which contains any thickening substance.

5. (1) No person shall sell any article which is recommended in any mark or label placed thereon or on its receptacle or container for use as a preservative of, or colouring matter for, any article of food or is described or referred to in any such mark or label in terms likely to lead to its being so used,—

(i) if such use would be contrary to these Regulations; and

(ii) if in the case of a preservative, its receptacle or container is not labelled in accordance with the Rules set out in the Second Schedule to these Regulations.

(2) No person shall on or in connection with the sale of any article or in any advertisement, circular or notice relating thereto recommend it for use as a preservative of, or colouring matter for, any article of food, or describe or refer to it in terms likely to lead to its being so used, if such use would be contrary to these Regulations.

(3) No person shall sell any article which is recommended in any such mark or label as aforesaid for use as a thickening substance for cream or is described or referred to in any such mark or label in terms likely to lead to its being so used, and no person shall on or in connection with the sale of any article or in any advertisement circular or notice relating thereto recommend it for use as a thickening substance for cream or describe or refer to it in terms likely to lead to its being so used.

6. The Medical Officer of Health, and any person authorised by him or by the Local Authority in writing, may procure a sample of any article to which these Regulations apply, and for that purpose shall have all the powers of procuring samples conferred by the Sale of Food and Drugs Acts, 1875 to 1907, and those Acts shall apply as if the officer or other person were an officer authorised to procure samples thereunder; and where an analysis is required for the purposes of these Regulations, the provisions of section 14 of the Sale of Food and Drugs Act, 1875, (b) as amended by section 13 of the Sale of Food and Drugs Act, 1899, (c) shall apply.

(a) 52-3 V. c. 63.

(b) 38-9 V. c. 63.

(c) 62-3 V. c. 51.

7. Any officer authorised by the Minister and any officer of the Local Authority authorised by the Authority in writing shall have power to enter at all reasonable times any premises where articles to which these Regulations apply are prepared, packed, labelled or stored and to inspect any process carried on therein and to take samples of any such article or of any substance used or capable of being used in the preparation of any such article and of any labels designed to be affixed to any such article or to any package or other receptacle containing such article.

PART III.

8. (1) Subject to any directions given by the Commissioners of Customs and Excise after consultation with the Minister, the Officers of Customs and Excise shall have power to enforce and execute this Part of these Regulations and may take such samples as may be necessary of consignments of imported articles to which these Regulations apply.

(2) Where an Officer of Customs and Excise takes a sample for the purpose of analysis he shall send the sample or a portion thereof to the Government Chemist, and either the officer or the Government Chemist shall send a portion of the sample to the importer.

9. The Port Sanitary Authority or the Council of any borough or urban or rural district which includes or abuts on any part of a Customs port which part is not within the jurisdiction of a Port Sanitary Authority shall also be an authority for enforcing and executing this Part of these Regulations, and the provisions of the second paragraph of the last preceding Article shall apply, with the substitution of the Medical Officer of Health of a Port Sanitary Authority or of such Council and persons authorised by him or them in writing for the officer of Customs and Excise and of a public analyst for the Government Chemist.

10. If, in any case, the Commissioners of Customs and Excise or a Port Sanitary Authority or other authority executing this Part of these Regulations are of opinion that an offence against this Part of these Regulations has been committed, they shall communicate to the Minister for his information the name of the importer and such other facts as they may possess or may obtain as to the destination of the consignment.

11. No person shall import into England or Wales—

- (i) any article of food intended for sale which contains any added preservative except in such proportions as are permissible under Part I. of the First Schedule to these Regulations or which contains any of the colouring matters specified in Part II. of the said Schedule; or
- (ii) any cream intended for sale which contains any thickening substance.

PART IV.

12. The provisions of these Regulations with respect to prohibiting any preservative or colouring matter or thickening substance in articles of food and requiring the labelling of certain articles of food and of articles sold as preservatives shall not apply in the case of any article which is intended to be exported or re-exported.

13. (1) In any proceedings under these Regulations the certificate of the Government Chemist or the public analyst, as the case may be, of the result of the chemical examination of a sample shall be sufficient evidence of the facts therein stated unless the defendant requires that the person who made the examination be called as a witness.

(2) In any proceedings under these Regulations, where the fact that any article has been dealt with contrary to these Regulations has been proved, if the respondent desires to rely upon the exceptions or provisions contained in these Regulations with reference to such articles being sold for consumption on the premises or being intended for export or re-export, it shall be incumbent upon him to prove that the article was so sold or was intended for export or re-export.

14. A person shall, if so required, give to any officer of Customs and Excise or of any local authority who is acting in the execution of these Regulations all reasonable assistance in his power, and shall, in relation to anything within his knowledge, furnish any such officer with all information which he may reasonably require for the purposes of these Regulations, and shall produce for inspection all such books as the officer may reasonably require for the purposes of ascertaining the persons for whom or places from which any article to which these Regulations apply has been obtained and to whom and where it has been consigned or otherwise.

15. The Public Health (Milk and Cream) Regulations, 1912, the Public Health (Milk and Cream) Regulations, 1912, Amendment Order, 1917, and so much of the Public Health (Imported Food) Regulations, 1925, as relates to paragraph (f) of the First Schedule thereto are hereby revoked, but without prejudice to any proceedings begun or other action taken in pursuance of any of those Regulations.

The First Schedule.

PART I.—ARTICLES OF FOOD WHICH MAY CONTAIN PRESERVATIVES AND NATURE AND PROPORTION OF PRESERVATIVE IN EACH CASE:—

- (1) The articles of food specified in the first column of the following table may contain sulphur dioxide in proportions not exceeding those specified in the second column:—

| Food. | Maximum proportion of sulphur dioxide. |
|---|--|
| 1. Sausages | 3 grains per pound. |
| 2. Jam | 0·3 grain per pound. |
| 3. Fruit and fruit pulp, not dried | 5 grains per pound. |
| 4. Dried fruit | 7 grains per pound. |
| 5. Beer and cider | 5 grains per gallon. |
| 6. Alcoholic wines | 3 grains per pint. |
| 7. Non-alcoholic wines and cordials: fruit juices, sweetened or unsweetened | 3 grains per pint. |

- (2) The articles of food specified in the first column of the following table may contain benzoic acid in proportions not exceeding those specified in the second column:—

| Food. | Maximum proportion of benzoic acid. |
|---|-------------------------------------|
| 1. Coffee extract | 3 grains per pound. |
| 2. Non-alcoholic wines and cordials: fruit juices, sweetened or unsweetened | 5 grains per pint. |
| 3. Sweetened mineral waters and brewed ginger beer | 1 grain per pint. |

Provided that no article of food may contain both sulphur dioxide and benzoic acid.

PART II.—COLOURING MATTERS WHICH MAY NOT BE ADDED TO ARTICLES OF FOOD.

1. *Metallic Colouring Matters.*

Compounds of any of the following metals:—

Antimony, Arsenic, Cadmium, Chromium, Copper, Mercury, Lead, Zinc.

2. *Vegetable Colouring Matter.*

Gamboge.

3. *Coal Tar Colours.*

| Number in Colour Index of Society of Dyers and Colourists, 1924. | Name. | Synonyms. |
|--|-------------------|--|
| 7 | Picric Acid | Carbazotic Acid. |
| 8 | Victoria Yellow | Saffron Substitute; Dinitro cresol. |
| 9 | Manchester Yellow | Naphthol Yellow; Martius Yellow. |
| 12 | Aurantia | Imperial Yellow. |
| 151 | Orange II | Mandarin G. extra; Tropaeolin 000 No. 2. |
| 724 | Aurine | Rosolic Acid; Yellow Coralline. |

The Second Schedule.

LABELLING OF ARTICLES OF FOOD CONTAINING PRESERVATIVE AND OF PRESERVATIVES.

1. The articles of food containing preservative to which the Rules as to labelling set out in this Schedule apply are—

(a) Sausages; (b) Jam; (c) Coffee extract.

2. (1) Any of the said articles of food containing preservative shall be enclosed in a wrapper or container on which is printed the following declaration or such other declaration substantially to the like effect as may be allowed by the Minister:—

| | |
|-----|---------------|
| (a) | CONTAIN(S) |
| (b) | PRESERVATIVE. |

2. The declaration shall be completed by inserting at (a) "These Sausages" or This "Jam," or "This Coffee Extract," and by inserting at (b) "Sulphur Dioxide" or "Benzoic Acid," as the case may require.

3. (1) The declaration on the label of an article sold as a preservative shall be in the following form or in such other form substantially to the like effect as may be allowed by the Minister:—

THIS PRESERVATIVE CONTAINS
(a) PER CENT. OF SULPHUR DIOXIDE.

(2) Where the preservative contains benzoic acid the words "Benzoic Acid" shall be substituted for the words "Sulphur Dioxide."

(3) The declaration shall be completed by inserting at (a) in words and figures, excluding fractions (*e.g.* "seventy (70)") the true percentage of the sulphur dioxide or benzoic acid present in the article.

4. The prescribed declaration shall in each case be printed in dark block type upon a light coloured ground within a surrounding line and no other matter shall be printed within such surrounding line. The type used shall be not less than one quarter of an inch in height.

5. The label shall, in addition, bear the name and address of the manufacturer of the article or of the dealer or merchant in Great Britain for whom it is manufactured.

6. The label shall be securely affixed to the wrapper or container so as to be clearly visible. If there is attached to the wrapper or container a label bearing the name, trade mark, or design representing the brand of the article the prescribed declaration shall be printed as part of such label.

7. No comment on or explanation of the prescribed declaration (other than any direction as to use in the case of a preservative) shall be placed on the wrapper or container.

The Commissioners of Customs and Excise hereby consent to the foregoing Regulations so far as they apply to the officers of Customs and Excise.

Note.—The Public Health Act, 1896, provides by sub-section (3) of Section 1 that if any person wilfully neglects or refuses to obey or carry out, or obstructs the execution of any regulations made under any of the enactments mentioned in that Act, he shall be liable to a penalty not exceeding £100, and, in the case of a continuing offence, to a further penalty not exceeding £50 for every day during which the offence continues.

The power of making regulations under the Public Health Act, 1896, and the enactments mentioned in that Act, is enlarged by the Public Health (Regulations as to Food) Act, 1907.

The Butter and Margarine Act, 1907, provides by sub-section (3) of Section 7 that any person who manufactures, sells, or exposes or offers for sale or has in his possession for the purpose of sale, any butter, margarine or milk-blended butter which contains a preservative prohibited by a Regulation under the Section or an amount of a preservative in excess of the limit allowed by any such Regulation shall be guilty of an offence under the Act. Under Section 11 of the Act any person guilty of an offence under the Act is liable for a first offence to a fine not exceeding £20 and for a second offence to a fine not exceeding £50, and for a third or any subsequent offence to a fine not exceeding £100, and in cases where imprisonment can be inflicted under Section 17 of the Sale of Food and Drugs Act, 1899, to such imprisonment as is authorised by that Section.

By Section 5 of the Butter and Margarine Act, 1907, the importation of any butter, margarine, or milk-blended butter which contains a preservative prohibited by any Regulation made under the Act, or an amount of a preservative in excess of the limit allowed by any such Regulation, is made an offence under Section 1 of the Sale of Food and Drugs Act, 1899.

New Zealand Department of Health.

REGULATIONS UNDER THE SALE OF FOODS AND DRUGS ACTS, 1908. 30TH JUNE, 1924.*

GENERAL REGULATIONS (Sections 1-25).—These specify types of packages, details of labelling, prohibited additions, statements as to contained preservatives, colours, flavours, etc. It may be noted that the general regulations as to persons handling food or drugs and those dealing with the preparation and storage of foods are exceedingly stringent.

POISONOUS METALS (Section 13).—The table for limits is as follows:—

| Food. | Arsenic as grains of As ₂ O ₃ . | Lead as grains of metal. | Tin as grains of metal. |
|---|---|--------------------------------|-------------------------------|
| Cream of tartar and its substitutes | 1/100th per lb. | 1/7th per lb. | Nil |
| Custard-powder | 1/100th per lb. | 1/7th per lb. | Nil |
| Malt & malt preparations .. | 1/100th per lb. | 1/7th per lb. | Nil |
| Baking-powder | 1/100th per lb. | 1/7th per lb. | Nil |
| Vegetables in tins | Nil | Nil | 2 per lb. |
| Milk & milk products hermetically sealed in tins | Nil | Nil | 2 per lb. |
| Sauces | 1/100th per pint. | 1/7th per pint | 2 per pint |
| Vinegar | 1/100th per pint | 1/7th per pint | 2 per pint |
| Pickles | 1/100th per lb. | 1/7th per lb. | 2 per lb. |
| Glucose | 1/100th per lb. | 1/7th per lb. | Nil |
| Honey | Nil | 1/7th per lb. | 2 per lb. |
| Fruit & fruit products in tins .. | Nil | Nil | 2 per lb. |
| Citric & tartaric acid | 1/100th per lb. | 1/7th per lb. | Nil |
| Non-dutiable fermented drinks .. | Nil | 1/100th per gal. | Nil |
| Flavoured non-alcoholic beverages | Nil | 1/100th per gal. | Nil |
| Ale, beer and stout | 1/100th per gal. | Nil | Nil |
| Fish and meat in tins | Nil | Nil | 2 per lb. |

SPECIFIC REGULATIONS (Sections 26-87).—Details in connection with some of the main articles of food only are referred to below, but the list of foods, etc., specifically dealt with in the regulations is as follows:—(28) Flour, Bread and Meals, (29) Custard-powder, (30) Cream of Tartar and (31) its substitutes, (32) Baking-powder, (33) Infants' Food, (34) Invalids' Food, (35) Malt and Malt Extract, (36) Meat, (37) Gelatin, (38) Eggs, (39) Pulped, Liquid, Bakers' and Dried Egg, (40) Edible Fats and Oils, (41) Margarine, (42) Milk, Cream and Skim Milk, (43) Condensed Milk, (44) Dried Milk, (45) Reconstituted Milk and Cream, (46) Butter, (47) Cheese, (48) Tea, (49) Coffee, (50) Cocoa, (51) Salt, (52) Spices and Condiments, (53) Sauces, (54) Vinegar, (55) Imitation Vinegar, (56) Pickles, (57) Sugar and Glucose, (58) Honey, (59) Confectionery, (60) Pastry, (61) Ice-cream, (62) Vegetables, (63) Fruit and Fruit products, (64) Jelly Crystals, (65) Essences, (66) Potable Water, (67) Aerated Waters, (68) Pure Fruit Cordials and Syrups, (69) Lime-juice, (70) Lemon-juice and Squash, (71) Compound Cordials, (72) Flavoured Cordials and Syrups, (73) Artificial Cordials and Syrups, (74) Non-dutiable fermented Drinks, (75) Flavoured non-alcoholic Beverages, (76) Wine, (77) Carbonated Wine, (78) Medicated Wine, (79) Quinine Tonic Wine, (80) Quinine

* Obtainable from the High Commissioner, New Zealand Government, 415 Strand, W.C.2.
Price 1/-

Tonic Waters, (81) Ale, Beer, Porter and Stout, (82) Cider, (83) Standard of strength for Spirits, (84) Drugs, (85) Biological products, (86) Disinfectants, Germicides, Antiseptics and Deodorants.

(28) *Flour, Bread and Meals.*—*Whole meal, part whole meal flour and flour* shall not contain more than 14 per cent. moisture, and part *whole meal flour* not less than 60 per cent. of bran and germ, 1.5 per cent. of fat and 0.5 per cent. of phosphoric anhydride; *flour* not less than 1.3 per cent. of nitrogen, or more than 0.5 per cent. of fibre or 1 per cent. of ash; *self-raising flour* shall liberate not less than 45 grains weight of carbon dioxide per lb. when moistened and heated, and shall contain not more than 7 grains per lb. of sulphates (as CaSO_4). *Whole meal bread* may contain salt and not more than 10 per cent. flour, *brown bread* not more than 10 per cent. of rye meal; *white bread* not over 45 per cent. of water, 2 per cent. of ash, 0.2 of ash insoluble in hydrochloric acid, and 10 grms. of crumb from the centre shall not be of an acidity to require more than 2 c.c. 0.1 N sodium hydroxide solution for neutralisation. *Polished rice* may contain glucose but not over 0.5 per cent. of talc; *cornflour* not over 0.5 per cent. of ash; *maize meal* not over 1.6 per cent. of ash or less than 1.1 per cent. of nitrogen.

(29) *Custard Powder.*—Shall be a powder prepared from wholesome starch with or without harmless colouring and/or flavouring matter.

(36) *Meat.*—*Fresh and chilled meat* must have been kept at a temperature above 35° F. Not more than 14 grains per lb. of saltpetre (calculated as KNO_3) may be added to *manufactured meat*. *Dripping* may not contain more than 1 per cent. of extraneous matter, or *lard* more than 1 per cent. of water. *Minced and sausage meat* must contain as much as 75 per cent. of the specified meats, not more than 6 per cent. of starch, or 14 grains of saltpetre (as KNO_3) per lb., or 3.5 grains of sulphur dioxide per lb. (for cooked or smoked meat up to 1.8 grain per lb.).

(38) *Eggs.*—In *fresh eggs* the air cell shall be not more than $\frac{3}{8}$ in. in depth.

(39) *Pulped, Liquid, Bakers' and Dried Eggs.*—Nothing may be added to these.

(40) *Edible Fats and Oils and Salad Oils.*—These shall be free from mineral oil or more than 1 per cent. water. Olive oil shall have sp. gr. at 60° F., 0.913–0.919, saponification value of 185–196, and iodine value of 79–90.

(41) *Margarine.*—Margarine must contain either 1 part of potato starch or Queensland arrowroot per 1000 parts, or not less than 5 per cent. by weight of sesame oil. Not more than 16 per cent. of water shall be present; no colouring matter, nor any other substance but salt and boron preservative (up to 20 grains of boric acid per lb.) may be added.

(42) *Milk, Cream and Skim Milk.*—*Milk* shall contain not less than 8.5 per cent. of milk solids-not-fat, and 3.25 per cent. of milk fat, and 10 c.c. shall not decolorise 1 c.c. of a 1 in 2000 solution of methylene blue, diluted with 9 parts of water immediately before use, at 38° C. in less than 3 hours. *Cream* shall contain at least 40 per cent. of milk fat, and “*reduced*” *cream* 25 per cent. *Pasteurised milk* shall have been maintained at a temperature of between 145 and 150° F. for at least 30 minutes, and immediately cooled to below 51° F. It shall not be heated more than once and shall contain no living bacilli.

(43) *Condensed Milk.*—*Unsweetened* shall contain not less than 25.5 per cent. milk solids and 7.8 per cent. milk fat and no added substance; *sweetened* not less than 31 per cent. of milk solids and 9 per cent. of fat, and no added substance other than cane sugar. *Unsweetened condensed skim milk* shall not contain less than 26.5 per cent. of milk solids-not-fat, and *sweetened skim* the same, with addition of cane sugar.

(44) *Dried Milk.*—Maximum percentage of water is 5.

(45) *Reconstituted Milk and Cream.*—*Milk*, not less than 8.5 per cent. of

milk-solids-not-fat and 3.25 per cent. of milk fat, and in the reductase test (see Section 42) shall require at least 4 hours to decolorise the methylene blue solution. *Cream* must contain at least 40 per cent. of milk fat.

(46) *Butter*.—Butter shall contain at least 80 per cent. of milk fat, and not more than 16 per cent. of water or 20 grains per lb. boron preservative (calculated as boric acid).

(47) *Cheese*.—Cheese shall contain not less than 50 per cent. of milk fat on the dry substance, and *skim-milk cheese* not less than 10 per cent.

(48) *Tea*.—Tea shall yield between 4 and 7 per cent. of ash (at least one half of which is water-soluble) and at least 30 per cent. of extract, which shall be determined by boiling 2 grms. of tea in 200 c.c. of distilled water under a reflux condenser for 1 hour, filtering hot, cooling and evaporating an aliquot portion to constant weight. *Tea dust* shall not yield over 5 per cent. of ash insoluble in water.

(49) *Coffee*.—Coffee shall contain not less than 10 per cent. of fat, and more than 1 per cent. of saccharine matter, and shall yield not more than 6 per cent. of ash, of which not less than 75 per cent. shall be soluble in water. *Coffee essence* shall contain not less than 0.5 per cent. of caffeine.

(50) *Cocoa*.—Cocoa paste, mass or slab, is the solid or semi-solid mass produced by grinding cocoa nibs, and shall contain not less than 45 per cent. of cocoa fat. The dry fat-free residue shall not contain more than 19 per cent. of natural cocoa starch, 6.33 per cent. of crude fibre, 8 per cent. of total ash, 5.5 per cent. of insoluble ash, and 0.4 per cent. of ferric oxide. *Soluble cocoa* or *cocoa essence* must not exceed a maximum of 3 per cent. of added alkali (as K_2CO_3), and *prepared cocoa* must contain at least 20 per cent. of fat-free cocoa. *Chocolate paste, coatings, powder* and *confectioners' chocolate* shall contain at least 16 per cent. of fat-free cocoa. No cocoa husks, weighting substance, paraffin wax, or foreign fat may be added to cocoa or to any preparation thereof.

D. G. H.

ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

Food and Drugs Analysis.

Composition of Fresh Fried Fish. K. Kobert. (*Chem. Zeit.*, 1925, 49, 66–68.)—The author discusses the composition and food value of fried fish and potatoes, and gives results to show their food value. Their composition, before and after frying in oil in the usual way, was:—

| | SHELL FISH. (meat only). | | SEA SALMON. | | POTATOES (sliced). | |
|-----------------------------|-----------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Fresh. Per Cent. | Fried. Per Cent. | Fresh. Per Cent. | Fried. Per Cent. | Fresh. Per Cent. | Fried. Per Cent. |
| Water | 80.89 | 64.05 | 80.43 | 60.21 | 76.73 | 38.11 |
| Fat | 0.33 | 10.10 | 0.20 | 7.29 | 0.08 | 7.29 |
| Protein ($N \times 6.25$) | 16.20 | 22.13 | 16.95 | 29.05 | 2.12 | 4.26 |
| Ash | 1.06 | 1.17 | 1.04 | 1.15 | 1.21 | 2.06 |
| Undetermined | 1.52 | 2.55 | 1.38 | 1.94 | — | — |
| Carbohydrates | — | — | — | — | 19.26 | 48.28 |

The calorific values of these foods are calculated from the composition by the usual method.

H. E. C.

Effect of some Inorganic Salts on the Polarisation of Sugar Solutions.

R. J. Brown. (*J. Ind. Eng. Chem.*, 1925, 17, 39-40.)—The effect of certain salts on the polarisation of sucrose in solutions of the concentrations of thin juices is proportional to both the amount of salt and of sugar present, within the limits of analytical error. Thus the percentage of sugar may be determined from the formula $P + KPM$, where P is the polarisation, M the weight in grms. of the salt present in 100 ml. of the solution as read in the polariscope tube, and K a constant for the salt. As yet no neutral salt has been found that will affect the polarisation of sucrose to the extent of 0.01° when present up to 5 per cent. of the sugar, when a normal weight of the solution is made up to 100 ml. D. G. H.

Polarimetric Determination of Sucrose in Condensed Milk. Gunner

Jörgensen. (Pamphlet, Copenhagen, June, 1924; abstract by the author.)—The author shows that the German "Bundesrat" method for the polarimetric determination of sugar in condensed milk is not generally reliable, because it presupposes that the precipitate thrown down by the lead salt is always of the same volume, which is not the fact. It is safer to calculate the volume of the precipitate by polarising two solutions of different concentration. In agreement with several English writers, the author substantiates the fact of an abnormal rotation of the sugar of milk (lactose); showing that, *e.g.* half an hour's heating in a weak alkaline solution ($P_H = 7.3$) can cause a reduction in rotation of lactose from $+6.4^\circ$ to $+5.2^\circ$ Ventske.

He advises, therefore, that the method by weighing should be used, whereby these sources of error can be eliminated. The most reliable method at present is undoubtedly that of Jessen-Hausen (*Meddelelser fra Carlsberg Laboratoriet*, B. 15, 1923), who has drawn up tables showing (for condensed milk) the power of reduction of Fehling's solution by mixtures of lactose with sucrose and invert sugar. Soluble calcium salts are to be precipitated by sodium fluoride. It is immaterial whether the lead precipitation is made with the lead acetate of the Danish Pharmacopœia or with a solution of normal lead acetate. For the complete inversion of sucrose the following procedure is recommended: To the solution of sucrose, which should have a volume of about 70 ml., add four drops of Clark's thymol blue solution and *N*-hydrochloric acid until the liquid is permanently red, and then add a further 1 ml. of acid. The solution is kept in a bath of boiling water for $\frac{1}{2}$ hour, then cooled, neutralised by *N* sodium hydroxide solution and made up to 100 ml. Lactose is not affected by this treatment.

To determine fat in condensed milk the author recommends that the mixture should not be boiled with hydrochloric acid, but that the mixture of solution and acid as prepared for boiling, should be left overnight at the ordinary temperature. In this way the formation of tar-like substances is prevented.

Effect of Hydrogen Ion Concentration on the Determination of Diastatic Power by the Polarimetric Method. H. C. Gore. (*J. Amer. Chem. Soc.*, 1925, 47, 281-283.)—The activity of the diastase in an infusion of malt was found

to vary with the hydrogen ion concentration in the same way as with highly purified diastase (Sherman, Thomas and Baldwin, *J. Assoc. Off. Agric. Chem.*, 1924, 7, 364), and the optimum P_H range was from 4.5 to 5.5. The polarimetric Lintner method should therefore be modified by introduction of a suitable buffer into the soluble starch solution, such as, for example, a mixture of *N* acetic acid and *N* sodium acetate solution.

D. G. H.

Spontaneous Decomposition of Butter Fat. C. A. Browne. (*J. Ind. Eng. Chem.*, 1925, 17, 44-47.)—Decomposition over a period of 27 years was found to be periodic in rate, varying according to the relative humidity of the air. The proportion of free and volatile acids increased, whilst the insoluble acids decreased; and in these the ester and acetyl values became pronounced, owing to the formation of fatty anhydrides and hydroxy acids. The change in iodine values was slight. It is suggested that one atom of oxygen is liberated for each atom of oxygen absorbed at the unsaturated bond of a fatty acid molecule, and that this is the prime cause of decomposition, a secondary one being the effect of the absorbed moisture.

D. G. H.

Determination of Hard and Soft Resins in Hops. A. C. Chapman. (*J. Inst. Brewing*, 1925, 31, 26-27.)—*Total Resins.*—Ten grms. of well sampled hops are digested for 12-15 hours at the ordinary temperature in 400 c.c. of methylated ether (sp. gr. 0.73), followed by 5-6 hours' digestion at the boiling point of the ether. After cooling, making up to 507 c.c. (7 c.c. for the volume of the hops) and filtering, 100 c.c. are evaporated, and the residue weighed. *Soft Resin.*—The ether is distilled from a further 100 c.c. of filtrate until about 10 c.c. remain, which are poured evenly over an Adams' paper, followed by the rinsings of the flask. After drying, the paper is extracted with petroleum spirit, and the extract is dried and weighed. Results obtained by these methods are considerably higher than those given by the old method, and for soft resin slightly lower than with the Walker method.

D. G. H.

Grant's Test for Sparteine. J. F. Couch. (*Amer. J. Pharm.*, 1925, 97, 38-39.)—A modified technique for Grant's test for sparteine is as follows:—Part of the chloroform extract of the ammoniacal solution is allowed to moisten $\frac{3}{4}$ to 1 inch of the length of a strip of filter paper, and, after the chloroform has evaporated, the strip is held in the neck of a bottle of bromine water for a few seconds, when a yellow stain appears on the chloroform wetted area. The colour is bleached by holding the strip in ammonia vapour, and, on warming, the bright pink colour of the reaction appears. The test appears to be specific for sparteine, and negative results were obtained with lupinine from *Lupinus luteus*, spathulatine from *L. spathulatus*, *d*-lupanine from *L. augustifolius*, *dl*-lupanine from *L. albus* and hydroxy-lupanine from *L. polyphyllus*; also with nicotine.

D. G. H.

Butesin Picrate, a new type of Anæsthetic Antiseptic. F. K. Thayer. (*Amer. J. Pharm.*, 1925, 97, 39-42.)—Butesin picrate is the *n*-butyl ester of para-amino-benzoic acid, and the picrate may be prepared by the reaction of 2 molecular

equivalents of butesin with one of picric acid, either (1) by warming the benzene solutions of each, mixing and allowing them to stand, or (2) in aqueous medium by holding the butesin in solution by 2 molecules of hydrochloric acid, thus increasing its solubility from 1 in 7700 to 1 in 200, and mixing the liquid with a saturated picric acid solution (1.2 per cent.), when the butesin will separate, or (3) by a modification of the latter process, in which an alcoholic solution of butesin is added to the aqueous solution of picric acid, and the mixture vigorously stirred and allowed to cool. Butesin picrate is a yellow solid, amorphous or crystalline, of m.pt. 109–110° C., odourless and slightly bitter, easily soluble in organic solvents, and to the extent of 1 per cent. in cotton seed oil. Its composition is determined as follows: (1) *Picric acid* by titration of an alcoholic solution with 0.1 N sodium hydroxide solution to methyl red, or precipitation as the insoluble nitron-picrate and weighing. (2) *n-butyl-p-amino benzoate*, by hydrolysing with boiling alkali, adding 0.1 N bromine solution, and titrating the excess of bromine, thus finding the amount taken up by the aminobenzoic acid; or isolation of the butesin by repeated extractions with ether from an ammoniacal aqueous solution. A 1:2000 aqueous solution of butesin picrate flooded into a rabbit's eye enables a pencil to be drawn across the cornea without sign of winking for 15–20 minutes, and no irritation resulted in rabbits injected with 4.5 c.c. per kgm. of body weight. The solution killed *Staphylococcus aureus* in 5 minutes, and a 1:2500 solution *Streptococcus pyogenes* in 15 minutes. D. G. H.

Biochemical, Bacteriological, etc.

The Green Growth on Oysters. G. Ranson. (*Comptes Rend.*, 1925, 180, 165–167.)—It is the pigment of naviculæ which makes the gills, feelers, terminal intestine and the edges of the covering of oysters green. The pigment has been isolated and its action studied. Oysters placed in a sea-water containing only the pigment of naviculæ in solution have become green in 24 hours. The phenomenon was thought to be a particular case of leucocytic excretion, but the author disproves this by experiments with an oyster from which the stomach had been removed in such a way that the mollusc would live for at least three days in its natural surroundings. The gills of an oyster so treated became green in 24 hours in water coloured green by the pigment. In water containing red and blue dyes the corresponding colours were taken up by the oysters. With neutral red the water became decolorised as the gills and covering became red. The pigment of *Navicula ostrearia* Bory, in making certain organs of the oyster green, penetrates directly across the membrane of the epithelial cellules of these organs and fixes itself there. P. H. P.

The Sulphuric Acid Reaction of Butter Fat. N. Sjörslev. (*J. Biol. Chem.*, 1924, 62, 487–493.)—Experiments made by the author on the sulphuric acid reaction with butter fat and the disappearance of the reaction from vitamin A-containing butter fat through oxidation are described. Butter fat gives a

reaction with sulphuric acid, but not in such low concentrations as cod-liver oil, and colour indices do not attain so high a value. Lard produced from abdominal fat from a pig did not give a reaction with sulphuric acid, but a mixture of equal parts of butter fat and non-heated lard gave one. The reaction is not given by a mixture of butter fat and lard heated to 100–102° C. during 24 hours in the air. The growth-promoting power disappears simultaneously. If the heated lard amounts to less than 20 per cent. of the mixture, the only result is a decrease in the intensity of the colour index in the reaction with sulphuric acid. When butter fat is heated for 4 hours in the air its ability to give a typical sulphuric acid reaction disappears. There is an intimate association between the chromogenic substance and the growth-promoting power.

P. H. P.

Antirachitic Properties Imparted to Inert Fluids and to Green Vegetables by Ultra-Violet Irradiation. A. F. Hess and M. Weinstock. (*J. Biol. Chem.*, 1924, 62, 301–313.)—Various inert fluids were irradiated with the mercury vapour lamp in an attempt to endow them with antirachitic potency. The experiments are described. It was found that cottonseed oil and linseed oil could be rendered specifically active by this means. After irradiation they were able to protect rats from rickets when 0.1 c.c. daily was added to the rickets-producing dietary. An antirachitic factor therefore had been produced outside the living organism. It was noticed that the cottonseed oil acquired a peculiar fishy odour after treatment, suggestive of cod-liver oil. The irradiated oils were able to store this factor for a considerable period. With olive oil irregular results were obtained. Possibly too thick a layer of oil was exposed to the lamp. Wheat grown in the dark (etiolated) had no antirachitic potency, but wheat grown in the light and irradiated with the lamp conferred protection when given to rats. Vegetables acted similarly. Green lettuce leaves from the market were of no value in preventing rickets, whereas after irradiation they had become antirachitic. In the plucked, as well as in the growing green vegetable, irradiation led to the formation of an antirachitic factor. In these experiments an antirachitic factor was produced both *in vitro* and in the growing plant.

P. H. P.

Inactivating Action of Some Fats on Vitamin A in other Fats. L. S. Fridericia. (*J. Biol. Chem.*, 1924, 62, 471–485.)—Many experiments on this question (which are described) were carried out, and curves show the results. Rats did not grow on an apparently adequate diet when the butter fat yielding the vitamin A of the diet was mixed (after melting) with a brand of hydrogenated whale oil. This oil had no toxic action on the growth of rats, but it had an inactivating action on the vitamin A of butter fat when the two fats were mixed, after melting, at a low temperature. Two hydrogenated vegetable oils (hydrogenated coconut oil and hydrogenated hemp-seed oil), and a non-hydrogenated vegetable oil (coconut oil) showed no toxic effect on the growth of rats and no inactivating action on the vitamin A of butter fat, this action accordingly not being regularly connected with the process of hydrogenating. Untreated abdominal fat from a pig did not inactivate the vitamin A of butter fat, but did so after being heated in

thin layers to 102–105° C. for 24 hours, exposed to the air, and mixed with the butter fat after melting. This inactivating action is supposed to depend on the generation of peroxides in the aerated heated fat, the vitamin *A* of butter fat being destroyed by these peroxides through oxidation. The whale oil being hydrogenated, it is difficult to consider it an oxidising agent, and experiments with recently prepared hydrogenated whale oil must be made to determine this point. The bearing of the results on the interpretation of previous experiments and on the manufacture of margarine and some problems in cookery is pointed out.

P. H. P.

Nature of the Variations of Aldehyde in Blood. R. Fabre. (*Compt. Rend.*, 1925, **180**, 83–85.)—On the distillation of blood, liquids are obtained containing an aldehydic compound which possesses the characteristics of acetaldehyde. Experiments described have been carried out to ascertain whether this compound itself exists in blood, or whether it is formed by the decomposition of some other product under the action of heat. This volatile reduction (?) product possessing the characteristics of acetic aldehyde does exist, not only in defecated blood, but also in serum collected aseptically. It exists in concurrence with ketonic bodies. Experiments have been made on human blood, blood of horses, oxen and rabbits. A table gives some of the results. Tests on blood from a dog shewed that insulin almost totally destroyed the acetic aldehyde from the blood. This is of interest physiologically from the point of view of the action of insulin on the metabolism of the carbohydrates.

P. H. P.

Iodimetric Method for the Determination of Sodium in Small Amounts of Serum. B. Kramer and I. Gittleman. (*J. Biol. Chem.*, 1924, **62**, 353–360.)—The gravimetric method for the determination of sodium in serum described by Kramer (*J. Biol. Chem.*, 1920, **41**, 263), and modified by Kramer and Tisdall (*J. Biol. Chem.*, 1921, **46**, 417) has not been found satisfactory by all investigators. Sodium is precipitated as the pyroantimoniate. The method has been improved by substituting for the gravimetric determination an iodimetric titration of the antimony in the precipitate. The sodium can be determined in small amounts of serum, both ashed and unashed. The method involves several distinct steps: first, the precipitation of the sodium as the pyroantimonate compound; second the separation of the supernatant fluid from the precipitate by centrifuging, followed by either siphoning or careful aspiration of all the supernatant fluid; third, the solution of the precipitate by means of an excess of *concentrated* hydrochloric acid or the acidification of the supernatant fluid and with re-solution of the precipitate that forms; fourth, the reduction of antimonic ion with a simultaneous oxidation of the iodide ion of hydriodic acid to free iodine; and lastly, the reduction of free iodine to iodide ion by sodium thiosulphate, with the formation of sodium iodide and sodium tetrathionate. Full experimental details and results are given. The method has a maximum error of plus or minus 2 per cent. The various sources of error are discussed.

P. H. P.

Useful Stain for Blood Films. A. K. Gordon. (*Lancet*, 1925, 208, 127.)—

This is an improvement on the panoptic method in that only one stain is required which is easy to prepare and simple to apply. It consists of eosine and methylene blue 0.02 grm., eosine and methylene violet 0.02 grm., methyl alcohol (pure for analysis) 25 c.c. The film is flooded with the undiluted stain for one minute. An equal part of water is then added on the slide, and the diluted stain allowed to act for three minutes, followed by water for about two minutes. The film is dried and mounted in Canada balsam or, better, in green euparal which gives better definition and is more permanent.

R. F. I.

Agricultural Analysis.

Determination of Polysulphide Sulphur in Spray Materials. W.

Goodwin and H. Martin. (*J. Agric. Sci.*, 1925, 15, 96–105.)—Although the common practice of determining the specific gravity of lime-sulphur solution affords an indication of the total solids present, it bears no relation to the polysulphides. After a review of the methods available for the determination of polysulphides a modification of that of Chapin (*J. Ind. Eng. Chem.*, 1916, 8, 339) is recommended, and, in order to avoid the tedious preliminary determination of sulphide sulphur, the following procedure is adopted:—Add 35 c.c. of the diluted spray material to 10 c.c. of ammoniacal zinc chloride and 35 c.c. of a 10 per cent. solution of crystallised sodium sulphite. Heat the mixture on the steam bath for 45 minutes, shaking it every 10 minutes and washing down the sides with boiling water. Then add 30 c.c. of 10 per cent. strontium chloride solution, and, after 5 minutes, filter through a close paper, diameter not more than 12.5 cm., wash well with hot water, cool and make up to 250 c.c. To 50 c.c. add just enough tartaric acid solution to make it acid to methyl red, and then titrate with 0.05 *N* iodine solution. A correction must be made for the thiosulphate originally present. Add 50 c.c. of diluted spray to 50 c.c. of water and 20 c.c. of ammoniacal zinc chloride, dilute to 200 c.c., filter, neutralise and titrate as before. On these quantities $x - y/5$ gives the true polysulphide titration, where x is the total polysulphide and y the thiosulphate titration; $x - y/5$ should be less than 35 to ensure that the requisite excess of sulphite has been used. Ammoniacal zinc chloride is prepared by adding 125 c.c. of ammonia (0.90) and 50 grms. of ammonium chloride to 500 c.c. of 10 per cent. zinc chloride solution and diluting to 1 litre.

H. E. C.

Determination of the Degree of Humification of Soil Organic Matter.

G. W. Robinson and J. O. Jones. (*J. Agric. Sci.*, 1925, 15, 26–29.)—The use of hydrogen peroxide in the preliminary treatment of humus soils (*cf.* ANALYST, 1923, 48, 84.) has been further investigated. It has no appreciable effect on fibrous substances such as cellulose and the lignins, but does cause separation of humified and unhumified organic matter, the former being completely oxidised or changed into soluble substances. As the result of a limited number of experiments on soils low in clay and calcium carbonate, it appears that the highest

degree of humification is shown by peat soils or uncultivated soils, and the lowest by garden and cultivated soils. This suggests that the degree of humification is associated with the extent to which anaerobic conditions prevail. H. E. C.

Organic Analysis.

Detection of Methylamine in Presence of Excess of Ammonia. P. A. Valton. (*J. Chem. Soc.*, 1925, 127, 40.)—The method depends on the much greater reactivity of the methylamine with 2:4-dinitrochlorobenzene. The product, 2:4-dinitromethylaniline, is very sparingly soluble in alcohol, readily crystallisable, melts sharply at 175.5° C., and depresses the m.pt. of 2:4-dinitroaniline (179° C.). When, however, ammonia is added to a weak alcoholic solution of dinitrochlorobenzene no crystals separate after 20 hours. The procedure recommended is as follows:—The solution containing the methylamine and ammonium salts is mixed with 30 c.c. of 2 N sodium hydroxide solution, diluted to 80 c.c., and distilled into 10 c.c. of a 0.5 per cent. alcoholic solution of 2:4-dinitrochlorobenzene. After being allowed to stand for 20 hours, the precipitated dinitromethylaniline is crystallised once from alcohol and identified by the method of mixed melting points. By this process one can detect 0.005 gm. of methylamine hydrochloride, if present alone, or 0.008 gm. in the presence of 0.08 gm. of ammonium chloride. Dimethylamine does not interfere, unless it exceeds 10 per cent. of the total amines. R. F. I.

Colour Test for Aniline and Toluidine. H. D. Murray. (*Chem. News*, 1925, 130, 23.)—The amines are best isolated by steam distillation, and the test must be made upon the free amines or their organic salts. Three drops (about 0.2 gm. of amine) are dissolved in 2 c.c. of 50 per cent. sulphuric acid, warmed to 60–70° C., 3 drops of a saturated solution of potassium dichromate added, the mixture gently shaken until no further colour change occurs, and the whole poured into about 800 c.c. of water and rendered strongly alkaline with ammonium hydroxide. On the addition of the dichromate, (a) aniline and the mono-substituted methyl and ethyl derivatives develop a purple colour, (b) *o*-toluidine, a blue colour (slowly), (c) *m*-toluidine, a green colour; (d) *p*-toluidine; a reddish brown colour. On pouring the mixture into water; with (a) the colour persists, with (b) a transitory purple forms, with (c) it changes to brown, and with (d) it becomes straw-coloured. On rendering the liquid alkaline: (a) the colour darkens, (b) it becomes light blue, (c) dull purple; and (d) slightly darker. Di-substituted tertiary amines give little or no colour on pouring the liquid into water. D. G. H.

Determination of the Copper Number of Cellulose. E. Benesch. (*Chem. Zeit.*, 1924, 48, 861.)—The following procedure, occupying two hours, is recommended for the determination of the copper value of cellulose. The Fehling's solution used consists of: (1) 34.6 grms. of crystallised copper sulphate, as free as possible from iron, dissolved in about 300 c.c. of water, diluted to 500 c.c., and

filtered; (2) 171 grms. of Rochelle salt and 50 grms. of sodium hydroxide dissolved in about 300 c.c. of water, diluted to 500 c.c. and filtered. Between 3 and 4 grms. of the substance and then 25 c.c. of each of solutions (1) and (2) are introduced into a litre Erlenmeyer flask, the latter being washed down with 50 c.c. of water and the funnel used also rinsed. The flask is then covered with a small crystallising dish, and its contents heated to boiling, which is maintained for 15 minutes. The walls of the flask are rinsed with water, and the liquid filtered through a small thimble containing two quantitative filter-papers, previously fitted well by suction. The cellulose is washed until no copper is detectable, and is then washed into a litre beaker with the red side of the paper uppermost, the thimble being thoroughly washed with 100 c.c. of water. Twenty-five c.c. of ferric ammonium sulphate solution (10 grms. of the salt dissolved in 100 c.c. of 10 per cent. sulphuric acid, and permanganate solution added to give a persistent red coloration) are then added, and the liquid shaken until the precipitate is completely dissolved from the filter-paper and this left clean. The liquid is filtered through the original thimble prepared in the same way, the precipitate being washed by decantation about 6 to 7 times with 50 c.c. quantities of water until ammonium thiocyanate gives no reaction. The filtrate is heated to 50° C., acidified with sulphuric acid, and titrated with permanganate. The ferric ammonium solution used is similarly titrated, and the result corrected accordingly.

T. H. P.

Value and Interpretation of Tests for Oxycellulose and for the Oxidising Attack of Cotton. C. Birtwell, D. A. Clibbens, and B. P. Ridge. (*J. Textile Inst.*, 1925, **16**, 44-51.)—Like the copper number, the absorption of methylene blue by cellulose products furnishes but slight quantitative indication of the extent of oxidation, since either different oxidising agents or the same oxidising agent at different acidities or alkalinities produce oxycelluloses of greatly divergent absorptions, although the actual consumption of oxygen remains the same. When, however, the type of oxidation is such as to cause only a small increase of methylene blue absorption the copper number is found to be high, and *vice versa*, so that the two measurements together are of far more quantitative value than either alone. Absence of oxidising attack may be inferred only when both measurements give low values, and when the possibility of boiling with alkali subsequent to oxidising attack is excluded. Determination of the loss of weight on boiling with 1 per cent. sodium hydroxide solution may be substituted for that of the copper number, and is affected by the same considerations. In the same way, the measurement of ash alkalinity may be used as an alternative or confirmatory test to that of the methylene blue absorption, the value of either test being affected by similar conditions.

While oxidising attack may or may not be revealed by increased copper number or methylene blue absorption, it is invariably accompanied by decreased viscosity in "cuprammonium" solution, and in this sense the measurement of such viscosity furnishes the most generally useful test for injury caused by oxidation. Low viscosity, however, may be the result of attack by acid or of prolonged boiling with alkali.

The above considerations indicate that two types of oxycelluloses may be conveniently recognised, these being characterised by (1) high copper number and low methylene blue absorption, and (2) low copper number and high absorption. The behaviour of different oxycelluloses towards various dyeing and other tests is also considered, and the practical interpretation of the results is discussed.

T. H. P.

Analysis of Ink. B. Walther. (*Chem. Zeit.*, 1925, 49, 17–18.)—For the determination of the gallotannin and gallic acid in ink, the following procedure is recommended. Ten c.c. of the ink are treated with a large proportion of hydrochloric acid in order to separate the tannin, the mixture being shaken with three quantities of ethyl acetate or extracted with this solvent in an extraction apparatus. Any iron carried over is removed from the extract by shaking this with slightly acidified potassium chloride solution, which is afterwards washed with fresh ethyl acetate solution to avoid loss of tannin. The extracts thus obtained are together evaporated to dryness on a water-bath. Traces of liberated acetic acid are removed in a vacuum, use being made of Mecklenburg's apparatus, consisting of two cylinders, one inside the other. The inner one contains the substance and is evacuated by means of a water pump, a current of dry air being passed over the substance; steam is passed through the outer cylinder. This treatment is continued until several successive weighings of the residue agree.

The iron is determined either gravimetrically or iodimetrically in the ash of 10 c.c. of the ink.

T. H. P.

Inorganic Analysis.

Qualitative Separation of the Zinc-Nickel Group. Lemarchands. (*Bull. Soc. Chim.*, 1924, 35, 1666–1668.)—The chloride solution is treated with sodium hydroxide so that the alkali concentration is 20 per cent. An excess of solid sodium perborate is sprinkled into the tepid solution. The precipitate is filtered off, and the filtrate tested for zinc. The precipitate is digested with 20 per cent. nitric acid at 60° C., the insoluble part being tested for manganese, and the solution for nickel and cobalt.

W. R. S.

Determination of Metallic Lead in Litharge. C. Mayr. (*Zeitsch. anal. Chem.*, 1924, 65, 254–257.)—One grm. of the sample is kept at a temperature near 100° C. with 6 grms. of mannitol, 6 c.c. of 4*N* sodium hydroxide, and 70 c.c. of boiled water until the oxide has dissolved. The residue is collected, washed with 1 per cent. sodium hydroxide, and dissolved in nitric acid. The solution is filtered, and the lead determined as sulphate in the filtrate; the weight of sulphate is calculated to metal. The mannitol used may be recovered, the liquors being neutralised with dilute sulphuric acid against phenolphthalein, the lead sulphate filtered off, and the filtrate evaporated to crystallisation on the water-bath. The crystals are washed by suction with water and dilute alcohol. The other solvents used for this determination (*e.g.* acetic acid, sodium hydroxide solution) give low results.

W. R. S.

Determination of Bismuth in Lead Ores. V. Hassreidter. (*Zeitsch. anal. Chem.*, 1924, **65**, 128-134.)—In commercial practice this assay gives rise to considerable differences. It is shown that the greater part of the bismuth is co-precipitated with the lead sulphate when the nitric acid solution of the ore is evaporated to fumes with sulphuric acid. If, however, the nitric acid solution is treated with sulphuric acid without the evaporation to fumes, the lead sulphate is free or almost free from bismuth. The author endorses a recommendation of a German committee of metallurgical chemists, *viz.* to fuse 25 grms. of ore in an iron crucible and determine the bismuth in the lead button. This is dissolved in 40 c.c. of nitric acid (1:1) and 40 c.c. of water; the lead is precipitated with sulphuric acid, the liquid made up to volume, and an aliquot part of the filtrate diluted and precipitated cold with hydrogen sulphide; the bismuth is found in the precipitate. For a direct bismuth determination, the ore must be dissolved in *aqua regia*, and the solution, after evaporation with hydrochloric acid, treated with hydrogen sulphide.

W. R. S.

Determination of Radium in Minerals containing Tantalum, Niobium and Titanium. P. Curie. (*Compt. Rend.*, 1925, **180**, 208-211.)—In order to determine the radium in minerals, such as those from Madagascar, which contain tantalum, niobium and titanium, by the emanation method, it is necessary to obtain a solution containing either all the substances or the radioactive constituents; these can be separated by the following procedure. One gm. of the finely powdered mineral is intimately mixed with 0.2 gm. of barium sulphate which collects the radium, and fused with potassium bisulphate in a platinum crucible. The product is extracted with water, and the insoluble portion, which contains the radium, is filtered off and treated with hydrofluoric acid. The bulk of the radium is contained in the barium sulphate, which is unaffected and is filtered off. To the filtrate are added a few drops of sulphuric acid and 0.2 gm. of barium chloride, and the precipitate, which carries down any radium that had passed into solution, is added to the other part of the barium sulphate and boiled with concentrated sodium carbonate solution. The barium carbonate thus formed is dissolved in dilute hydrochloric acid, evaporated to a small bulk, and the emanation measured by the ionisation method described in the author's text book (*Le Radium*, Paris, 1910, p. 65).

H. E. C.

New Reagent for Aluminium. L. P. Hammett and C. T. Sottery. (*J. Amer. Chem. Soc.*, 1925, **47**, 142-143.)—The test depends on the formation (by as little as 2×10^{-5} mole aluminium) of a bright red lake with the dye aurintricarboxylic acid, which, when once formed in acetic acid acetate buffer, is not decomposed in any reasonable time on rendering the solution alkaline with ammonium hydroxide (in contradistinction to the chromium precipitate). The supposed aluminium precipitate is dissolved in 5 c.c. of *N* hydrochloric acid and 5 c.c. of *3N* ammonium acetate solution, and 5 c.c. of a 0.1 per cent. solution of the ammonium salt of aurintricarboxylic acid added, and the liquid, after mixing, is rendered alkaline with ammonium hydroxide containing ammonium carbonate.

D. G. H.

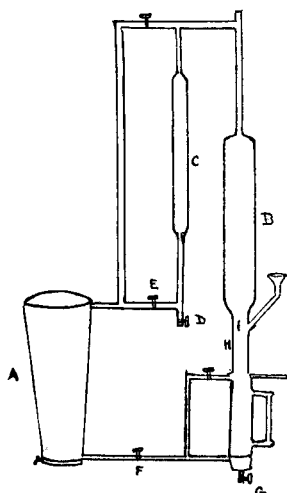
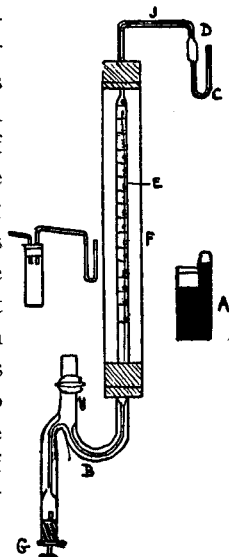
Rapid Examination of Sulphur. F. Kühn. (*Zeitsch. anal. Chem.*, 1924, 65, 185-186.)—The fine powder (0.2 grm.) is boiled with 50 c.c. of *N* sodium hydroxide until solution is complete. After some cooling, 5 c.c. of hydrogen peroxide (perhydrol, Merck) are added, and the excess of alkali measured with *N* acid: $S+2NaOH+3H_2O_2=Na_2SO_4+4H_2O$ (1 c.c. *N* alkali=0.0016 grm. S). Sulphates, which cause high results in the gravimetric method, do not interfere.

W. R. S.

Physical Methods, Apparatus, etc.

Burette for Micro Analysis of Gas. J. A. Christiansen. (*J. Amer. Chem. Soc.*, 1925, 47, 109-112.)—The apparatus is suitable for analysing 20 c.mm. of gas or less. The gas is collected in holders of the type A, consisting of a smaller tube closed at the top cemented to the inner side of a larger open at the top. C is the intake of the gas burette, D the absorption bulb, F is filled with water and surrounds the capillary tube E, graduated over a length of 15 cm. and of a volume of approximately 10 c.mm. The apparatus is filled with mercury by means of the screw G; the gas drawn into the bulb from the holder; the tip C is put under water, and, by further unscrewing of G the bubble of gas is drawn into E and measured. The bubble is next forced into D, and the tip C transferred to the absorption liquid which is drawn into the bulb. When absorption is complete the liquid is pressed back to its reservoir, the tip placed in water, and the solution washed out by filling the bulb with water and pressing out, and finally the length of the gas bubble again measured. Details are given for using the same apparatus for combustible gases.

D. G. H.



Continuous Extraction Apparatus. A.

Viehoever. (*Amer. J. Pharm.*, 1925, 97, 42-44.)—The diagram illustrates an entirely closed combined extraction and distilling apparatus. The percolator A contains the material to be extracted, B is a steam jacket surrounding the solvent tube, H another jacket for either steam or water surrounding the concentrator I. The solvent is heated in B, the vapour condensed in C, and the solvent flows into the percolator. The liquid level in the percolator is that at I in the concentrator, and the concentrated extract is obtained from G. When desired, the percolator may be shut off from the system, and the condensed distillate collected at D. Steam connections are not shown.

D. G. H.

Peroxidised Lead Anodes. G. Bozza and M. Bertozzi. (*Giorn. Chim. Ind. Applic.*, 1924, 6, 571–575.)—The results of experiments on the electrolysis of sulphuric acid solutions containing various proportions of hydrochloric acid by means of leaden electrodes show that attack of the electrodes becomes serious if the concentration of chlorine exceeds 0.28 grm. per litre or, if allowance is made for the continuous elimination of chlorine from the liquid, 0.17 to 0.21 grm. per litre. Addition of 0.1 per cent. of manganese to the solution in most cases exerts a deleterious effect on the anode, which exhibits increased tendency to flake. If the current density is below about 2 amp. per sq. dm., the metal is profoundly attacked, the action being diminished and almost annulled as the density is increased. The greatest current yield attained under any conditions was 63 per cent.

T. H. P.

Reviews.

A COMPREHENSIVE TREATISE ON INORGANIC AND THEORETICAL CHEMISTRY.
Vol. V. Pp. 1004. By J. W. MELLOR, D.Sc. London: Longmans, Green & Co. 1924. 3 guineas.

It is difficult to write of any of the volumes of Dr. Mellor's invaluable treatise except in the terms of the greatest appreciation. The rapid succession of the first five volumes is an amazing feat, and in the able hands of Dr. Mellor there seems no doubt that his colossal work will be completed ere many years have passed. In spite of the fact that 5000 pages have been published in less than three years, they all bear the stamp of thoroughness. They include the matter available right up to the time of going to press—a point which is proof of the successful indexing system. Thus we find in the present volume many references dated 1924 scattered amongst the copious lists, and in one case some work is referred to on the atomic weight of boron which has just been published in the *Journal of the Chemical Society*.

Volume V. contains a description of the elements, including the Rare Earths, of the third group of the Periodic Classification, together with a part (267 pages) of the chemistry of carbon.

Some objection might be made to the nomenclature which has been applied to the many complex and often doubtful compounds. It serves no purpose beyond that covered by the empirical formulæ, for all it does is to supply a cumbersome rendering of them. Little is known of the orientation of atoms in inorganic compounds, and certainly nothing in the complex substances which are encountered in this volume. Many unfounded guesses, however, have been made. It is therefore much too premature to attempt the formulation of

a system of nomenclature which will do justice to both composition and constitution. Another difficulty is the legion of so-called compounds whose only claim to the status of "compound" is that of a single analysis. Often they are badly defined, and no efforts have been made to establish their individualities. It is not safe to omit descriptions of such substances from an exhaustive treatise until they have been shown experimentally to be indefinite, but to the reviewer it appears unnecessary to emphasise them by means of names. In the present volume many of the borates seem to be poorly defined, and their analyses, when converted into molecular proportions, give rise to long formulæ and still longer names. For example, substances whose compositions approximate to the formulæ $2\text{Na}_2\text{O}\cdot 4\text{CuO}\cdot 9\text{B}_2\text{O}_3\cdot 38\text{H}_2\text{O}$ and $4\text{ZnO}\cdot 2\text{B}_2\text{O}_3\cdot 4\text{NH}_3\cdot 6\text{H}_2\text{O}$, are burdened with the respective names "complex hydrated tetrasodium tetra cupric octadecaborate" and "hexahydrated zinc tetrammino-tetraborate."

In a few cases the names have some bearing on the supposed constitution, and then they become even more objectionable; thus $\text{NaCl}\cdot\text{AlCl}_3$ is also represented as NaAlCl_4 , and is therefore "sodium tetrachloraluminatè," whereas a pasty translucent mass, $4\text{AlCl}_3\cdot 3\text{ZnCl}_2$ is called "zinc octadecachlorotetraluminatè" (why not aluminium . . . zincatè?). $\text{LaH}[\text{Ce}(\text{SO}_4)_4]_3\cdot 12\text{H}_2\text{O}$ (?) is "lanthanum sulphatocerate." These names are extremely misleading.

A few misprints have been noticed, *viz.* p. 65, " LiO_2 " is given in a compound instead of " Li_2O "; p. 78, " $\text{K}_2\text{O}\cdot\text{B}_2\text{O}_3\cdot 5\text{H}_2\text{O}$ " should read " $\text{K}_2\text{O}\cdot 3\text{B}_2\text{O}_3\cdot 5\text{H}_2\text{O}$ "; p. 100, " $\text{B}_2\text{O}_7''$ " should be " $\text{B}_4\text{O}_7''$ " (borax on solution gives " BO_2'' "); p. 108, the formula for Copaux's ammonium borotungstate should contain 24WO_3 in place of the $24\text{H}_2\text{O}$. It will be observed that the formula given above for the ceric lanthanum acid sulphate does not represent a compound made up of the integral sulphates. The formulæ for several other similar sulphates are also given incorrectly on page 660.

The statement on page 563 that Dennis and co-workers separated thoria from the rare earths by means of either sodium or potassium azide is incorrect. A solution of either sodium or potassium azide happens to precipitate much of the rare earths as well as the thoria. Dennis, however, eliminated the possibility of the precipitation of the rare earths by using an azide solution *containing an excess of hydrazoic acid*. The presence of the free acid is the all-important factor in the process, but no word is to be found about it. Spencer is also silent on this point in his well-known Text book on the Rare Earths.

These points are, of course, insignificant compared with the remarkably efficient and systematic way in which the great wealth of detail has been collected and presented in this volume. Our warmest thanks are again due to Dr. Mellor for the inestimable service he is continuing to do to English-speaking chemists.

HUBERT T. S. BRITTON.

ALLEN'S COMMERCIAL ORGANIC ANALYSIS. 5th Edition, Vol. 2. FIXED OILS, FATS AND WAXES. Edited by SAMUEL S. SADTLER, ELBERT C. LATHROP and C. AINSWORTH MITCHELL. ix. + 807 pages. London: J. & A. Churchill. 1924. Price 30s. net.

The appearance of a new edition of this volume of A. H. Allen's organic analysis classic is most welcome, since it is more than overdue. The fourth edition, published some fifteen years ago, has become considerably out-of-date, and the fact that the new edition is larger than it by nearly 300 pages is evidence of the amount of new work that has had to be recorded.

The book preserves its previous form, each of its ten sections having been revised, in some cases entirely re-written, by a recognised authority on his subject. This system of book-building undoubtedly makes for excellence in the treatment of the subject-matter, though it tends to create a marked difference in the style and structure of the various parts.

The first section deals in a general way with the properties of the oils, fats and waxes and the physical and chemical methods of analysis which are employed in their investigation. In the second section, properties and characteristics of the individual oils are more particularly dealt with, being classified in groups for convenience of treatment.

These sections together occupy nearly one-half of the volume, the remainder being taken up by what may be described as monographs on special branches of the subject.

In a work of this kind, which is essentially devoted to methods of analysis, a detailed description of technological processes is not to be looked for, but it will be admitted that some account of them is necessary if an appreciation of the properties of the products is to be obtained, as well as of the nature of the by-products which they produce, some of the latter being articles of not inconsiderable commercial importance. In the main, such descriptions are provided in the second section where individual oils are dealt with, and it is doubtful, therefore, whether the meagre and somewhat imperfect description of the methods employed for the purification of oils given in the first section is necessary.

It is unfortunate that the greater number of the typographical and other errors which occur in the book are to be found in the above sections.

Errors in printing need not be specifically mentioned, but some of the textual errors, being of more importance, should be noted. Thus on p. 42 in the table of apparent and true acetyl values of various oils there is an obvious error in the statement of these values for butter fat; on p. 48 the Normann hydrogenation patent is quoted as No. 1515 of 1905, this should be 1903; on p. 72 the reference to Fig. 71 should read Fig. 6 on p. 71; on p. 82 amyl alcohol should be read instead of ethyl alcohol as the second constituent of Fryer and Weston's solubility test solution; on p. 180, in the second line of the description of Archbutt's method of carrying out Milliau's test for cottonseed oil there is an omission of text which makes the description incomplete.

In the portion of the first section dealing with the classification of oils it is stated that oils belonging to the coconut oil group have low saponification values, whilst a few lines later they are stated to have high saponification values. Later, on pp. 150 and 158, the saponification values of olive and olive kernel oils are quoted in percentages. It is to be feared that some of this confusion arises from the diversity of ways in which the results of the original Koettstorfer test are stated. Uniformity in this is certainly desirable.

The sections devoted to more special subjects have been brought very fully up to date, and apart from the particular purpose of their inclusion in the book, that is the analysis of the materials of which they treat, they provide an excellent digest of present-day knowledge of their composition and properties.

An excellent feature of the volume is the frequent statement of typical analyses and the many references to important publications and specifications which are critically discussed in the text.

The new edition of this important work worthily maintains the high standard set by its original author, and must take a high place among the many books on analysis which have been recently published.

Certainly no chemist concerned with the analysis of oils and fats can afford to be without it.

JOHN ALLAN.

SPECTROSCOPY. By E. C. C. BALY, M.Sc., F.R.S. Vol. I. Pp. 298, 3rd Edition. London: Longmans, Green & Co. 1924. Price 14s. net.

"Baly" has become firmly established. The first edition appeared in 1905, and at once occupied a position not challenged by any similar work. This position was strengthened by the second edition, and it is now fortified further, not only by a third edition, but also by its expansion to two volumes, of which only the first has yet been published. This embraces the first eight chapters of the previous impression, each at greater length, followed by a ninth chapter on the "Practical resolving power of the Spectroscope."

The style of the book is the same as before, but a great deal of new matter has been incorporated, and the work is sufficiently re-written for the insertions not to break the sequence. References to the chemist's side of the subject occur only occasionally, and then as an aid to physics rather than to chemistry. However, the chemist who wishes to apply spectroscopy to his own science, either for its own sake or to the purposes of analysis or industry, will find in the book most of the fundamental information he requires laid out concisely and thoroughly; and, moreover, in very readable form. Spectroscopy is a vast subject, and yet little of it lies outside the realm of interest to the chemist, whether he require the prism, the grating, or the bolometer. The book will be found sufficient for a fundamental study of the particular branch of spectroscopy under investigation, and a valuable work of reference to other branches in which the worker is less immediately concerned.

A fair number of references to literature are given, and these are perhaps sufficient for a full appreciation of the subject, but the worker would be grateful

for a somewhat more comprehensive bibliography, or at least for several guides thereto, such as the particular instance given on p. 413 in the first edition.

S. JUDD LEWIS.

THE SPECIFIC HEATS OF GASES. By J. R. PARTINGTON, D.Sc., and W. G. SHILLING, M.Sc. With Illustrations, Tables and Diagrams. Pp. 251. London: Ernest Benn, Limited. 1924. Price 30s. net.

The subject of the specific heat of gases, especially on the numerical side, is usually dealt with relatively briefly in the ordinary text-book. As the authors point out in their preface, "Such outlines doubtlessly fulfil the purpose of indicating the crevice in the structure of thermodynamics into which the subject fits, but can scarcely be regarded as adequate in so far as the industrial user is concerned. In the present volume the main object has been to correlate such data as exist. Much experimental work has been done, but much more remains to be done before the desired accuracy can be attained. Nevertheless, a critical survey of the whole field has yielded results which, when properly sifted and, when necessary, recalculated with more modern data, are believed to be substantially accurate. The book is not intended for the beginner, nor is it written to cover any course of study; it is a work addressed to the expert. Pure theory has been almost eliminated where the results are still tentative. . . . The book is also intended for use as a work of reference for specific heat data."

After dealing with equations of state and methods of determining the specific heat of gases, together with the effect of temperature and of pressure thereon, the authors give a set of three tables of data covering some 20 pages, which is followed by a chapter on the application of specific heats to internal combustion engines, furnaces, gas producers, and refrigerators. The concluding chapter deals with the theory of specific heats.

It is to be remembered that this book is intended, not only for the general chemical reader, but even more expressly for the chemist in industry. Twenty years ago such a book would have made little appeal; to-day its appeal ought to be great, and for the reason that it is now being realised more and more that the quantitative physico-chemical control of an industrial process is essential if the maximum efficiency is desired. The present work gives that kind of information which is essential in technical processes which involve gaseous reactions. Such processes require for their scientific control an application of the Heat Theorem of Nernst (and all that that implies), and the Theorem cannot be applied without reliable and extensive specific heat data.

This book will be welcomed as a valuable contribution to scientific literature.

W. C. M. LEWIS.

THE ELEMENTS OF COLLOIDAL CHEMISTRY. By HERBERT FREUNDLICH (Hon. Professor in the University of Berlin). Translated by GEORGE BARGER, F.R.S. Pp. 210. London: Methuen & Co. 1924. Price 7s. 6d. net.

This book is a translation of Freundlich's recent "Grundzüge der Kolloidlehre,"

written as a strictly non-mathematical introduction to colloid chemistry. The author's classical work, "Kapillarchemie," is mathematical, extensive, and most suitable for the advanced student and investigator. By abbreviation and excision of mathematical deductions and numerical data, a very much smaller book has been prepared. It is easy to read, introduces all the fundamental points, and can be heartily recommended as a sound, interesting and adequate survey of elementary theoretical colloid chemistry.

The translation has been well done, whilst the style and binding are also good. No printer's errors have been observed.

The reviewer takes exception to the statement (p. 165) relating to emulsions: "When one liquid is in considerable excess, it necessarily becomes the dispersion medium." The literature on colloidal chemistry records several instances of even 99 per cent. of one liquid being dispersed in 1 per cent. of another liquid. Also, both types of such concentrated emulsions are known, *viz.* oil-in-water and water-in-oil.

WILLIAM CLAYTON.

THE DESTRUCTIVE DISTILLATION OF WOOD. By H. M. BUNBURY, M.Sc. (Bris.), B.Sc. (Lond.). Pp. xx.+320. London: Benn Brothers, Ltd. Price 35s. net.

This book gives a complete account of the wood-distilling industry both from the theoretical and practical aspect. The task of collecting and digesting the mass of existing data, mainly from American and Scandinavian sources, has been no light one, and the author is to be congratulated on having selected his material with great judgment and having presented it in a readable form. The main feature of the book is the large number of diagrams and tables, 107 illustrations and 115 tables (many of the latter of considerable length) being included within the compass of 310 pages.

In the earlier chapters the physical and chemical properties of wood are discussed, and the recent views of Irvine on the structure of cellulose and of Klason on the nature of lignin are well summarised. The thermal decomposition of wood of various kinds, and the factors influencing the yield of the different products of distillation, are then dealt with. Many published results are of little value, owing to the general use of the "cord" as a measure of wood. A cord of wood is 128 cubic feet, and the weight of wood in a cord will vary with the specific gravity and moisture content of the wood, the size of the wood pieces, and the way in which they are stacked. In fact, a cord of wood may vary in weight from 1 to 3 tons, so that the difficulty of comparing distillation results given in terms of this unit will be readily appreciated.

A table of interest to analysts is given on page 37, where the variation in ash content of different parts of a tree is shown. The leaves may contain over 7 per cent. of ash, while the wood of the trunk contains only 0.3 per cent., the bark about 3 per cent., and the lower part of the root 5 per cent. According to the

author, it is to be expected that those parts of the tree most active in the assimilation processes should be the richest in inorganic compounds, but there are probably many other factors which combine to produce this uneven distribution of mineral matter. Another interesting point, which is well shewn by means of diagrams, is the exothermic reaction which always occurs at a certain stage in wood distillation. As the point is approached at which the decomposition of the wood proceeds at its greatest speed, the temperature inside the retort rises above that of the exterior, and if the distillation be uncontrolled, the violence of the reaction may lead to explosions.

Later chapters are devoted to a description of wood distillation plant, including that used for the refining of the final products and the production of dry calcium acetate, pure methyl alcohol, refined wood turpentine and pine oils. Analytical methods for the examination of crude and refined products are briefly summarised in a separate chapter.

The price of the book is high, but it is extremely well printed and bound.

G. W. MONIER-WILLIAMS.

Institute of Chemistry of Great Britain and Ireland.

PASS LIST.

JANUARY EXAMINATIONS, 1925.

F. E. Ball, B.Sc. (Lond.), J. D. Buxton, B.A. (Cantab.), L. J. Couzens, J. Foster, B.Sc. (Lond.), E. A. Murphy, B.Sc. (Lond.), G. W. Trobridge, B.Sc. (Birm.), W. J. Walker, and W. Wilson.

Publications Received.

ORGANIC MEDICAMENTS AND THEIR PREPARATION. Translated from the French of E. Fourneaux by W. A. Silvester. London: J. & A. Churchill. 1925. Price 15s.

THE ACTION AND USES IN MEDICINE OF DIGITALIS AND ITS ALLIES. By A. R. Cushny, F.R.S. London: Longmans & Co. 1925. Price 18s. net.

PHYSICO-CHEMICAL EVOLUTION. By C. E. Guye. Translated by J. R. Clarke, M.Sc. London: Methuen & Co. 1925. Price 6s. net.

THE FOUNDATIONS OF COLLOID CHEMISTRY. (A Selection of Early Papers.) Edited by Emil Hatschek. London: Ernest Benn, Ltd. 1925. Price 18s. net.