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The Journal of the TEXTILE INSTITUTE

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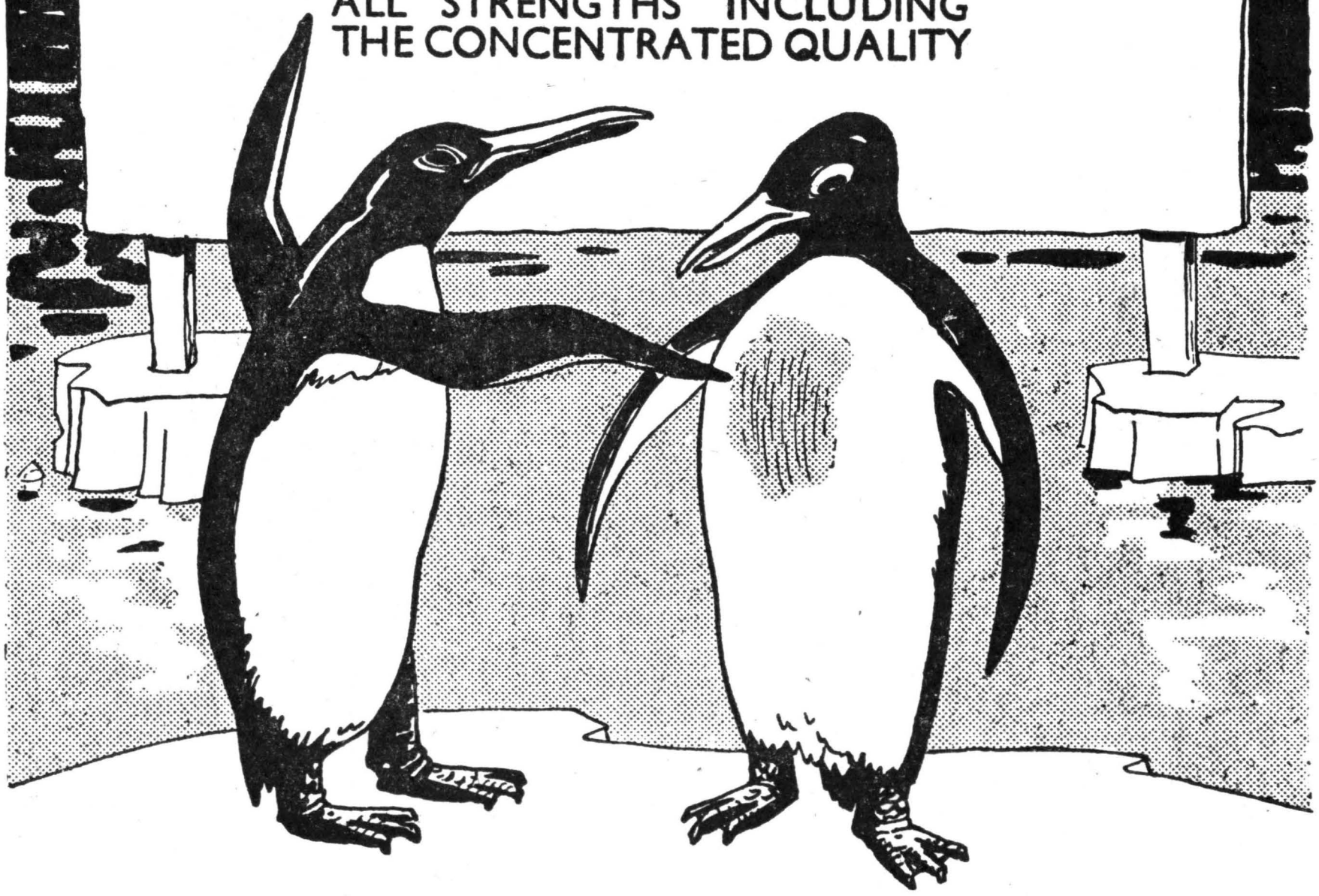

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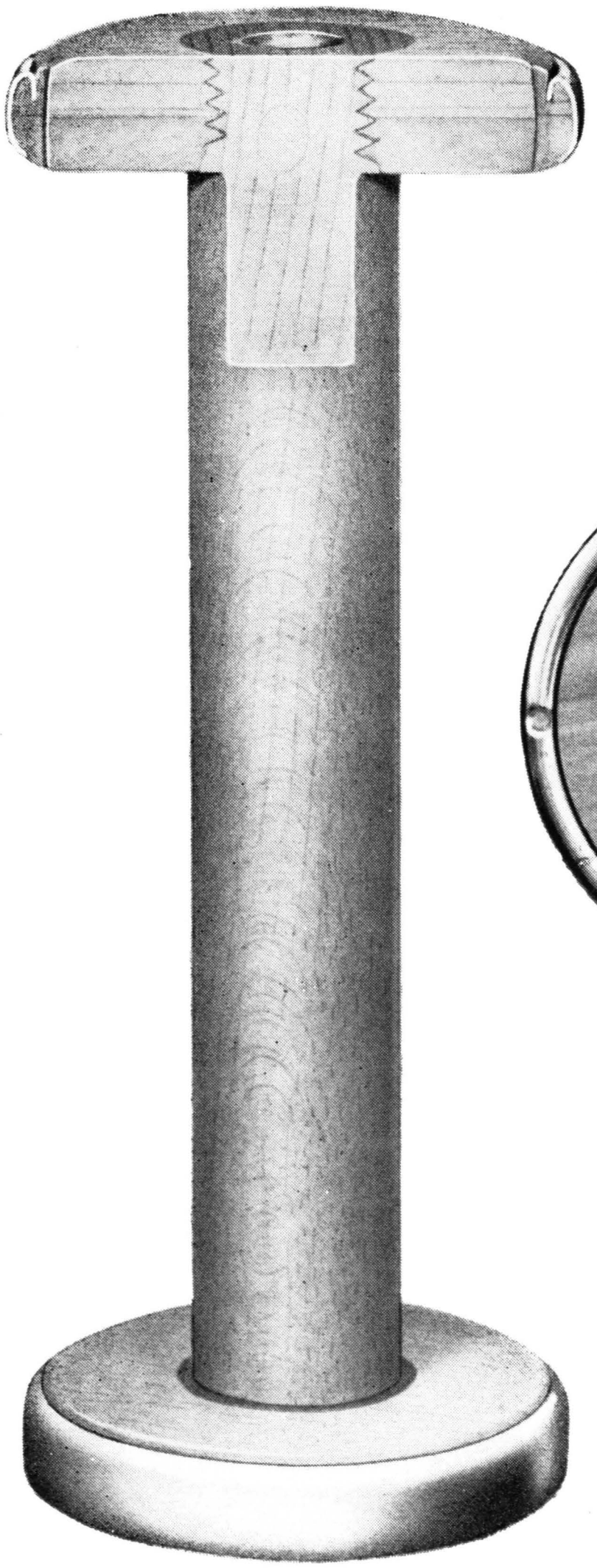

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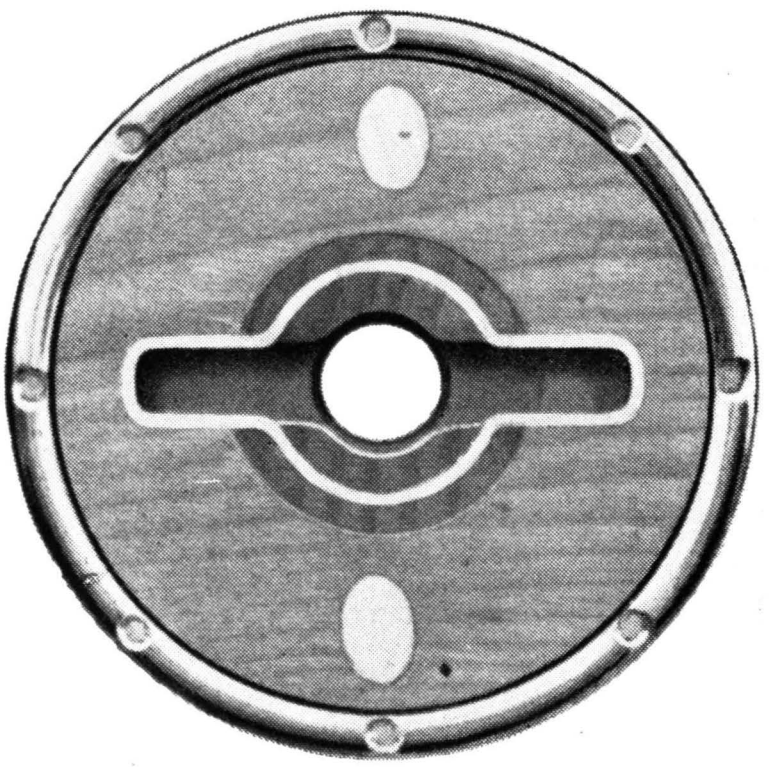

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THE JOURNAL *of the* TEXTILE INSTITUTE

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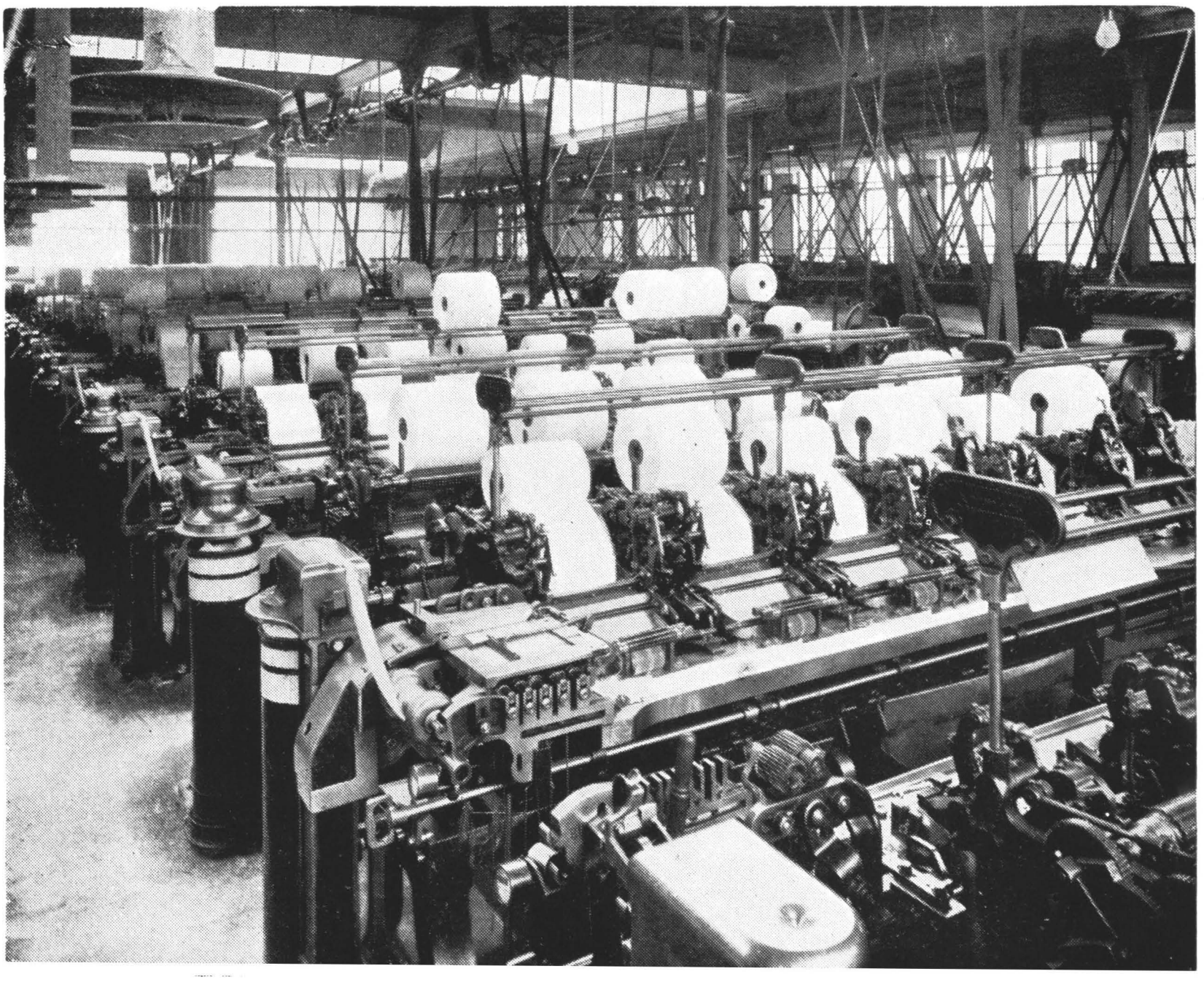

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The NASMITH PATENT New Model COMBING Machine

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THE JOURNAL OF THE
TEXTILE INSTITUTE

Vol. XXXI OCTOBER 1940 No. 10

PROCEEDINGS

NOTES AND ANNOUNCEMENTS

Midlands Section

On Saturday, September 21st, the Midlands Section held its first meeting of the session at the Rex Banqueting Hall, Coventry. Mr. W. Pritchard, F.T.I., of Derby, Chairman of the Section, presided, and he was supported by Mr. H. A. Turton, of Messrs. Courtaulds Ltd.

Apologies were received from Mr. Frank Nasmith, who had promised to attend this function but was unfortunately unable to do so on account of ill-health.

Mr. Pritchard, in his opening remarks, said he was very glad to have the honour of officiating at this meeting in Coventry, whose textile industry dated back to the 13th Century.

Mr. H. A. Turton introduced himself as the oldest Textile Institute member in Coventry, and in welcoming the members of the Institute to Coventry he said he was proud that they should have chosen that city for their opening meeting.

In referring to the history of Coventry's textile industry, Mr. Turton pointed out that in 1385 Richard II permitted the Mayor to tax wool and worsted cloth for a period of five years to help pay for the City Wall and Gates. He also mentioned that the ribbon trade had been in existence since the early part of the 18th century.

For some time now there has been under consideration the formation of a local textile society. Mr. Turton emphasised the opportunities that such an organisation would afford in Coventry, and strongly urged that this idea be put into motion. On the proposal of Mr. G. Fielden, of Nuneaton, supported by Mr. H. Biddulph, of Coventry, it was agreed at this meeting to form a Coventry Textile Society. The arrangements for the time being are left in the hands of Mr. L. V. Hewitt, of Messrs. Courtaulds Ltd.

Continuing with the business of the meeting, the subject chosen was "Coventry's Textiles", and Mr. Pritchard introduced the lecturers as follows:—

Mr. L. J. Clarke, B.Com., of Messrs. Wm. Franklin & Son Ltd., who spoke on " Ribbons and Smallwares ", Mr. R. I. Martin, A.M.I.E.E., of the British Thomson-Houston Co. Ltd., who gave an address on " Textiles in the Electrical Trade ", and Mr. G. Loasby, B.Sc., F.I.C., of British Nylon Spinners Ltd., whose subject was " Synthetic Fibres, Past and Present ".

These three lectures were followed with deep interest and stimulated lively discussions.

Dr. E. Wildt, F.T.I., proposed a very warm vote of thanks to the lecturers and was supported in this by Dr. H. C. Smith, of the Coventry Technical College, and the meeting closed with a hearty vote of thanks to the joint chairmen.

RIBBONS AND SMALLWARES*

By L. J. CLARKE, Esq., B.Com.

The lecturer illustrated his remarks by reference to an extensive display of smallwares and ribbons illustrating the many types of work produced in Coventry. The exhibits ranged from $\frac{3}{8}$ in. worsted shalloon braid to 9 in. real silk regalia ribbons and many types of jacquard work.

As in other branches of the textile industry, the looms used fall into two main classes, plain and jacquard. Illustrations were given of the decorative effects which could be produced in plain looms such as simple fancy weaves, striped and ombre effects in the warp, and also by the combining of contrasting yarns such as bright and delustred rayon.

The extreme versatility of the smallware loom, while it is to some extent a virtue, tends to prevent the development of specialised looms perfectly adapted for one job. There has always been a tendency to build a loom which could be adapted to a wide range of products.

There is a vast amount of traditional knowledge in this trade based on long experience, but much of it is purely empirical, and has not been submitted to scientific analysis with a view to discovering the underlying principles. There is a very real need for the application of constructive criticism in matters of technique to see whether things which are generally accepted as good are really well founded. This possibility is evident in all traditional trades, especially when they are contrasted with younger industries such as those concerned with rayon, plastics or electricity, which have been developed from their inception on more highly scientific lines.

The complete collapse of the European countries, from which the bulk of the competition in ribbons and smallwares formerly came, has created a very extensive demand both at home and abroad. There are reasons to think that the Continental industry will not speedily re-establish itself after the war. There are also good grounds for assuming that the present time affords a valuable opportunity for British manufacturers of these goods to study methods of production with a view to capturing this trade and by superior technique holding it after the war, even in the face of foreign competition. It may well be that time and money spent in developing methods and machinery may serve to offset the advantages of cheap labour which the Continental industry has for many years enjoyed, owing to the fact that in France and Germany the industry is still to a great extent domestic, and therefore the workers do not need a living wage from their weaving activities, but make up their income from other sources.

TEXTILES IN THE ELECTRICAL INDUSTRY †

By R. I. MARTIN, A.M.I.E.E.

(Research Laboratory, British Thoomsun-Hoston Co. Ltd.)

Textiles form one of the most useful and important groups of materials employed by the electrical manufacturing industry in fairly large quantities, mainly for insulation purposes.

Practically all the principal types of fibres are used. Cotton, silk and asbestos are the more important, but linen, rayon and jute are also used to a smaller extent, and manufactured synthetic fibres, such as glass and nylon, are being introduced.

The principal reasons for using textiles are their great adaptability and strength combined with flexibility and insulating properties, although the latter

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* Abstract of a Lecture delivered at Coventry on 21st September, 1940.

† Lecture before the Textile Institute, Midlands Section, at meeting held in Coventry on 21st September, 1940.

are not of a high order and are invariably limited by the presence of moisture. It will be seen that these properties, particularly the mechanical features, combined with the relatively low cost and general availability, are responsible for electrical engineers making such extensive use of textile products.

In the electrical industry, textile materials are used in the form of yarns, sleevings, tapes and woven cloths. Knitted fabrics are very seldom used and can be neglected.

Textile Fibres. Cotton, Manila hemp, jute and other fibres, either alone or in association with wood-pulp, are employed in the manufacture of papers, pressboard, and vulcanised fibre, which are used extensively for insulating coils, armatures and transformers. Asbestos papers and millboard are made from asbestos fibres which are also employed as fillers in mouldings. Asbestos and cotton fibres are also applied as insulating coatings on wires, a mixture being felted on to the conductor to give a fire-resisting covering. Apart from these few cases the fibres alone are not used to any great extent.

Yarns. Cotton, silk and asbestos yarns are employed extensively for insulating wires, and glass filaments are now being used for the same purpose. The yarns are generally lapped on to the conductors, several ends being applied together; often two or more lappings are applied, in alternate directions, an example being double cotton-covered wire, which is used for winding coils. Silk is advantageous because it takes up less space and is a better electrical insulator than cotton or asbestos.

Yarns are also applied to conductors by braiding, such braided coverings of cotton (usually glazed), silk, rayon, asbestos and jute being applied as a mechanical protection over other insulating materials such as rubber and varnished cloth. The most familiar example is provided by the flexible cords for portable domestic appliances, table-lamps, etc. Asbestos and wool (Genappe) are used where greater resistance to fire is required. In some cases yarns are included as packings between two or more insulated cores, to give additional padding and protection. Jute coverings are applied to heavy cables and are subsequently treated with bitumen and other compounds to give protection against the weather, burying in the ground and other conditions.

Yarns and threads, principally cotton, are useful for tying parts of coils together and for various binding, tying and protective purposes, such as the outer covering of small coils for relays and operating coils of control gear and switchgear.

Sleevings (Tubular braidings). Sleevings of braided cotton, silk and rayon are used for insulating leads of coils, sometimes in the untreated form but more usually after they have been coated several times with a good flexible insulating varnish. The varnished cotton or silk sleevings are familiar to many through their use for slipping over connections of radio sets. Certain high-quality insulating tubings are also made of varnished silk rolled around a mandrel and covered with a varnished sleeving, this combination having superior electrical properties to those of the plain varnished braidings.

Tapes and Webbings. Textiles are most extensively used in the form of tapes and webbings made from cotton, silk or asbestos—the bulk being cotton--for all manner of insulating, binding and protecting purposes. The majority of motor, generator and transformer windings require tapes and webbings for insulating the conductors, binding coils and leads together and wrapping around the exterior to give mechanical protection. They are generally treated with varnishes or compounds (such as bitumen), to give moisture resistance and improve their electrical properties, either during application or by dipping or impregnation after completion of the winding.

Cloths. Fabrics made from cotton, silk and asbestos are principally utilised in three ways: (*a*) Untreated. (*b*) Varnished or compound treated. (*c*) Bonded with synthetic resin.

(*a*) Untreated cotton cloths are employed in various coils and windings; for example, as insulation between layers and as an outer protection against the ingress of dust, oil, etc. Thus, the armatures of tramway and railway motors often have a canvas dust-cap over the end-windings to prevent metallic brake shoe dust entering the winding. These cloths are treated with varnish, shellac or bituminous compound either during or subsequent to the winding operations. Asbestos cloths are used, to a small extent, for similar purposes on machines which have to work at high temperatures.

(*b*) The major proportion of fabrics used is for the manufacture of varnished cloths which is an offshoot of the oil-silk industry. Selected cotton and silk fabrics are prepared with special finishes to give a regular smooth surface, and these are coated on both sides with flexible baking insulating varnishes. Silk fabrics are used where the thinner materials are required, such as 3 to 6 mils (thousandths of an inch), and cotton cloths for the thicker varieties ranging from 5 to 15 mils. In many cases the varnished fabrics are slit into narrow strips or "tapes", such as $\frac{3}{4}$ inch and 1 inch wide, for insulation

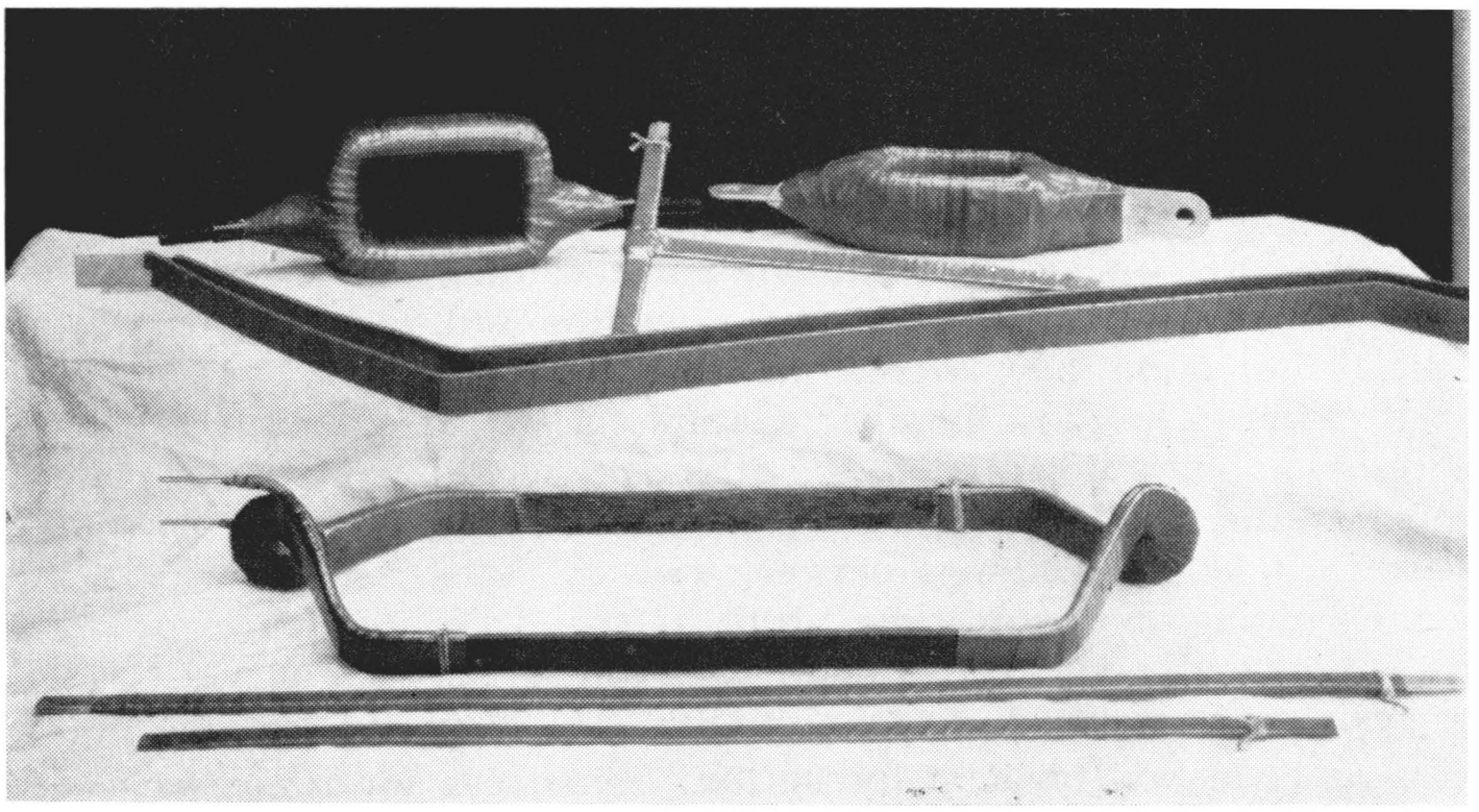

Fig. 1. Typical coils and bars insulated with seamless bias-cut varnished cloth tapes.

between layers and turns of coils, and for taping conductors, particularly parts of motor armatures and field windings. In order to obtain the degree of flexibility required such tapes are usually cut on the bias, the most useful variety being the continuous seamless bias tape. This is made from a tubular woven fabric cut helically to give a continuous sheet, say 36 inches wide, with threads oblique to the edges. The fabric is then starched, calendered and finally varnished in this form, the tape being slit longitudinally so that it, too, has the threads on the bias. These varnished cloths and tapes are most useful and adaptable insulating materials, as the fabric provides good strength and the varnish films on both sides impart good insulating properties. Fig. 1 shows typical coils and bars insulated with these bias-cut tapes.

Another type of treated fabric used extensively is the material familiar to most wiremen and electricians as adhesive tape, this being a cotton cloth treated with a rubber compound which adheres well on contact.

(*c*) Perhaps the most interesting use of cloths is in the form of reinforcement in boards and mouldings made of synthetic resins. The cloth, usually cotton, is treated with a solution of the synthetic resin (generally of the phenol-formaldehyde type dissolved in methylated spirit) and dried. The coated cloth is then stacked in sheets—for making boards—and placed between polished metal plates in a heated hydraulic press, pressures of about $\frac{1}{2}$ to 1 ton per square inch being applied whilst the temperature is maintained at about 150° C.

During this pressing operation, which may last for periods ranging from a few minutes to two hours depending upon the thickness of material, the resin sets, or " cures ", resulting in a solid mass of rigid material having considerable strength. The special sample shown in Fig. 2 was made to illustrate the three stages of this manufacture. The cloth in section (*a*) is untreated, whilst section (*b*) is the cloth after treatment with the synthetic resin (before pressing), and section (*c*) is the final rigid compound board after pressing. This shows clearly the degree to which the material is compressed. Rods, tubes and simple mouldings are also made by pressing the treated fabric in suitable moulds.

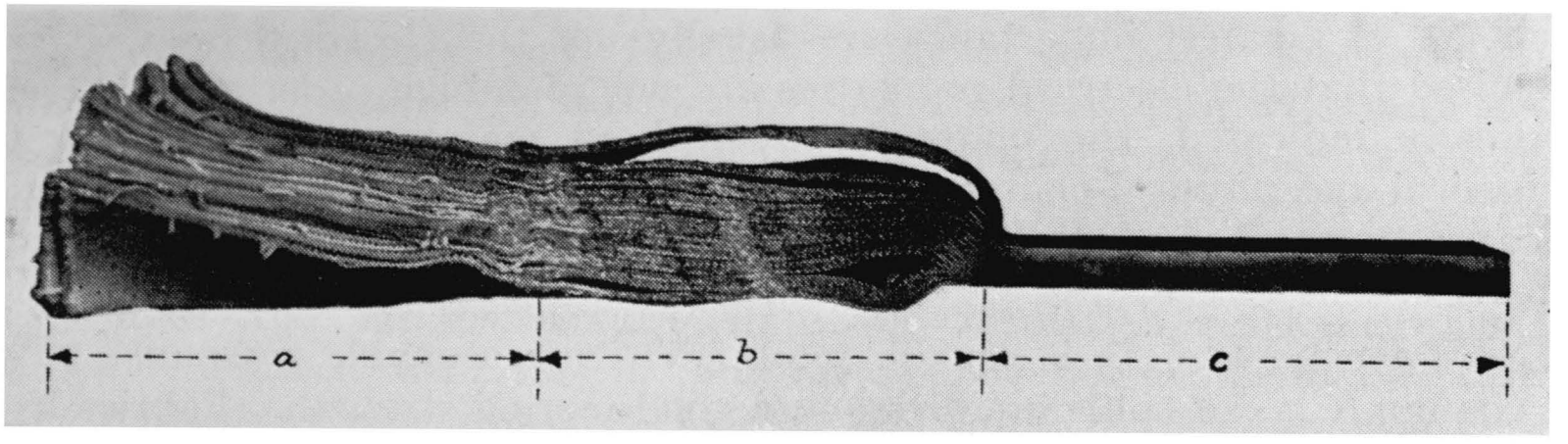

Fig. 2. Synthetic resin bonded fabric compound sample showing stages of manufacture.

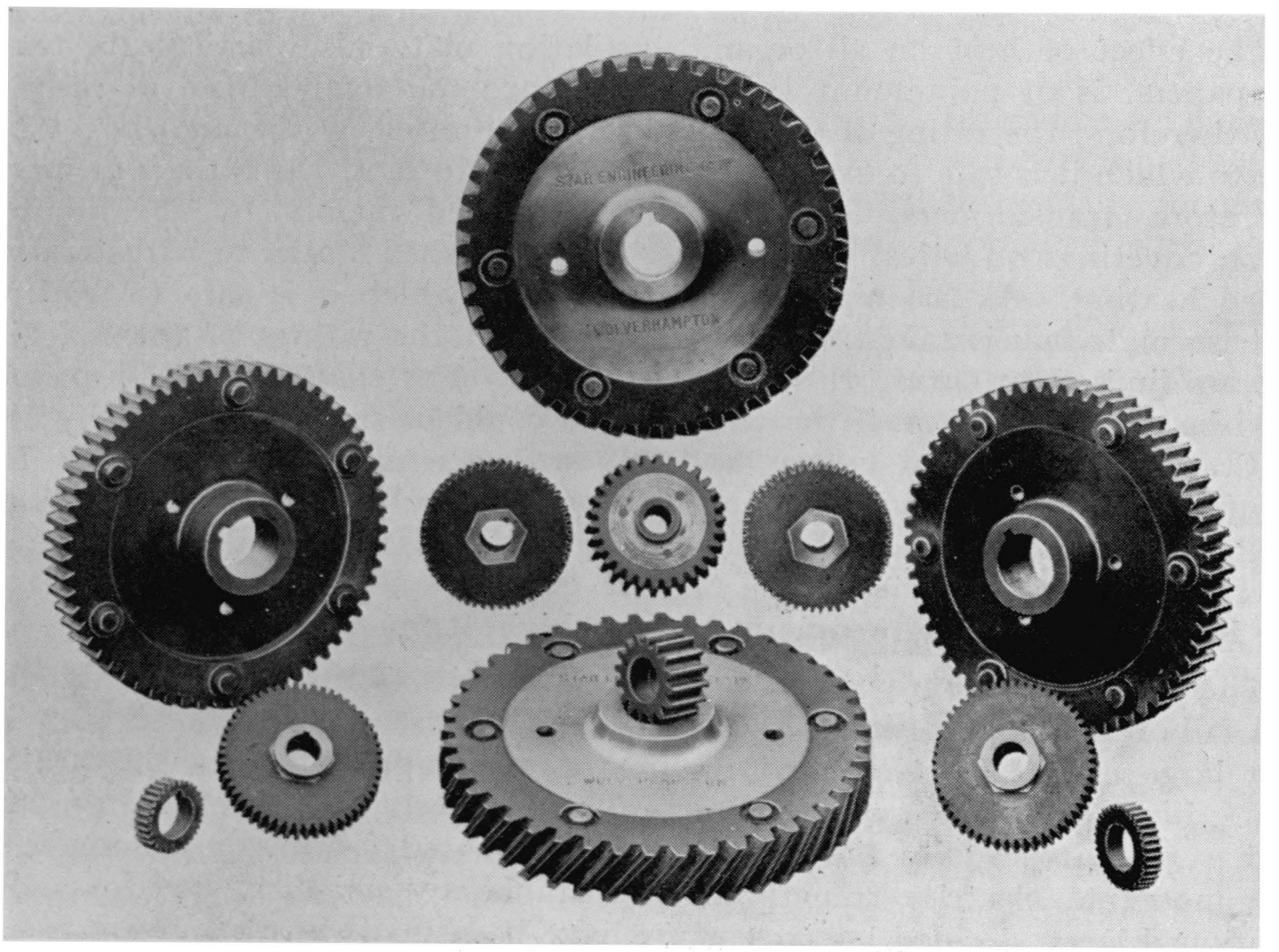

Fig. 3. Gears made from Fabroil-A (Synthetic resin bonded cotton fabric).

Various cloths are used for this purpose ranging from fine cambrics of about 1 oz. per yard to 12 or 15 oz. ducks, according to requirements. For example, the finer cloths are used for thin sheets, suitable for punching into washers and small terminal boards, also for the more intricate mouldings, whilst from the heavy ducks are made thick boards up to 4 inches thick. One of the most important uses of the latter is for making non-metallic gear wheels, such as " Fabroil-A ", examples of which are shown in Fig. 3.

The uses of these laminated fabric compounds are numerous, and include moulded spools for coils, insulated bars and operating rods for switches, panels

for switchboards, slot wedges for motors and terminal boards for transformers. By the use of a printed cloth for the outer layer a very serviceable diagram board or nameplate is made.

Fabrics cut into small pieces are also used as a filler in mouldings. The small pieces of cloth are impregnated with synthetic resin and mixed with a moulding powder of the Fabrolite or Bakelite type and moulded in the usual way in hot steel moulds.

THE PROPERTIES OF TEXTILES FOR ELECTRICAL PURPOSES

In using textiles for electrical purposes the characteristics and properties which are of greatest importance are usually *not* the electrical ones, it being recognised that the electrical properties are not of a high order and, therefore, as already indicated, the materials are utilised mainly on account of their mechanical and physical characteristics. The chief limiting factors are strength, resistance to heat and moisture, insulation resistance, ageing and chemical properties.

Good tensile strength is usually required with reasonable resistance to wear and chafing (e.g. for cable braidings) and good tearing strength. Fabrics having practically the same strength in warp and weft are generally preferred, particularly for making varnished cloths and laminated compounds. Cotton, especially the Egyptian variety, usually fulfils most of these requirements. Linen is used in a few cases on account of its higher strength.

The effect of heat on all organic insulating materials, particularly textiles and papers, is of paramount importance, since the temperature of operation and, therefore, the rating of the apparatus, are limited by the highest temperature to which it is safe to expose the insulation. In fact, the ratings of motors, generators, transformers, etc., have been decided mainly by the ability of cotton coverings on wires, cotton tapes and varnished cloths to withstand continued heating. As the highest temperature at which it is safe to work any of these materials is taken as about 105° C. and the ratings of the machines, etc., are limited to ensure this is not exceeded. For example, a 10-h.p. motor could be used for 12-h.p. if the temperature could be safely increased by about 10° C. Good grades of cotton and silk are generally satisfactory, it being essential that they do not contain acids or other substances such as chlorides which would accelerate tendering. The asbestos materials are naturally superior in this respect to all the organic textiles, and glass fibre products are also being adopted where practicable for high temperature operation.

The effect of moisture on the electrical properties of textiles is mainly shown by a fall of insulation resistance—a most serious consequence. This is prevented to a large extent by treatment, before or after application, with varnishes, waxes, bitumen and other compounds. The relatively poor electrical properties of the cloth are usually the cause of the laminated fabric compounds having only moderate electric strength and resistance to moisture, but, as will be mentioned later, decided improvements have been made in these respects. The electrical properties of the varnished fabrics and the laminated compounds are, of course, largely determined by the type of varnish or synthetic resin used and the process of manufacture. For example, a bituminous varnish is better than an ordinary linseed oil varnish and certain phenol-formaldehyde resins require longer and more careful curing than others to obtain the optimum electric strength. Nevertheless the fabric itself has its influence, an example being the finish on the surface of cloths used for making varnished fabrics. This has to be smooth and free from nap, otherwise the varnish film is irregular and has low electric strength.

All the textiles used for insulation are required to have good ageing characteristics as, obviously, any deterioration is liable to shorten the life of machines, etc., and may cause failure. The chief cause of failure is the effect

of heat, but there are some applications where the effects of corona, sunlight, mildew or micro-organisms cause deterioration.

In addition to their influences on ageing, moisture absorption and electrical properties, chemical constituents and additions may cause other troubles such as corrosion of fine wires in coils, particularly when moisture is present, and on direct current apparatus where electrolytic corrosion is liable to occur. Hence freedom from impurities and chemically active materials, particularly electrolytes, is very desirable.

RESEARCH AND DEVELOPMENTS

Electrical Engineers and Textile Technologists have for many years collaborated in research on textiles to improve their properties and develop new processes and materials. Among the outstanding developments the following may be mentioned as examples.

Washing of Cotton and Asbestos. By careful washing or scouring of cotton yarns, tapes and fabrics, greatly improved insulation resistance has been obtained, combined with less liability to mildew development and corrosion by the thorough removal of electrolytes. This has enabled substantial improvements to be obtained in the electrical properties of laminated compounds, especially under damp conditions of service.

Asbestos tapes have also been improved considerably by similar processes and by the use of specially selected crude fibre.

Acetylated Cotton. The use of acetylated cotton (such as "Cotopa") is being developed actively as this has greatly increased resistance to moisture, heat and chemical effects, and considerably better electrical properties than ordinary cotton. Cotopa fabrics are already being used successfully for making improved synthetic resin laminated compounds in accordance with Patent No. 513,687.

Synthetic Fibres. The advent of completely synthetic organic fibres, such as nylon and vinyon, is opening up a new line of research, and these products are being investigated. The effect of heat on nylon, however, appears to be more severe than is the case with cotton, which is a severe handicap.

Glass Fibre Products. The quest of the ideal textile has inevitably been directed towards one having greater resistance to heat than the organic fibres and better electrical properties under damp conditions than are obtainable with asbestos. Hence the recent introduction of improved spun glass fibre has provided the electrical engineer with a very promising new material, which is obtainable in the form of covered wires, braided sleevings, and woven tapes and cloths.

Many motors have already been completely insulated with glass fibre products and, although a certain amount of organic material in the form of varnish and synthetic resin has had to be used in their construction, they are, nevertheless, capable of being operated at fairly high temperatures such as 200° C. The glass fibres have very high tensile strength but poor shearing strength and are, therefore, liable to damage by cutting and chafing. Also, owing to the smoothness of the yarns, the threads of fabrics readily move apart. Special care has, therefore, to be taken during handling and winding operations, it being usual to pre-treat the tapes and cloths with varnish before use. Although these glass products are expensive they are certainly likely to be utilised more in the future.

CONCLUSION

This brief review of the use of textiles in the electrical industry is necessarily incomplete but should give an indication of the extent to which electrical engineers are dependent upon textile products. There are many technical

problems involved which require the closest collaboration between the two industries. This already exists to a marked degree. Very helpful assistance has been given on these problems by such bodies as the Shirley Institute, the Bleachers' Association and the Textile Institute itself, in collaboration with individual firms, the Electrical Research Association and the British Standards Institution.

In conclusion, the author wishes to thank the British Thomson-Houston Co. Ltd. for permission to read this paper and would like to express his appreciation of the opportunity provided by this meeting for acquainting those engaged in textile manufacture with some of the conditions and problems involved in the electrical engineer's endeavours to adapt textiles to his service.

Textile Institute Competitions— Prize Distributions at Leicester and Nottingham

On Monday, 7th October, the prizes won by students in the Leicester district were presented by Mr. P. A. Bentley. The Chairman of the Midlands Section, Mr. W. Pritchard, F.T.I., presided, and he was supported by Dr. E. Wildt, F.T.I., Vice-President of the Institute and past Chairman of the Section.

Mr. Pritchard, in briefly introducing Mr. Bentley, referred to his generosity in providing the prize money for E Competition last year. Mr. Bentley warmly encouraged students to compete. He said that they derived lasting benefits from their efforts out of all proportion to the actual value of any prize. Prizes should be looked upon as tokens.

Dr. E. Wildt proposed a vote of thanks to Mr. Bentley for presenting the prizes.

A similar brief ceremony took place at Nottingham on Thursday, 17th October, at 3-30 p.m.

Yorkshire Section

Textile Institute Competitions—Prize Distribution at Bradford

On Thursday, 3rd October, the Yorkshire Section held its first meeting of the 1940-1941 session at the Midland Hotel, Bradford, when the prizes won by Yorkshire students in the Textile Institute Competitions were presented by Mr. John Crompton, F.T.I. Mr. Crompton was supported by the President, Mr. H. Jaques, A.S.A.A., Mr. George Garnett, F.T.I., and by Mr. Harry Hardy, A.T.I., Chairman of the Yorkshire Section.

Mr. Crompton, in a short address, outlined the foundation and development of the Textile Institute Competitions. He stressed the value to the students of the work they put into the preparation of their albums, whether they were successful in winning prizes or otherwise. He drew attention also to the negotiations in progress, between the Royal Society of Arts and the Textile Institute whereby prize-winners in these Competitions will become eligible to compete for the Society's prizes and Scholarships.

Mr. Garnett proposed a vote of thanks to Mr. Crompton. He referred to the economic difficulties and restrictions arising from the war and remarked on the value of the competitions to those who would be in the struggle for markets after the war.

The vote of thanks was ably seconded by Principal H. Richardson, of the Technical College.

A very pleasing display of the albums and print designs submitted by the prize-winning candidates was arranged by Mr. W. E. King, F.T.I., and Mr. F. E. Ellis, A.R.C.A., A.T.I.

Mr. Kenneth Lockwood gave an interesting display of silent and talking films.

Obituary

Sir William Henderson, C.B., LL.D., D.L., F.T.I.

The Institute has lost, in the passing of Sir William Henderson, another of its Foundation Life Members. Sir William was 77 years of age and had been associated with Messrs. Alex Henderson & Sons Ltd., Jute Spinners and Manufacturers, since 1881. He became a partner in 1892.

Distance prevented Sir William Henderson from pursuing a very active part in the work of the Textile Institute. His energies were devoted to such work as that of the Dundee Chamber of Commerce and the Association of Jute Spinners and Manufacturers. He was once Chairman of the Chamber of Commerce and three times Chairman of the Association.

Sir William was deeply interested in educational and welfare work and took an active part in the building of the Technical College and School of Art. He was Chairman of the College Committee from 1897 to 1936, a governor of University College, Dundee, and a member of the Advisory Committee of the School of Economics and Commerce. In the municipal life of Dundee he was a prominent figure as well as in such movements as the Y.M.C.A. and the Territorial Force. He served as Deputy Lieutenant of the city and a Justice of the Peace.

In 1921 he received the honour of knighthood, having been made a C.B. in 1919. St. Andrew's University bestowed on him the degree of LL.D.

Mr. S. B. Hollings, F.T.I.

Mr. S. B. Hollings died in April at the age of 72. The " Wool Record and Textile World ", which he founded in 1909, wrote of him as follows in its issue of April 25th, 1940:—

" The Journal 31 years ago consisted of four quarto pages, but it was gradually built up and developed until in the course of time it won a world-wide circulation, exercising a considerable influence in trade circles at home and abroad. For eighteen years after the Great War Mr. Hollings and Mr. F. H. Meek acted as joint editors, and then in 1936 Mr. Hollings, who for several years had taken a less active interest in journalism, resigned from the staff and went into business on his own account in the wool trade.

" Throughout his life Mr. Hollings took a keen interest in all matters connected with the wool textile industry, but his chief concern was the raw material itself, and more especially the historical side of wool production. He made a hobby of collecting samples of wool from different countries, and was always pleased to lecture on his pet subject. Before the Great War he regularly attended the London wool sales, but although during the last twenty-five years he was seldom seen at Coleman Street Wool Exchange, he never lost interest in the offerings and prices realised.

" At one time he took an active part in the public life at Calverley, his native village, and he was a stalwart of Methodism."

Reviews

" Textile Testing ", by J. H. Skinkle (Macmillan & Co. Ltd. Price 15/-).

Mr. Skinkle has done two useful jobs for the English reader. He has described with intimate detail current American practice, and he has sorted and abstracted most of the papers on testing which have appeared in the *Journal of the Textile Institute*. Of 283 references, 91 are to papers in this Journal, and many of the remainder are to other English books and journals. His extracts are so extensive that it would appear that American practice is based on British research. Whether or not this is true, the author has produced a book which covers the wide field of textile testing well.

The book is in three sections, namely, physical, chemical and microscopical testing. The physical section is the largest and discusses a wide variety of

special tests, including the measurement of fibre resilience, fabric porosity, thermal properties and draping quality, in addition to more common tests. The chemical section deals briefly with estimations of filling materials, the analysis of mixtures of fibres, tests for damage, and tests for finishing materials including oils, gums and synthetic resins. The microscopical section, being very short, gives brief notes, without illustrations, on the identification of fibres and description of some estimations of quality and damage, including the methods of estimating fibre maturity and extent of mercerisation in cotton, and of measuring the diameter of wool fibres.

The book starts with a chapter on statistical methods. This is an excellent idea, because to the tester the variability of textile materials is their most characteristic feature. The sensitivity required in an instrument should not be decided without reference to the usual variation to be expected in the feature to be measured, and, generally, statistical considerations should help to indicate what refinements are helpful and which are quite beside the point. Unfortunately, the author's first chapter is the poorest in his book, and, perhaps more unfortunately, he fails to show in subsequent chapters that critical attitude which one associates with statistical analysis. His statistical examples are calculated from unsuitable data. The standard deviation as defined for samples consisting of large numbers does not lead to the best measure of variance for small samples, for which the number of degrees of freedom should be used instead of the population number. It seems unfair to the reader to describe how individual differences are found and squared when the mean range method, and the use of an arbitrary origin and arbitrary units are so much more convenient. A general review of statistical method as applied to textile testing would have been an excellent opening. The author has missed his opportunity.

The work of an author on physical testing of textiles is made difficult by the lack of satisfactory books on textile science, which binds him to include more discussion of scientific principles than is necessary in a book on chemical testing, but the author might allow his readers some previous knowledge of arithmetic and so reduce the number of conversion formulae and numerical examples. The formulae quoted, though imposing enough at first sight, are disappointing because they do not, as a rule, add anything to the information already given in words. The book would be improved if most of the formulae and all the examples were printed as notes in very small type.

The illustrations are weak. The diagrams are very rough c.f. Fig. 21 " Regular Twist " which is anything but regular, but they are considerably more informative than the half-tone illustrations. Some of these are recognisable only to persons already familiar with the instruments. Both faults are indications of haste and there is ample corroboration of this in the letterpress: " true accounts " for " true counts ", " type " for " T.Y.P.P.", " Ball " for Dr. W. Lawrence Balls, and Figs. 32 and 44 are identical though Fig. 32 cannot be made to fit the detailed description. There are indications, too, that the author has not first hand experience of some of the tests he describes. For instance, has he tried drawing a chalk line on a velvet pad and then making a Baer diagram on it, as he recommends? There are some other ideas mentioned which should not have been left unsupported. Some of these are, that cotton stapling gives the average fibre length, that " yarn might be very uniform as regards counts, but the twist might be very uneven ", that belting duck should have minimum crimp in the warp, and that " clothing seldom wears out ".

His " references " at the end of each chapter, though numbered, have no corresponding numbers in the type and the page of the reference is not indicated. They are, in fact, mere bibliography and might with advantage be collected and put at the end of the book. It is an unfortunate result of his sections that the immaturity test for cotton is separated from the Baer diagram and hair weight per centimetre test by 200 pages, but the author might have sustained the reader with a reference.

So long as our subject continues rapidly to expand and become more complex, the author's job will be difficult and no doubt it will always be much easier to review the book than to improve on it. Our thanks are due to Mr. Skinkle but, next time, could he publish the second edition first?

A. W. BAYES

Davisons' Textile Blue Book (United States, Canada and Mexico). Diamond Jubilee Issue, July, 1940. (Office Edn. $7.50, Handy Edn. $5, Salesmen's Directory $4.—Foreign Countries 50 cents extra).

The compilers of this valuable directory are to be congratulated upon this issue.

The work must be absolutely indispensable to those engaged in textiles in North and Central America for the arrangement of the Directory is excellent. Davison Publishing Company have nothing to learn about their job.

List of Members and Records

The Textile Institute " List of Members and Records ", which is normally published annually, was last issued in May, 1938. Many changes of address have been notified, particularly since the outbreak of war.

The Finance and General Purposes Committee consider that no good purpose would be served by correcting and reprinting at the present time. Instructions were given for the preparation of corrected typewritten copies, one of which will be available to members at the Institute. Inquiries sent to the Institute regarding members' addresses will be answered by return of post.

Office and Library Hours

The Finance and General Purposes Committee has agreed temporarily to alter the office hours so that the members of the clerical staff may get to their homes reasonably early in the evening.

Notice is therefore given that the Institute Library will close at 4 p.m. from the present date to the end of February, 1941. The Office will be open from 9 a.m. to 4-30 p.m.

Textile Institute Diplomas

Elections to Fellowship and Associateship have been completed as follows since the appearance of the previous list (September issue of the *Journal*):—

FELLOWSHIP

JAMES RUSSELL HEALEY,
Lecturer, Bradford Technical College.

ROWLAND STYANT MEREDITH,
Manager and Director. Messrs. Adam & Lane & Neeve Ltd., London.

ASSOCIATESHIP

PHILIP BROUGHTON LAW.
JOHN EDWARD LYNAM.

NOTICES: INSTITUTE MEETINGS

Tuesday,	5th November	*Manchester*—1.15 p.m. Meeting of the Diplomas Committee at the Institute.
Tuesday,	5th November	*Manchester*—2.45 p.m. Meeting of the Publications Committee at the Institute.
Wednesday,	20th November	*Manchester*—2.0 p.m. Meeting of the Finance Committee at the Institute.
Wednesday,	20th November	*Manchester*—2.45 p.m. Meeting of the Council at the Institute.

OTHER ORGANISATIONS

Blackburn Textile Society.

Friday,	8th November	*Blackburn*—Lecture: "Shrinkage in Cotton Goods" by G. E. Collins, M.Sc.Tech. (Shirley Institute, Manchester).
Saturday,	16th November	*Blackburn*—Visit to Richmond Hill Paper Works.
Friday	22nd November	*Blackburn*—Lecture: "Sizing Ingredients: Their Use and Abuse" by W. W. Wilkinson, A.T.I. (Technical College).

Bradford Textile Society.

Monday,	4th November	*Bradford*—Lecture: "Olive Oil Substitutes" by Dr. L. L. Lloyd, Ph.D., F.I.C. (Bradford Technical College), at the Midland Hotel, at 7.0 p.m.
Monday,	18th November	*Bradford*—Debate with Batley, Dewsbury, and Morley Textile Societies on "Woollen and Worsted Cloths" at the Midland Hotel, at 7.0 p.m.

Morley and District Textile Society.

Monday	18th November	*Bradford*—Joint Debate with Bradford Textile Society at the Midland Hotel, at 7.0 p.m.

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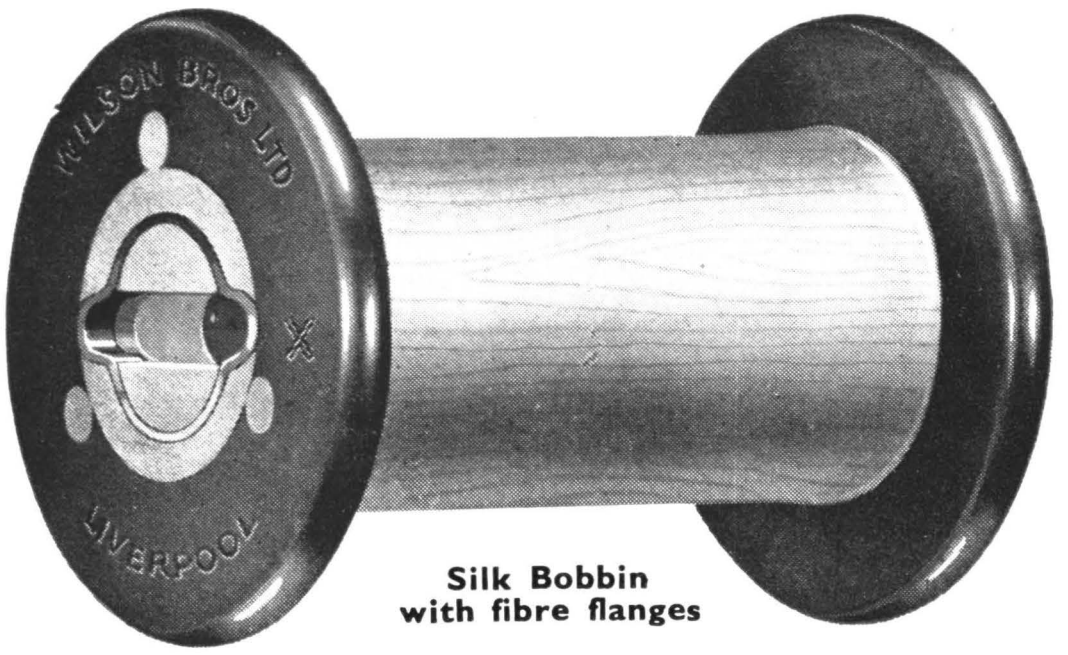

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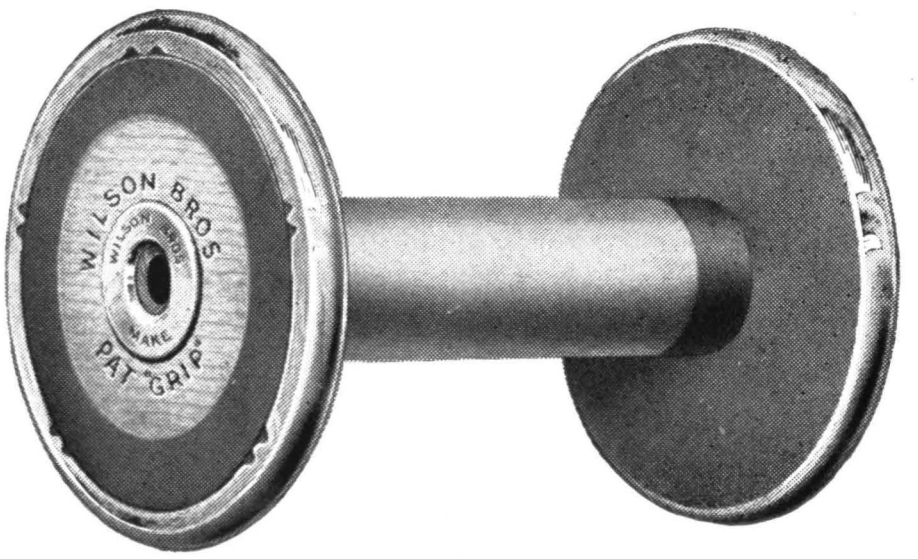

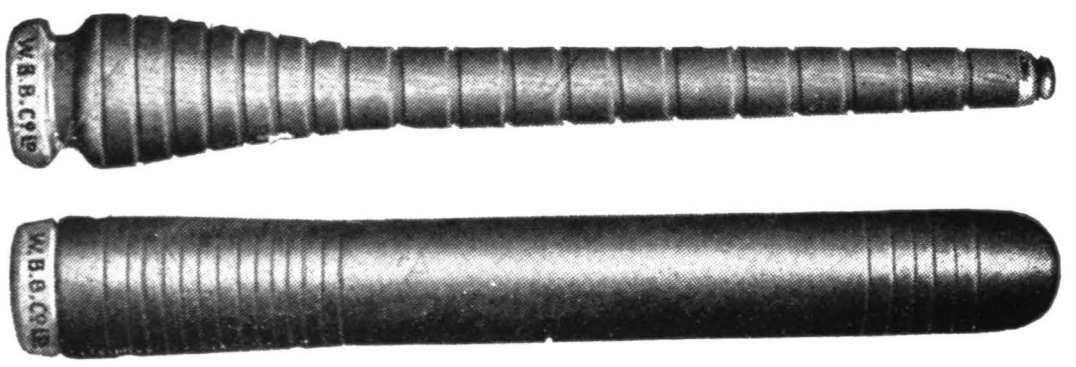

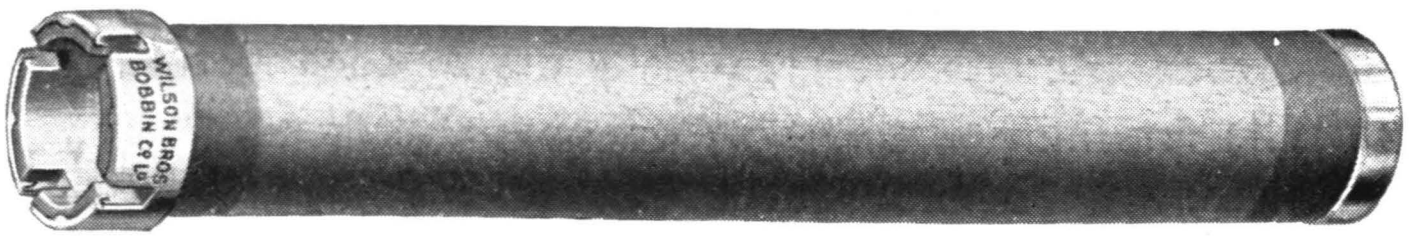

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THE JOURNAL OF THE
TEXTILE INSTITUTE
TRANSACTIONS

12—ON THE HEAT TRANSMISSION OF TEXTILE FABRICS

PART II

By C. D. NIVEN.
(Physicist, National Research Laboratory, Ottawa, Canada)

Abstract

The work described in a previous communication was continued with a view to comparing the heat transmission through fabrics worn by women indoors with the heat transmission of those worn by men. The results show that women can be just as warmly clothed on the body as men without wearing unusual clothing, but that on the calf of the leg a man's clothing has a T.I.V. about twenty times that of a woman. The results are discussed from the point of view of the heating engineer.

In a previous communication[1] a description was given of an apparatus for measuring the heat transmission of fabrics and some results on the fabrics worn by men indoors were given. One of the main objects of undertaking this investigation was to obtain data which would be of use in connection with comfort temperatures. The most important conclusion reached was that the effect of warm clothing was far more noticeable when air was moving than when it was still. Thus in still air a warmly clad man might not be particularly uncomfortable in conditions which suit a lightly clad man, while if a draught is admitted which the warmly clad man would scarcely notice, the lightly clad man would be extremely uncomfortable. It is not merely because human beings are more sensitive to atmospheres which are a little too cold than to those which are a little too warm: the clothing which they may be wearing changes in thermal insulating value when the air movement changes.

This fact emphasized the desirability of completing the survey of typical fabrics worn indoors by including those worn by women. The general opinion among people is that men are very much more warmly clad than women; but as men do not wear women's clothes nor do women wear men's clothes under normal conditions, the general opinion may be far more of an assumption than most of us realize. An apparatus, which is inanimate, can decide whether women are really very much more lightly clad than men and can also inform us what combinations of fabrics worn by women give similar thermal insulating values to combinations of entirely different fabrics worn by men; and in point of fact we reach the very interesting conclusion that without wearing unusual clothing a woman can be actually more warmly clad than a man on the body.

Samples Selected

The fabrics used in the tests consisted of the following :—

1. A piece of an elastic girdle expanded to one-and-a-half times its normal length.
2. A piece of artificial silk commonly used for a slip.
3. A piece of wool underwear.
4. A piece of jersey material cut from a small child's sweater.
5. A piece of flannel used for dresses.
6. A piece of cotton print used for dresses.
7. Two pieces of " silk " used for dresses—one weighted real silk, the other artificial silk.
8. A piece of a thick silk stocking.
9. A piece of a thin silk stocking.

The thicknesses and weights of these materials are given in Table I.

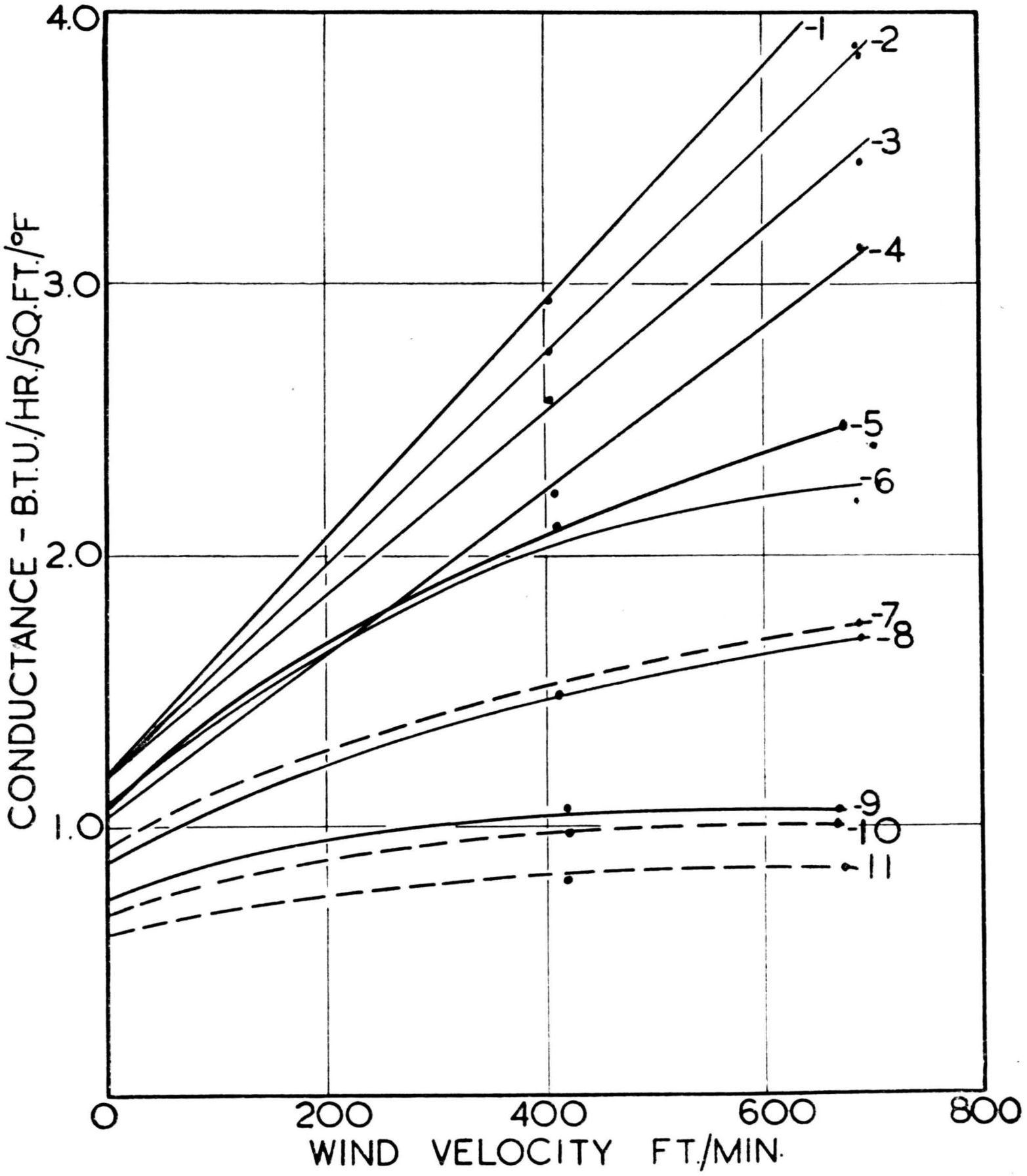

Fig. 1 (*a*)

1. Uncovered cylinder : also thin silk stocking.
2. Weighted silk : also thick silk stocking.
3. Acetate rayon.
4. Cotton print.
5. Flannel.
6. Girdle (expanded 1½ times normal length).
7. Serge + suit lining + shirting.
8. Jersey.
9. Acetate rayon over ¼″ rings.
10. Serge over ¼″ rings.
11. Serge + suit lining + shirting over ¼″ rings.

Results of Tests

Some of the materials were tested alone, but the most interesting results were obtained from tests in which dress materials were combined with some of the other samples. The girdle for instance was combined with the four kinds of dress materials : the results of this group of tests are shown diagrammatically in Figs. 2 (*a*) and (*b*), (*a*) referring to conductance values and (*b*) to T.I.V.'s* The results on another group of tests in which the dress

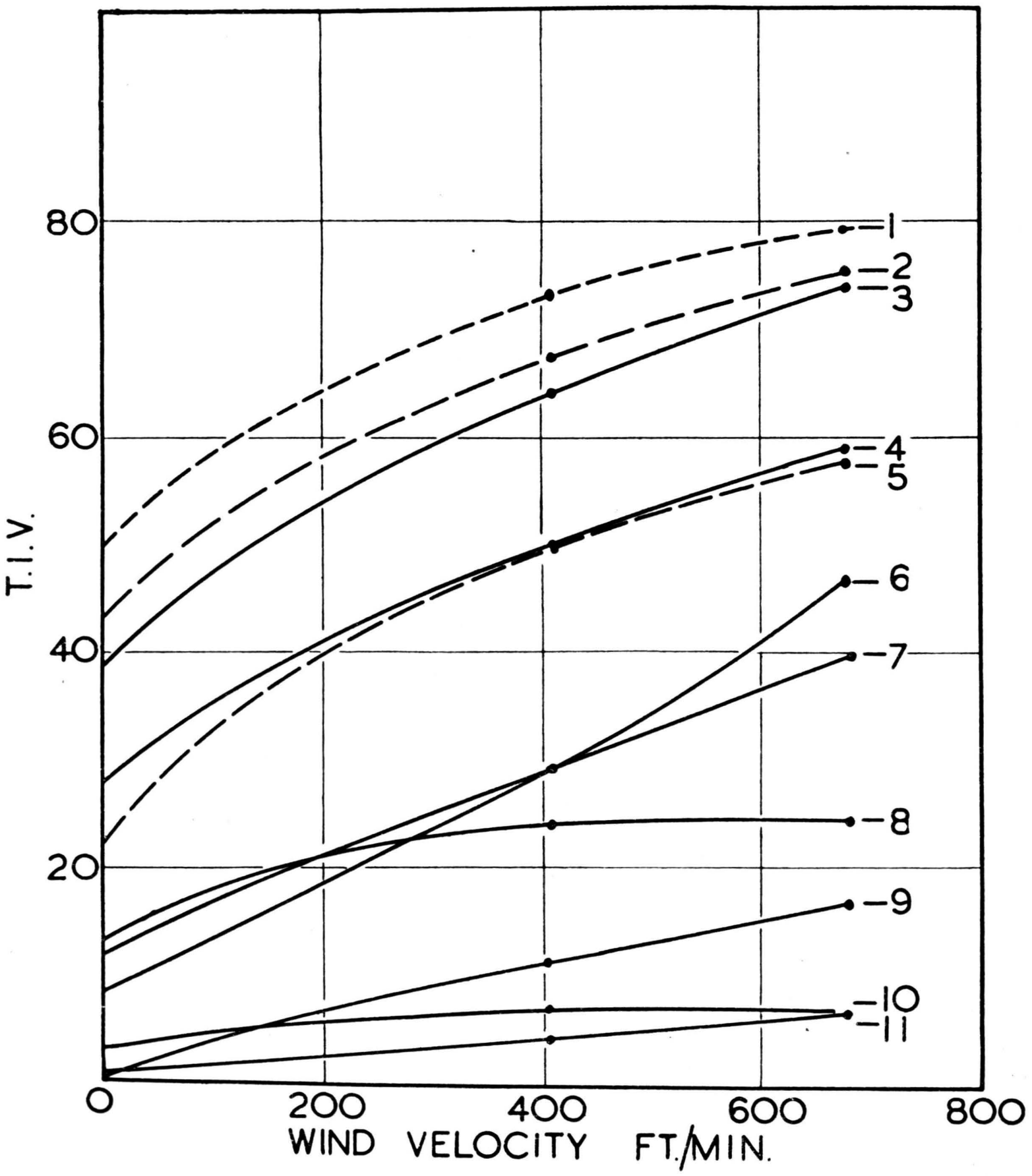

Fig. 1 (*b*)

1. Serge + suit lining + shirting over $\frac{1}{4}''$ rings.
2. Serge over $\frac{1}{4}''$ rings.
3. Acetate rayon over $\frac{1}{4}''$ rings.
4. Jersey.
5. Serge + suit lining + shirting.
6. Girdle (expanded $1\frac{1}{2}$ times normal length).
7. Flannel.
8. Cotton print.
9. Acetate rayon.
10. Thick silk stocking.
11. Weighted silk.

materials were combined with the girdle and white wool underwear are shown in Figs. 3 (*a*) and (*b*), and results with a third group of tests in which the dress materials were combined with the girdle and silk slip material are shown in Figs. 4 (*a*) and (*b*). Results on some of the materials measured

* T.I.V. or thermal insulating value is defined as

$$\left(1 - \frac{\text{heat loss from covered cylinder}}{\text{heat loss from uncovered cylinder}}\right) 100$$

alone and the results on some materials held out over $\frac{1}{4}$ inch celluloid rings are shown in Figs. 1 (*a*) and (*b*). The broken lines on the diagrams refer to fabrics or combinations of fabrics worn by men. It can easily be seen that the thermal insulation afforded by a knitted jersey material along with wool underwear and a girdle is as great or even greater than the insulation afforded by a tweed suiting with lining along with wool underwear and shirting.

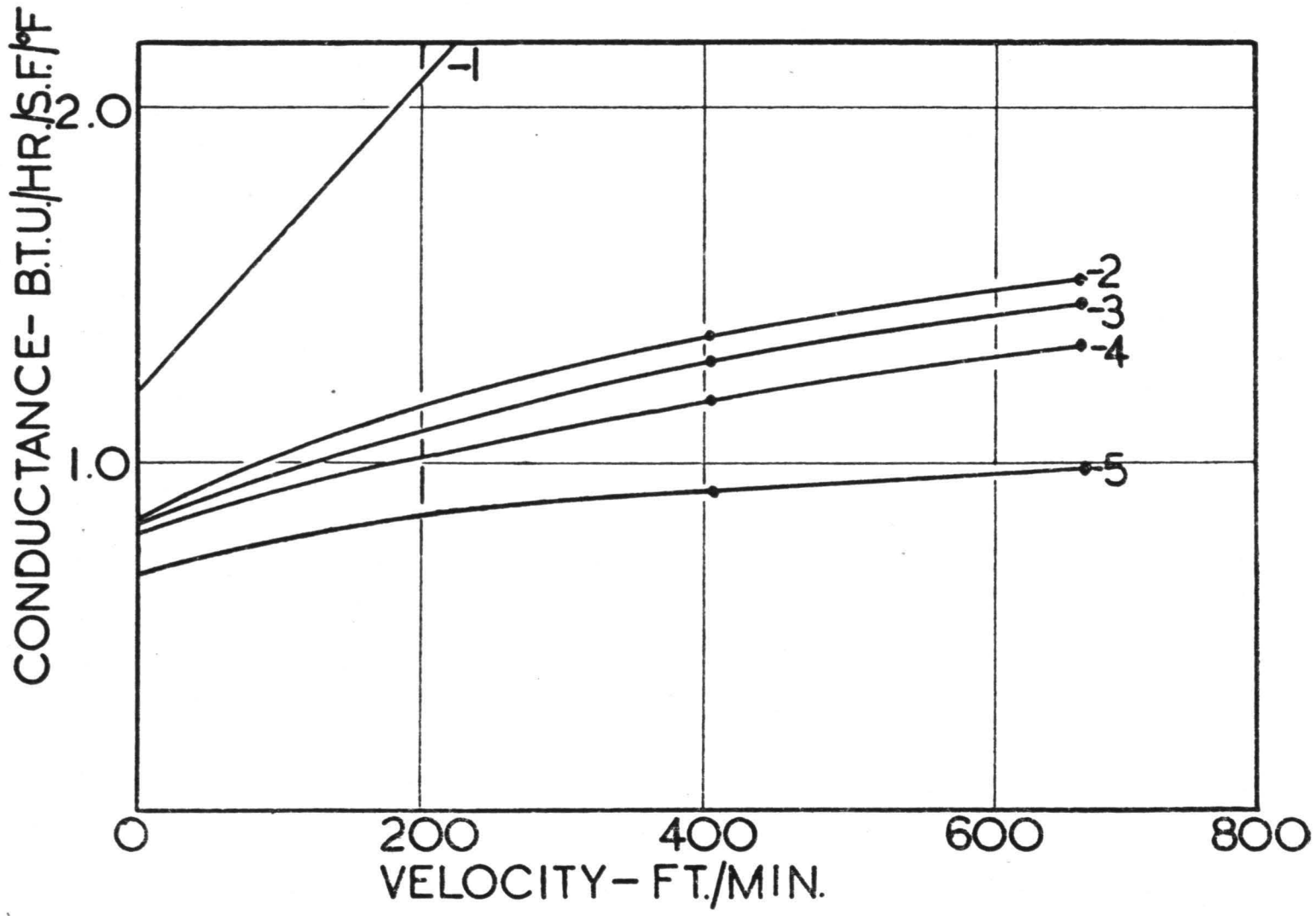

Fig. 2 (*a*)

1. Uncovered cylinder.
2. Girdle + wool underwear +weighted silk.
3. ,, ,, ,, + cotton print.
4. ,, ,, ,, + flannel.
5. ,, ,, ,, + jersey.

While these comparisons are simple on an apparatus, the application of the results to clothing worn on the body is not straightforward. The body is not evenly covered by garments as an apparatus is by samples of cloth, and furthermore air pockets are formed which on the one hand provide insulation but on the other hand are liable to introduce a sort of bellows effect when an individual is moving and thus cool the body. One must be careful therefore in concluding that because the broken line of Fig. 3 (*b*), for instance, which relates to a man clothed in a lined serge jacket over a shirt, lies below the line relating to a woman wearing a jersey material over a girdle, that therefore the woman is more warmly clothed than the man.

The style of clothing comes into the matter and is indeed a very important factor. For instance, a man wearing a serge jacket over a shirt may not be covered over the chest with anything but the shirt. Yet if the shirt happens to be loose over the skin he may have as much protection as he has where the serge jacket is tight. The importance of these air spaces is seen in Figs. 1 (*a*) and (*b*). Even a piece of thin Celanese held out from the apparatus a quarter of an inch was found to be almost as efficient a heat insulator as a piece of tweed suiting with lining over shirting and wool underwear if these were close to the apparatus. Soft materials like Celanese lie close to the body as a rule and therefore the possibility of improving their thermal insulating value in this way is of course remote in practice, even

if fashion did not favour snug fitting garments for women. The results, however, do indicate—if they do not prove conclusively—that a man need not be more heavily clothed on the body than a woman wearing a jersey material. The results show, too, that silk is not more efficient than cotton in so far as thermal insulation value is concerned. Silk has a tendency to lie close to the body and when this occurs one can see from Figs. 1 (*a*) and (*b*)

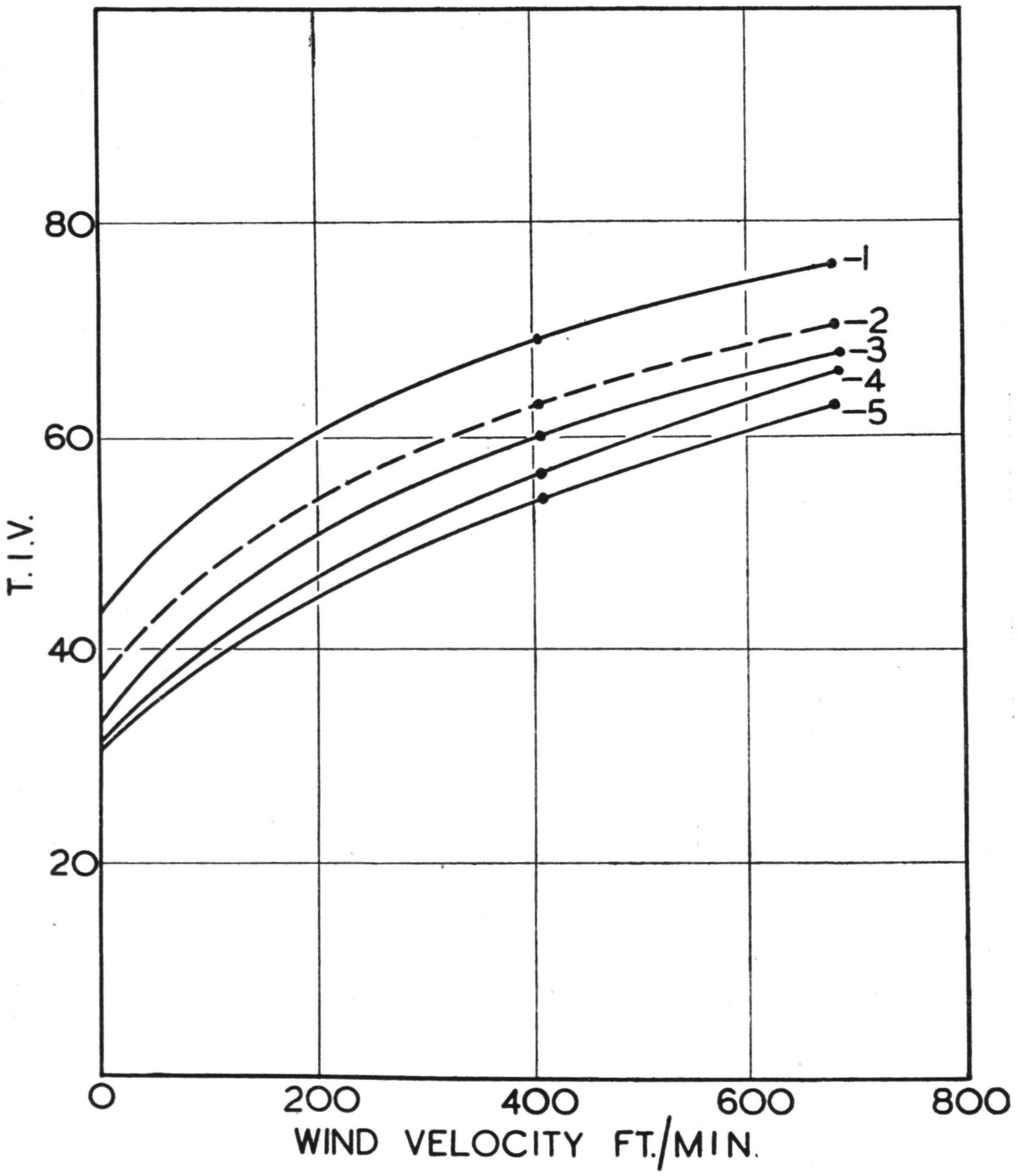

Fig. 2 (*b*)

1. Girdle + wool underwear +jersey.
2. Wool underwear + shirting + suit lining + tweed sewn on loosely.
3. Girdle + wool underwear + flannel.
4. ,, ,, ,, + cotton print.
5. ,, ,, ,, + weighted silk.

that its value as thermal insulation on the body is very small indeed. There is not a great advantage in wearing flannel instead of a cotton, although the data do show that the flannel is definitely the warmer ; but the jersey material appears to be very much warmer than the flannel. It is worth noting that the jersey material shows up to advantage particularly in still air.

While the comparison of clothing on a man's body with that on a woman's is complicated by the difference in styles, the comparison of the clothing on the lower part of the leg is more simple. The insulation on the lower part of the leg is rather an important matter under those heating conditions

which produce large temperature gradients. Draughts, windows open at the bottom instead of at the top, and zero weather on the outside of a single glazed window are all contributing factors to the formation of temperature gradients and while a discussion of these factors is outside the scope of this communication, they are mentioned because the lower part of the leg is often in an atmosphere two to four degrees colder than the head. To offset this notoriously uncomfortable condition the lower part of the leg should be well insulated against cold. Our results on silk stockings show that they afford practically no thermal insulation at all. The conductances of the thin sample differed so little from the values obtained for the uncovered body that the differences compared with the experimental error and rendered the T.I.V. calculations unreliable. The sample of thick silk stocking did show a measurable T.I.V., but this was about 2/43 of the T.I.V. found for a piece of serge held out from the apparatus on the $\frac{1}{4}$-inch celluloid rings; this is the test which would appear to correspond most closely to the clothing

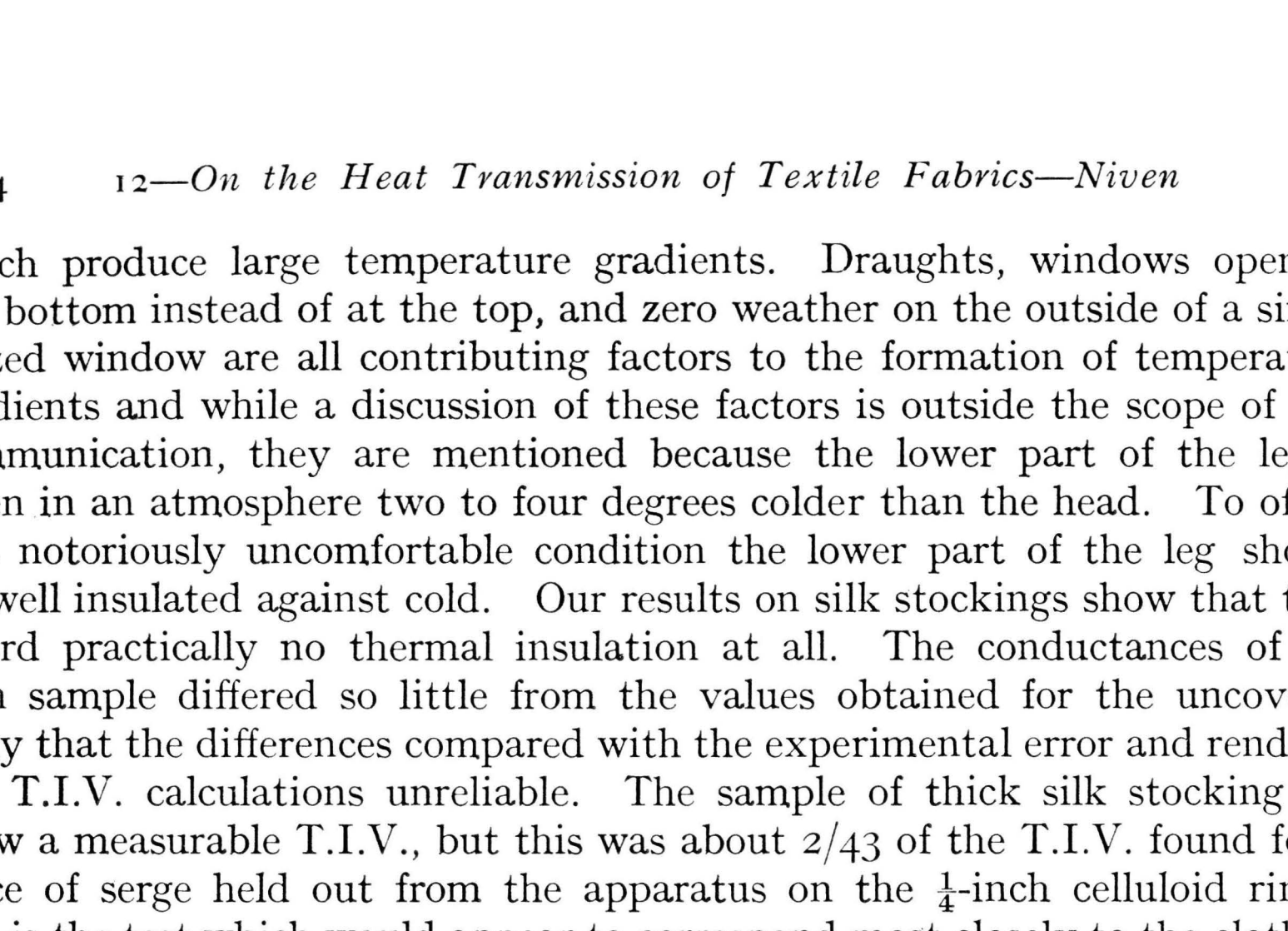

Fig. 3 (*a*)

1. Uncovered cylinder.
2. Girdle + weighted silk : also girdle + cotton print.
3. Girdle + flannel.
4. Shirting + suit lining + serge.
5. Girdle + jersey.

worn by men on the lower part of the leg. On the ankle of course the T.I.V. of a man's clothing is much lower than the T.I.V. of serge held out from the body.

The figures obtained from the various measurements are given in Tables II and III. A slight difference has been made in calculating the T.I.V.'s in this communication from the last. Instead of measuring the wind velocity on each occasion a mean value of a number of measurements of wind velocity was taken for two settings of the current driving the fan. The corresponding wind velocities were termed moderate and strong. The actual mean value for the " moderate " velocity was 405 feet per minute and for the " strong " velocity 677. The conductance from the uncovered apparatus at these velocities was taken to be 2·95 and 4·12 respectively : these figures were obtained from the graph shown in Figs. 1, 2 and 3 of the previous com-

munication. The T.I.V.'s at "moderate" and "strong" velocities were simply

$$100\left(1-\frac{C_m}{2.95}\right) \text{ and } 100\left(1-\frac{C_s}{4{\cdot}12}\right)$$

respectively where C_m and C_s were the conductances of a particular sample in the moderate and strong air current.

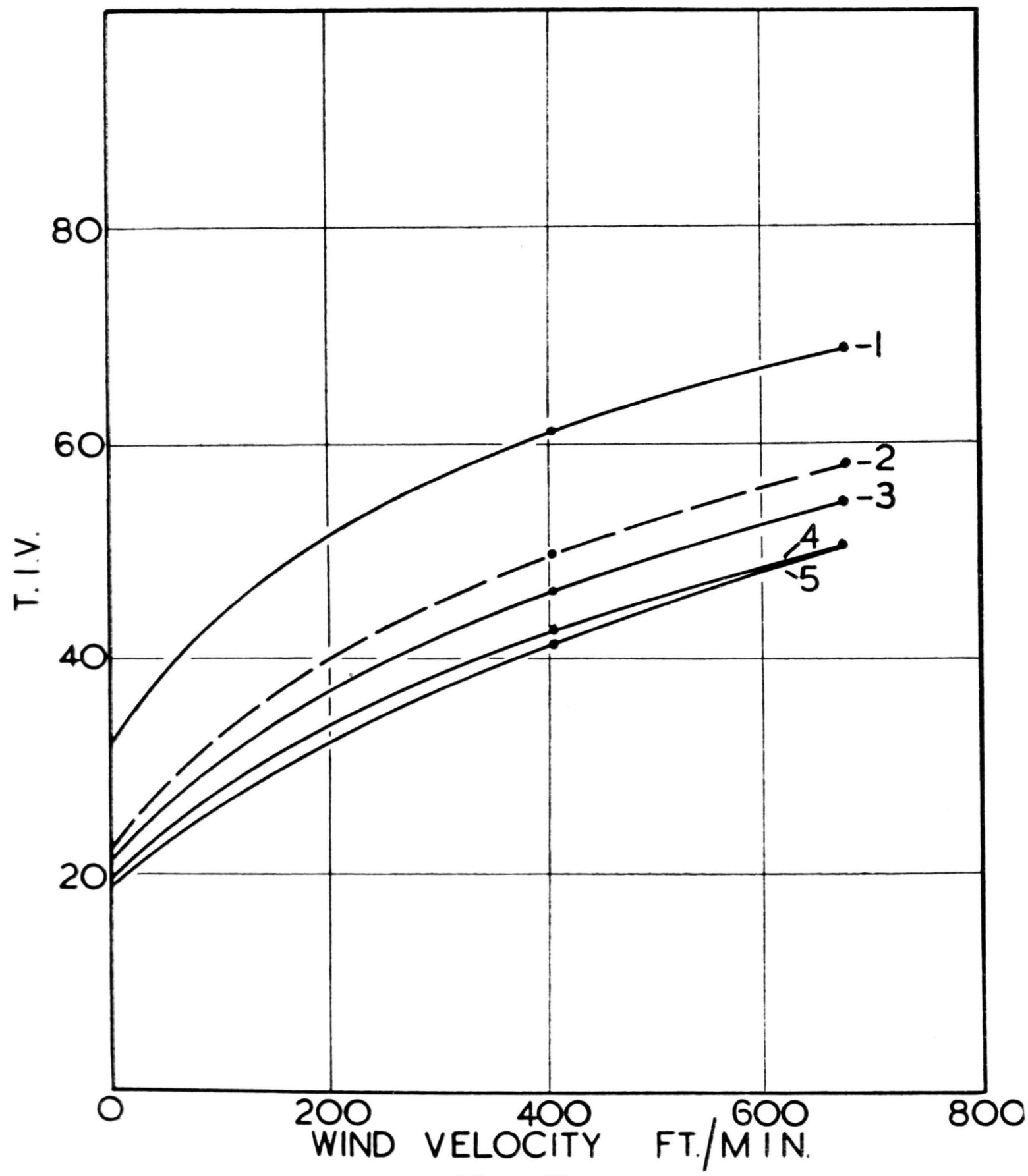

Fig. 3 (*b*)

1. Girdle + jersey.
2. Shirting + suit lining + serge.
3. Girdle + flannel.
4. Girdle + cotton print.
5. Girdle + weighted silk.

General Conclusions

When this work was first undertaken, it was criticized on the ground that no matter what results were found, people would still wear the clothing which fashion decreed. But the value of such data does not consist in constituting a basis for a campaign against conventional clothing but rather to give those who have the responsibility of heating buildings an idea of what complaints to expect from those who are conventionally dressed and to enable them to distinguish between justifiable complaints and unjustifiable ones. If we could place our thermostats at the level of the body and ignore all complaints if the room felt too hot or too cold provided this thermostat

was operating as desired, then there would be no justification for the complaint that women were more lightly clothed than men. Any such complaint should be replied to by the individual himself or herself by wearing suitable clothing. But the heating engineer's problem is not so simple. One reason that women demand a higher temperature indoors than men is apparently because the lower part of the leg is not protected. Thus women have a

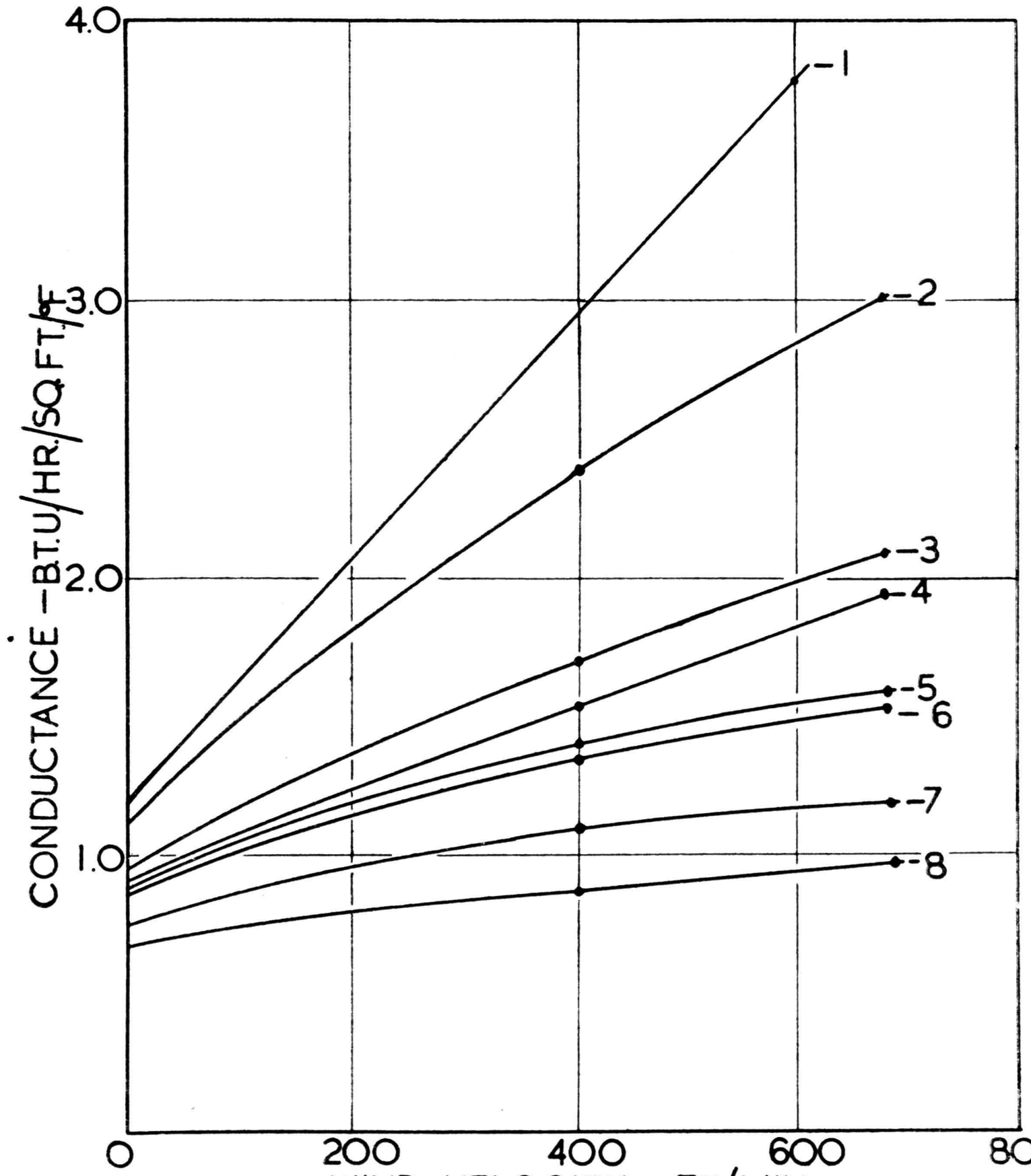

Fig. 4 (*a*)

1. Uncovered cylinder.
2. Silk slip + weighted silk
3. Girdle + silk slip + weighted silk.
4. ,, ,, ,, + cotton print.
5. Girdle + silk slip + flannel.
6. Silk slip + jersey.
7. Girdle + silk slip + jersey.
8. Silk slip + weighted silk over $\frac{1}{4}$″ rings.

genuine reason for requiring higher temperatures than men, and the great problem at the present day in heating buildings for conventionally dressed men and women is the elimination of temperature gradients. While everyone knows that conventionally dressed women are sensitive to cold on the lower part of the legs few people probably realize that the thermal insulating value of the clothing on the calf of a man's leg is more than 20 times as great as that of the stocking on the woman's leg.

The surprising thing is that women do not demand even higher temperatures relative to what men require and the explanation may be that the calf of the leg is fairly insensitive to cold. Nevertheless, in view of the results given above, there can be little possibility of improving the atmospheric conditions indoors so that the air may be fresh and cool to breathe unless

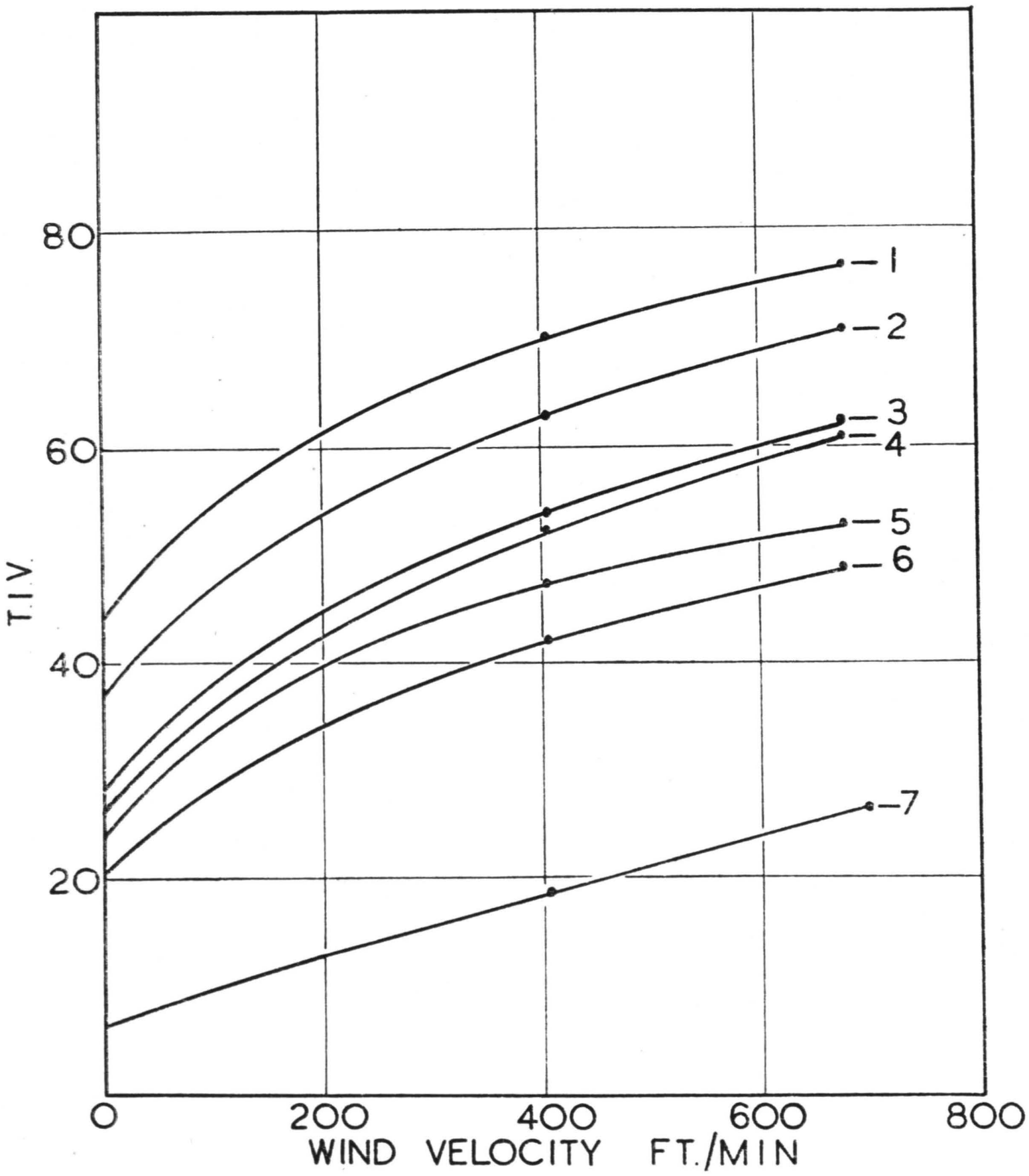

Fig. 4 (*b*)

1. Silk slip + weighted silk over ¼″ rings.
2. Girdle + silk slip + jersey.
3. Silk slip + jersey.
4. Girdle + silk slip +flannel.
5. Girdle + silk slip + cotton print.
6. ,, ,, ,, + weighted silk.
7. Silk slip + weighted silk.

heating engineers devise some method to keep the temperatures near the floor actually warmer than those at the level of the body. With any method of heating which heats the air, convection currents render this almost a physical impossibility but by the use of radiant heat the problem does not seem entirely insoluble.

The author's thanks are due to Mr. C. H. Bayley of the Division of Chemistry, National Research Laboratories, Ottawa, and to Miss A. S. Tweedie, until recently of that division, for their advice in the selection of typical samples and for their assistance in obtaining them.

REFERENCE

[1] Niven and Babbitt. *J. Text. Inst.* 1938, **29**, T161.

Table I

Material	Thickness $\left(\frac{\text{mm.}}{100}\right)$	Weight oz./sq. yd.
Weighted silk	19	2·82
Acetate rayon	35	5·19
Cotton print	18	3·01
Flannel	47	3·99
Jersey	103	6·63
Silk Slip (viscose rayon)	15	2·29
Wool Underwear	100	6·15
Girdle (not expanded)	193	21·07
Thick Silk Stocking	31	2·93
Thin Silk Stocking	11	0·59
Serge	68	9·26

Table II

Description of Test	Conductance			T.I.V.		
	Still Air	Moderate Air Movement	Strong Air Movement	Still Air	Moderate Air Movement	Strong Air Movement
Acetate rayon, fairly tight	1·19	2·61	3·42	0·5	11·4	16·9
Weighted silk, ,, ,,	1·19	2·76	3·83	0·9	4·4	7·0
Cotton print, ,, ,,	1·04	2·23	3·10	13·2	24·4	24·7
Flannel, ,, ,,	1·06	2·09	2·49	11·8	29·3	39·6
Jersey material, ,, ,,	0·87	1·47	1·69	27·6	50·1	59·1
Acetate Rayon over $\frac{1}{4}''$ rings	0·74	1·06	1·06	38·7	64·1	74·2
Girdle-expanded $1\frac{1}{2}$ normal	1·10	2·09	2·19	8·1	29·1	46·8
Silk Stocking, thick ...	1·16	2·74	3·81	3·2	7·1	7·5
Silk Stocking, thin ...	1.21	2·95	3·75	—	—	—
Blue Serge over $\frac{1}{4}''$ rings ...	0·68	0·97	1·01	43·4	67·2	75·5
Blue Serge + suit lining + shirting	0·93	1·48	1·73	22·5	49·8	58·1
Ditto over rings	0·60	0·79	0·85	49·9	73·2	79·4

Table III

Description of Test	Conductance			T.I.V.		
	Still Air	Moderate Air Movement	Strong Air Movement	Still Air	Moderate Air Movement	Strong Air Movement
Girdle + wool underwear + weighted silk	0·83	1·35	1·52	30·5	54·2	63·0
Girdle + wool underwear + cotton print	0·82	1·28	1·44	31·2	56·7	66·1
Girdle + wool underwear + flannel	0·80	1·17	1·33	33·2	60·4	68·0
Girdle + wool underwear + jersey	0·67	0·91	0·98	43·9	69·1	76·2
Girdle + weighted silk ...	0·97	1·73	2·03	18·8	41·4	50.7
Girdle + cotton print ...	0·96	1·69	2·04	19·5	42·7	50·4
Girdle + flannel	0·94	1·58	1·87	21·5	46·4	54·6
Girdle + jersey material ...	0·82	1·14	1·28	31·8	61·2	68·8
Shirting + suit lining + serge	0·93	1·48	1·73	22·5	49·8	58·1
Girdle + silk slip + weighted silk	0·95	1·71	2·10	20·7	42·1	49·0
Girdle + silk slip + cotton print	0·91	1·55	1·95	24·1	47·4	52·8
Girdle + silk slip + flannel	0·88	1·41	1·60	26·5	52·2	61·3
Girdle + silk slip + jersey	0·75	1·10	1·20	37·0	62·9	70·9
Slip silk + weighted silk ...	1·12	2·40	3·02	6·4	18·7	26·8
Silk Slip + jersey	0·86	1·35	1·54	28·3	54·1	62·5
Silk Slip + weighted silk over $\frac{1}{4}''$ rings	0·67	0·88	0·97	44·2	70·1	76·6

Received 15/4/40

Correspondence

REGAIN CALCULATORS

To the Editor of the Journal of the Textile Institute.

Dear Sir,

The description in your pages recently of two regain calculators seems to me to imply a serious reflection on our textile education. The calculation of regain is a matter of simple proportion, one of the easiest things to do on a slide rule, and if there is really a demand for these specialised calculators it is obvious the slide rule has not been taught either as widely or as well as it should be. One of the specialised calculators has slide-rule scales and therefore the same accuracy but the calculator described in your September issue appears to use either squared paper or hand-marked scales. As far as I know, squared paper lithographed from engine-divided originals is available only in small sizes and machine-ruled square paper is notoriously inaccurate both in regularity of division and parallelism. Even when marked out on an engineer's drawing board by a skilled draughtsman I cannot see the calculator coming anywhere near a slide rule in accuracy. The scales of the latter, engine-divided on a relatively rigid base can be read if necessary through a magnifying glass to a far greater accuracy than is possible in any graphical method.

(Signed) A. W. STEVENSON.

Galashiels,

30*th September*, 1940.

THE JOURNAL OF THE
TEXTILE INSTITUTE

ABSTRACTS

LIST OF ABSTRACTORS

The Abstracts in this section of the "Journal" are supplied by the following Organisations, and the source indicated by the initials hereunder shown.

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In some instances a second reference is given in parenthesis as " (through *Chem. Abs.*, 1940, 34, 269) ", which means that the abstract has been taken from another abstracting journal and the original publication is not obtainable at the Textile Institute.

1—FIBRES AND THEIR PRODUCTION

(B)—ANIMAL

Inheritance of Horns and Scurs in Sheep. H. L. Ibsen and R. F. Cox. *J. Heredity*, 1940, 31, 327-336. W.

Undercoat of the Platypus: Comparison with Wool. A. F. Barker. *Nature*, 1940, 145, 186-187.

The medulla of wool fibres on treatment with concentrated caustic potash for ½-3 hrs., followed by washing in water, breaks up into short lengths. It is suggested that these may each represent a day's growth. The medulla of the undercoat fibre of the platypus has a " ladder " structure, each division of which probably represents a day's growth. W.

(C)—VEGETABLE

Mechanical Cotton Harvester: Factors Influencing Efficiency. H. P. Smith, D. T. Killough, D. L. Jones and M. H. Byrom. *Texas Sta. Bul.*, No. 580, 1939, 49 pages (through *Exp. Sta. Rec.*, 1940, 82, 830).

An investigation is reported into the most suitable cotton plant habit for harvesting by machinery and into the factors that influence the efficiency of the auxiliary " extractor ". Plant characteristics appear to be more important than mechanical factors or cultural methods. At one experiment station hand-picked cotton was half a grade better than hand-snapped cotton and 1½ grades better than mechanically-harvested cotton. At another station, where the yield per acre was twice as great, the mechanically-harvested cotton was a grade poorer in one season but about the same as the hand-snapped cotton in another season. C.

Agaves and Yuccas of Mexico. J. E. A. den Doop. *Cord Age,* 1940, **24**, No. 2, 28-30.

The number of Agaves and Yuccas occurring in Mexico are many and exploitation for markets other than local is confined to a few types only. Henequen, the chief fibre export from Yucatan State, is obtained from *Agave fourcroyides* as against *Agave Sisalana* grown in East Africa, East Indies, etc. *Ixtile* fibre from *Agave ixtile* is also exported from Yucatan. Mexican *maguey* fibre is distinct from the *maguey* fibre of the Philippine Islands, produced from *Agave cantala,* or the Java *cantala* of the Dutch East Indies. *Ixtile de lechuguilla,* known in world commerce as *Tampico* fibre, is the only high quality white vegetable brush fibre known. Some 8,000 tons of this fibre are exported yearly. *Ixtile de Palma,* the third important fibre of Mexico, coming after *Tampico* and *henequen, can* be used for twines, coarse sacks, etc. L.

Flax Pulling Machine. *Irish Textile J.,* 1940, **6**, No. 9, 8.

Refers to a recent trial of the Bartram flax pulling machine. A brief description of the machine is given. L.

Flax Growing in Eire. *Irish Text. J.,* 1940, **6**, No. 9, 8.

The Eire flax area this year was much larger than had been anticipated, totalling some 15,500 acres as against 4,123 acres in 1939 and 3,915 in 1938. Donegal, where some excellent fibre is produced, has some 5,500 acres under flax this year as against about 2,500 acres in 1939. Last year the Eireann flax yield was 32·9 stones as compared with 26·6 stones in 1938. L.

(D)—Yarns and Cords

Cellulose Pulps: Sources. J. Grant. *Nature,* 1940, **146**, 219-223.

The shortage of wood pulp as a result of the cutting off of supplies from Scandinavia and the increasing difficulty of obtaining esparto grass from French Africa are discussed and it is pointed out that shortage of cellulose pulp supplies to Great Britain will probably persist, if the war continues, in spite of increasing output of wood pulp in both Canada and the United States. Materials available in Great Britain for the production of cellulose pulp include rags, waste paper, and straw, and similar plant materials. Supplies of rags and waste paper are limited and disintegration, purification and re-manufacturing processes are accompanied by degradation so that when waste paper is being used it is generally necessary to introduce a certain amount of virgin fibre. Straw is a promising source of cellulose pulp; it is produced regularly and in large quantities and can be collected and handled relatively easily. Straw pulp can be prepared in most of the existing plant previously used for rag and esparto. Certain minor modifications are necessary and improvements in bleaching operations have recently been developed. Possible alternative sources of cellulose include Norfolk reeds, bracken, peat, potato and tomato haulms, sunflower stalks, linseed straw, hop waste and hop vines. C.

Nylon Raw Materials: Production. *British Plastics,* 1940, **12**, 80.

The raw materials used in the production of nylon are discussed and patent processes for the production of adipic and sebacic acids and hexamethylene and decamethylene diamines are outlined. C.

Patents

Protein-containing Artificial Threads, Filaments, Bands, etc. T. Koch (to American Enka Corp.). U.S.P.2,195,930 of 2/4/1940 (through *Chem. Abs.,* 1940, **34**, 5298).

An alkali salt of a protein, e.g. sodium caseinate, is spun into an acid precipitating bath containing an aromatic or hydroaromatic acid, e.g. toluene sulphonic acid or its condensate with an aldehyde. The product is stretched in the precipitating bath and finally treated with a hardening agent, e.g. formaldehyde. W.

Artificial Wool-like Product. J. B. Miles, Jr. (to E.I. du Pont de Nemours and Co.). U.S.P.2,197,896 of 23/4/1940 (through *Chem Abs,* 1940, **34**, 5677).

A product suitable for making wool-like fabrics, etc., comprises crimped fibres of a synthetic linear polymer such as polyhexamethylene adipamide having a crimp retentivity of at least 40 per cent. and exhibiting by characteristic X-ray patterns orientation along the fibre axis. W.

Viscose and Cellulose Ether Mixture Films and Filaments: Production. British Cellophane Ltd. (Bridgwater). B.P.523,566 of 5/1/1939: 17/7/1940 (Conv. 8/1/1938).

Regenerated cellulose films and filaments are prepared from casting or spinning solutions which comprise in homogeneous admixture normal viscose and an alkali-soluble cellulose ether, the proportion of the cellulose ether being not in excess of 25 per cent., and preferably not in excess of 5 per cent. of the regeneratable cellulosic material. Normal viscose is prepared by using for xanthation a proportion of carbon bisulphide of from 27 per cent. up to about 40 per cent. of the cellulose used, and contains about 7 per cent. of regeneratable cellulose. Suitable alkali-soluble cellulose ethers include methyl, ethyl, glycol, propylene glycol and glyceryl cellulose, cellulose glycollic acid and cellulose propionic acid. Films, filaments and the like prepared by this method have a high ratio of wet to dry strength and when used as base material show in the presence of water a more durable adhesion between the base and moisture-proof compositions of the known type applied thereto. The incorporation of the cellulose ether also produces desirable modifications in the dyeing properties of the products. When oxy-acid ethers of cellulose are used metallic ions may be introduced by treatment with metal salts, such methods being of especial interest for the preparation of fireproof, mildew-resistant and other special materials. C.

Treatment of Hides for Tanning. E. I. du Pont de Nemours & Co. B.P.523,578 of 17/7/1940.

Sulphamic acid or its ammonium salt is used for deliming and/or pickling hides and skins. W.

Octyl Alcohol: Application in Viscose Spinning. Courtaulds Ltd. (London), H. J. Hegan, J. H. Givens and L. Rose. B.P.523,864 of 17/1/1939: 24/7/1940.

For the production of threads from viscose, coagulation by acid solution is effected in the presence of a proportion of octyl alcohol which is so small as to have no substantial effect on the lustre of the thread. The octyl alcohol (normal or iso, primary, secondary or tertiary) may be added to the viscose alone or together with a small proportion of a compound which acts as an emulsifying or surface tension reducing agent. The octyl alcohol may alternatively, or in addition, be added to the coagulating bath, e.g. in a proportion of about 0·20 per cent. of the bath. An emulsifying or surface tension reducing compound may be added to the coagulating bath. C.

Thread Guiding Device. Lustrafil Ltd. (Nelson) and S. W. Barker. B.P.523,902 of 17/1/1939: 25/7/1940.

In a device for guiding threads during treatment, e.g. rayon threads in washing or drying processes, the thread or filament is wound over a pair of rollers and over the surface of a fixed bar or rod inclined at an angle to the plane containing the axes of the rollers or at an angle to a plane symmetrical to the axes of the rollers where these are skew, the rollers having conical portions thereon contiguous to one or a pair of cylindrical surfaces and usually of much less length than such cylindrical surfaces. The angle of taper of the conical portion or portions on the rollers may be such that they would have the effect of stretching the thread without the addition of a bar, in which case the effect of the addition of the bar is to increase the spacing, but the conicity can be such that it would be too steep and the threads would, without the presence of the bar, tend to slip down the cone to the narrow end and in contact with one another. C

Casein Filaments: Spinning. Courtaulds Ltd. (London), R. L. Wormell and C. L. Knight. B.P.523,939 of 18/1/1939: 25/7/1940.

Filaments are produced by extruding an alkaline solution of casein into a bath at *p*H not greater than 2 which contains, in addition to the usual sulphuric acid and sodium sulphate, a soluble monocarboxylic aliphatic acid such as acetic or lactic acid. The filaments obtained are then subjected to washing, hardening, stretching, drying and other known treatments. The addition of the fatty acid to the spinning bath makes possible the production of finer filaments. C.

Ground-nut Protein Filaments: Production. D. Traill, W. Sever and Imperial Chemical Industries, Ltd. (London). B.P.524,090 of 21/1/1939: 30/7/1940.

Artificial fibres are made from ground-nut protein by extruding into a coagulating bath a thixotropic viscous solution made by a thermal treatment that comprises maintaining at a temperature not below about 60° C. a dispersion of ground-nut protein in dilute aqueous ammonia until an increase in natural viscosity at least of the order of 5-fold has been obtained and if necessary applying a mechanical shearing treatment to the resulting hot viscous solution or jelly sufficient to bring about a desired reduction in viscosity. A suitable ground-nut protein concentration is from about 10 to about 25 per cent. and the ammonia concentration is preferably 0·5 to 1 per cent. Suitable coagulating baths include acid solutions and acidified saline solutions, e.g. aqueous solutions of sulphuric acid with or without sodium or ammonium sulphate. The fibres should be subjected to an after-treatment with formaldehyde or other hardening agent, and are advantageously also subjected to a treatment to increase their resistance to wet processing. C.

Nitrogenous Cellulose Derivatives: Preparation. H. Dreyfus (British Celanese Ltd.). B.P.524,292 of 26/1/1939: 2/8/1940.

Cellulose derivatives containing nitrogen are obtained by subjecting cellulose derivatives which contain aryl-sulphonyl radicals to the action of compounds containing at least two basic nitrogen atoms which are separated by a chain of at least three atoms. Specified nitrogen-containing compounds include trimethylene-diamine, tetramethylene-diamine and the xylylene-diamines. The cellulose derivatives may be simple cellulose arylsulphonates or may contain e.g. aryl-sulphonated hydroxyalkyl groups. The products have a relatively slight solubility in the usual organic solvents and a good dye affinity. When the treatment is applied to filamentary materials and the like having a basis of aryl-sulphonated cellulose derivatives soluble in organic solvents, products may be produced which have an increased resistance to ironing and a high tenacity, particularly if the materials have been pre-stretched in a hot aqueous medium, e.g. hot water or wet steam, or in an organic swelling medium. C.

2—CONVERSION OF FIBRES INTO FINISHED YARNS

(A)—Preparatory Processes

Automatic Sliver-can Transfer Mechanism. S. A. G. Caldwell. *Textile Manufacturer,* 1940, **66,** 303.

In an arrangement for automatic changing of the supply from a full can to an empty one on drawing frames for flax, jute, etc., the sliver guide is mounted so that it can be moved as a whole and in a direction parallel to the axis of the delivery rollers. For this purpose it is carried on a bar which is supported on suitable bearings, the change-over being effected automatically through gearing operated from the delivery rollers, when a pre-determined quantity of sliver has been delivered into each cam. The arrangement is shown diagrammatically and its action is explained. C.

Cotton: Carding. *Textile Weekly,* 1940, **26,** 202-4, 230-1, 240.

A concise account is given of " good average practice " in carding, including notes on waste, drafts, erection, wire fillet, grinding, defects, and settings. C.

Flat Strips: Control of Output. *Cotton (U.S.),* 1940, **104,** No. 8, 101-102.

The writer contributes some tables of the weights of flat strips obtained on a number of carding engines under the following conditions: (1) setting of front top plate to the cylinder 15, 22, 29 and 34 thousandths of an inch; (2) flats set to 7 and 10 thousandths; (3) strips collected 1, 3 and 5 hours after stripping. The variations in the weight of strips are discussed on the assumption that centrifugal force is responsible for depositing the strips on the flats. C.

Flax Tow Dressing. S. A. G. Caldwell. *Textile Manufacturer,* 1940, **66,** 349-350.

Improvements and recent developments in flax tow carding and combing are discussed, with remarks on modern practice in flax tow dressing. L.

Unretted Flax. Flaxman. *Textile Recorder,* 1940, **61**, No. 690, 24.

The production and processing of natural flax fibre is briefly discussed. It is shown how past failure in processing unretted flax has been due to ignorance of the special requirements and characteristics of this material. L.

(B)—SPINNING AND DOUBLING

Condenser Mules. W. J. Guy. *Textile Recorder,* 1940, **60**, No. 689, 15-16.

The condenser mule used for spinning cotton waste and other short fibre materials is a continuous draft type and has a driving apparatus arranged to give three different spindle speeds together with a uniform carriage velocity. The three spindle speeds are obtained through two rim pulleys which can be changed to give the required spindle speeds and the fractions of the draw over which each of these speeds operate can be adjusted for controlling the " set " of the yarn. The delivery rollers, carriage and spindles on first speed are driven from the same belt. Speed is dependent on quality of roving, yarn counts, size of cop, etc. Typical values are a first spindle speed of 1950 r.p.m. during a carriage travel of about 20 in., a second speed of 2900 r.p.m. for a carriage travel of about 26 in., and a third speed of 5500 r.p.m. for about the last 18 in. of carriage travel. The condenser mule generally used for spinning wool and longer fibres operates with a uniform spindle speed and a variable carriage velocity. It is a deferred draft type and does not begin to draw out the roving until the carriage has travelled half-way or more than half-way outward. The speeds range between 3300 r.p.m. and 5000 r.p.m. Yarn count and twist change wheel calculations are explained. C.

Cotton Spinning Production Nomograph. S. V. Mehn. *Textile World,* 1940, **90**, No. 8, 57.

A nomograph for the determination of roller speeds and production in cotton spinning is shown and its use is explained. C.

Waste in Weft Yarn. R. Sanderson. *Textile Manufacturer,* 1940, **66**, 273.

The scope of this article is limited to cop waste. Irregular winding, faulty condition of the loom and shuttle, and a lack of skill in cop skewering are the three common causes of excessive waste. These are discussed and suggestions are put forward for overcoming the difficulties. L.

PATENTS

Twine Polishing Machine. W. Bywater Ltd. (Leeds) and K. T. B. Rimington. B.P.523,523 of 6/5/1939: 16/7/1940.

In this twine polishing machine the usual scrubbing rollers are dispensed with and the sizing trough is adapted, either by extension or by the provision of appropriate twine guiding or conducting means therein, or both, to afford a very much greater path of travel for the twine through the size, and after sizing, the twine is polished by being passed in known manner a number of times around a drying cylinder and past and in contact with high speed polishing rollers, the twine being guided across the machine, also in known manner, during the drying and polishing treatment by means of angle rollers. The guiding and conducting means in the sizing trough comprise loose runners over and around which the ends of twine pass backwards and forwards or to-and-fro so that the ends travel several times through the trough and around a separate or fresh runner at each reversal. C.

Sliver Guide. Courtaulds Ltd. (London), W. Hardacre, E. Saville and E. A. Morton. B.P.523,579 of 6/1/1939: 17/7/1940.

Apparatus for use in guiding and conveying a sliver from a pair of rollers comprises a funnel-like device one end of which has an acute-angled edge which is fitted against the lower of the two rollers to act as a doctor blade to divert the sliver therefrom. The funnel-like device may comprise, for example, a sheet or plate of metal, one of the edges of which is acute-angled, provided with two members which act as guides, one on each side of the sliver. The guide members may comprise, for example, two trough-like lengths of V cross section. They may be fixed permanently in position on the sheet, or they may be detachable or adjustable. The slivers may be of wool, cotton, staple fibre, etc. C.

Sliver Conditioning Apparatus. P. Rayner (Shipley). B.P.523,805 of 14/1/1939: 23/7/1940.

Conditioning apparatus for wool slivers and the like comprises a fixed curved surface over which the sliver is passed, of sufficient width to give the desired contact with the sliver, and of any convenient length, and preferably comprising a base portion, suitably hollowed out to form a water way, and a cover plate perforated with rows of apertures or slots or a combination thereof. The perforations are connected with a water supply which is controlled by a valve and a collecting trough is arranged to catch any water not absorbed by the sliver. C.

Bobbin Lubricating System. H. Schneider (Zurich). B.P.523,838 of 16/1/1939: 24/7/1940 (Conv. 14/1/1938).

A lubrication system for self-braking bobbins or bobbin carriers which are driven by the pull of the thread and are intended for rotation about dead spindles is distinguished by the fact that neck-bearings located inside the rotating part, between the latter and the dead spindle and at both the upper and the lower ends thereof, are oil-charged or made of oil-bearing material. The neck bearings may have oil spaces in their outer sides or may have oil spaces which are connected to the dead spindle by capillary means such as wicks, felts or the like. C.

Spinning and Twisting Machine Bobbins. Saco-Lowell Shops (Boston, Massachusetts, U.S.A.). B.P.523,972 of 18/1/1939: 26/7/1940 (Conv. 15/10/1938 and 19/12/1938).

A bobbin for use in spinning, twisting and similar machines, of the kind comprising a tubular body adapted to be slipped on and off a spindle in such a machine, having a resilient bushing mounted within the upper portion thereof and adapted to engage the surfaces of the bobbin and the spindle to centre the former on the latter, is characterised in that a truncated conical metal washer is associated with the bushing at the lower end thereof for guiding the spindle into the bore of the bushing. C.

Roving Guide. W. Feather (Bingley). B.P.524,400 of 30/1/1939: 6/8/1940.

A guide for roving in drawing, spinning, doubling, twisting and like machines is fixed near the drawing rollers and has projections the space between which is slightly less than the width of the leather covered roller so that the traverse of the roving is restricted to the width of the roller. An additional member may also be provided to prevent the roving being carried around the bottom carrier roller. The guide has projections extending vertically from it at sufficient distance apart from each other as to leave nearly the whole surface of the roller free, the distance between the projections being a fraction of an inch less than the width of the roller to guide the rove on to the roller and keep it from leaving the roller during the whole operation. The guide is preferably made of sheet steel. C.

Drafting Mechanism. Saco-Lowell Shops (Boston, Massachusetts, U.S.A.). B.P.524,666 of 6/2/1939: 12/8/1940 (Conv. 13/6/1938).

In a mechanism for drafting cotton sliver and the like, of the kind comprising two pairs of drafting elements mounted to act successively on the sliver, the front pair being adapted to draw the sliver from the rear pair and the latter pair including a belt passing about a lower rear roll and a guide situated forwardly thereof by means of which a considerable length of fibre is gripped, the belt co-operates with an upper rear roll such that the sliver is gripped between the roll and the belt from a point adjacent the forward portion in or approximately in a plane containing the axes of the upper and lower rear rolls. C.

3—CONVERSION OF YARNS INTO FABRICS

(A)—Preparatory Processes

Cotton Duck Warp and Weft: Preparation. J. Middleton. *Cotton (U.S.)*, 1940, **104**, No. 3, 55-59; No. 4, 87-90, 136; No. 6, 68-72; No. 8, 68-72.

A series of articles giving practical hints on warp and weft preparation for duck looms, dealing with equipment, splicing, re-winding, beaming, pirning, ordering warp and weft yarns, yarn identification, inspection and storage, wage systems and safety measures. C.

Silk Soaking Bath: Effect of Bacteria on Tinting. A. J. Kellner. *Cotton (U.S.)*, 1940, **104**, No. 8, 117.

Some cases of the gradual fading of the fugitive tints used for identification purposes in silk soaking have been traced to the action of bacteria in the bath. This was considerably checked by altering the exit pipes of the tank so that the liquor was aerated during circulation. C.

(B)—SIZING

Sized Rayon Warps: Regain Determination. W. E. Yelland. *Textile Research*, 1940, **10**, 420-424.

A procedure for the determination of the regain of entire warps immediately after slashing on the silk system comprises (1) recording the relative humidity of the warping room, (2) weighing the unsized warp beam to 0·1 lb. as soon as it has been made, (3) placing the unsized warp beam in the back of the slasher, (4) weighing an empty beam and placing it in the front of the slasher, (5) slashing as usual, (6) weighing the sized warp beam, (7) weighing the empty beam from which the unsized warp was taken, and (8) removing samples for desizing from the sized beam and determining the per cent. size in the standard manner. The samples for size determinations are taken when the warp has woven in the loom as far as a convenient cut mark near the middle of the warp. The calculations are explained and results obtained in a test of the efficiency of a warp conditioner installed at the front of the slasher are given. The capacity of the conditioner was found to be much too small. The required increased capacity is calculated. C.

(C)—WEAVING

Looms: Oiling. *Textile Manufacturer*, 1940, **66**, 309 and 312.

The importance of efficient and regular lubrication of loom parts is emphasized and it is pointed out that it is a mistake to be sparing of lubricating oils. The only economies that should be allowed are an extension of the time limit for oil in a motor sump, and special instructions to oilers not to waste oil. Oil holes should be cleared of dirt, leaking oilcans should be repaired, and the spilling of oil should be carefully avoided. Oiling of loom parts cannot be carried out satisfactorily when the loom is running. Photographs are given of crankpins and treadle, dobby and picking bowls worn as a result of lack of lubrication, and the causes and effects of the wear are discussed. C.

Circular Box Loom: Maintenance. H. Smith. *Textile Weekly*, 1940, **25**, 763-4, 767; **26**, 18-23, 266-8, 291-2.

A description is given of the special parts of the Hattersley circular-box loom, with practical hints about timing and setting the assembly. C.

Silk and Rayon Check Fabrics: Weaving in Drop-box Looms. J. W. Hutchinson. *Silk & Rayon*, 1940, **14**, 604.

Practical hints are given on the arrangement of shuttle boxes, pegging plans and aids to safe picking in the weaving of silk and rayon checks in drop-box looms. C.

Automatic Loom Weft Feelers. *Textile Manufacturer*, 1940, **66**, 357.

Modifications of the side slip feeler for bobbin changing automatic looms are described. The disadvantage of shuttle face wear varying the adjustment and causing weft waste has been overcome by fitting the feeler with a roller, and fitting the shuttle with a small metal plate. As the plate surface is parallel to the taper of the bobbin an efficient feeling range, of about one inch, exists; the motion is therefore independent to some extent of the position at which the shuttle stops. Waste can therefore be finely controlled with a minimum of attention. L.

Positive Control for Extra Beam Stripes. J. W. Hutchinson. *Textile Manufacturer*, 1940, **66**, 356.

In weaving stripe effects in which the warp stripe ends are of different counts from those of the ground weave, or in cases where they must be woven under lower tension than those of the ground, it is essential that separate beams should be employed. The usual method of controlling these beams is by ropes and weights. These, however, require adjustment as the beams decrease in diameter and increase in speed. The positive control method described consists

of two mechanically coupled beams. The warp sheet coming from the ground warp beam passes over a back shell which is rotated by the passage of the yarn. The motion thus derived is transmitted by a gearing and chain system to a roller over which the stripe warp sheet passes. The length of yarn delivered per unit length of the ground warp may be controlled by means of change wheels. An easing bar controls the ground warp, giving least tension when needles are level, and greatest tension at the beat up. When set at the beginning of weaving, the motion requires no further attention. L.

The Baddeley Shuttleless Loom. *Cordage World,* 1940, **21,** No. 8, 14.

The new Baddeley shuttleless loom is designed to weave full set, double pick, heavy cotton, jute and similar materials for packing and other purposes. The picking arrangement is based on the use of a large drum and steel tapes, the weft being threaded through a bronze eye. Tension on the weft can be kept at a moderate value and this makes possible the use of, for example, cotton sliver taken direct from card or drawing frame. Very little supervision is required and one operative can control a large number of looms, twenty-four or more. L.

(D)—KNITTING

Cellular Textures: Knitting. J. B. Lancashire. *Textile Manufacturer,* 1940, **66,** 311-312.

Tuck, fish-net and other stitches used for the production of open-work and honeycomb knitted structures are discussed and methods of producing such cellular textures are briefly described. C.

Tricot Fabrics: Designing. *Rayon Textile Monthly,* 1940, **21,** 473-474.

A brief discussion of the creation of new styles in tricot fabric by (*a*) the use of a pattern wheel, (*b*) threading the guide bars in different ways or with yarns of different type or colour, (*c*) altering thread tensions, and (*d*) by the use of Jacquard control for the guides. C.

(G)—FABRICS

Fancy Rayon Fabrics: Designing. *Textile Weekly,* 1940, **26,** 206, 209, 237-238.

Examples of designs for fancy rayon fabrics showing interesting effects produced by combination of bright and matt rayon yarns, and semi-figured and fancy stripe effects using various colour combinations are shown and discussed. C.

PATENTS

Straight-bar Knitting Machine Sinker. R. & K. Lieberknecht (trading as K. Lieberknecht; Oberlungwitz, Germany). B.P.523,493 of 7/1/1939: 16/7/1940 (Conv. 3/11/1938).

A sinker for a straight-bar knitting machine has at its upper edge at least one resilient lamella, or a narrow recess in its upper edge of a width just great enough to accommodate the tip of the carrier, formed by cutting the sinker downwards from the upper edge, the location of which lamella or recess is so chosen as to be adapted to coincide with that position in the length of the sinker, occupied by the carrier immediately before the nose of the sinker enters the plane of the needle shanks, and the dimensions thereof being such as not excessively to impair the guidance of the upper edge of the sinker in the sinker bed, the said sinker being thereby capable, should it be deflected by a wrongly positioned carrier during its forward advance, of springing back to its correct position before its nose enters the plain, the lamella yielding to accommodate the carrier or, in the case of a recess, the carrier entering the recess. The lamella may either be formed by a single cut which extends first downwardly and then rearwardly away from the nose, or it may be defined by two downward cuts. The sinker should be cut between the nose and that part of the sinker which, immediately before the nose enters the plane of the needle shanks, is still located in the sinker cover. C.

Dust-resistant Rayon Fabrics. R. J. Tugwood (C. H. Masland & Sons, Inc., Carlisle, Pennsylvania, U.S.A.). B.P.523,537 of 9/12/1938: 17/7/1940.

A fabric of the type subject to washing at infrequent intervals only has a face yarn containing rayon filament or staple fibre of substantially uniform cross-sectional area and of average diameter between 22 and 75 microns. the

periphery conforming to the following specification: (1) Less than 20 per cent. is on a radius of curvature between 3 microns and 0·4 micron, (2) the periphery is substantially free from re-entrant curves that have a depth greater than 0·5 micron or include any arc on a radius less than 3 microns, and (3) is substantially free from re-entrant curves of depth greater than 0·5 micron the mouth opening of which is less than five times the depth. The filament or fibre has a reduced permanent electrical moment at the surface as compared with the interior and may be composed of regenerated cellulose or a partial ester of cellulose and its permanent electrical moment may be reduced by surface esterification or by chemically combining at the surface with a halogen derivative of a long-chain alkylated nitrogenous base. Fabrics of the type described show reduced dust retention and are suitable for use as furnishing fabrics, suitings, etc. C.

Loom Picker. J. H. Fenner & Co. Ltd. (Hull), B. Tebb and E. Holt. B.P.523,550 of 4/1/1939: 17/7/1940.

In a loom picker made of hide moulded to form a barrel portion and a striker portion, the outer layer of hide is folded inwards for about one-third of the width of the picker at each side, with the hair or grain side outwards, so that the width of the striking faces of the picker, parts of which are formed by the fold, is made greater than the thickness of the picker between the ends of the turned-in parts. C.

Rotating Yarn Guide. A. Barzaghi (Legnano, Italy). B.P.523,553 of 4/1/1939: 17/7/1940 (Conv. 4/1/1938 and 2/7/1938).

A rotating yarn guide for the production of cross-wound bobbins is characterised by an element forming a continuous circular yarn guiding rim transversely mounted at an inclination on a shaft running parallel to the axis of the bobbin and passing through the centre of the element, the continuous guiding rim being intersected at two diametrically opposite points forming deviating members so that the yarn is alternately guided over the right side of one half of the rim and over the left side of the other half. The deviating members may consist of incisions in the rim. When bobbins of asymmetrical profiles are to be wound the deviating members are not arranged diametrically opposite one another. C.

Yarn Tension Compensating Device. Courtaulds Ltd. (London) and F. Wholton. B.P.523,580 of 6/1/1939: 17/7/1940.

A device for compensating for variations in the tension in yarns, threads or the like being delivered from one point to another comprises two fixed guides and between them a frictional surface and a movable guide attached to a hollow disc containing a loosely inserted stabilising weight and having on the opposite side of the disc to the movable guide an adjustable weight for balancing the guide, the disc being freely mounted so that it can oscillate and move the guide over a path inclined to the direct path between the frictional surface and the fixed guide farther from the source of supply. The frictional surface may form part of a cymbal tensioning device. C.

Dust-resistant Rayon Fabrics. C. H. Masland & Sons, Inc. (Carlisle, Pennsylvania, U.S.A.). B.P.523,590 of 31/7/1939: 17/7/1940 (Conv. 9/1/1939).

A fabric of the type subject to washing at infrequent intervals only has a face yarn made of at least 20 per cent. of artificial fibre of substantially uniform cross-sectional area and of average diameter between 27 and 75 microns (for floor coverings preferably between 37 and 75 microns). The periphery of the fibre is specified as follows: (1) Less than 20 per cent. (preferably less than 10 per cent. and for best results substantially none) is on a radius of curvature between 4 microns and 0·4 micron (preferably less than the specified percentage between 6 microns and 0·4 micron), (2) the periphery is substantially free from re-entrant curves that have a depth greater than 0·5 micron or include any arc on a radius less than 4 microns, and (3) is substantially free from re-entrant curves of depth greater than 0·5 micron the mouth opening of which is less than five times the depth. The artificial fibre in the face yarn may be regenerated cellulose or cellulose derivative rayon or staple fibre and may be blended with up to 80 per cent. of suitable natural fibre. Experimental studies of the soiling characteristics of various fibres in fabrics are described. C.

Straight-bar Knitting Machine Speed Control Mechanism. G. Blackburn and Sons, Ltd. (Nottingham), and H. W. and E. Start. B.P.523,596 of 6/12/1938: 18/7/1940.

Automatic speed control mechanism for an electrically-driven straight-bar knitting machine comprises three longitudinal slides disposed side by side parallel to each other, and adjustable longitudinally, the middle slide being connected to the speed regulator of the motor, one of the other slides being connected to the manually operated control rod of the machine, and the other slide being connected to slowing down mechanism associated with the knitting machine, and coupling means carried by the middle slide for connecting the latter to either side of the other slides so disposed that the coupling of one of the outer slides to the middle slide effects the release of the other therefrom. The middle slide is fitted with two pivoted coupling devices which are disposed one in the reverse position to the other and are interconnected. The two outer slides are each interconnected. The two outer slides are each fitted with a projecting stud and a tappet, which are so disposed that the outer slides are self coupling to the middle slide which is connected to the speed regulator, when they are moved longitudinally, and the coupling of one outer slide to the regulator slide effects the release of the other therefrom. C.

Fabrics Containing Artificial Nitrogenous Yarns. P. and G. Donagemma, and Snia-Viscosa Societa Nazionale Industria Applicazioni Viscosa (Milan). B.P.523,834 of 14/1/1939: 24/7/1940 (Conv. 26/1/1938).

A mixture fabric is composed of non-nitrogenous regenerated cellulose rayon or cotton and/or silk wool or cellulose acetate rayon, and artificial nitrogenous fibres obtained by mixing albuminoid vegetable substances or albuminoid animal substances or caseins with viscose spinning solutions. Two- and three-colour effects may be obtained on such fabrics by suitable dyeing processes. Examples are described. C.

Heddle Frame. Tefag Textil-Finanz A.-G. (Winterthur, Switzerland). B.P.523,857 of 16/1/1939: 24/7/1940 (Conv. 5/3/1938).

A heddle frame, which is adapted to be operated from below, comprises in combination a hollow lower stave and two or more vertical support members for the horizontal stringing rods, these members, which are placed intermediately between the usual end supports, each extending upwards from a block-like base member which engages and is firmly held in the lower stave while being also movable therein in the longitudinal direction. In the preferred construction the hollow lower stave has vertical end supports which carry not only the stringing rods but also a guide rod which extends horizontally above the upper stringing rod, and the upper part of each intermediate support lies in contact with guide blocks carried and longitudinally movable on adjoining guide rods. The lower stave is conveniently formed as a hollow flat plate or tube which may be made e.g. from sheet metal bent to the required V-shape cross-section. One or more springs may be provided which will tend to prevent unintentional movement in the longitudinal direction within the stave of a supporting base member. C.

Shuttle. C. Formenti (Milan). B.P.524,001 of 19/1/1939: 26/7/1940 (Conv. 20/1/1938).

A shuttle consists of at least two longitudinal parts which form a complete shuttle when brought together and joined at their ends. The parts are made by casting, moulding or pressing and contain all the elements of a complete shuttle, such as strengthening parts, spindle pin bosses, spindle spring seats, yarn guide elements, etc. C.

Glass Fibre Insulating Materials. Algemeene Kunstvezel Maatschappij N.V. (The Hague). B.P.524,051 of 20/1/1939: 29/7/1940 (Conv. 21/1/1938).

A method of producing impregnated or coated products composed of glass fibres or the like, consists in first coating each of the fibres with a layer of tenaciously adherent substance, then forming the coated fibres into a textile material and subsequently impregnating the material with a substance which is miscible with or adherent to the coating previously applied to the fibres. The method is particularly useful for the production of electrical insulating material, glass fibres for this purpose being first coated with a tenacious layer

of insulating substance and then made up into woven, knitted, braided or similar material, and the material subsequently impregnated with an insulating substance which is miscible with or adherent to the coating previously applied to the fibres. The initial coating substance and the impregnating substance may be resins or resinous substances or compounds. Alternatively, the initial coating substance may be a wax or oil and the impregnating substance a hydrocarbon oil, wax or asphaltic gum. C.

Warp Thread Selecting and Separating Mechanism. A. F. Burgess (Barber-Colman Co.; Rochford, Illinois, U.S.A.). B.P.524,333 of 27/1/1939: 5/8/1940.

In a mechanism for selecting and separating warp threads in warp tying and other machines of the type in which the foremost thread of a leased warp is separated from the remaining threads of the warp by a pusher means reciprocated edgewise of the warp, the pusher is in the form of a pair of spaced fingers, between which a hook member is reciprocated in alignment with the reciprocatory movement of the fingers, the hook member in moving towards the warp receiving a pivotal movement to cause it to engage over that part of the separated foremost thread lying between the fingers whereupon the hook member is moved in the reverse direction to clamp the part of the thread against an abutment member which is also positioned between the spaced fingers. C.

Winding Machine Thread Tensioning Arrangements. United States Rubber Co. (New York). B.P.524,490 of 29/4/1939: 7/8/1940 (Conv. 12/5/1938).

Mechanism for pulling the thread forward under substantially uniform tension comprises a snubbing drum about which the thread is looped in not appreciably more or less than one complete circle, and means for driving the drum at a surface speed in excess of the winding speed of the thread, whereby the tension of the thread controls the speed at which it is pulled forward from the source of supply by the snubbing drum. There may also be provided a booster pulley for guiding the thread towards the drum and about which the thread passes part way around in one loop only as it approaches the drum, the pulley being driven at the same surface speed as the drum. The mechanism is particularly useful in the winding of fine elastic thread and in the formation of soft packages such as soft pineapple cones. C.

Shuttle-box Motion. Priestleys Ltd. (Bradford). B.P.524,536 of 1/2/1939: 8/8/1940.

Mechanism for operating a box motion on a circular box fast reed loom in conjunction with Jacquard mechanism comprises a pegged wheel, and positive and negative operating rods carried from and operated by a lever carried by an extension of the Jacquard cylinder operating shaft, the pegged wheel operating in connection with an added box cylinder in such a manner that the box cylinder and Jacquard cylinder operate as one unit either forwards or backwards. The box cylinder and peg wheel are mounted and operable, when the loom is stationary, independently of the Jacquard cylinder. The box cylinder is adapted to receive pattern lags which in turn operate levers connected by a rod and link system to the shuttle change box motion. C.

Loom Beat-up Mechanism. O. and D. W. Shimwell (Shiplake-on-Thames) and C. Cooper (Southport). B.P.524,563 of 2/1/1939: 9/8/1940.

In a loom of the type described in B.P.498,191, the cam, eccentric or other mechanism by which the shuttle boxes, slay and reed, and shuttle are operated, is so timed or disposed that when the slay is moving backwards from the beat-up position the reed and slay go past the exact alignment of the shuttle box backs until the reed becomes positioned slightly in the rear of that alignment so that when the shuttle leaves a shuttle box the reed is behind the line of shuttle box backs, and thus there is no possibility of the flight of the shuttle being impeded by striking the reed, and when the slay and reed are moving forwards towards the position at which the shuttle leaves the reed space to enter a shuttle box, the reed goes past the exact alignment of the shuttle box backs until the reed

becomes slightly in advance of that alignment, so that when the shuttle enters the shuttle box the shuttle is not liable to be diverted by striking the shuttle box back before it is well boxed. While the shuttle boxes are moved back and forth by very short crank arms, which give the shuttle boxes a long dwell at about back centre, the slay and reed are reciprocated by cams which give to the slay and reed an equal long dwell at about back centre followed by a continuous acceleration up to a maximum with a continuous deceleration until front dead centre is reached on the outward or beat-up stroke and likewise a continuous acceleration followed by a continuous deceleration and a long dwell at about back centre on the return stroke. C.

Interlock Fabric. Interlock Patents, Ltd. (Nottingham), W. Reynolds and F. Bonser. B.P.524,651 of 2/2/1939: 12/8/1940.

A ribbed knitted fabric consisting of two opposed ribbed webs with the needle wales of one web disposed in the spaces between the needle wales of the other web and having the sinker bars of the two webs crossing, is characterised in that at least one of the webs is patterned or incorporates stitch variations, and in that the fabric consists of a succession of series of ribbed courses whereof each series consists of an equal number of courses of both webs and includes a number of successive courses of one web interposed between two successive courses of the other web and a number of successive courses of the latter web interposed between two successive courses of the first web. An interlock fabric consists of two opposed ribbed webs having the needle wales of one web disposed in the spaces between the needle wales of the other web and having the sinker bars of the two webs crossing, at least one web being patterned or incorporating stitch variations and a number of successive sinker bars of the one ribbed web being interposed between successive sinker bars of the other ribbed web. The fabric may be patterned by yarn changes and/or may incorporate stitch variations, either in the form of a pattern or so disposed as to shape the fabric, or both. The fabric has at least one area, occupying only a portion of the length of the courses that extend across it, in which the stitch formation or arrangement in certain courses differs from that in the same courses outside the said area. C.

4—CHEMICAL AND FINISHING PROCESSES

(A)—Preparatory Processes

Sodium Sulphoarylstearates: Wetting Properties. A. J. Stirton, R. F. Peterson and P. H. Groggins. *Ind. Eng. Chem.*, 1940, **32**, 1136-1137.

The preparation and properties of sulphonated arylstearic acids are discussed and tables are given showing the yields obtained in the preparation of arylstearic acids and esters, conditions of preparation, yield, sulphur and sodium contents and calcium stability of disodium sulphoarylstearates, and penetrant properties of disodium sulphoarylstearates and various commercial wetting agents. Disodium sulphoarylstearates can be used effectively in hard water and have penetrant properties and calcium stability equal to those of some of the commercial wetting agents. Penetrant properties are at a maximum at *p*H 4 to 6 and at a minimum in one per cent. sodium hydroxide solution. Disodium sulphoethoxyphenylstearate and disodium sulphoxylylstearate have the best properties from the point of view of over-all yield and wetting efficiency. Surface tension and interfacial tension data and data showing the influence of concentration on sinking time are given for these two compounds. C.

(D)—Milling

Simple Laboratory Method of Studying Milling Phenomena. G. C. Le Compte and J. W. Creely. *Amer. Dyes. Rep.*, 1940, **29**, 387-390, 408-409.

The shrinkage of yarn agitated in various solutions in a bottle attached to the vane of an electric washing machine has been studied. It was found that $(1/t)\log(1-s)$, where t is the time and s the shrinkage, was approximately constant. It is suggested that the results obtained are in qualitative agreement with commercial experience in milling and felting. W.

(G)—BLEACHING

Hydrogen Peroxide Storage System. R. L. Ericsson. *Amer. Dyes. Rept.*, 1940, **29**, 343-345.

An account is given of a modern installation for handling hydrogen peroxide, including stainless steel storage and measuring tanks and arrangements for feeding a measured quantity of peroxide into the bleach bath. C.

Pulps: Bleachability Determinations. J. F. Hechtman and J. H. Graff. *Paper Trade J.*, 1940, **111**, *TAPPI*, 52-56.

Methods of determining the bleachability of pulps are discussed and results are compared. It is shown that cooking stain values correlate well with lignin content and likewise with those properties of a pulp dependent upon the lignin content. If the lignin content of pulps is to be regarded as a fair measure of the degree of cooking, it then follows that the cooking stain value is also a fair measure of the degree of cooking. Permanganate number and chlorine number also show a good correlation with the lignin content. The dye adsorption changes faster for a given change in lignin content for sulphite pulps than for alkaline pulps. The permanganate number gives a somewhat better indication of bleach requirement than the cooking stain value and chlorine number for the pulps considered. A correlation comparable with the permanganate number might possibly result with a greater range of pulps. A definite relationship exists between the cooking stain and permanganate number; this relationship is different for different types of pulps. The relation beween chlorine number and cooking stain is quite similar for sulphite, kraft and soda pulps. This similarity indicates that these two methods tend to measure the same properties of a pulp. C.

Wood Pulp: Bleach Liquor Requirement Determination. C. M. Koon. *Paper Trade J.*, 1940, **111**, *TAPPI*, 70-72.

Methods for the determination of the bleach liquor requirement of wood pulp are discussed and details are given of a procedure for the determination of the amount of calcium hypochlorite bleach required to produce a pulp of specified brightness which is an adaptation of the method of the Institute of Paper Chemistry. In this method calcium hypochlorite bleach liquor is applied to a series of pulp specimens under fixed conditions of temperature and consistency and the amount of bleach liquor added to successive samples is varied in even increments over a range which, it is estimated, will include the value required to effect a desired brightness. After exhaustion of the bleach liquor, the pulp is washed, hand-sheets are formed, and the brightness values are determined by means of the reflection meter. By plotting brightness against percentage of bleach liquor, a smooth curve is obtained, from which the amount of bleach liquor required, under the laboratory conditions, for any brightness of the range covered can be estimated. The proposed modification of the method consists in increasing the bleaching temperature from 40 to 55° C. and effects a large saving in the time required for the determination. C.

Digestion of Flax Fibres with Acid Salts of Sodium and Calcium Sulphites. V. D. Ponomarev. *L'no-Pen'ko-Dzhutovaya Prom*, 1939, No. 1, 21-5 (through *Chem. Abs.*, 1940, **34**, 3502).

The digestion liquid was prepared by passing sulphur dioxide through an aqueous suspension of lime until it contained 1 per cent. lime and 3-5·9 per cent. sulphur dioxide. The flax contained cellulose 81·30, wax compounds 2·68, ash 0·335, pectins 3·01, pentosans 5·42, and lignin 5·24 per cent. The flax was digested with this mixture and also with 1 per cent. caustic soda under pressure. The caustic soda was more effective in removing the lignin. This disadvantage of the sulphite is overcome by extracting the wax and fats with benzene before digestion. More rapid removal of lignin is secured by 20-min. digestion with 1 per cent. caustic soda followed by treatment with sulphite. Material treated in this manner is bleached more rapidly and more completely but it has more pentosans and nitrogen compounds. Material treated with caustic soda is bleached less effectively with sodium hypochlorite than that which was treated with sulphite. L.

(H)—MERCERISING

Merceran NV Wetting Agent: Stability. A. L. Khandros. *Khlopchato-Bumazhnaya Prom.*, 1939, No. 1, 51 (through *Chem. Abstr.*, 1940, **34**, 3924[1]).

Caustic soda solutions, 30° Bé, containing 20 gm. per l. of " Merceran NV " were constant in wetting power (drop number test) for 13 days and the shrinking effected by it in cotton yarn increased slightly after 5 days. C.

(I)—DYEING

Dyes: Reactions with Ferrous Hydroxide. H. Eichler. *Z. anal. Chem.*, 1940, **119**, 91-94 (through *Chem. Abstr.*, 1940, **34**, 4912[2]).

Ferrous hydroxide is recommended as a group reagent for dyes. Azo and triphenylmethane dyes are decolourised. Solutions of dyes of the triaminotriphenylmethane series containing sulpho groups are decolourised and the precipitate contains dye; this becomes evident on acidification. Diaminodiphenylmethanes, phenosafranines, oxazines, thiazines, oxazones, indophenols and fluorindines are decolourised, but the colour returns in acid or basic solutions on exposure to air. Rosindulines, acridines, nigrosines and pyrazolones may form iron lakes. Quinoline dyes and azo dyes that are free from sulphonyl or carboxyl groups are scarcely reduced, but are largely carried down in the precipitate. Alizarin, nitro, hydroxyketo, pyrazolonic and lake dyes give almost quantitative yields of lakes. The test is performed as follows: To the filtrate or centrifugate from insoluble dyes (leuco compounds first oxidised by air) add some 30 per cent. Na, K or NH_4 hydroxide and some cold, saturated ferrous sulphate. Shake or stir and then allow the precipitate to settle. Watch the supernatant liquid to see whether the colour returns on standing. Filter and dissolve the precipitate in acid. C.

Nylon: Dyeing. T. W. Whattam. *Textile Manufacturer*, 1940, **66**, 323.

The dyeing of Nylon with acetate, direct cotton, acid, chrome, vat and basic dyes is discussed. Dispersed acetate dyes are recommended for Nylon hosiery and neutral dyeing acid dyes for cases where a higher degree of fastness to washing is desired. C.

Staple Fibre Fabrics: Dyeing and Finishing. H. D. Smith. *Mech. Engng.*, 1940, **62**, 588-592.

The commercial, physical and chemical properties of viscose and cellulose acetate rayon staple fibres are discussed and compared with those of cotton, silk and wool, and a brief account is given of methods of desizing, scouring, bleaching, dyeing, fulling, carbonising, napping, drying and finishing fabrics containing staple fibres. C.

Dyes for the Preservation of Fine Nets and Webs. Y. D. Borodulin. *L'no-Pen'ko-Dzhutovaya Prom.*, 1938, **8**, No. 1, pp. 37-43 (through *Chem. Abs.*, 1940, **34**, 5283).

The protective action of individual dyes against the growth of microflora on fish nets was studied. The dyed nets were left in sea water for 90 days under fishing conditions. Alizarin-2, Indanthrene Brilliant Green W, Anil Copper Blue B, and aniline black showed the best protective action. Anil Brown DZG and Basic Brilliant Green (on tannin) were also valuable in fresh water. The protective action of the substantive dyes was improved by admixture of salts of heavy metals, as copper sulphate, mercuric nitrate and lead acetate. With Indanthrene dyes, after-treatment with tar emulsions improved the action, especially in the case of nets in fresh water. The protective action of the dyes is due to the presence of toxic groups in the molecule and not to the presence of salts of heavy metals. The protective effect of aniline black, Alizarin-2, and of Anil Copper Blue B is much greater than that of tanning and sometimes greater than the protection given by treatment with coal tar. W.

Dyeing Textiles Field Grey and Aviation Grey. R. Kahl. *Monats. f. Text.-Ind.*, 1939, **54**, 286-289 (through *Chem. Abs.*, 1940, **34**, 5284).

Suitable recipes and full working particulars are given. W.

Hair Dyes. II. Functions and Reactions of Phenols. H. E. Cox. *Analyst,* 1940, **65**, 393-398.
For Part I *see* this *Journal,* 1938, A538. W.

(J)—PRINTING

Tannin-Antimony Prints: Production. A. V. Boguslovskii. *Khlopchato-Bumazhnaya Prom.,* 1939, No. 1, 51 (through *Chem. Abstr.,* 1940, **34**, 3920[4]).

Antimony salts are introduced directly into the tannin print in the presence of oxalic acid. Intermediate drying of the tanned cloth is thus avoided and the colours are more stable. C.

High-speed Printing Machine. Rice, Barton and Fales, Inc. *Textile World,* 1940, **90**, No. 8, 58-59.

A printing machine for speeds ranging from 10 to 300 yd. a minute is made up of several sections that operate in synchronism. Each unit has its own individual driving motor, but push-buttons at the printing end of the machine centralize control of all operations. The cloth is first unwound into a conveyor located midway of the back-rigging so that enough cloth accumulates ahead of the printing machine to permit complete unwinding of one roll and attaching a fresh roll, thereby securing continuous operation. From the conveyor the cloth is pulled into the printing machine. Next it goes to the drying cans located on a balcony. From these the cloth is carried down and over the full length of the machine to a folder at the end of the line where it is deposited in boxes or trucks. The back-gray is unwound from a roll and pulled directly into a J-box, which holds a surplus for continuous operation. A set of draw rolls takes the back-gray from the J-box directly to the printing machine from which it travels over the back-gray cans. This arrangement may be used for either an endless or a continuous back-gray. At the end of the run as the last roll of cloth to be printed is being fed through the printing machine the seam in the endless back-gray is cut open and the back-gray is wound up on a batcher. A diagram and photographs are given and the method of threading up the machine is explained. Important mechanical improvements incorporated in the machine are described. The machine not only permits higher printing speeds but also makes possible continuous feeding of goods and back-grays, automatic control of tension of fabric entering the machine, accurate tracking of the goods, better registration, reduction in printing pressures, sharper printing with increased bloom, elimination of lapping and packs, easier means of changing blankets, increased mandrel life and lower maintenance costs. C.

Printed Fabrics: Causes of Scumming or "Tarnish". F. H. M. New. *Rayon Textile Monthly,* 1940, **21**, 480-482.

The author discusses the causes and prevention of scumming or "tarnish" (tinting of whites) on printed rayon and cotton goods. A rough edge on the doctor, a poorly adjusted doctor, a badly faced roller, defective chromium plating on the roller, rounded edges of engravings, and the use of unsuitable dyes and badly prepared printing pastes are the chief causes of this fault. C.

(K)—FINISHING

Cellulose Acetate Plasticizers: Properties. C. R. Fordyce and L. W. A. Meyer. *Ind. Eng. Chem.,* 1940, **32**, 1053-1060.

Tables are given showing the physical properties of 40 plasticizers used for cellulose acetate, the retention of the plasticizers by cellulose acetate under out-of-door conditions, in water at 40° C., and on incubation at 100° C., and the solubility of cellulose acetate in the plasticizers. Plasticizer retention curves constructed from these data indicate that most compounds which are readily compatible with cellulose acetate are rapidly removed from the composition unless used in relatively small quantities. Cellulose mixed esters of acetic and butyric acids offer increased compatibility with plasticizers of outstanding water resistance and retention characteristics. Products of 35-40 per cent. butyryl content are especially suited for moulding compositions, giving adequate flow characteristics with low plasticizer concentrations. Plastics of this type offer improved weathering qualities over those of similar flow temperatures made from cellulose acetate. C.

Worsted Cloth Manufacture. D. R. H. Williams. *Textile Manufacturer,* 1940, **66**, 11-12, 64-66, 99-100, 105, 142-143, 151, 186-187, 228-229, 270-271, 306-307, 344.

Scouring and milling, and finishing machinery are described, special reference being made to machines invented by the author. In a further series of articles the following aspects of mill management are reviewed—power, heating, lighting and cleanliness; canteen and welfare organisation; selling at home and abroad. W.

Bearskin Pile Fabric: Processing. A. E. Cabell. *Dyer,* 1940, **84**, 75-76, 106-107.

The scouring, dyeing and finishing are described of crossbred worsted and of mohair bearskin pile fabrics for the making of toy animals and of women's coatees. Special reference is made to the removal of spinning twist, choice of dyes and colouring the cotton foundation. W.

Processing Admiralty Cloth. *Wool Record,* 1940, **58**, 282, 285.

Practical details are given of the correct scouring and milling of fabric T14, which is used mainly for naval overcoatings, has a hard-twisted yarn and is heavily milled. In the grey and finished states the pieces are approximately 73 in. and 56 in. wide and 60 yds. and 52 yds. long respectively, the finished cloth being 28 oz./yd. In scouring, the pieces are first wet out in warm water, which is then run off and soap and alkali added. The strength of the alkali added is such that allowing for the alkali in the pieces the bath contains alkali at 4° Tw to 5° Tw. The pieces are run for ¾ hr., washed off for ¼ hr. and soaped up. In milling, best done in single piece machines employing the flange type roller with a shaft speed of 110 r.p.m., the duration of treatment is 1-1½ hr., 2½-3 weights being required on the lid of the machine. Soap is added frequently to secure uniform milling and to prevent felting or flocking. After milling, the pieces are run in the dolly with dilute soda to remove residual soap and finally scoured with soap and ammonia and washed off. In washing off, ample water should be used and its temperature increased as washing off proceeds and when complete the pieces should be brought gradually to the cold state. After dyeing and blowing, the cloths are best pressed in a broad press, then rigged and cramped under light pressure. W.

View of the Textile Assistant Industry. I. E. Last. *Allgem. Oel-u. Fett.-Ztg.,* 1939, **36**, 256-261 (through *Chem. Abs.,* 1940, **34**, 5667).

The author reviews the commercial products giving trade names and classifies them according to their chemical nature. Products suitable for different processes of the textile industry are suggested. W.

Nitrogenous Compounds Used in Textile Treatments. L. Bonnet. *Rev. Gén. Mat. Col.,* 1940, **44**, 168-172 (through *Brit. Chem. Abs. B.,* 1940, **59**, 598).

The uses of many nitrogenous textile auxiliary products including the Sapamines, Solidogens, Fixanol, Velan PF, etc., are discussed, the structure and action of the various types being given. Work carried out on the colloid chemistry of surface-active agents is reviewed. W.

Table of Various Textile Chemicals Containing Sulphonated Fatty Alcohols. J. Sisley. *Rev. Gén. Mat. Col.,* 1940, **44**, 131-133 (through *Chem. Abs.,* 1940, **34**, 5667). cf. this *Journal,* 1940, A388.

The table shows the chemical constitutions, and applications in the industry. W.

(L)—PROOFING

Naphthiol: Application as Fishing Net Preservative. O. Antipova and M. Mosevich. *Rybnoe Khoz.,* 1939, No. 1, 35-40 (through *Chem. Abstr.,* 1940, **34**, 3924[3]).

From experiments on the preservation of fishing nets in the Il'men lake (against rotting by aerobic bacteria) it appears that naphthiol is most effective (residual strength of the nets after 3-4½ months, 76·5 per cent.), followed by strong tannin, anthracene oil and aniline hydrochloride. C.

Vinyl Polymer Emulsions: Application. *Textile Weekly,* 1940, **26**, 114-5, 239.

The possibility of using emulsions of non-vulcanizing vinyl polymers in place of rubber latex are discussed. C.

Mothproofing Substances used in the Dyeing and Storing of Wool. A. M. Serebryakov. *Sherstyanoe Delo,* 1939, No. 2-3, pp. 38-39 (through *Chem. Abs.*, 1940, **34**, 5668).

Thiourea and the potassium salt of sulphophenyl-thiourea are effective mothproofers of wool during dyeing. Washing with soap and these agents is satisfactory. Protection against moths is provided by spraying the fabric with phenylaminothiazole, *p*-hydroxybiphenyl, dihydroxyphenylbutane and to a lesser extent with thiourea and naphthylthiourea. W.

Carpet Beetle Control. H. E. Jennings. *Pests,* 1940, **8**, No. 5, pp. 12-16 (through *Chem. Abs.*, 1940, **34**, 5203).

Diamylphenol as well as high concentrations of rotenone have proved effective as contact insecticides. W.

PATENTS

Improving the " Touch " of Fibrous Materials such as Wool, Cotton or Rayon. H. Ulrich, K. Küspert and J. Sattler (to I.G. Farbenindustrie, A.-G.). U.S.P.2,195,194 of 26/3/1940 (through *Chem. Abs.* 1940, **34**, 5298).

Amines of the general formula RR_1NR_2OH (R=an aliphatic hydrocarbon radical containing more than 7 C atoms, R_1 an aliphatic, cycloaliphatic, aromatic or mixed aliphatic-aromatic radical and R_2 an aliphatic radical), their salts or quaternary ammonium compounds, e.g. octadecyldiethanolamine monoglycol ether, are used, preferably from aqueous solution. W.

Recovery of Wool from Mixed Material by Carbonisation. C. P. Dyer (to Monsanto Chemical Co.). U.S.P.2,197,360 of 16/4/1940 (through *Chem. Abs.*, 1940, **34**, 5677).

Mixtures of wool with cellulosic materials are carbonised by conditioning them in an atmosphere of constant relative humidity, treating with hydrochloric acid gas and then baking long enough to destroy the cellulosic matter. W.

Wettable Water-repellent Solid Substances. [Sheep Dips, Insecticides, etc.]. T. W. Dickeson. B.P.522,727 of 26/6/1940.

Water-repellent powders, e.g. sulphur, carbon black, derris powder, etc., are rendered wettable by admixture with an insoluble gelatinous, or semi-colloidal, metallic hydroxide or oxide. Methods of preparation are described for hydrous hydroxides (copper, lead and zinc). Examples are given of the application of the method for preparing sulphur in cream or paste form of varying concentrations. The products are used as insecticides and fungicides, skin and hair tonics, maggot fly oil emulsions, dog mange preparations, anti-warble fly preparations and sheep dips. As a sheep dip, a mixture of arsenic oleate (1 per cent.-10 per cent.) and paraffin oil (10 per cent.-40 per cent.) is emulsified with aqueous activated gelatinous alumina and water, and cresols (1 per cent.-10 per cent.) are then added (I); water-repellent sulphur (5 per cent.-20 per cent.) is mixed with aqueous activated gelatinous alumina and water added till the preparation is of suitable consistency (II); (I) and (II) are then mixed, avoiding coagulation, and the whole made up to the strength required by the addition of water. W.

Cyano or Thiocyano Compounds [Wetting, Emulsifying and Mothproofing Agents; Fungicides and Bactericides]. J. R. Geigy, A.-G. B.P.523,109 of 5/7/1940.

A compound of general formula X-Y-CN or CNS (X=halogen, Y=aliphatic or araliphatic hydrocarbon radical, in the latter case the CN or CNS being linked to the aliphatic group of the araliphatic radical) is treated with ammonia, or an aliphatic (except *tert.*) amine, or an isocyclic amine, or a phosphine. The resulting products have varying properties, and may be used as bases dissolved in suitable solvents or as salts or quaternary compounds dissolved in water. Some of them are valuable wetting and dispersing agents; others mothproofing agents and others fungicides and bactericides. W.

Apparatus for the Coating of Surfaces with Liquids by Spraying. F. F. Schwartz and M. A. Chavannes. B.P.523,317 of 11/7/1940.

Spraying apparatus is described, with means for preventing wastage of the liquid. A chamber is provided for the final drying of the sprayed material. The apparatus is claimed to be particularly suitable for spraying latex on to fabrics. W.

Hat Body Forming Machine. G. T. Birdsall. B.P.523,453 of 15/7/1940.

Two bat-forming cones, each independently supported, are associated with each fur-depositing hopper and means are provided to carry the cones alternately into and out of the hopper. A wetting apparatus is provided for each cone, one cone being moved from its wetting position into the fur-depositing hopper while the other is moved from the hopper to its wetting position where the hat body is removed by mechanically inverting the cone at the end of the wetting operation. High suction is applied to draw the fur into engagement with the cone and this is maintained to hold the fur in position during transference from the hopper to the wetting position, means being provided for decreasing the suction on the cone after the initial wetting operation. W.

Vapour Phase Bleaching. Imperial Chemical Industries Ltd. B.P.523,467 of 15/7/1940.

Coloured textile fabrics (cotton, linen, wool and silk) are bleached by exposure to the vapour of *tert.* butyl hypochlorite. W.

Isatin Derivatives [Mothproofing Agents]. J. R. Geigy A.-G. B.P.523,496 of 16/7/1940.

Modification of B.P.424,967 and 424,972 (this *Journal,* 1935, A350). One molecule N-benzylated isatinsulphonic acid containing the sulphonic group in the benzene residue of the indol nucleus is condensed with 2 molecules of ether (*a*) a phenol, or (*b*) its homologue, substituted in the nucleus with an alkyl iodide containing more than 2 C atoms or by one or two halogen atoms or by halogen and an alkyl group, or (*c*) an ether of a phenol or such homologues. Applied in the usual manner the products impart a mothproof which is fast to washing and fulling. W.

Waterproof Fabric: Production. Ioco Rubber & Waterproofing Co. Ltd., Glasgow (M. Marchal; Montreux, France). B.P.523,499 of 9/1/1939: 16/7/1940.

A fabric for overcoats and similar garments comprises a light tweed forming a base, a coating of rubber or other waterproofing adhesive applied to one face of the tweed and fibres of silk, rayon, cotton or other materials of 1 mm. or more in length applied to the coating to impart a velvet or plush-like effect to one surface of the finished fabric. C.

Methylcellulose: Preparation. A. A. Houghton, C. M. Taylor and Imperial Chemical Industries Ltd. (London). B.P.523,546 of 3/1/1939: 17/7/1940.

In a process for the manufacture of low-substituted methylcelluloses from cellulose, aqueous sodium hydroxide and dimethyl sulphate, the cellulose is mechanically disintegrated in the presence of a non-mercerising aqueous medium in which the total amount of water is considerably less than that required for the etherification and the dimethyl sulphate is simultaneously or subsequently mechanically distributed in the disintegrated cellulose; the mixture thereafter is treated with concentrated aqueous sodium hydroxide so that a mercerising concentration of sodium hydroxide is formed therein; and the methylation is then carried out at a raised temperature. The cellulose may be disintegrated in presence of an aqueous solution of a neutral or alkaline lubricating agent, such as Turkey red oil, soap or glycerin, or a 2-5 per cent. solution of caustic soda may be used. C.

Azoic Dyes: Production on Cellulose Materials. G. J. Marriott, K. H. Saunders, and Imperial Chemical Industries Ltd. (London). B.P.523,547 of 3/1/1939: 17/7/1940.

The 4-amino-2:5-di(β-acetoxyethoxy)-anilides of benzoic and phenoxyacetic acids are condensed with 2:3-hydroxynaphthoic acid or an ester or the chloride thereof and hydrolysed so as to produce the corresponding 2:3-hydroxynaphthoic-2′:5′-di(β-hydroxyethoxy)-anilides. These are applied to cellulosic fibre and the material coloured by the application thereto of a diazo compound which is free from solubilising groups. The diazo compound may be applied in stabilised form, e.g. in the form of a metallic double salt or an arylsulphonate with or without other metallic salts. In this way, orange, red, brown and maroon shades are obtained of surprisingly good light fastness. The anilides described possess only small to medium affinity for the fibre and when used in printing can be easily washed from uncoloured portions of the printed fabric to

give a clear white. The shades obtained are also capable of being discharged to a good clear white. C.

Mercerising Lye Wetting Agents. G. B. Ellis (Chemical Works, formerly Sandoz, Basle, Switzerland). B.P.523,549 of 4/1/1939: 17/7/1940.

Polyether-monocarboxylic acids or their alkali metal, amine, or organic ammonium salts, corresponding to the general formula $R\cdot(OR_1)n\cdot OR_2COOH$, in which R is an alkyl radical or a cycloalkyl radical, R_1 and R_2 are the same or different alkylene radicals, and *n* is a positive integer, can advantageously be used as wetting agents for mercerising lyes either alone or in mixture with other known assistants for mercerising lyes such as phenols, low molecular aliphatic carboxylic acids, naphthenic acids, etc. Specified polyether-monocarboxylic acids (21 examples are given) include propyloxyethoxy-, β-butoxyethoxy- and isoamyloxyethoxy-acetic acids. Shrinkage data are recorded to demonstrate the rate of wetting when some of the agents are used. C.

Starch Products: Preparation. Corn Products Refining Co. (New York). B.P.523,665 of 10/12/1938: 19/7/1940 (Conv. 10/12/1937).

Starch is mixed in a moist state and in the presence of heat with sufficient alkali to give it a *p*H of above 7 during treatment, thus giving a starch that has increased fluidity without substantially increased content of matter soluble in cold water. For the purpose of providing a product which, when solidified, is cohesive, adhesive and insoluble in water, the above product is mixed, to form a paste, with formaldehyde and an acid. The acid should preferably be employed in an amount to give the mixture a *p*H of not substantially above 2 when insolubility in water is developed. The products may be used as bonding substances, sizing and coating materials, and water-resistant adhesives. C.

Plasticised Hydrocarbons [Moth-repellents]. Armour & Co. B.P.523,705 of 19/7/1940.

Naphthalene used for coating fabric, etc., does not chip off if an amide of general formula $RCONHR^1$ (R=alkyl>8 C and R^1=H, aromatic or aliphatic hydrocarbon or acyl radical) is incorporated, e.g. 0·5-5 per cent. stearamide. W.

Glazed Fabrics: Production. Tootal Broadhurst Lee Co. Ltd. (Manchester), H. Corteen, R. P. Foulds and F. C. Wood. B.P.523,731 of 13/1/1939: 22/7/1940.

A glazed or polished fabric is produced by coating a fabric with a thin layer of an artificial, polymerised, rubber-like material, and then applying a further thin coating of synthetic resin of the urea-formaldehyde type which is preferably modified with an alkyl resin. The final product may be calendered or not; the glazed effect is produced immediately and calendering is required only for the purpose of producing a uniform surface. Suitable artificial polymerised materials include synthetic rubber-like hydrocarbons or polymerised vinylacetylene, butadiene, isobutylene, acrylic acid esters, vinyl esters, ethers, etc. The polymerised material may be applied in the form of a dispersion of such viscosity that penetration of the fabric is avoided or may be applied in the form of a previously made film. The glazing treatment may be applied to printed or dyed fabrics. Glazed fabrics produced by this method are not spoilt by laundry washing and can be hot ironed without becoming sticky. C.

Cellulose Derivative Materials: Esterification to Raise Safe Ironing Point. H. Dreyfus (British Celanese Ltd.) and R. W. Moncrieff. B.P.523,774 of 12/12/1938: 23/7/1940.

Artificial filaments, yarns and other textile materials containing organic derivatives of cellulose which contain free hydroxy groups are improved, particularly in regard to safe ironing point, by esterification with a polybasic organic acid halide at a temperature above 100° C. under such conditions that their structure is retained. The esterification may be effected with adipyl, phthalyl or succinyl chloride in presence of an organic liquid which is a non-solvent for the materials, e.g. a hydrocarbon such as kerosene, toluene or xylene. Both the material to be treated and the reagent should be anhydrous. C.

Calender Bowl. D. Bentley Ltd. (Salford) and R. G. Oliver. B.P.523,794 of 14/1/1939: 23/7/1940.

A calender bowl is made of fabric impregnated with synthetic rubber, such as Neoprene or Buna, and compressed to form a laminated structure. The sheets of impregnated fabric may be in the form of discs having a central perforation which are threaded on to a steel shaft, the rubber impregnation being vulcanized prior to the application of the compacting pressure. C.

Brown Polyazo Dyes: Production on Cellulose Fibres. P. May (Chemical Works formerly Sandoz, Basle). B.P.523,918 of 17/1/1939: 25/7/1940.

Brown dyeings are obtained on fibres of cellulose, regenerated cellulose, or nitro-cellulose by dyeing the fibres with tris-azo dyes of given general formula and then treating in neutral or weakly acid conditions with diazo compounds of halogenated and/or nitrated amines of the benzene series which may also contain alkyl or alkoxy groups. C.

Fluid Mixture Consistency Regulating Apparatus. J. J. Livesey (Blackburn). B.P.524,034 of 20/1/1939: 29/7/1940.

Apparatus for automatically controlling the consistency of a fluid mixture which it is desired to maintain at a constant predetermined density comprises a two-armed balance lever, one arm of which carries a receptacle to which the fluid mixture is supplied, and the other arm an adjustable balance weight or weights, the receptacle having an outlet at the bottom connected to a bend with an outlet or nozzle at its outer end to direct the fluid on to a rotatable device, the movement of which controls the supply of one or more of the liquids forming the mixture, the arrangement being such that when the balance lever is level the fluid mixture is directed on to the rotatable device in such a way as will not cause rotation thereof; but if the arm carrying the receptacle is depressed, the device will rotate in one direction, whilst if it is raised, the device will rotate in the opposite direction, the rotation of the device controlling the opening and closing of a valve in the supply of one or more of the liquids of the mixture. C.

Cellular Polythene Materials: Production. Imperial Chemical Industries Ltd., London (E. I. Du Pont de Nemours & Co.; Wilmington, Delaware, U.S.A.). B.P.524,063 of 20/1/1939: 29/7/1940.

A coherent mass of polythene or modified polythene, permeated by a large number of small uniformly distributed gas cells, which may or may not be inter-connecting, is produced by melting granular polythene in the presence of a gas under pressure or introducing a gas under pressure into a melt of polythene, subsequently diminishing or releasing the pressure and cooling the resulting frothy melt to cause it to solidify. Alternatively, a substance adapted to give rise to a gas or vapour on heating, e.g. ammonium or sodium bicarbonate may be mixed with the polythene and the mixture then heated. In another method the polythene is dispersed in water to form a froth and the froth heated in a closed vessel so as to fuse the polythene into a spongy mass. Another method comprises heating a mixture of polythene and a soluble solid substance under pressure so as to form a compact mass of the solid substance interspersed with molten material, cooling the mass and dissolving out the soluble substance. The products have good heat-, sound- and electrical insulating properties and may be used as cork substitutes, padding materials, shock-absorbing cushions, etc. C.

Moisture-proof Sheet Material: Preparation. Wingfoot Corporation (Akron, Ohio, U.S.A.). B.P.524,108 of 23/1/1939: 30/7/1940 (Conv. 17/6/1938).

A moisture-proof sheet material is prepared by coating a sheet of paper or cellulosic wrapping material with a molten composition comprising wax or a wax-like substance and a condensation derivative of rubber obtained by reacting rubber with a halide of an amphoteric element, chlorostannic acid, or a phenolsulphonic acid. The molten composition may also contain resins or plasticizers and may be applied by spreading or spraying or by dipping the base into the molten mixture. C.

Multiple-layer Collar Fabric. Interfix Ltd. (London). B.P.524,191 of 9/6/1939: 31/7/1940 (Conv. 30/6/1938).

A multiple-layer fabric is composed of two outer layers of non-thermoplastic fabric such as ordinary cotton fabric, and an intervening layer of fabric, some

or all of the threads of which are composed of strands twisted together, one of the strands at least being composed of a non-thermoplastic material and another of cellulose acetate. The intervening layer is self-adhesively united to one of the outer fabric layers without destroying its porosity and strongly united to the other outer fabric layer by treating the layers with a volatile aqueous liquid which is not an active solvent of the derivatives of cellulose at ordinary temperatures but which softens the thermoplastic material upon the application of heat and pressure and then placing the layers upon a cold water-containing absorbent surface and applying heat and pressure to the upper face. Acetone, ethyl acetate, ethyl lactate and butyl acetate are suitable softening agents. The fabric may be used for the manufacture of porous washable collars and cuffs. C.

Cellulose Derivative Materials: Colouration. British Celanese Ltd. (London). B.P.524,273 of 25/1/1939: 2/8/1940 (Conv. 26/1/1938).

Yarns or other textile materials, films and like articles having a basis of an organic derivative of cellulose are coloured by applying to the articles a dye printing paste and steaming them at a temperature below 100° C. in an atmosphere saturated with water vapour. After steaming the articles may be scoured, e.g. with water containing a soap or like agent, to remove undesired components of the printing paste. C.

Patterned Fabrics: Production. A. H. Stevens (Bohleber and Ledbetter, New York). B.P.524,367 of 28/1/1939: 5/8/1940.

A fabric which is wholly or partially destructible comprises vegetable fibre yarns at least some of which have a diazotisable amino group compound absorbed and retainable therein. The diazotisable amino compound is diazotised and the fabric dried so that the yarns to be removed are rendered friable and the friable portions are removed, e.g. by beating or brushing. Pattern effects may be produced by treating selected areas with a compound such as hydrosulphite which removes or renders ineffective the diazotisable amino compound before the diazotising treatment. The fabrics are suitable for use as supporting fabrics in the manufacture of embroidery. C.

Cellulose Textile Materials: Improvement of Dyeing Properties. Courtaulds Ltd. (London), C. M. Whittaker and C. C. Wilcock. B.P.524,511 of 31/1/1939: 8/8/1940.

The dyeing properties of cellulose textile materials are improved by incorporating in the materials a product obtained by the interaction of cyanamide, formaldehyde and at least one phenolic compound selected from the group phenol, pyrocatechol, resorcinol, hydroquinone, phloroglucinol, para-nitrophenol and salol. The incorporation of the product in the textile materials may be effected by impregnating the materials with a solution of the compounds which react to form the product and subsequently heating or by adding the product in the form of a dispersion to the solution, e.g. viscose, from which the textile threads are made. The textile materials may be in the form of fabric, continuous filaments, or staple fibre yarn, sliver or roving. The treated materials have an increased affinity for dyes, including direct cotton, sulphur, vat, azoic, basic, acid and chrome dyes, and dyes used for cellulose acetate and other cellulose derivatives. C.

5—ANALYSIS, TESTING, GRADING AND DEFECTS

(A)—Fibres

Cellulose: Micellar Structure. O. Kratky, K. Kainz and R. Treer. *Holz roh u. Werkstoff*, 1939, **2**, 409-413 (through *Chem. Abstr.*, 1940, **34**, 4899[8]).

Cavities in the micellar system of native cellulose can be studied by swelling the fibre with salts of noble metals, depositing the metal by reduction, and tracing it by means of X-rays. Canal-like intermicellar cavities seem to run in the direction of the fibre. In ramie the crystalline portion may comprise one-third of the total. The relationship of intermicellar spaces to mechanical properties is discussed. C.

Cotton and Ramie Fibre: Crystallite Orientation. E. Plötze and H. Person. *Z. physikal. Chem.*, 1940, B**45**, 193-200 (through *Chem. Abstr.*, 1940, **34**, 4900[9]).

Microphotometer curves obtained from X-ray spectrographs show that the half-angle is independent of the average degree of polymerisation and is 15° for ramie fibre and 32° for cotton. The bearing of this on factors that determine the strength of fibres is stressed. C.

Cotton and Rayon Fibres: Structure. *Textile Mercury and Argus*, 1940, **103**, 106-107.

The writer briefly reviews Miss Farr's conception of the structure of cellulosic fibres and recent papers by Miss Clegg (B.C.I.R.A.) and by Hock and Harris that provide evidence for the older micelle theory. He suggests that there may be a parallel between the facts (1) that a small residuum of pectin in cotton so strongly restricts dissolution of the fibre in cuprammonium and (2) that a small amount of regenerated cellulose produced in cellulose acetate filaments by saponification so greatly reduces the solubility of the acetate in acetone or acetic acid. C.

Stretched Acetate Rayon: Strength and Extensibility. H. Lohmann. *Angew. Chemie*, 1940, **53**, 107-109 (through *Chem. Abstr.*, 1940, **34**, 4579[8]).

With increasing degree of orientation (through stretch) the strength of cellulose acetate filaments increases greatly but extensibility, transverse strength and knotting strength decrease. A higher degree of polymerisation is beneficial to both tensile and transverse strengths; there appears therefore to be an optimum degree of orientation for each degree of polymerisation. The bibliography has 63 entries. C.

Textile Fibre Plugs; Gas Flow through—. J. L. Fowler and K. L. Hertel. *J. Applied Physics*, 1940, **11**, 496-502.

Kozeny's approximate solution to the problem of fluid flow through porous media is developed and the result is checked by experimental data on air flow through plugs of cotton, wool, rayon and glass wool fibres. The solution gives

$$\frac{W}{A} = \frac{k\gamma_0}{2\mu}\left(\frac{\tau}{\sigma}\right)^2\frac{(1-c)^3}{c^2}\left(-\frac{\delta p^2}{\delta x}\right)$$

for the isothermal linear flow of a gas. W/A is the microscopic flux density, μ the viscosity, γ_0 the density of the gas at unit pressure, τ/σ the volume of fibres divided by their surface area, c the fraction of space occupied by fibres, $\delta p^2/\delta x$, the macroscopic gradient of the square of the pressure, and k is a numerical constant which depends on the shape and orientations of the fluid passages. The value of k found experimentally was 0·18, which is in approximate agreement with the value found for flow through media made up of spherical particles. The dependence of the flow on the factor c was checked over the approximate range from $c = 0{\cdot}1$ to $c =$ more than $0{\cdot}5$. Fibre densities determined from the gas flow data were in fair agreement with densities determined by other methods. C.

Cellulose Fibre Sheets: Swelling in Caustic Soda. G. A. Richter and K. E. Glidden. *Ind. Eng. Chem.*, 1940, **32**, 1122-1128.

Further work on the swelling of sheeted cellulose fibres in sodium hydroxide solutions, including investigations of the effects of temperature, the presence of secondary reagents distributed in the sheet or in the liquor and variations in the physical properties of the sheet, are described. The effects produced were measured in terms of dimensional changes and weight increase of the drained sheet. The data show that the maximum swelling and weight increase occur at about 5° C., and that for equivalent molar concentrations, sodium hydroxide causes greater swelling than lithium or potassium hydroxide. The presence of appropriate wetting agents slightly increases swelling and absorption of solution, but addition of ethyl alcohol in sufficient amount will repress the swelling and absorption to values comparable with those obtained when the sheets are dipped into water. C.

Textile Fibres: Electrodialysis and Ash Content. A. M. Sookne, C. H. Fugitt and J. Steinhardt. *Textile Research,* 1940, **10,** 380-389; *Amer. Dyes. Rept.,* 1940, **29,** 333-6, 355-6.

Recent work has shown that the hydrogen-ion equivalence of the cationic ash of fibres (the total content of the cations of bases whether free or combined with acids, or with the acid groups of the fibres) may be determined directly, without ignition, by electrodialytic procedures that have hitherto been applied principally to biological solutions. The content of any given anion in the sample may be similarly determined. By duplicating the procedure on a larger scale, the method has been used to obtain samples of fibrous materials of very low ash content. A simple extension of the method that permits the quantitative determination of the acidic and basic groups in the materials consists in combining them with suitable tightly bound cations or anions which are subsequently estimated by the electrodialytic procedure. Examples are given of the application of the method to " de-waxed " and " de-pectinized " cotton. In both cases the results are shown to correspond with the capacity of the fibres to bind acid. Examples are also given of ash determinations by this method on wool fibres and on samples of wool cloth at several stages in processing subsequent to the carbonizing process. C.

Cotton: Acidic Properties and Cation Exchange. A. M. Sookne and M. Harris. *Amer. Dyes. Rept.,* 1940, **29,** 357-360, 383-386; *Textile Research,* 1940, **10,** 405-419.

An account is given of an investigation of the fixation of hydrochloric acid by cotton, and its dependence on the concentration of the acid and on the ash content of the fibre. The materials examined were (1) " De-waxed cotton ", i.e. cotton extracted with hot alcohol for 24 hours and then washed with distilled water; (2) " De-pectinised cotton "; i.e. extracted cotton that was boiled with 1 per cent. caustic soda and washed with dilute acetic acid, as for the preparation of " standard cellulose "; (3) " Lime-washed de-pectinised cotton ", in which any acid liberated by the acid wash in (2) was fixed by steeping the cotton in lime water. The acid-binding capacity of the cotton was determined by titration, with bromocresol purple as indicator. The glass electrode with a cathode-ray " eye " as null indicator was used for *p*H measurements, and the H-ion equivalence of the cationic ash was measured by electro-dialysis. One experiment was conducted at $25 \pm \cdot 02°$ C., all the others at $0 \pm \cdot 01°$C. In order to allow for the possible selective adsorption of water from the acid solutions substances that were not likely to be fixed by cotton were added in parallel tests and the change in their concentrations determined; sodium chloride (determined by evaporation) and trehalose (polarimeter) were used. The correction for adsorption of water was considerable at *p*H's below $1 \cdot 5$ but negligible above $2 \cdot 5$. The effect of adding a neutral salt ($0 \cdot 1$ and $1 \cdot 0M$ potassium chloride) on the equilibrium between cotton and acid was also investigated. The results for the de-waxed and lime-washed de-pectinised cottons, at *p*H's $1 \cdot 08$ to $6 \cdot 38$, are tabulated and plotted as graphs of bound acid/*p*H. They show that the maximum acid-binding capacity ($0 \cdot 066$ milli-equivalent per gm. for de-waxed cotton and $0 \cdot 008$ m.equiv. for lime-washed de-pectinised cotton) occurs at about *p*H 1 and is equivalent to the cationic ash; that is the acid bound at any acidity depends on the ash content. Most of the acidic groups of cotton are obviously contributed by the pectic substance, and if it is assumed that the remainder are present as an integral part of the cellulose molecule (? end group) the results indicate a M.W. of about 100,000 or a minimum of 600 glucose units. The Donnan equilibrium is applied to the titration curves of the pectic substance. C.

Cotton and Rayon: Electrokinetic Potential. K. Kanamaru and T. Takada. *Kolloid Z.,* 1940, **90,** 315-319 (through *Chem. Abstr.,* 1940, **34,** 4565[6]).

A tetrode electrometer is found to give better results than the quadrant electrometer used in previous measurements of streaming potentials. Measurements of ζ-potential and specific conductivity are recorded for standard cotton cellulose (42-38 millivolts), purified ramie, α-cellulose pulp, viscose rayon, three types of cellulose acetate, and nitrocellulose of different N-contents. The values for the celluloses decreased in the order in which they are named, and values for

the cellulose derivatives decreased in the order Cellite>fibrous cellulose triacetate>nitrocellulose. C.

Viscose Filaments: Electrokinetic Potential and Micellar Parallelism. K. Kanamaru and T. Takada. *Z. physikal. Chem.*, 1940, A**186**, 1-9 (through *Chem. Abstr.*, 1940, **34**, 4564[7]).

The ζ-potential of viscose filaments was determined by the streaming-potential method as a function of the speed at which the viscose was spun (1 to 90 metres per minute). For filaments spun at low rates and having, therefore, low degrees of micellar parallelism, the initial ζ-potential is higher, and its fall with time greater, than for fast-spun filaments. C.

Silk: Causes of " Lousiness ". H. White. *Amer. Dyes. Rept.*, 1940, **29**, 409-410.

The silk filament consists of two parallel fibres of triangular cross section (fibroin), cemented together with a glue-like substance, sericin. Degumming agents remove the sericin and penetrate the fibre and, in the event of a lack of uniformity in structure, the fibrillae are separated and on further processing ends break and produce the exfoliation known as " lousiness ". Protective colloids such as protein decomposition products may be added to the processing baths to minimise the action of alkalis and the effects of prolonged boiling. Chafing of raw silk causes broken filaments which show up as white streaks after dyeing. The higher sulphonated fatty alcohols act as efficient lubricants and can be incorporated with a protective colloid and used to reduce exfoliation. C.

Textile Fibres: Identification. J. H. Skinkle. *Rayon Textile Monthly*, 1940, **21**, 461-463.

A scheme for the identification of textile fibres is given. A flame test is first used to distinguish glass and asbestos fibres. On burning, weighted silk fibres leave ash which retains the shape of the fibres but other fibres burn or melt to a ball. Silks, hairs and casein fibres dissolve in boiling 5 per cent. caustic alkali. Of these, silk and tussah fibres are soluble in cold, concentrated hydrochloric acid but hairs and casein fibres are insoluble. Hairs dissolve when treated with 20 per cent. caustic soda at 30° C. for 3 hours. Fibres which are insoluble in boiling 5 per cent. caustic alkali are treated with acetone at room temperature which dissolves acetate and Vinyl fibres. Acetate fibres are dis tinguished from Vinyl fibres by solubility in cold glacial acetic acid. Of the group insoluble in acetone, Nylon is distinguished by solubility in melted phenol. Fibres which are insoluble in 5 per cent. caustic alkali, acetone, and melted phenol, are stripped if dyed and then tested with zinc chloride-iodine solution. This test gives a blue colour with mercerised cotton, cuprammonium, viscose and Cisalfa fibres and no colour with cotton, jute, hemp, and flax. If the fibre is not dyed, those giving a blue colour with zinc chloride-iodine may be tested with Millon's reagent. Cisalfa gives a red colour in this test. Of the fibres not coloured by zinc chloride-iodine, jute and hemp give a yellow colour with aniline sulphate. C

Ultra-violet and Electron Microscopy: Development. L. C. Martin. *Nature*, 1940, **146**, 288-292.

A report of a Royal Institution discourse. The author discusses the development of ultra-violet and electron microscopy, and applications, limitations and advantages of these methods. C.

Determination of Fibre Fineness of a Merino Wool Sample. V. Bosman and C. M. van Wyk. *Onderstepoort J.*, 1939, **13**, 401-413.

A description of the South African technique for preparing and mounting a wool sample and for measuring and recording the results. 250 measurements are generally sufficient to bring the permissible error to within 3 per cent. of the mean, a chart being given to show the relationships between the statistical constants and the number of fibres necessary for measurement, the values given being for a 5 per cent. probability level of significance. The question of the human element among observers is discussed. Difficulties are stated peculiar to the weight-length method for determining fibre fineness, which has been suggested for arbitration purposes. W.

New Method of Determining the Wettability of Textile Fabrics. C. M. Blow and B. F. J. Moxon. *J. Soc. Chem. Ind.*, 1940, **59**, 171-174.

A new technique for the determination of the wettability of textile fibres is described. It is carried out on yarn and the wettability figure obtained has been shown to be independent of the count and twist. At present the measurements are confined to one quality of wool, but work of an experimental and theoretical nature is in hand to enable the wettability of fibres of different diameters to be determined and compared. The results given in this paper are chiefly concerned with establishing the principles of the method, but the effects of scouring, dyeing, unshrinkable processes, and "Velan" treatment of wool are examined in a preliminary manner. W.

Effect of Humidity and Temperature on the Young's Modulus of Keratin Fibres. H. J. Woods. *Proc. Leeds Phil. and Lit. Soc., Sci. Section*, 1940, **3**, 577-583.

Using high rates of extension within the Hooke's law region of the load/extension curve, a series of measurements of Young's modulus can be made with a single fibre. For humidity changes the results agree with Speakman's statistical values (this *Journal*, 1930, A405); the water adsorbed at low humidities has less effect than the remainder in reducing Young's modulus. The temperature effect for all types of hair is small compared with the large temperature variation of relaxation phenomena. For dry fibres the temperature coefficient of Young's modulus between 0° and 100° C. is of the order $-2{\cdot}5 \times 10^{-3}$ per degree, and a somewhat similar value is obtained for wet fibres between 40° and 90° C. Usually, particularly with human hair, Young's modulus for wet fibres decreases much more rapidly as the temperature rises to 40° C. than above this temperature. W.

Cystine Content of Merino Wool in Relation to its Physical Attributes. S. D. Rossouw and V. Bosman. *Onderstepoort J.*, 1939, **13**, 237-242.

There were no significant correlations between the cystine content and tensile strength, extension, fineness, crimp, scaliness and whiteness of fibres. There was a significant correlation between cystine content and resilience, but its value was not high. It is concluded that the cystine content of merino wool varies less than do the physical characteristics enumerated, that the role of cystine in wool production is not important, and that the possibility of improving wool characteristics by means of the cystine content does not appear to be great. W.

Electrodialytic Estimation of Ash and of Acidic and Basic Groups in Textile Fibres. A. M. Sookne, C. H. Fugitt and J. Steinhardt. *Amer. Dyes. Rep.*, 1940, **29**, 333-336.

The hydrogen-ion equivalence of the cationic ash of fibres (the total content of the cations of bases whether free, or combined with acids, or with the acidic groups of the fibre) may be obtained directly, without ignition, by existing electrodialytic procedures which have been hitherto applied principally to biological solutions. The content of any given anion in the sample may be similarly determined. The method has also been used to obtain samples of fibrous materials of very low ash content. A simple extension of the method permits the quantitative determination of the acidic and basic groups in the material by combining them with suitable tightly bound cations or anions which are subsequently estimated by the electrodialytic procedure. Examples are given of the application of the method to cotton and wool. A sketch of the apparatus is given. W.

(B)—YARNS

Cotton Yarn: Quality; Factors and Testing. R. P. Richardson. *Indian Textile J.*, 1940, **50**, 254-255.

A report of a lecture on modern knowledge of the relationships between fibre characteristics and yarn quality and how quality is influenced by blending, combing, twisting and sizing. Some indication of the performance of a warp yarn in the loom is given by a test in which a pendant group of threads (12 or 30 inches long) is loaded by weights and the extension under load and the residual extension after release are observed. Typical figures are tabulated for a 30's yarn under loads of 3·7, 5·0 and 6·2 oz. per thread. C.

Viscose Rayon: Stress-Strain Properties; Effect of Relative Humidity. H. R. Bellinson. *Textile Research,* 1940, **10,** 372-379.

Measurements of the strength and extensibility of viscose rayon yarns at 43 to 74 per cent. R.H. show that strength decreases and extensibility increases almost linearly as the relative humidity is increased. The change in breaking load is 2·58 g. and in extensibility 0·047 per cent. for each 1 per cent. change in relative humidity. Load/extension diagrams are shown. Apparently the " yield " region decreases and the " work hardening " region increases with increased relative humidity. Breaking load and extensibility of individual specimens are positively correlated; the best estimate of the coefficient is +0·185. C.

Novelty Yarn: Analysis. *Textile World,* 1940, **90,** No. 8, 56.

The analysis of a " ratine burette " novelty yarn composed of a cotton core with a cut woollen yarn buretted on it, and a cotton binder is described. The analysis includes twist, take-up and count determinations and determinations of the proportionate weights of each yarn. Cost calculations are explained. C.

Silk Hosiery Yarns: Influence of Twist on Shortening, Diameter, Dullness and Torsion. W. P. Seem, T. Andrew and E. Simmat. *Rayon Textile Monthly,* 1940, **21,** 104-106, 168-170, 223-225, 303-305, 365-367, 423-424, 467-468.

Silk hosiery yarn definitions and nomenclature are discussed and a study is made of the influence of twist on the shortening, diameter, dullness and torsion of the yarns. Formulae are given and applied to different types of hosiery yarns. Diameter measurements are tabulated and compared with calculated values. C.

(C)—FABRICS

Cellulose Acetate: Tendering in Mercury Arc Light. J. Grard. *Pub. sci. tech. Ministère Air (France), Bull. Services tech.,* No. 88, 1939, 11 pages (through *Chem. Abstr.,* 1940, **34,** 3923[8]).

An apparatus for light-exposure tests (of aeroplane fabrics) has two tungsten filament-mercury arc daylight lamps in an aluminium chamber. With this source of radiation cellulose acetate materials rank superior to nitrocellulose. The mercury arc emits radiation that is especially injurious to cellulose acetate. C.

Dyed Cellulose Acetate Goods: Gas Fading. C. A. Seibert. *Amer. Dyes. Rept.,* 1940, **29,** 363-374.

A report of a lecture and subsequent discussion. The author records a number of miscellaneous observations on the fading of dyed acetate goods in the vicinity of, or caused by, electric fires, motor car exhaust fumes, and vapours from refrigerators and air-conditioning plant, but holds that burning gas has the most powerful effect. Differences between classes of dyes are mentioned. On the understanding that the active agents are oxides of nitrogen substances may be added by the dyer to inhibit fading. Unfortunately, some of these are removed in laundering and some are upset by perspiration, and the inhibitors may have an adverse effect on dyed viscose rayon if present in the same cloth; tests are reported. The work of a sub-committee of the American Association of Textile Chemists and Colorists on a fastness test is mentioned. Some types of apparatus are described, with illustrations, and a specification is given of a gas-fading oven developed by Macy's " Bureau of Standards ". A wire gauze over the gas flame is reported to enhance the fading effect considerably. C.

Crease-resisting Fabrics: Production and Testing. A. D. J. Piesse. *Rayon Textile Monthly,* 1940, **21,** 478-479.

The principle of the Tootal Broadhurst Lee process for the production of crease-resisting fabrics is outlined and its application to cotton, rayon, staple fibre and linen fabrics is briefly discussed. It is pointed out that the crease-resisting fabrics should not be boiled, treated with acid, or washed in the presence of active chlorine. The use of the trade mark " Tebilized " is discussed and it is pointed out that fabrics bearing this mark must meet definite standards. Methods of measuring the crease-resistance of flat goods, the crush resistance of velvet, and the resistance of fabrics to wear are outlined. C.

Dyed Textiles: Fastness. J. G. Williams. *J. Textile Inst.*, 1940, **31**, P81-83. C.

Printers' Sheets: Production. J. Forrest. *Trans. Inst. Rubber Ind.*, 1940, **15**, 298-300.

An account is given of difficulties that arose in the production of printers' sheets, their causes and methods by which they were overcome. These sheets are used for printing trade marks, etc., on cardboard boxes, sacking and so forth; they form the printer's " block ". They comprise a backing consisting of a ply of rubber between two plies of cotton duck, the over-all thickness of the backing ranging from $\frac{1}{16}$ in. to $\frac{1}{8}$ in., and a rubber face of thickness ranging from $\frac{3}{16}$ in. to $\frac{1}{4}$ in. The design is marked out on the face and the surrounding rubber cut away. The rubber face should have an unblemished surface and be resistant to the action of printing dyes, should cut fairly easily, and should strip cleanly and with moderate ease from the backing. The weight of the cotton duck is one factor in the production of a successful sheet. C.

United States Army Clothing Fabrics: Specifications. *Textile World*, 1940, **90**, No. 8, 47.

United States Army specifications for 18-oz. worsted serge, sleeveless summer undershirts of knitted cotton fabric, and rayon-wool fabrics are summarised. C.

(D) OTHER MATERIALS

Electrical Insulating Paper: Properties. J. M. Finch. *Ind. Eng. Chem.*, 1940, **32**, 1021-1028.

The effect of moisture on the insulation resistance of washed and unwashed cotton and of cellulose acetate rayon is discussed, and tables and graphs are given showing the moisture absorption of unimpregnated and impregnated papers, the effect of impregnation on the insulation resistance of paper, and the effect of electrolytic contamination on the insulation resistance of phenolic-resin laminated material. The methods of manufacture and properties of the various types of paper insulations used in the telephone industry are described and the use of substitutes such as cellulose acetate sheet, Cellophane, etc., is mentioned. Typical specification requirements for insulating papers are given and methods of testing are discussed. C.

Paper: Relation between Sheet Strength and Fibre Surface Conditions. H. P. Dixson, jun. *Paper Trade J.*, 1940, **111**, *TAPPI*, 29-36.

Theories of the cellulose-water relationship and of beating and sheet formation are discussed and it is pointed out that there must be a close relation between the condition and amount of water retained on fibre surfaces and the sheet-forming characteristics of the fibres. An account is then given of investigations of the effects of varying surface tension conditions and variations of the hydrophilic character of pulp fibre surfaces produced by the use of surface tension depressants and hydrophilic colloids on the properties of sheets formed from the pulp. The hydrophilic character of pulps and other materials was measured by the amount of bound water determined by a cryoscopic method and the hydrophilic character of the pulps was also checked by measurements of alkali-binding power. The hydrophilic character of unbeaten bleached sulphite pulp was reduced by treatment with Duponal WA (sodium lauryl sulphate) and the treatment produced a decrease in sheet bursting strength. Treatments of the pulp with locust bean gum, cellulose gel, and gelatin increased the hydrophilic character of the pulp fibres and produced increases in the bursting strength and decreases in the tearing strength of the sheets, the effects of the added materials increasing with increasing hydration. Sheets made from tannic acid-mordanted fibres were merely felted masses and the fibres could be brushed from the sheets by hand. C.

Newsprint Paper: Effect of Atmospheric Humidity. D. Jones. *Paper Trade J.*, 1940, **111**, *TAPPI*, 57-60.

The general effects of atmospheric humidity on newsprint are discussed and measurements of the physical changes in wrapped rolls and the radial and endwise penetration of moisture into rolls on storage are given. The data show that newsprint in wrapped rolls is hygroscopic and responds to changes in atmospheric humidity by corresponding changes in moisture content, and that

the hysteresis effect of atmospheric humidity is non-reversible in so far as finish and caliper are concerned. C.

Paper: Water Vapour Permeability Measurement. *Paper Trade J.*, 1940, **111**, *TAPPI*, 61-63.

Details are given of the apparatus and procedure for the determination of the water vapour permeability of paper and paperboard specified in TAPPI Tentative Standard T448 m-40. The method is essentially that described in a previous report by Brabender. C.

Paper Sheet: Structure and Properties. G. E. Landt and S. A. Rulon. *Paper Trade J.*, 1940, **111**, *TAPPI*, 44-48.

The possibilities of explaining the properties of paper in terms of fundamental cellulose molecular structures are examined, and the effects of protracted beating, the hydration theory of beating and of sheet formation, cohesion due to pressing, and fibre orientation are studied. It is shown that the beating process breaks down the fibres to fibrils and simultaneously dissolves pectic substances, pentosans, and any other cementing material that separates the fibrils from each other. Such treatment exposes the surfaces of the cellulose micelles which are studded with hydroxyl groups. In the subsequent operation of forming the sheet, these hydroxyl groups establish a continuous structure between fibrils through exercise of their residual attractive or cohesive force. Molecular cohesion between these hydroxyl groups probably commences to establish itself on the felts, but does not get well under way until the sheet is taken on to the driers. Tension at the draw and on the driers will serve to orient the fibrils and, therefore, the crystallites in the direction of travel of the sheet. The effects of the tension on the properties of the sheet are indicated. C.

Determination of Sulphides in Depilatories. E. M. Hoshall. *J. Assoc. Official Agric. Chem.*, 1940, **23**, 437-444 (through *Chem. Abs.*, 1940, **34**, 5600).

On the basis of analytical data presented, a modification (technique described in detail) of Mohr's arsenious oxide method for the determination of sulphuretted hydrogen is tentatively proposed for the determination of sulphides or hydrosulphides of sodium, barium, strontium, calcium, potassium, ammonium and lithium in liquid, powder and paste depilatories. A supplementary method is described, which is applicable in the presence of carbonates; it provides for the escape of carbon dioxide liberated by the action of the acid, without permitting of loss of sulphuretted hydrogen. W.

PATENT

Yarn Regularity Tester. Fairbairn Lawson Combe Barbour Ltd. (Leeds) and J. R. Bee. B.P.523,504 of 10/1/1939: 16/7/1940.

In apparatus for measuring and indicating the number of thick and thin parts of a yarn or thread, each thick part gives an indication on one dial and each thin part gives an indication on another dial. The yarn is passed over an adjustable gauge so arranged that thin parts pass through the gauge to operate one indicating device and thick parts by extending from the gauge operate the other indicating device. The thin parts in passing through the gauge rotate a disc, and lever devices operated by the disc move another graduated disc against a fixed pointer. The thick parts in extending from the surface of the gauge rotate a disc and lever devices to move another graduated disc against a fixed pointer. Each thick or thin part is arranged to give an indication whatever the length of such part may be whilst a prolonged portion of thick or thin yarn will repeatedly indicate until such portion has passed. The disc with which the thick parts contact can be adjusted to vary the thickness of yarn by which it will be operated. C.

7—LAUNDERING AND DRY CLEANING

(A)—CLEANING

Staple Fibre Fabrics: Laundering. American Institute of Laundering. *Rayon Textile Monthly*, 1940, **21**, 455.

Difficulties encountered in the laundering of spun rayon garments and the confusing instructions often found on labels accompanying the garments are briefly discussed and suitable washing and drying procedures are outlined. The causes and prevention of such faults as moiré effect, chafe marks, streaks, shrinkage, seam damage, colour migration, etc., are discussed. C.

8—BUILDING AND ENGINEERING

(A)—Construction and Maintenance of Buildings and Plant

Paint: Discoloration by Moulds. W. P. K. Findlay. *J. Oil & Colour Chemists' Assoc.*, 1940, **23**, 217-232.

A comprehensive discussion of fungi which grow on paint, occurrence and distribution of mould damage to paintwork, the composition of paint and liability to attack by moulds, influence of substrate on liability of paint films to mildew, fungicidal paints, laboratory methods of test and the results of tests of the effectiveness in paint of a large number of antiseptics (including " Shirlan "), the effect of adding fungicide on the properties of paint, field tests on fungicidal paints, and the treatment of an outbreak of mould on painted surfaces. C.

(B)—Fire Prevention

Solids: Ignitibility. H. C. Porter. *Ind. Eng. Chem.*, 1940, **32**, 1034-1036.

The nature of ignition is discussed and a method of determining relative ignitibilities is described which consists in applying a small igniter to the surface of the material, in one spot only, and raising its temperature until self-propagating combustion is initiated, the test being carried out in oxygen under moderate pressure in a closed bomb. The amperage required in the igniter and the " approximate percentage of burning in two minutes " are recorded for cellulose nitrate, celluloid, cotton, resins, wood, " Cellophane ", cellulose acetate, starch, paper pulp, gelatin, carbons, coals, etc. The results show that ignition in solids is closely related to the presence of particular types of chemical structure. The open and long-chain structure of paraffin wax is much more easily ignitible than the closed-ring structure of naphthalene. Wood, peat, lignite and class B bituminous coals (all of which contain either humic bodies or lignin with structures comprising open-chain groupings) are of greater ignitibility than semi-bituminous coal, anthracite and cokes which consist largely of multiple ring structures. Cellulose, in the form of loose cotton or paper pulp, has a very high ignitibility, but in compact form the influence of the physical state may outweigh that of chemical structure. The ether or bridged linkage of oxygen in the molecular structure tends to promote ease of ignition, as in phenol-formaldehyde resins and the lignin of peat and wood. Ignitibility in cokes depends on the temperature at which they are manufactured. In general, the ignitibility of coals increases with the increase of oxygen in the dry, ash-free material. C.

Ignition-retarding Agents: Application and Efficiency. R. Schlyter. *Statens Provningsanstalt, Meddelande* 62, Stockholm, 1939 (through *Building Science Abs.*, 1940, **13**, 86).

This report is the last of a series about investigations of the fire-resistance of building materials, carried out at the State Testing Laboratory, Stockholm. The first part describes tests of various commercial liquid fire-proofers for wood, including paint and preparations for impregnation, etc., of the wood. Of special interest was the resistance shown by the treated wood to " initial fire ", which is defined as the stage beginning with ignition and ending when the wood is capable of continuing to burn alone. The tests were carried out one month and one year after application of the treatment; details are given in the original paper. A list of approved fire-proofers and fire-resistant facing materials is given. The second part of the report contains an account of similar tests on textiles. The chemical composition and quantity to be used of four approved fire-proofers are stated. An extensive bibliography relating to the regulations for the fire-resistance of building materials, fire-resistance tests, etc., is appended. C.

(C)—Steam Raising and Power Supply

American Viscose Corporation's Power Plant. H. A. Kuljian. *Gen. Elec. Rev.*, 1940, **43**, 280-284.

The American Viscose Corporation's power plant at Front Royal (Va.) is described and photographs and diagrams are given. The plant includes three steam-generating units each having a nominal full-load rating of 225,000 lb. of steam per hour, two 7,500-kw 60-cycle turbine-generators, and three 3,000-kw high-frequency turbine-generators, all with control equipment chosen for its

reliability and flexibility. The 60-cycle current is used for general mill purposes, such as driving refrigerating machines, air-conditioning equipment, hydraulic pumps, cranes, lighting, etc. The high-frequency current is used only for the spinning motors. Each spindle is equipped with an individual motor drive. C.

(D)—Power Transmission

Lubricated Metals: Friction. F. P. Bowden and L. Leben. *Phil. Trans. Roy. Soc.*, 1940, A239, 1-27.

An analysis has been made of the kinetic friction between metals sliding under conditions of boundary lubrication. With mineral oils and many other lubricants an intermittent clutching and breaking away of the surface still occur through the oil film. The friction, the surface temperature and the area of contact all show violent fluctuations and the behaviour may be essentially the same as with unlubricated metals. With short-chain fatty acids the motion is also " stick-slip ", but when the chain reaches a certain length continuous sliding occurs. Alcohols and saturated hydrocarbons of the same, or longer, chain length do not cause sliding. Even with the best lubricant the film breaks down to some extent during sliding and some wear of the surfaces takes place. The metal is torn to a depth which is large compared with the dimensions of a molecule. The frictional force between lubricated metals must therefore be greatly influenced by the bulk properties of the metals concerned. The frictional behaviour of metallic surfaces covered with successive monolayers of lubricant has also been investigated. A single layer can cause a large reduction in the friction but the film is soon worn away. With multilayers the rate at which the film wears off is markedly dependent on its molecular thickness. Methods are described for measuring the rate of wear of lubricant films. A single film of long-chain fatty acid molecules is more effective than a single film of the flat leaf-shaped cholesterol molecule. For effective boundary lubrication it is necessary to have present a layer of lubricant several molecules thick. The experiments show that boundary lubrication cannot be regarded as a purely surface phenomenon. On the basis of these experiments a theory is put forward to explain boundary lubrication. In general it appears that even with lubricated surfaces the local pressures in the region of contact are very high so that the lubricant film between the surfaces is partly broken down. If the sliding speeds are appreciable this breakdown is aided by the local high temperatures. Metallic junctions, the size of which is large compared with the dimensions of a molecule, are formed between the surfaces. There will be some resistance due to the interaction of the surface films themselves, but under many conditions of sliding the resistance to motion is due mainly to the force necessary to break the junctions. The frictional behaviour of boundary lubricated surfaces is therefore largely governed by the extent to which the lubricant film breaks down during sliding. C.

V-Rope Loom Drives. *Textile Weekly*, 1940, **26**, 232-234.

Belt, chain and gear drives for looms are briefly compared and the advantages of V-rope driving are pointed out. V-rope and V-rope pulley constructions are described, pulley ratios and speeds for different types of looms are indicated, and methods of mounting motors on loom frames are briefly discussed. C.

Oil Economies are Dangerous. I.L. *Textile Manufacturer*, 1940, **66**, 309, 312.

The greatly increased wear resulting from inefficient and irregular oiling of looms is discussed. Specific examples are given and photographs illustrate wear which has taken place on crank pins and picking bowls which have been carelessly oiled. Excessive wear on crank pins may cause uneven places in the cloth because of lack of rigidity in the sley, while in the case of picking bowls the pick may be weak, with consequent banging off. Inefficient oiling is generally caused by attempting to do so while the loom is in motion and by neglect to remove dirt from oil holes. The importance of correct lubrication for dobby looms is also discussed. L.

(G)—Heating, Ventilation and Humidification

Air Conditioning in Textile Mills. VI. Estimation of Plant Capacity. A. Dearnaley. *Textile Manufacturer*, 1940, **66**, 341.

The practical and economic limitations in meeting variable conditions are

discussed and examples of the calculations of required capacity in heating, ventilation and humidity are given. L.

(H) —WATER PURIFICATION

Sand Filters: Care and Cleaning. H. Nix. *Textile World,* 1940, **90,** No. 8, 62-63.

Factors influencing the efficiency of sand filters in water-purification plant are discussed and methods of preventing and correcting troubles are indicated. Particular stress is placed on proper methods of back-washing and modern systems are briefly described. Chemical methods of cleaning the sand, e.g. with caustic soda, chlorine, sulphur dioxide or sodium bisulphite, are described. C.

New Trends in Boiler Feedwater Treatment. F. G. Straub. *Trans. Amer. Inst. Chem. Engrs.,* 1940, **36,** 395-401 (through *Chem. Abs.,* 1940, **34,** 5579).

The paper reviews the new trends in boiler-water treatment for the prevention of scale, corrosion, embrittlement and carry-over. These include the later developments in cold process softeners and the organolites or Zeo-Karb softeners. Consideration is given to the latest method used for prevention of silica scale, as well as the so-called " threshold treatments " for stopping scale in condensers and heat exchangers. The newer types of steam purifiers are described. There is also a discussion on corrosion in the " steam blanketed " areas of the boilers. W.

Modern Methods of Handling Hydrogen Peroxide. *See* Section 4G. 8A

PATENTS

Air Conditioning System. British Thomson-Houston Co. Ltd. (London). B.P.523,846 of 16/1/1939: 24/7/1940 (Conv. 15/1/1938).

A system for conditioning the air within an enclosure comprises means for circulating air drawn from the enclosure and fresh air through a duct and into the enclosure, two refrigerant evaporators arranged in the duct in parallel with respect to the path of the air circulating through the duct for cooling the air circulating therethrough, a single refrigerating machine including a compressor and a condensing unit having a refrigerant circuit for supplying liquid refrigerant to both evaporators and for withdrawing gaseous refrigerant from both evaporators, means responsive to the temperature of the air within the enclosure for controlling the starting and stopping of the compressor, means for preventing the flow of air over one of the evaporators, means for preventing the flow of liquid refrigerant to that evaporator, and automatic means dependent upon the temperature or humidity of air admitted to the duct for actuating the air flow preventing means and the refrigerant flow preventing means to remove that evaporator from the refrigerant circuit and from the path of the air circulating through the duct. C.

Air Conditioning System. British Thomson-Houston Co. Ltd. (London). B.P.523,847 of 16/1/1939: 24/7/1940 (Conv. 15/1/1938).

A system for conditioning the air within an enclosure includes a duct, a reversed-cycle refrigerating machine having a compressor and first and second heat exchangers, the compressor being arranged to supply compressed refrigerant to the second and to withdraw vaporised refrigerant from the first, means for circulating air through the duct and into the enclosure, means including the second heat exchanger for heating the air circulated through the duct, means for circulating a fluid over the first heat exchanger to supply heat to the system, means dependent upon the pressure of vaporised refrigerant withdrawn from the first heat exchanger for controlling the rate of flow of the fluid over the first heat exchanger, means for reversing the operation of the refrigerating machine to supply liquid refrigerant to the second heat exchanger to cool the air circulating through the duct and to transfer heat to the fluid circulated over the first heat exchanger, means for reversing the direction of flow of fluid over the first heat exchanger, and means dependent upon the pressure of refrigerant discharged by the compressor for controlling the rate of flow of the fluid in the reversed direction. The system also includes means arranged within the duct for supplying moisture to the air circulating therethrough for increasing the relative humidity of the air within the enclosure, means for supplying water

for the humidifying means, means utilising a portion of the heat of compression of the refrigerant discharged from the compressor for heating the water supplied to the humidifying means, and means dependent upon the relative humidity of the air within the enclosure for controlling the flow of water to the humidifying means. C.

9—PURE SCIENCE

Growing Cotton Boll: Internal Temperature. D. B. Anderson. *Amer. J. Botany,* 1940, **27**, 43-51 (through *Exp. Sta. Rec.*, 1940, **82**, 734).

The temperature at the centre of full-sized unripe bolls exposed to full sunshine was regularly about 6-8° C. above that of the atmosphere. Every passing cloud caused a drop in temperature which was often greater at the centre of the boll than in the air. High and low points in the temperature curves occurred at nearly the same times. Bolls growing in the shade differed much less from the air in temperature and were less responsive to changes. At night bolls exposed to a clear sky were very slightly colder than the air but shaded bolls were very slightly warmer. C.

Corn Starch Limit Dextrins: Preparation. B. Ortenblad and K. Myrbäck. *Biochem. Z.*, 1940, **303**, 335-341 (through *Chem. Abstr.*, 1940, **34**, 4086[9]).

Nine fractions of " limit dextrin " have been prepared from corn starch by digestion with malt extract and brewer's yeast, and their P content, specific rotation and molecular weight determined. About 22 per cent. of the starch is recovered as limit dextrins comprising hexa-, tetra- and tri-saccharides. Several consecutive fractions have molecular weights of about 500. C.

Limit Dextrin: Fermentability. K. Myrbäck. *Biochem. Z.*, 1940, **304**, 147-159 (through *Chem. Abstr.*, 1940, **34**, 4605[2]).

In the preparation of " limit dextrins " from an amylase digest of starch any maltose or glucose formed is first fermented by yeast. There is some evidence that some, but not all, of the trisaccharides included in " limit dextrins " are also partially fermented. The tetrasaccharide fractions are not fermented. C.

Linoleic and Linolenic Acids: Thiocyanogen Values. T. P. Hilditch. *Analyst,* 1940, **65**, 437-446.

An account is given of determinations of the iodine and thiocyanogen values of purified oleic, linoleic and linolenic acids, methyl oleate, methyl linoleate and ethyl linolenate and the values obtained are compared with those of other workers and with the theoretical iodine values and the thiocyanogen values calculated according to Kaufmann's assumptions (addition to one of the double bonds in oleic and linoleic acids, and to two of the three double bonds in linoleic acid). The thiocyanogen values (0·2 *N* reagent, 24 hours' contact, 150-200 per cent. excess) of linoleic and linolenic acids are respectively 95·9 and 162·5, corresponding values being observed for the esters. Both values differ from those originally postulated by Kaufmann (respectively 90·7 and 182·7); the present results, especially for linolenic acid, accord well with recent data published by other workers. Examination of binary and ternary mixtures of the pure acids or the pure esters shows that the observed values hold for the examination of mixtures of the compounds, subject to possible discrepancies when the unsaturation is high (iodine value above 170), especially with mixtures of the three acids. It is recommended that agreed empirically determined values obtained under carefully prescribed conditions should replace the hitherto-accepted " theoretical " thiocyanogen values of linoleic and linolenic compounds, but that extensive revision of already published data should be deferred until general agreement has been reached as to the precise values and the conditions of determination. In the meantime, data obtained by thiocyanometric analysis for the component acids of fats which contain high proportions of linolenic and linoleic acids must be regarded as uncertain. Instances of the variations involved are quoted for a number of the more important liquid fats. C.

Cellulose: Ease of Esterification. I. Shettle, N. Klyuchkin, N. Mikhailov, G. Popov and M. Fuks. *Byull. Vsesoyuz. Khim. Obshchestva im. Mendeleeva,* 1939, No. 3/4, pp. 68-69 (through *Chem. Abstr.*, 1940, **34**, 4901[2]).

The extent of esterification by means of acyl chlorides in the presence of pyridine and organic diluents is greatest for raw linters, followed by celluloses regenerated from mercerised linters and from viscose. It is also less when benzene is replaced by chloroform as diluent. C.

Granular Starch: Influence of Combined Phosphoric Acid on Swelling. W. A. Richardson and R. S. Higginbotham. *Nature,* 1940, **146**, 234.

In potato starch phosphorus occurs as a salt of an amylomonophosphoric ester. The metal combined with the phosphorus can be varied by washing with appropriate salt solutions and the properties of the washed starch vary with the identity and amount of the combined metal. It was expected that after washing with the same salt solution the swelling behaviour of potato starches would be related to their phosphorus contents provided that their average molecular chain lengths were the same but no simple correlation was found in a group of eight starches satisfying this condition. Fractions of uniform granule size separated from a sample of potato starch were studied and the effects of phosphorus content and the presence of salt on swelling noted. In wheat starch the phosphorus is not combined with the starch and the swelling is independent of granule size, phosphorus content, the salt used in washing, and the presence of salt during swelling. These results show that esterified starch does facilitate the swelling of starch granules to an extent dependent upon its amount, but the effect is manifest only in the absence of free electrolyte and when the average chain-length and the structure of the granules are the same. C.

Starch: Saccharification by Organic Acids. T. Yabuta and K. Aso. *J. Agric. Chem. Soc., Japan,* 1939, **15**, 171-176 (through *Chem. Abstr.,* 1940, **34**, 4604[6]).

The extent of saccharification when one part of starch was heated with 5 parts of 1 per cent. organic acid at 130° C. for 3 hours is given by the following percentages: oxalic 96·3, maleic 91·2, citraconic 87·6, pyruvic 78·4, tartaric 74·0, fumaric 72·2, citric 70·1, formic 65·1, mesaconic 63·7, malic 58·4, glyceric 53·1, malonic 52·0, lactic 47·3, itaconic 43·3, succinic 32·6, glutaric 20·7, acetic 18·7, levulinic 17·1, α-crotonic 16·6, propionic 13·2, butyric 12·1, *iso*-valeric 9·8, *iso*-butyric 9·8, and valeric 9·8. The amount of hydrolysis was generally parallel to the *p*H. C.

Flax Wax: Composition and Properties. M. M. Chilikin and L. D. Kamolova. *L'no-Pen'ko-Dzhutovaya Prom.,* 1938, No. 12, 38-43 (through *Chem. Abstr.,* 1940, **34**, 3939[1]).

Flax contains up to 2·5 per cent. of wax, and flax dust 8·7-13·7 per cent. The wax has acid number 48·3, saponification no. 101·2, iodine value 26·4, acetyl value 20·3, and unsaponifiable substance 80·3 per cent. It contains ceryl, neoceryl and myricyl alcohols, a hydrocarbon (? triacontane) and cerotic, stearic, palmitic and linoleic acids. It can be chlorinated to a Cl content of 36·2 per cent. The dry chlorinated wax darkens when kept and a solution of it will tender cotton when heated above 100° C., owing to production of hydrochloric acid. C.

Plastics: Solubility in Organic Solvents. W. Coltof. *J. Oil and Colour Chem. Assoc.,* 1940, **23**, 176-209.

A report of a lecture on the " Establishment and application of rules for the interaction between high-molecular solutes and organic solvents ". The lecture embodies the same material as presented to the Society of Chemical Industry (1937), supplemented by Moll's work on the relationship between surface tension, dipole moment and dielectric constant of solvents. C.

Polished Metal Surfaces: Wettability by Graphite Hydrosols. R. Szymanowitz and B. H. Porter. *Rev. Sci. Instruments,* 1940, **11**, 230-231.

Tests with polished chromium-plated steel have shown that a straight line relationship exists between the concentration of aqueous colloidal graphite and the minimum temperature at which it will wet unclean, highly polished surfaces of metal. Satisfactory coatings are not obtainable when the graphite content is less than 3 per cent. by weight. With a 3 per cent. suspension the body to which it is applied must be heated to a temperature of not less than 97° C. whilst an 11 per cent. suspension wets a surface at 40° C. Surfaces cleaned with

metallographic powder and water are wetted by aqueous colloidal graphite dispersions at room temperature. C.

Solids: Drying; Limitations of Diffusion Equations. O. A. Hougen, H. J. McCauley and W. R. Marshall, Jun. *Trans. Amer. Inst. Chem. Engrs.*, 1940, **36**, 183-209 (through *Chem. Abstr.*, 1940, **34**, 3953[1]).

In the drying of solids the movement of liquid water by diffusion is restricted to the equilibrium moisture content below the point of atmospheric saturation and to single-phase solid systems in which the water and solid are mutually soluble. The differential diffusion equations can be applied to calculations of moisture distribution and rates of drying under these conditions, but integrations should allow for the variable nature of diffusivity. It has been found that diffusivity decreases with decreasing temperature and with increasing pressure and density. Mathematically formulated integrations for conditions of variable diffusivity are not available. C.

Wheat Flour Films: Gelation Phenomena. J. D. Hamilton. *Canadian J. Res.*, 1940, B18, 194-202.

Empirical equations describing the behaviour of wheat protein films have been established by means of the hydrophil balance technique. The protein forms a gel when the film area is decreased and de-gelation occurs when the area is expanded. A theoretical picture of gel structure is developed to account for the phenomena characteristic of gelation and de-gelation. It is assumed that the protein micelles in the gelled condition and in the film stage are in equilibrium only when the film micelles are close packed and oriented in such a position that the binding force between the film micelles and the aqueous substrate is perpendicular to the water surface. From these assumptions the general form of the gel term is deduced and it is then shown that gels in the form of logarithmic spirals satisfy the physical and theoretical conditions. C.

Ellipsoid Particle Suspensions: Electrical Conductance. S. Velick and M. Gorin. *J. Gen. Physiology*, 1940, **23**, 753-771.

The mathematical theory of the electrical conductance of colloidal suspensions is extended from Fricke's treatment of spheroids to cover the case of ellipsoids with three axes different. The results are applied to a study of the red blood cells of birds. The electrical resistance of such suspensions fluctuates after stirring, owing to streaming orientation of the cells. The theory covers four types of orientation and has been tested experimentally by electrical and optical means in conductance cells that somewhat resemble viscometers, in which it is possible to secure orientation of the particles with their long axes parallel or perpendicular to the electric field. C.

Plastic Materials: Measurement of Rheological Properties. G. W. Scott Blair. *J. Sci. Instruments*, 1940, **17**, 169-177.

An attempt is made to classify the rheological properties of industrial materials such as asphalts, butter, casein, cement, cheese, clay, enamels, dough, milk, oils, paints, resins, rubber, soaps, soils and starch pastes. Eight factors of importance—viscosity, elastic modulus, elastic after-effect and/or hysteresis, rate of shear or stress for " breakdown in structure ", plasticity, thixotropy and false body, strain-hardening, and tensile strength—are enumerated and assessed as non-existent, very low, low, moderate, fairly high, or " very high for the materials examined ". The resultant rheological table is reproduced. A detailed appendix gives references to the test methods adopted. C.

Starch Sodium Salicylate Solutions: Viscosity. M. I. Knyaginichev. *Colloid J.* (U.S.S.R.), 1939, **5**, 899-906 (through *Chem. Abstr.*, 1940, **34**, 4325[7]).

Solutions of wheat, rye, barley, pea and bean starches (0·2 gm. per 100 c.c.) in 30-50 per cent. sodium salicylate solution often differ more widely in viscosity than solutions in water. The viscosities do not fluctuate with time and are greater for large than for small granules. Starch regenerated from the solution by adding alcohol gives a blue colour with iodine, but behaves differently from the native starch on mixing with water. C.

High-speed Recording Spectrophotometer. G. R. Harrison and E. P. Bentley. *J. Optical Soc. America*, 1940, **30**, 290-294.

An automatic recording spectrophotometer designed to cover the range 10,000 to 2,000 A is described. With present light sources the instrument will

trace absorption curves at high speed from 9,800A to 3,400A, and can be used somewhat more slowly to cover the spectrum to 2,300A. A ten-foot concave grating monochromator with fixed slits is used to provide a spectral band 0·5 to 10A wide, the purity available depending on the light intensity and the speed of recording desired. An 11-stage electron multiplier is used to balance a light beam which has passed through the sample to be measured, against the same beam later reduced by a photometric disk by a recorded amount. An electric "memory" device is used to accomplish this balance, and at the instant of balance a spark is passed through a piece of suitable graph paper wrapped around a rotating cylinder. Twenty absorption measurements can thus be made and recorded per second. The instrument will plot either transmission or density values against wave-lengths on a linear scale to an accuracy of about 1 per cent. C.

Photo-cell Multiplier Tubes. C. C. Larson and H. Salinger. *Rev. Sci. Instruments,* 1940, **11**, 226-229.

Structural and performance data are given for a Cs-Cs_2O-Ag type of photo-electric cell the current output of which is amplified by an integral 6- or 11-stage electron multiplier. The multiplier stages have the shape of small boxes and only d.c. electrostatic fields are used to direct the flow of electrons. Both the photo-cathode and the secondary emitting surfaces are caesium coated. The 6-stage tube has 8 electrodes, namely, the photo-cathode, six multiplying stages, and a collector. The voltage per stage may be anywhere between 30 and 140 volts. The peak photo-electric sensitivity lies in the near infra-red which makes the tube especially adapted to work with incandescent light sources. C.

Photo-electric Spectrophotometer. S. Jacobsohn, H. E. Bent and A. J. Harrison. *Rev. Sci. Instruments,* 1940, **11**, 220-226.

A precision photo-electric spectrophotometer for use in the range 450 to 820 mμ is described which illuminates absorption cells with light that has passed through two monochromators, the half-intensity width of the spectral region isolated being from 5 to 10 mμ. Cells 20 cm. long and as much as 14 cm. in diameter may be used when it is necessary to work at low or high temperatures with thermostated equipment. A Martens photometer is used and the detector is a null instrument giving a sensitivity of $0{\cdot}0001I_0$ and an accuracy under favourable conditions in the optical density of 0·1 per cent. C.

Spectrophotometer: Residual Errors. O. W. Pineo. *J. Optical Soc. America,* 1940, **30**, 276-289.

It is pointed out that the advantage of the spectrophotometer over the eye, in giving a quantitative record for future reference or interlaboratory comparison, cannot be utilised effectively in some applications unless its accuracy corresponds to the closest tolerances in direct visual comparisons. Examples of tolerances in dye strength testing are discussed. Errors due to different types of stray light are studied and specific recommendations are given for reducing the individual sources of stray light and for compensating the remainders by adjustment of the photometric scale. Ordinate plotting mechanism errors are also considered. C

White Luminescent Kinescope Screens: Optimum Efficiency Conditions. H. W. Leverenz. *J. Optical Soc. America,* 1940, **30**, 309-315.

Calculations based on energy ratios and relative luminosities of complementary colours show that the efficiency of white-light production is greatest for the pair of spectral lines at 4590A (violet blue) and 5720A (yellow green). Spectral distribution curves of relative absorption and emission are given for zinc-cadmium sulphide phosphor systems and for typical white kinescope screens. C.

Bacteria: Killing with Ultra-violet Light. J. F. D. Smith. *J. Franklin Inst.,* 1940, **229**, 775-778.

A mathematical solution is given of the problem of the killing of bacteria in air passing through a cylindrical duct with an ultra-violet light source centrally located and considered to be a point, it being assumed that the velocity across the duct is uniform and that the law of mortality of the bacteria is given by the statement that: "The ratio of the number killed per unit time to the total number existing at the time is inversely proportional to the square of the distance of the bacteria from the light source". C.

Sugar: Triboluminescence. Frances G. Wick. *J. Optical Soc. America,* 1940, 30, 302-306.

When crystals of sugar are ground or cracked so that they show triboluminescence there is an electric discharge in the air or other gaseous medium which fills the space between the parts of the crystals broken. A part of the triboluminscent light is due directly to this discharge. The addition of fluorescent oils or dyes to a crystalline mass of sugar causes an increase in the intensity of triboluminescence due to the fact that fluorescence in the oil or dye added is excited by the spark emitted when the crystals are broken thus making the total emission of light greater. The triboluminescence is strongest at those temperatures at which the fluorescence of the oils and dyes added is strongest when excited by the iron spark. The discharge in air is not the only source of excitation of fluorescent oils or dyes added to sugar as is indicated by the fact that the addition of such oils and dyes increases the intensity of the triboluminescence when the sugar crystals containing them are ground under liquids. Crystals of sugar emit light upon sudden change in temperature such as is brought about by dropping them into liquid air and by suddenly withdrawing them from liquid air. This emission is increased in intensity by the addition of fluorescent oils or dyes to the solutions from which the crystals are formed. Ice is phosphorescent and triboluminescent at low temperatures. The intensity of this triboluminescence is increased by exposure of the ice to the iron spark at a low temperature before grinding it. This work confirms previous general assumptions that one or more of the following factors may be present in the emission of triboluminescence in any given case: (*a*) an emission which resembles phosphorescence and thermoluminescence and which may be increased in intensity by exposure to radium X-rays and the iron spark, (*b*) emission characteristic of the material itself, not dependent upon previous excitation, and (*c*) emission due to an electric discharge in the gas surrounding the crystal when it is broken. C.

Aromatic Compounds: Spectrographic Identification and Determination in Mineral Oils. C. Weizmann, V. Henri and E. Bergmann. *Nature,* 1940, 146, 230-231.

Ultra-violet spectrography may be used for the identification and determination of aromatic compounds in mineral oils. For the following hydrocarbons absorption bands exist which are characteristic and the intensity of which is directly proportional to the concentration of the hydrocarbons: benzene, toluene, xylene, naphthalene, phenanthrene, anthracene. The method may be only of limited value in two instances: dialkylbenzenes with identical positions of the alkyl groups but substituted with different alkyls may be indistinguishable; and alkylated polycyclics may exhibit spectra practically identical with those of the parent hydrocarbons. For quantitative determinations, the intensity of the characteristic absorption bands for a given sample is compared visually- or by means of a microphotometer, with the intensity of the same bands for the standard substances in known concentrations. For these comparisons the substances are either used in solution in (non-absorbent) light petroleum or in the gas phase. Bands to be used for the identification of the hydrocarbons mentioned are listed and results of determinations of the amounts in Iraq petroleum and Palestinian shale-oil are given. C.

Kinescope Screens: " Whiteness " Analysis. T. B. Perkins. *J. Optical Soc. America,* 1940, 30, 295-296.

A method of determining the " degree of whiteness " of kinescope screens is described which consists in projecting three colours on to the same spot on a comparison screen with means for controlling the intensity of each colour so that a white, or any near-white colour, which will be produced by an acceptable kinescope screen, can be matched. The apparatus is described. C.

High Speed Stroboscope. L. O. Cook. *J. Sci. Instruments,* 1940, 17, 186-187.

A stroboscope suitable for direct speed measurement of high-speed wheels (5,000-20,000 r.p.m.) is described. A slotted disc is rotated by an inverted chain of gears (gramophone worm wheel and worm, spur gears and rachet wheel, actuated by a pawl carried on a trigger lever) mounted on ball bearings and enclosed in a cylindrical case fitted with an eye piece and rectangular slot.

The speed of the disc is measured by a tachometer. The lamp, with bull's-eye lens, is supplied from a dry battery in the handle of the instrument, which is also fitted with a mercury switch so that when the stroboscope is picked up the lamp is automatically switched on. The instrument weighs 2 lb. C.

Optical Smoothness Meter. J. Guild. *J. Sci. Instruments,* 1940, **17,** 178-182.

When a beam of light is incident on a surface, the fraction of the total reflected light comprised within a small cone whose axis is in the direction of specular reflection, is a measurable property that increases with the smoothness of the surface. An instrument utilising this principle has been designed to test the quality of finish of flat metal surfaces. The reflected light from a small area of surface on which a beam of light is concentrated, is collected inside a small integrating sphere and the illumination is indicated by a photocell. A shutter inside the sphere enables the separation of the specularly reflected and the diffusely scattered light. An appendix records "S/T ratios" for a number of surfaces. C.

Photo-elastic Instrument. F. W. Bubb. *J. Optical Soc. America,* 1940, **30,** 297-298.

An adaptation of Michelson's interferometer designed to provide a photograph of the contour lines (isopachics, or lines of constant principal stress-sum, $P+Q$) for any transparent plane test model under plane stress is shown diagrammatically. The instrument employs Faraday's effect, the magneto-optic rotation of light. The theory of the instrument is explained. C.

Universal Electron Microscope. M. v. Ardenne. *Z. Physik,* 1940, **115,** 339-368 (through *Sci. Abstr.,* 1940, **A43,** 578).

A detailed description is given of a new electron microscope that can be used with magnetic or electrostatic lenses. The objective system can be separated by air locks from the vacuum of the rest of the instrument. For a magnetic objective and illuminated field a resolving power of 30A has been reached, and particles of only 10A diameter can be recognised. For dark-field observations, which can be obtained by the adjustment of a screen, the resolving power amounts to 50A at least. Stereoscopic pictures are obtained by tilting the plane of the object. A system of optical auxiliary microscopes and fluorescent screens allows the visual adjustment of the object and the screens. Schumann plates are used in the photographic camera and the pictures are 30 × 45 mm. C.

Carbohydrates: Structure. H. Mark. *Chemical Reviews,* 1940, **26,** 169-186.

A short survey is given of present knowledge of the structure of erythritols, sugars with five, six and more carbon atoms, cellulose, and starch, derived from X-ray investigations. Work on well crystallising carbohydrates shows that in the lattices of these substances the atomic distance rules are maintained, although there may be considerable distortions of the direction of the valence forces. All the carbohydrates and their derivatives so far investigated have normal molecular lattices. The lower sugars, including glucose and cellobiose, have ring structures. The dimensions of the rings have been determined. The X-ray study of cellotriose, cellotetrose, cellohexose, and some other dextrins has led to a reasonable picture for the transition from a normal molecular lattice to a structure built up of chains of irregular length which are held together by intermolecular forces. The lattice of cellulose may be regarded as a combination of a chain lattice and a layer lattice. The strongest forces act along the *b*-axis, but the forces along the *a*-axis are also comparatively large. There are main-valence chains along the *b*-axis and hydrogen bond nets in the *a*-*b* plane. Perpendicular to this plane, however, weak forces are acting and the spacing between these planes is large. This permits chemical reagents to penetrate easily into the lattice and to react with the hydroxyl groups of cellulose. The impossibility of getting fibre diagrams of starch, even after extreme mechanical treatment of the samples, indicates that there are no long unbranched chain molecules present in starch. The bibliography contains 55 items. C.

Native Cellulose Membranes: Structure and Behaviour. W. A. Sisson. *Chemical Reviews,* 1940, **26,** 187-201.

The characteristics of cellulose diffraction patterns and the effects of various treatments, such as purification, degradation, swelling, deformation and dis-

persion, on the X-ray diagram are reviewed. The essential attributes of the micellar theory, the continuous structure theory, and the cellulose particle theory of crystallite structure are explained and it is shown that the available data indicate that the existence of ellipsoidal microscopic crystalline cellulose particles separated by an amorphous inter-particle material is adequate for explaining that portion of the X-ray data pertaining to cellulose membrane structure. All the chemical data that point to the pre-existence of well-defined micelles in native fibres rest upon acts of disruption and are therefore open to suspicion. Viscosity, ultracentrifuge, diffusion coefficients, osmotic pressure, total surface, and methylation methods are useful for estimating the average size of the " micelle " or " molecule " as it exists in solution but extrapolation of the results to untreated native cellulose membranes is difficult without certain knowledge of what happens during the solution process. The conclusion that it is unnecessary to assume a crystalline unit smaller than the cellulose particle in order to explain X-ray data, however, in no way discredits the important rôle which cellulose chain molecules or a further secondary structure of the particle may play in the interpretation of many chemical and physical data. The bibliography contains 57 items. C.

Proteins: X-ray Structure. R. B. Corey. *Chemical Reviews,* 1940, **26,** 227-236.

A review of X-ray studies of proteins and related substances, with special reference to the interatomic distances. The bibliography includes 43 items. C.

Rubber: X-Ray Investigation. S. D. Gehman. *Chemical Reviews,* 1940, **26,** 203-226.

A review of the results of investigations of crystalline and amorphous unstretched rubber, the X-ray diffraction patterns of amorphous, frozen and stretched rubbers, the nature of the crystallites in stretched rubber, time effects with the X-ray diagram of stretched rubber, and the X-ray diagram and the physical properties of vulcanized rubber. The bibliography contains 69 items. C.

Synthetic Linear Polymers: X-Ray Investigation. C. S. Fuller. *Chemical Reviews,* 1940, **26,** 143-167.

A review of the results that have been obtained to date by the X-ray and electron diffraction study of synthetic linear polymers, such as polymethylene and polyethylene oxides, linear polyesters, polyamides and polysulphides, and vinyl derivatives. The bibliography contains 76 items. C.

Median: Sampling Error. E. B. Wilson. *Science,* 1940, **92,** 58-59.

The author shows that the usual formula $\sigma_m = 1/(2\phi_m\sqrt{n})$ for the standard deviation of the median cannot be universally valid like the formula $\sigma/\sqrt{n}$ for the mean. C.

Asiatic and American Cotton Pollen Tubes: Behaviour in Hybridization. N. Yamada. *Botany & Zoology,* 1939, **7,** 559-566, 729-736 [through *Japanese J. Botany,* 1940, **10,** (72)].

Hybridization between two Asiatic and one American cotton strains has been performed successfully. No special difference was observed between the two reciprocal hybridizations. The greater majority of pollen tubes pass through the basal part of the style 12 hours after pollination. Feng has stated that 24 hours are required for the pollen tube to reach the basal part of the style. His experiments were carried out in a room at 25° C., but the author's were carried out on plants out-of-doors at 35° C. The germination rate of pollen on the stigma is somewhat lower in cross-pollination than in self-pollination. The breaking of pollen tubes and their malformation within the stylar tissue of the other strain are observed in cross-pollination. However, a great number of pollen tubes seem to reach the embryo sac safely and effect fertilization. The osmotic value of the leaf tissue is 2-3 atm. higher in Asiatic than in American cotton strains. The limit of sugar solution for the bursting of pollen grains is 1-5 mol. in the American strain and somewhat higher in the Asiatic strains. These differences may account for the bursting of pollen tubes and the production of malformations observed. The pollen tube with a certain osmotic value, passing through the stylar tissue with a lower value, may absorb too much water, so as to lead to its breaking (Asiatic within American). Pollen tubes with lower osmotic value within stylar tissue with a higher value are not

able to absorb sufficient water for perfect formation so that malformations appear (American within Asiatic). C.

Cotton Embryo-sac: Development and Fertilization. *J. Coll. Agric., Tokyo,* 1939, **14**, 407-415 [through *Japanese J. Botany,* 1940, **10**, (72)].

Studies of embryo-sac formation and fertilization have been made on certain species of Asiatic and Upland cotton plants. No qualitative differences were observed between the two types. The floral organs of the cotton plant develop in acropetal succession. One sub-epidermal cell of the ovule develops into the archesporium, where a megaspore mother-cell takes its origin. After two successive divisions, a linear tetrad is formed, and the cell situated at the chalaza end functions as the embryo-sac, whilst the remaining three cells degenerate and form a shapeless mass. Three antipodals, one egg, two synergids, and two polar nuclei are produced in the usual way. The polar nuclei which are in contact come into fusion just after the fertilization, and then receive one male nucleus to enter into the triple fusion. The antipodals degenerate soon after their formation. Fertilization occurs 24-30 hours after pollination. In the course of fertilization the lint begins to develop, though this process depends on neither pollination nor fertilization. C.

Cotton Leaf Tissue Fluid: Extraction. N. Yamada. *J. Coll. Agric., Tokyo,* 1939, **14**, 417-428 [through *Japanese J. Botany,* 1940, **10** (71)].

Pre-freezing and pre-heating methods of obtaining the press juice of living cells have been compared in experiments on Asiatic and Upland cotton plants. The pre-heating treatment is recommended as easier and less expensive. Samples were pressed into cork-stoppered glass tubes which for freezing were left in an ice-salt mixture for 24 hours, whilst for the pre-heating treatment the glass tubes were fitted with an aluminium tube and placed in boiling water. After the pre-treatment, the juice was expressed from the samples, and the volume, the osmotic value and the *p*H value of the sap were determined. It was found that the amount of sap obtained was nearly the same in either treatment. The osmotic value was generally slightly higher in the pre-heated materials than in the pre-frozen ones, but the difference is so slight as to be almost negligible. The *p*H value was much higher in the pre-heated samples than in the others, so that the pre-heating method is not utilizable in the case of *p*H determinations. The period of heating should be from 15 to 30 minutes. C.

Silkworm: Biochemistry of Growth. A. Akao. *J. Biochem. Japan,* 1939, **30**, 303-349 (through *Brit. Chem. Physiol, Abstr.,* 1940, AIII, 668).

Data for growth rates, dry weight and ash, C, H, Na, K, Ca, Mg, Fe, Zn, Mn and Cu contents of silkworms at various stages of development are tabulated and discussed. Ca levels are high in the discarded skin and in the cocoons. Zn appears to be an important catalyst in the biological stages and during metamorphosis. The distributions of Zn and Fe fluctuate in contrary manner. The concentration of catalytic metals in the tissues decreases in the order Zn, Fe, Mn, Cu. C.

Taka-diastase: Influence of Buffer on Activity. G. A. Ballou and J. M. Luck. *J. Biol. Chem.,* 1940, **135**, 111-118.

An account is given of a study of the influence of the buffer used on the activity of taka-diastase at a given *p*H. The preparation of the buffers and mixtures is described and activity/*p*H curves are given. At 30° and an ionic strength of 0·05 the saccharogenic action of taka-diastase was found to have an optimum *p*H of 5·1 in the presence of formate, acetate, propionate, butyrate, valerate, phenylacetate, and succinate buffers. An optimum *p*H of 5·4 was obtained when phthalate and citrate buffers were employed. A variation of the buffer anion was without influence on the relative activity of the enzyme at the *p*H optimum and on the alkaline side of the optimum, but on the acid side marked differences in activity were observed. C.

Glycerin: Determination. H. Ka. *Rept. Inst. Sci. Res., Manchoukuo,* 1940, **4**, 29-30.

A report is given of investigations of the influence of the conditions of the reaction and the presence of impurities on the Denigés glycerin and codeine colour reaction. The most suitable periods for the bromine oxidation and the

time of warming after the addition of codeine and sulphuric acid were found to be 25 and 20 minutes, respectively. The maximum blue-colour value was in direct proportion to the concentration of glycerin and the use of excess quantities of bromine caused no change in the colour value. Impurities which might interfere with the blue value can be eliminated by the use of lime. The quantities of impurities in the glycerin of fats and oils, especially plant oils, are so small that glycerin can be determined directly after saponification and decomposition with dilute sulphuric acid. The method gave approximately the same value as the acetin method but the dichromate method gave a somewhat higher value. C.

Periodic Acid Oxycelluloses: Properties. G. F. Davidson. *J. Textile Inst.*, 1940, **31**, T.81-96. C.

Hardwood Hemicelluloses: Origin and Composition. E. Anderson, M. Seeley, W. T. Stewart, J. C. Redd and D. Westerbeke. *J. Biol. Chem.*, 1940, **135**, 189-198.

Hemicelluloses have been prepared from white birch wood, lemon wood, and the sap-wood and heart-wood of black locust before and after chlorination of the wood. Lemon wood and the sap-wood of locust contained starch. The other two woods were free from starch. All of the hemicelluloses obtained from lemon wood and the sap-wood of black locust before chlorination gave a blue or pink coloration with iodine solution. Analyses of these hemicelluloses show that those which are not coloured by iodine solution consist of a monomethylated uronic acid combined with a series of *d*-xylan groups. The largest of these hemicelluloses contains approximately 19 xylan groups in the molecule whilst the smallest contains as few as 8 xylan groups. It appears that a mixture of hemicellulose molecules varying in size from approximately 10 to 19 xylan groups exists in the wood. During the process of isolation and purification some of these are hydrolysed to still smaller molecules. The hemicelluloses which are coloured blue or pink by iodine solution apparently contain anhydroglucose groups in the xylan chain. They seem to be intermediate products in the transformation of starch or dextrin to hemicelluloses. It appears that the same hemicelluloses are present in all the woods that do not contain starch and that these are formed from starch or dextrin. C.

Maize Starch: Composition. K. H. Meyer. *Arch. Sci. phys. nat.*, 1940 [v], **22**, Suppl. 19-23 (through *Brit. Chem. Physiol. Abstr.*, 1940, AII, 268).

Extraction of maize starch by water at 70° gives, on cooling, crystalline amylose. On fractionation, this yields an insoluble variety that does not give colour with iodine and reverts to a soluble form when dissolved in aqueous chloral and precipitated by acetone. Solutions of the acetyl derivative in chloroform resemble cellulose acetate in viscosity and film-forming capacity and their osmotic pressure corresponds with M.W. 20,000-50,000 for the amylose. Amylopectin, on the other hand, has M.W. about 400,000, gives clear solutions in aqueous chloral at 80° or in hydrazine or diethylamine at room temperature and the acetyl derivative gives brittle films and solutions in chloroform of only one-quarter of the viscosity of cellulose acetate. The amylose is hydrolysed completely by β-amylase to maltose, but the amylodextrin only partly, giving a dextrin of M.W. 150,000. C.

Water Caltrop Starch: Properties. J. L. Sarin and R. L. Sehgal. *Current Science*, 1940, **9**, 185-6 (through *Brit. Chem. Physiol. Abstr.*, 1940, A III, 695). C.

The starch of water caltrop (Tribulus, order Zygophyllaceae) contains 4·27 per cent. of α-amylose and nearly as much β-amylose as white potato starch. It is superior to maize or potato starch in coating and penetrating power. C.

Silk Fibroin: Reversibility of Denaturation. C. J. Cadwallader, F. O. Howitt and S. G. Smith. *Nature*, 1940, **146**, 301.

The cortical protein material (sericin) of silk filaments is readily dispersed by hot solutions of soap or mild alkali, but the protein material (fibroin) forming the core of the filament is insoluble in water and is resistant to relatively strong chemical reagents. Protein material obtained directly from the isolated silk glands of the silkworm is readily dispersed in water but equally readily coagulated by shaking, addition of acid, and so forth. Coagulation by

mechanical action apparently occurs during the passage of the secretion from the worm to the outside air. During an investigation of the solubility of fibroin in various solvents, it was found that solutions of fibroin in cupriethylene-diamine reagent, neutralised by acetic acid to *p*H 7·5 approximately, and treated with solid sodium chloride to about two-thirds saturation, yielded a mucilaginous precipitate readily soluble in water. The aqueous solutions of fibroin thus obtained behave similarly to those obtained directly from the silk gland and coagulation occurs extremely readily on mechanical agitation or addition of dilute acid. It seems that the coagulation of fibroin can be considered as a process of denaturation and that this denaturation is reversible Attempts to apply the method to heat-coagulated ovalbumin have so far proved unsuccessful. Examination of the products afforded by the renaturation of fibroin of various origins indicates that the fibroin of commercial raw silk is heterogeneous in composition. C.

Globular Proteins: Hydrogen Bridge Models. M. L. Huggins. *J. Chem. Phys.*, 1940, **8**, 598-600.

Two hypothetical types of structure, derived by folding from basic patterns containing extended zigzag polypeptide chains, joined together by hydrogen bridges, are described and critically discussed. The (idealized, undistorted) 288-residue open-ended octahedron model has suitable horizontal dimensions, but is somewhat too large vertically to fit satisfactorily into the unit cell of air-dried insulin. C.

Powdered Wool: Composition. J. I. Routh. *J. Biol. Chem.*, 1940, **135**, 175-181.

The prolonged grinding of wool in a steel ball mill produced little change in the total nitrogen and sulphur content. The cystine content of the powdered material decreased appreciably. Aqueous extracts contained increased amounts of nitrogen, amino nitrogen, cystine, inorganic sulphates, and the intermediate oxidation products of cystine. The production of powdered wool was accompanied by oxidation, since the cystine sulphur accounted for a decreased percentage of the total sulphur and more than 50 per cent. of the water-soluble sulphur was in the form of inorganic sulphates. C.

Vanadium Lakes of Azo Dyes: Structure. H. D. K. Drew and F. G. Dunton. *J. Chem. Soc.*, 1940, 1064-1070.

An account is given of the preparation, structure and properties of lakes of quadrivalent vanadium with azo dyes, each containing two reactive substituents (OH,NH_2,CO_2H) in the *oo'*-positions with respect to the azo group. The effects of introducing one or two sulpho groups into the nuclei of the dye are examined, and also that of introducing a *p*-hydroxyl group. The lakes are of two kinds, viz., the vanadyl lakes, which are similar in structure to the principal lakes of tervalent chromium, and the vanadi-lakes, in which the metal exerts its full quadrivalency in combination with two residues of the azo dye. The lakes are much less stable to mineral acids than the chromium lakes. The co-ordination number of quadrivalent vanadium is six. C.

Clays: Adsorption of Malachite Green. V. L. Bosazza. *Nature*, 1940, **146**, 334.

Attention is called to a possible means of distinguishing white clays by their different powers of adsorbing and holding malachite green. Thus, kaolinite is stained deep blue-green and the colour is not discharged by prolonged washing with water, acid or alkali. The common impurity in most white clays, namely quartz, does not adsorb malachite green. C.

Ester Mono-layers: Characteristics. G. L. Clark and J. V. Robinson. *J. Amer. Chem. Soc.*, 1940, **62**, 1948-1951.

With an improved film balance under carefully controlled conditions measurements were made of area per molecule, and collapse pressure on water surfaces for mono-layers of esters that may have use as addition agents in lubricating oils, namely, methyl stearate, α-chlorostearate, dichlorostearate, oleate, ricinoleate and chlororicinoleate, ethylene glycol distearate and ricinoleate and tricresyl phosphate. The results are tabulated and discussed. The addition of hypochlorous acid to the double bonds of methyl oleate and ricinoleate was studied by spreading mono-layers on an aqueous solution of chlorine in the film balance trough. Films were built up by the Blodgett-

Langmuir technique. Only methyl stearate and ethylene glycol distearate formed solid condensed films which could be picked up in any number of mono-layers and subjected to X-ray diffraction analysis. The remaining esters formed "liquid" films from which only 2 to 5 mono-layers could be picked up for electron diffraction analysis. C.

Multimolecular Films; Evaporation of Water through—. A. R. Docking, E. Heymann, Lucy F. Kerley and K. N. Mortensen. *Nature,* 1940, **146**, 265.

Investigations were made of evaporation through layers of 0·5-5μ thickness of paraffin oil obtained with the aid of swelling agents, the films being formed on neutral water in open Petri dishes. No particular difficulty was experienced in obtaining a film of about 1—2μ thickness which would reduce evaporation by 50-60 per cent. The most successful films were those obtained from dilute solutions (e.g. 1 : 50) of boiled linseed oil, stand oil, terebinth oil, or high-boiling fractions of eucalyptus oil in white paraffin oil. Simple fatty acids and alcohols, added to paraffin oil, may cause initial spreading, but the films are unstable and collect into lenses after some time. Lubricating oils also do not generally spread well, although they no doubt contain "amphipathic" molecules as a consequence of oxidation of paraffins. Particularly high reductions (up to 99 per cent.) have been obtained with thin films (0·5-1·0μ) of certain high boiling fractions of the neutral oil of vertical retort tar. The films deteriorate with time, probably owing to dust settling on the surface. Reduction of evaporation by multimolecular films is greater in a wind than in still air. C.

Polyoxyethylene Glycol Solutions: Surface Tension. E. L. Lovell and H. Hibbert. *J. Amer. Chem. Soc.,* 1940, **62**, 2144-2148.

The surface tensions of aqueous solutions of a number of unipolymeric oxyethylene glycols (with 3, 6, 18, 42, 90 and 186 repeating units respectively) have been measured at various concentrations. For the higher members, the surface tension lowering is a linear function of the logarithm concentration. The results are compared with the known behaviour of short-chain polymethylene compounds, and some molecular areas calculated from Gibbs' adsorption isotherm. C.

Sodium Palmitate: Phase Transitions. F. G. Chesley. *J. Chem. Physics,* 1940, 8, 643.

Studies of the phase transitions of sodium palmitate by the X-ray method have revealed the existence of seven phases, with their corresponding six transitions, between room temperature and the condition of isotropic liquid, the transitions being at 67°, 117°, 138°, 205°, 257°, and 290° C., respectively. These results are compared with those obtained by the Volds by a dilatometric method in which they did not observe the 67° transition but found five phase changes at 117°, 135°, 208°, 253° and 292° C., respectively. C.

Peptides: Activities. Elizabeth R. B. Smith and P. K. Smith. *J. Biol. Chem.,* 1940, **135**, 273-279.

Isopiestic vapour pressure measurements of aqueous solutions of glycylglycine, triglycine, alanylglycine, glycylalanine, and alanylalanine have been made at 25° and the osmotic and activity coefficients of these peptides calculated. Certain relations between the activity coefficients and the dielectric constants are discussed. The activities of the glycine peptides become progressively lower with increase in length. The osmotic coefficients, especially in dilute solutions, were found to decrease with increased dipolar distance. The interaction constants increase with the number of peptide bonds, but the salting-out constants show a less regular relation. C.

Stearanilide: Hydration. B. A. Toms. *Nature,* 1940, **146**, 266.

Quantities (0-40 c.c.) of distilled water were added to 50 c.c. samples of a 0·1 per cent. solution of stearanilide in alcohol. The relative viscosities of the solutions were measured at 20° C. and the relative viscosities of a series of alcohol-water mixtures (prepared by adding 0-40 c.c. distilled water to 50 c.c. samples of alcohol) were measured under the same conditions. Curves showing relative viscosity against water added are given. It is suggested that addition of water to the stearanilide solution lowers the solubility of the stearanilide but before precipitation occurs aggregation of the stearanilide molecules into micelles of colloidal dimensions takes place. Addition of more water has three

effects: (1) hydration of the micelles in solution, (2) precipitation of hydrated stearanilide, (3) dilution of the intermicellar fluid. The precipitation of hydrated stearanilide is complete when 15 c.c. of water have been added to 50 c.c. of the 0·1 per cent. solution. At this stage the precipitated material contains about 95 per cent. water of hydration as it floats in the liquid phase. This " primary " bound water is difficult to remove by ordinary desiccation. With the addition of water in excess of 15 c.c., further hydration of the precipitate takes place. Easily removed by ordinary drying methods, this " secondary " bound water is probably held loosely on the outer surfaces of the swollen micelles. The amount of " secondary " bound water taken up reaches a constant value when the quantity of water added to 50 c.c. of the solution exceeds 30 c.c. C.

China Clay Suspensions: Sedimentation. G. G. Kandilarov. *Kolloid Z.*, 1940, **91**, 56-61 (through *Brit. Chem. Physiol. Abstr.*, 1940, A I, 294).

Previous work on the volume of sediment given by kaolin suspensions in electrolyte solutions is extended to tervalent ions; data are recorded for Na_2H and Na_3 phosphates. A comparison of the effects of hydrochloric acid, sodium hydroxide, aluminium chloride and Na_3 phosphate suggests that with the last two the effects are due to H and OH ions produced by hydrolysis. In general the effects of the various species of ion present are additive. C.

Polyoxyethylene Glycols: Concentration and Viscosity. E. L. Lovell and H. Hibbert. *J. Amer. Chem. Soc.*, 1940, **62**, 2140-2143.

The viscosities of 42- and 90-membered oxyethylene glycols, and the 42-membered dichloride, have been measured at 20° in dioxane over the concentration range 1 to 4·5 per cent. Solutions of the 186-membered glycol in carbon tetrachloride have been similarly investigated over the concentration range 2 to 10 per cent. In the region of dilute solutions (below 5 per cent.) a linear relationship is found between the specific viscosity and concentration. The data at all concentrations are in accordance with the Arrhenius equation, $\log \eta_r = Kc$. When any two members of the series are mixed the resultant specific viscosity is the sum of the specific viscosities of the individual components. The polyoxyethylene chain appears to be highly convoluted in solution, being unlike the polymethylene chain in this respect. C.

Proteins: Viscosity and Molecule Shape. J. W. Mehl, J. L. Oncley and R. Simha. *Science*, 1940, **92**, 132-133.

In the expression for specific viscosity at infinite dilution $\eta/\eta_0 - 1 = \nu c$ (where c is the volume fraction of the solute), ν is a function of the axial ratio, ρ, of an ellipsoid of revolution. Numerical values of the factor ν for values of $1/\rho$ and ρ from 1 to 300 are given. These values have been applied to viscosity data for various proteins. The axial ratios are compared with those determined from sedimentation and diffusion data. The agreement seems to be generally good on the assumption that the protein molecules can be approximated by rigid elongated ellipsoids. In an attempt to evaluate the importance of hydration and to determine whether any choice can be made between the elongated and flattened shapes, values of ρ were calculated from viscosity and from sedimentation and diffusion, assuming that the protein carried varying amounts of water. The influence of experimental error was also considered. Asymmetry-hydration curves were constructed for egg albumin and thyroglobulin. For these two cases, hydration greater than 0·5 gram of water per gram of protein, and the flattened shape, seem relatively improbable. C.

Focal Isolation Monochromator. A. B. F. Duncan. *Rev. Sci. Instruments.* 1940, **11**, 260-261.

A fluorite vacuum monochromator and auxiliary apparatus for the study of photochemical reactions in the Schumann region (1900-1300A) are described. With this apparatus lines in the nitrogen arc spectrum were isolated in as high as 85 per cent. purity. Estimates by three methods gave intensities of the order of 1×10^{13} quanta per second for the 1742-45A doublet. C.

Artificial Retina: Photo-chemistry. F. Weigert and J. W. Morton. *Ophthalmologica*, 1940, **99**, 145-179 (through *Brit. Chem. Physiol. Abstr.*, 1940, A III, 575).

" Artificial retinæ " were prepared by casting films of gelatin containing visual purple from the frog. On exposure to coloured light they exhibited

measurable dichroism for wave-lengths near to that of the incident light, the effect appearing after an induction period the length of which depended on the incident wave-length. It is suggested that colour-sensitivity is developed during this induction period and that sensitivities for red and blue are due to different reactions in the artificial retina. The photodichroism disappears on continuous exposure to coloured light. Exposure to several wave-lengths simultaneously or consecutively produces photodichroism with a single maximum at the wave-length matching the mixed colour for a trichromat observer. Mixtures of wave-lengths longer than 620 mμ and shorter than 490 mμ (purple) or mixtures of red or blue with white light produce two maxima. The maximum produced by white light is the same as that produced by light of wave-length 530 mμ. It is pointed out that measurements of photodichroism in artificial retinæ (" colour graphs ") give an objective method of colorimetry that is independent of the observer's own colour sense. The relationship of the phenomena observed in artificial retinæ to visual processes is discussed in detail. C.

Bacteria: Killing by Radiation. D. E. Lea and R. B. Haines. *J. Hygiene,* 1940, **40**, 162-171 (through *Bull. Hygiene,* 1940, **15**, 509).

Survival curves obtained in the irradiation of *B. coli, B. prodigiosum* and *B. mesentericus* with monochromatic ultra-violet light, wave-length 2537A, were exponential and the rate of death proportional to the intensity over an intensity range of 500 to 1. By comparison, X-rays are much more effective; one ionisation produced by X-rays is as effective as some hundreds of ultra-violet quanta. C.

Colour Names: Standardisation. Dorothy Nickerson. *Amer. Dyes. Rept.,* 1940, **29**, 392-396.

The American Inter-Society Colour Council and National Bureau of Standards (ISCC-NBS) method for the standardisation of colour names is explained. In this method the terms " light," " medium " and " dark " designate increasing degrees of darkness and the adverb " very " is added to extend the lightness scale to " very light " and " very dark." The adjectives weak, medium, strong, vivid designate increasing degrees of chroma. In order to avoid unwieldly combinations of adjectives, the following substitutions are made: pale for light, weak; brilliant for light, strong; moderate for medium, medium; dusky for dark, weak; and deep for dark, strong. These terms are used to modify the following hue or limited hue range names: pink, red, orange, brown, yellow, olive, green, blue, purple, and combinations of these, such as blue green or purplish pink. For the neutral series the terms " white," " gray," and " black " are used. The representation of colours in a three-dimensioned surface-colour solid, the dimensions of which are hue, lightness and chroma, is briefly discussed and a method of determining the colour names by the use of Munsell charts and a mask made of a neutral gray is described. Colour name charts are shown and applications and limitations of the system are discussed. C.

***dl*-Valine.** C. S. Marvel. *Org. Syntheses,* 1940, **20**, 106-108 (through *Chem. Abs.,* 1940, **34**, 5052).

$Me_2CHCH_2CO_2H$ and Br with PCl_3 give 87·5-87·6 per cent. of the α-Br acid; NH_4OH gives 47·8 per cent. of *dl*-valine. W.

***dl*-Threonine.** H. E. Carter and H. D. West. *Org. Syntheses,* 1940, **20**, 101-105 (through *Chem. Abs.,* 1940, **34**, 5052).

Crotonic acid is treated with mercuric acetate in methyl alcohol and then with bromine in potassium bromide and finally with hydrobromic acid, giving 88-93 per cent. of crude (75-85 per cent. of distilled) α-bromo-β-methoxybutyric acid; reaction with concentrated ammonium hydroxide at 90-100° for 6 hrs. and then with formic acid and acetate anhydride gives 25 per cent. of formyl-*dl*-*o*-methylthreonine; refluxing with hydrobromic acid gives 85-90 per cent. of *dl*-threonine. The mother liquors contain *dl*-allothreonine. W.

Cysteic Acid Monohydrate. H. T. Clarke. *Org. Syntheses,* 1940, **20**, 23-24 (through *Chem. Abs.,* 1940, **34**, 5052).

Addition of 80 g. commercial bromine to 24 g. cystine in a cold mixture of 150 c.c. water and 50 c.c. concentrated hydrochloric acid (the temperature rising to about 60°) gives 81-90 per cent. of cysteic acid monohydrate. W.

Fine Structure of Biological Systems. L. E. R. Picken. *Biol. Rev. Cambridge Phil. Soc.*, 1940, **15**, 133-167 (through *Chem. Abs.*, 1940, **34**, 5097). cf. K. H. Meyer and L. E. R. Picken. *Proc. Roy. Soc.*, 1937, **B124**, 29-56, also L. E. R. Picken, *J. chim. phys.*, 1937, **34**, 764-769.

Nägeli's ideas have been extended and modified by the continuation of his optical studies of biological structures, the development of X-ray analysis, and the investigation of the properties of long-chain high polymers. The term "micelle," proposed by Nägeli, is re-defined as "an anisodiametric particle possessing some measure of internal structural regularity." Linear (or fibrous) and laminar structures, the two main types of molecular aggregate of particular importance, may be classified as subcellular, extracellular and supracellular. The subcellular structures examined include protein fibres from the sap of virus-infected plants, chromosomes, asters and spindles, and contractile fibrils (muscle fibrils, myonemes, pseudopodia and cilia). These all appear to be composed of chain molecules arranged approximately parallel to the long axis of the structure in question. Laminar subcellular structures include the surface membranes of animal cells (nerve fibres, echinoderm eggs, red blood corpuscles) and the outer portion of the rods and cones of vertebrate retinae. These are composed apparently of alternating layers of protein and lipoid molecules. Extracellular fibrous structures are represented by elastoidin, collagen, elastin and chitin; laminar structures by the keratinous egg cases of selachians, the cellulose test of tunicates and chitinous integuments in general. The relation of these to other natural and synthetic high polymers is discussed. The category of supracellular structures, i.e., of macroscopic fibrous or laminar structures of multicellular origin includes (*a*) hair and muscles, and (*b*) enamel and bone. It is clear that a close parallel in structure and behaviour exists between biological materials and high-polymer substances. The morphological implications of this parallel are discussed and the importance of molecular morphology for the biologist is considered. Extensive bibliography. W.

Guanidic Groups in Protein Molecules. J. Roche and G. Blanc-Jean. *Compt. rend.* 1940, **210**, 681-683 (through *Chem. Abs.*, 1940, **34**, 5102).

All the guanidic groups in arginine are not free (monosubstituted) in any natural protein. The fraction of the free groups (giving the Sakaguchi reaction, cf. *J. Biochem., Japan*, 1925, **5**, 133-142, 143-157, 159-165), attains 30-35 per cent. of the total arginine in protamines containing nearly 90 per cent. of arginine, about 50 per cent. in other protamines, thymohistone, the globins, edestin and ovalbumin and up to 75 per cent. in proteins low in arginine. During hydrolysis of proteins the free guanidic groups are liberated more rapidly and until hydrolysis is complete exceed the proportion of guanidine to total arginine. It is concluded that proteins contain guanidic groups not belonging to arginine. W.

Progress in the Fundamental Chemistry of Skin Proteins and Tanning Processes. J. H. Highberger. *Hide and Leather*, 1940, **99**, No. 15, pp. 26-32, No. 19, pp. 30-34, No. 24, pp. 18-23 (through *Chem. Abs.*, 1940, **34**, 5309).

A review covering constitution and fibre structure of collagen and its combination with tanning agents. About 60 references. W.

Activation of Dipeptidases. J. Berger and M. J. Johnson. *J. Biol. Chem.*, 1940, **133**, 639-640.

In isolating a yeast dipeptidase, a combination of metal, e.g. Mn^{++} or Fe^{++}, and reducing agent, e.g. cysteine, glutathione or thioglycollic acid, was used as activator. The most reliable combination was Mn^{++}-cysteine. A table is given showing that dipeptidases from other sources were similarly activated by Mn^{++} or Mn^{++}-cysteine. Many common proteolytic systems are capable of hydrolysing the "unnatural" peptide *d*-leucylglycine, although an activator such as Mn-cysteine is usually required to make this apparent. W.

Preparation of *d*(-)-Glutamic Acid from *dl*-Glutamic Acid by Enzymatic Resolution. J. S. Fruton, G. W. Irving, Jr., and M. Bergmann. *J. Biol. Chem.*, 1940, **133**, 703-705. W.

Fabric Structure of Proteins with Special Reference to Cytogenetics. D. Wrinch. *J. Genetics,* 1940, **40,** 359-377.

It is suggested that the protein units of genes, enzymes, virus proteins and other biologically active proteins, which must be regarded as chemical individuals, are atomic envelopes, stabilised in the case of genes by nucleic acid. Studies of the reversible breakdown of proteins due to mild agencies, e.g. slight changes in *p*H, may be of great importance in elucidating the nature of reproduction in the living organism. W.

Relations between Molecular and Morphological Shape of Protein Solutions. A. S. C. Lawrence, J. Needham and Shis-Chang Shen. *Nature,* 1940, **146,** 104-105.

The behaviour of protein fractions from amphibian neurulae was compared with that of other proteins in a coaxial cylinder viscosimeter. The results indicated the presence of anisometric particles which may be concerned with the shape changes of neural cell formation. W.

A Patterson Analysis derived from the Cyclol C_2 Skeleton. D. Riley. *Nature,* 1940, **146,** 231.

As pointed out by Wrinch (this *Journal,* 1940, A542), a previous figure given by the author (this *Journal,* 1939, A558) was derived from an arrangement of the cyclol molecules with a tilt of 36°, and not of 6°. The Patterson map obtained by placing the cyclols of the insulin unit-cell with a tilt of 6° has therefore been recalculated numerically. The resulting contour diagram does not agree very closely with the experimentally derived basal Patterson projection of Crowfoot (*Proc. Roy. Soc.,* 1938, **A164,** 580). These diagrams, which are reproduced, are discussed, and it is concluded that this new derived Patterson analysis does not agree sufficiently well with the experimental data for insulin to afford evidence in favour of the cyclol hypothesis. There is no justification for Wrinch and Langmuir's claims (*J. Amer. Chem. Soc.,* 1938, **60,** 2247) to have confirmed the cyclol hypothesis in the case of insulin by the X-ray data. W.

Crude Papain: Preparation and Properties. A. K. Balls, R. R. Thompson and W. W. Jones. *Ind. Eng. Chem.,* 1940, **32,** 1144-1147. W.

Studies in the Amino-Sugars. II. Action of Dilute Alkali Solution on N-Acylglucosamines. T. White. *J. Chem. Soc.,* 1940, 428-437.

N-Acylglucosamines, after treatment with hot dilute alkali solution, give a red-purple with Ehrlich's reagent. It has been suggested that this is due to the presence of heterocyclic derivatives formed by elimination of a molecule of water and consequent linkage of the *N*-acyl chain with the reducing group of the amino-sugar derivative concerned. The present author concludes that, under the influence of hot dilute alkali solution, *N*-acetylglucosamine forms a glucoxazoline, whereas *N*-α-bromopropionylglucosamine forms a glucoxazine. W.

Behaviour of Isonitroso and Isonitro Compounds under the Conditions of the Van Slyke Amino-nitrogen Determination. M. Schenck and J. Reschke. *Ber,* 1940, **73B,** 200-205 (through *Chem. Abs.,* 1940, **34,** 3759).

The behaviour under the conditions of the Van Slyke amino-nitrogen determination of various N-containing derivatives of the bile acids (oximes, etc.) was studied. W.

"Hydroxylysine." D. D. Van Slyke *et al. J. Biol. Chem.* 1940, **133,** 287-288. cf. Van Slyke *et al., Proc. Soc. Exper. Biol. and Med.,* 1938, **38,** 548.

"Hydroxylysine" on electrometric titration shows three buffer groups having pK′ 2·20, 8·70 and 9·50. On oxidation with periodate, 1 molecule of periodate is consumed and 1 molecule of ammonia and formaldehyde are liberated instantaneously per molecule of "hydroxylysine." It is suggested that "hydroxylysine" is either δ-hydroxy-αε-diaminocaproic acid or ε-hydroxy-αδ-diaminocaproic acid. The liberation of 1 molecule of ammonia by periodate from serine, threonine and β-hydroxyglutamic acid may be used for recognising these amino acids also. W.

Earmarking of Sheep: Stable Composition removable by Washing. A. I. Matetskii and F. I. Raikhlin. *Sherstyanoe Delo.,* 1939, No. 1, pp. 14-15 (through *Chem Abs.,* 1940, **34,** 5666).

A stable composition for earmarking of sheep contains a mineral pigment, lanolin and benzene. Chalk can be added to increase the viscosity and also a

small amount of wax. The marking is not washed off with hot or cold water and is completely removed by soap-alkali washing. A typical composition contains lanolin 30, benzine 15, pulverized chalk 14, and pigment 3-4 parts by weight. W.

High-speed Photography of Shuttles, etc. V. Sepavich and A. Palmer. *Textile Manufacturer,* 1940, **66,** 303.

The use of the power stroboscope is suggested for mechanisms where there is no connection at all between the driving and the driven part, for example, the shuttle of the loom. The stroboscope is used in conjunction with a "still" camera and an instantaneous flash by a tube developing 2,000,000 watts in incandescent light for 0·00001 second. The electrical system for timing of the light can be controlled by a commutator placed upon some part of the machine or if the shutter is open for a longer period, a synchronised commutator may be used; this gives multiple exposures on a single film. L.

PATENTS

Electrically-operated Exterminator for Insects, e.g. Blowflies. R. Symon and L. W. Buddle. B.P.523,716 of 22/7/1940. W.

Powdered Cellulose: Preparation. J. Kent (New York). B.P.524,415 of 30/1/1939:6/8/1940 (Conv. 31/1/1938).

A process for the production of a powdered cellulose of increased resistance to moisture comprises subjecting the cellulose to the action of a solution of formaldehyde or a formaldehyde-releasing body in the presence of a small amount of acid, freeing from excess liquid, e.g. by pressing or centrifuging, heating until brittle at a temperature preferably above 100° C., but not so high as to injure the material, preferably with simultaneous drying, and subsequently pulverising the material. C.

10—ECONOMICS

Cotton Statistics. J. A. Todd. *Textile Manufacturer,* 1940, **66,** 300.

The U.S. Government's first estimate of the area planted to cotton this year is 25,077,000 acres, an increase of 1·6 per cent. on last year's acreage; this should give a crop of 11,500,000 to 12,000,000 bales. The Egyptian Government's first estimate gives a total of 1,684,869 feddans, against 1,624,817 last season. United States consumption figures in recent months show large advances and mill and warehouse stocks have declined rapidly; stocks of American cotton outside the U.S.A., however, have increased. The World's carry-over at the end of July is estimated at 12,815,000 bales, against 14,030,000 bales last year. Board of Trade import and export and price index figures show declines since April and Futures prices have shown marked changes during May and June. C.

Textile Price Indices, July, 1940. W. H. Slater. *Textile Weekly,* 1940, **26,** 246.

The Index numbers for July are Raw cottons, American 110·81, Egyptian 111·40; Cotton yarns, American 156·3, Egyptian 142·9; Cotton piece goods 172·3; "All cottons" 151·6; Wool group 197·6; Other textiles 112·9; "All commodities" 166·2 (1913=100). C.

Textile Wholesale Prices, July, 1940. *Bd. Trade J.,* 1940, **145,** 106.

The Index numbers for July are Cotton 124·5, Wool 159·1, Other textiles 105·7, All articles 139·7 (1930=100). Raw cottons and yarns were 3-5 per cent. dearer on the month, but cloths were somewhat cheaper. C.

American Cotton Mill Costs. F. P. Sheldon & Son. *Textile World,* 1940, **90,** No. 8, 50.

A comparison is made of the cost of manufacturing a typical cotton fabric at the same New England mill in 1875 and in 1939. The fabric considered is a $3\frac{1}{4}$ yd. sheeting, 84 reed, 96 picks, 28's warp, 36's weft, 40 in. gray width. Manufacturing costs amounted to 22·078 cents per lb. in 1875 and 33·51 cents in 1939, exclusive of cotton. The labour cost in 1875 was 12·675 cents per lb., and the overhead cost including supplies, etc., was 9·403 cents per lb. The corresponding figures for 1939 are 20·35 cents and 13·16 cents, respectively. Costs of preliminary processes, weaving, power, etc., in the two periods are compared. At the present time rates of pay are over $3\frac{1}{2}$ times as much as those

of 1875 but the manufacturing cost of the fabric is only 1½ times the cost in 1875. The result is considered gratifying and refutes suggestions that the cotton textile industry is decadent or that its profits, if any, are made at the expense of labour. It is pointed out that the operative has obtained reductions in hours of labour and increase in rates of pay at the expense of security and that the industry cannot continue to operate under the conditions prevalent during the last five years. C.

Textiles in South America. W. G. Ashmore. *Textile Bull.*, 1940, **58**, No. 8, pp. 16, 18, 48-52, 54-55 (through *Chem. Abs.*, 1940, **34**, 5666).
A survey of the textile industry. W.

War Diary of an Ulster Linen Man. *Irish Text. J.*, 1940, **6**, No. 9, 2-5.
A month by month diary of events, from a linen aspect, is given. Among the main items are the trend of unemployment in the linen trade for the first year of the war, flax and yarn prices, various Government Orders and notes on flax production. L.

11—INDUSTRIAL WELFARE, INDUSTRIAL PSYCHOLOGY, AND EDUCATION

Asbestos Textile Workers: Health Hazards. W. C. Dreessen, J. M. Dallaville, T. I. Edwards, J. W. Miller and R. R. Sayers [with H. F. Easom and M. F. Trice]. *United States Public Health Bulletin,* No. 241, 1938, 126 pages (through *Bull. Hygiene,* 1940, **15**, 468).
This important official monograph describes an investigation into the health of asbestos textile operatives (423 men and 118 women) in four factories in N. Carolina. The processing is summarised in "flow sheets." Dust counts are reported and related to the findings of radiological and clinical tests. The conclusion is tentatively drawn that new cases of asbestosis should not arise if the dust concentration of the atmosphere could be kept below 5,000,000 particles per cubic foot. This is considered to be feasible. C.

Cotton Spinners: Blood Tests. N. Vlaeyen. *Arch. Méd. Soc. et Hyg.*, Brussels, 1940, **3**, 33-36 (through *Bull. Hygiene,* 1940, **15**, 470).
Blood counts on 50 cotton operatives, including those with several years' service, did not reveal significant changes in the number of red cells. The average leucocyte count was also about normal but lymphocytosis was a common symptom. C.

Operatives: Health in War Time. Industrial Health Research Board. *Medical Research Council Emergency Report, No.* 1, 1940, 28 pages.
This "Summary of research findings capable of immediate application in furtherance of the National effort" makes the following recommendations: (I) *On Work and Fatigue.* (1) Avoid over-long hours and continuous work without intervals for rest. (2) Allow Sunday rest and ordinary holidays. (3) Take measures to alleviate boredom, e.g. by varying the work and by providing distractions, such as music, that do not too greatly alienate the attention. (4) Study the arrangement of the work to cut out unnecessary movements and effort. (5) Keep an eye open for danger signals, such as increase in sickness absence, accidents and labour wastage. (II) *On Lighting.* Even for rough work, illumination should not be less than 2 foot-candles. For medium work (such as weaving light-coloured cloth) it should be 4 to 10 foot-candles, and for fine work (e.g. weaving dark cloth) 10-100 foot-candles. (III) *On Heating and Ventilation.* A suitable winter temperature for active yet light work is 60-65°F. The supply of fresh air should be not less than 1,000 cub. ft. per person per hour. Relative humidity should not generally exceed 70 per cent. (IV) *On Accidents.* Machines should be timed at a regular and optimum speed. Records should be kept and "accident-prone" people changed to other tasks. (V) *On Sickness Absence and Labour Wastage.* A system for keeping records is explained. C.

Skin Protectives. M. A. Lesser. *Drug Cosmetic Ind.*, 1940, **46**, 284-286 and 323 (through *Chem. Abs.*, 1940, **34**, 5598).
The causes of occupational dermatoses and the classes and properties of protectives are discussed. Six formulae and 16 references. W.

Alphabetical Index to Advertisements

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