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TEXTILE INSTITUTE

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THE TEXTILE INSTITUTE
ST. MARY'S PARSONAGE, MANCHESTER
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Thursday, 15th November, 1945—*Belfast*. 7.45 p.m. Lecture: "Dyeing of Nylon;" by Dr. Abbott (Imperial Chemical Industries Ltd.), at the College of Technology.

Tuesday, 27th November, 1945—*Belfast*. 7.45 p.m. Lecture: "Flax Spinning," by S. A. G. Caldwell (Textile Consultant), at the College of Technology.

LANCASHIRE SECTION

Friday, 9th November, 1945—*Manchester*. 1.0 p.m. Lunch-time meeting at the Institute's premises. "Points in Modern Ring Spinning," by A. E. Whitehead (Platt Bros. & Co. Ltd.).

Tuesday, 13th November, 1945.—*Bolton*. 7.30 p.m. Lecture: "A Modern Fancy Loom," by L. Armstrong (Tootal Broadhurst Lee Co. Ltd.), at the Municipal Technical College, Bolton.

Friday, 16th November, 1945—*Manchester*. 6.45 p.m. Lecture: "Developments in Textile Finishing Machinery," by K. S. Laurie, M.A., A.M.I.Mech.E., A.M.I.E.E. (John Dalglish & Sons) at the Engineers Club, Albert Square, Manchester. By invitation of the Manchester Association of Engineers.

MIDLANDS SECTION

Friday, 16th November, 1945—*Leicester*. 6.45 p.m. Lecture "The Future of the British Fully-Fashioned Hosiery Trade." Group addresses by Messrs. J. A. Beachell (Machine Builder), A. W. Eley (Manchester), A. R. Knight, B.Sc. (Rayon Manufacturer), and M. Stevenson, M.Sc. (Dyer and Finisher), at the Colleges of Art and Technology, Leicester (Room 104).

YORKSHIRE SECTION

Monday, 12th November, 1945—*Bradford*. 7.0 p.m. Lecture: "Are Worsteds and Woollens Competitive or Complementary?" by H. D. Halliday, B.A. (Bradford), and other speakers. (Joint meeting with Bradford, Batley, Dewsbury and Morley Textile Societies), at the Midland Hotel, Bradford.

Thursday, 22nd November, 1945—*Bradford*. 6.30 p.m. Lecture: "Making up of Clothing," by G. W. Sumpter, (Messrs. Hart & Levy Ltd., Leicester), at the Midland Hotel, Bradford.

Saturday, 24th November, 1945—*Leeds*. 9.30 a.m. Visit to Joseph May & Sons (Leeds) Ltd., Maenson House, Whitehall Road, Leeds, 12.

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PROCEEDINGS

TEXTILE TERMS AND DEFINITIONS

The Textile Terms and Definitions Committee has approved the following lists of definitions and notes for publication. The terms in the Tentative List will be considered again after a period of two months with any relevant comments and criticisms which might be received. After a more lengthy period terms in the Recommended List will be reconsidered before the definitions in their final form are adopted. Readers are invited to send comments on any of the definitions and notes, or to submit for consideration textile terms which in their opinion require clarification. Communications should be addressed to the General Secretary.

TENTATIVE LIST No. **6** (October, 1945)

Chase.

n. The conical part of the body of yarn in cop, bobbin, spool, tube, or pirn form on which the thread is coiled during one traverse.

Chase Length.

n. (1) In reference to the package itself the length of the chase is measured along its surface, and not by its projection on the package axis.

(2) In other contexts, where attention is centred on the yarn of which the package is composed, the term chase length refers to the length of yarn wound on in one complete traversing cycle.

Condenser.

n. The word to have the ending—er.

Crimp.

n. (1) Fibre. The waviness of a fibre.

Note.—This fibre characteristic may be expressed numerically by reference to the number of waves or crimps per unit length or (as in U.S.A.) by the difference in distance between points on the fibre as it lies in an unstretched condition and the same two points when the fibre is straightened under suitable tension, expressed as a percentage of the unstretched length.

(2) Yarn. (*local,* take-up, regain, shrinkage). The waviness or distortion of a yarn due to interlacing in the fabric.

Note.—In woven fabrics the crimp is measured by the relation between cloth length and the corresponding length of yarn when it has been removed from the cloth and straightened under suitable tension.

Crimp may be expressed numerically as (*a*) percentage crimp, which is 100 × difference between yarn and cloth length divided by cloth length, and (*b*) crimp ratio, which is the ratio of yarn length to cloth length. In both methods the cloth length is the basis, that is to say 100 for percentage crimp and 1 for crimp ratio.

This definition could logically be applied to knitted fabrics or fabrics of pile construction, but it is preferable to employ special terms, e.g. "stitch length," "take-up," "terry ratio."

Filament.

n. A fibre of indefinitely great length.

Rayon Staple.

n. Rayon fibres which have been stapled from filaments, usually by cutting to predetermined length.

Roving.

n. The name given, individually or collectively, to the relatively thin fibrous strands produced in the later and/or final processes of preparation for spinning.

Note.—In the special case of condenser spinning, the roving from which the yarn is made is obtained directly from the condenser part of the finished card.

Slubbing.

n. The name given, individually or collectively, to the relatively thick fibrous strands produced in the early stages of attenuation of finished slivers in preparation for spinning.

Staple.

n. A lock or tuft of fibres of similar properties. Hence a lock or tuft prepared to demonstrate fibre length. In bulk a mass of fibres having a certain homogeneity of properties, usually length.

Staple.

v. To bring fibres to a certain uniformity of properties, usually length, e.g. by sorting wool or cutting filaments.

Take-up.

n. See Crimp.

Tear.

n. The ratio of top to noil, produced in combing.

Terry Ratio.

n. See Crimp.

Traverse.

n. The distance between the extreme positions of the thread guiding means in one cycle of its movement.

Note.—In addition to its ordinary dictionary meaning, connoting translatory movement, the term Traverse is here additionally defined for textile purposes as a dimension. The traverse may be a constant quantity, as in building a cheese or in winding on to a double-flanged bobbin; or may be variable, as in building a ring bobbin or conical-ended roving bobbin. In the building of roving-built ring bobbins and conical-ended roving bobbins, the traverse during the winding-on of the first complete layer of yarn or roving determines the lift (*q.v.*). Otherwise the traverse is smaller than the lift.

It should also be noted that the traverse is not necessarily the same as the length of the chase (*q.v.*). The two are equal only when the path of the thread-guiding means is inclined to the axis of the package, as for example in the case of a drum-wound cone.

RECOMMENDED LIST No. 4 (October, 1945)

Bleaching.

n. The procedure, other than by scouring only, of improving the whiteness of textile material, by decolourising it from the grey state, with or without the removal of natural colouring matter and/or extraneous substances.

Combing.

n. Straightening and parallelising fibres and removing short fibres and impurities by using a comb or combs.

Condenser-spun.

adj. Descriptive of yarn spun from sliver which had been consolidated from strips of card web by rubbing.

Note.—The definition "condenser-spun" includes "woollen spun," and the term "condenser-spun" is preferred.

Lift.

n. The distance measured axially between the extremities of the body of yarn or rove on a textile package.

Note.—Although originally, and still generally, used in reference to a package built on an upright spindle, this term may properly be used in reference to any textile package, without restriction as to the manner of its formation.

Mungo.

n. The fibrous material made in the woollen trade by pulling down new or old hard woven or milled cloth or felt in rag form.

Noil.

n. The short fibres rejected in combing.

Recomber's Noil.

n. The short fibres rejected when recombing tops.

Shoddy.

n. The fibrous material made in the woollen trade by pulling down new or old knitted or loosely woven fabrics in rag form.

Sliver.

n. An assemblage of fibres in rope form without twist.

Top.

n. A sliver in which the fibres have been parallelised and, usually, combed.

Wool.

adj. Appertaining to wool.

Woollen.

adj. Descriptive of yarns, or fabrics or garments made from yarns, which have been produced on the condenser system and which contain wool fibres, new or otherwise, in some agreed proportion.

Note 1.—As an adjective appertaining to wool generally the term "wool," and not "woollen" should be used.

Note 2.—The trade term "woollen-spun" is descriptive of any yarn carded, condensed and spun on woollen machinery. As such yarn might not contain any wool, it is preferable, therefore, to avoid the use of the term where possible. The term "condenser-spun" is recommended instead.

Scottish Section

THE MOLECULAR STRUCTURE OF FIBRES A REVIEW OF THE PRESENT POSITION

By Dr. W. T. ASTBURY, F.R.S.

(Textile Physics Laboratory, University of Leeds).

Summary of a lecture given to the Scottish Section at Edinburgh, on March 2, 1945.

A " Progress Report " may be presented as a series of " unifications " :

(1) Of Fibres as Molecular Yarns. This is the most comprehensive unification of all. The fibre and fabric business is not only nearly as old as the human race; it is as old as life of any kind. The fibre, as a molecular yarn constructed from long chain-molecules, is the supreme instrument of physical creation—witness the wonderful geometrical fabric that constitutes the cellulose balloon of the alga, *Valonia ventricosa,* or the beautiful crossed collagen structure of the skin of the common earthworm.

(2) Of the Protein Fibres. X-rays show that all the protein fibres fall into no more than two main configurational groups, the keratin-myosin-fibrinogen group, and the collagen group. Members of the former show long-range elastic properties based on the fact that in the normal unstretched state the polypeptide chains are thrown into a series of regular folds (α-form), from which they may be pulled out into the extended configuration (β-form), and to which they tend to return when the tension is released. Fibres of the collagen group are inelastic at ordinary temperatures, but they contract spontaneously at higher temperatures, and thereupon show the phenomenon of long-range thermo-elasticity. Thus the long-range elasticity of protein fibres of all kinds is unified under the heading of unfolding and folding of polypeptide chains.

The intramolecular fold in the α-form of fibres of the keratin-myosin-fibrinogen group is one of the master plans in the evolution of biological molecules: it is the basis not only of all mammalian hairs and similar keratinous tissues, but also of the fibrous proteins of the epidermis, the elastic protein of muscle, and the blood-clotting proteins, fibrinogen and fibrin. It is not the result of particular amino acid residues, for there are great differences in composition from member to member of the group: rather is it the product of a special distribution of amino acid *types.* The present interpretation given by X-rays is that the side chains are alternately polar and non-polar, and that the former aggregate in triads on one side of the main chain while the latter aggregate in triads on the other side. This conclusion was arrived at by the usual process of scientific induction from experiment, but it is seen now that all the characteristic properties of the keratin-myosin-fibrinogen group may be *deduced* from two fundamental postulates, that of alternating types of residues and that of the close-packing of side chains.

(3) Of Fibrous and Non-fibrous Proteins. The molecules of the non-fibrous proteins, such as egg albumin, haemoglobin, insulin, edestin, pepsin, etc., are massive rounded bodies—hence the name " corpuscular " proteins—and they often form orthodox crystals. It was an outstanding and urgent problem how polypeptide *chains* came into the story. The answer given by X-rays is that the corpuscular proteins in their active, native state are organised systems of polypeptide chains grouped and folded in highly specific ways. On denaturation, however, they become disorganised and lose their specific configurations—in fact, they all give then the same kind of X-ray pattern, *like that of disoriented β-keratin.* It followed, therefore, that if under the action of some denaturing agent (such as concentrated urea solution) the polypeptide chains could be liberated from their specific configurations and at the same

time be brought into viscous solution, it should be possible to spin fibres from originally corpuscular molecules. This is the genesis of the idea of artificial protein fibres and the scientific basis of a potential new industry. Success was first attained in the laboratory with the seed globulins, edestin and excelsin, but since then development to commercial satisfaction has been carried out by I.C.I., Ltd., using the protein, arachin, of peanuts (the product is known as "Ardil"). More recently, fibres have been prepared in America from egg albumin that are two or three times as strong as wool and that give one of the best oriented β-photographs yet obtained.

(4) Of the Polysaccharides. The fibrous polysaccharide from seaweed, alginic acid (poly β-mannuronic acid), gives an excellent X-ray fibre photograph, but contrary to expectation the period along the fibre axis is not the same as that of cellulose (10·3 Å), but 8·7 Å, in spite of the fact that the chain-molecules are undoubtedly in a fully-extended configuration. The unification here consists in explaining this paradox in terms of *one and the same set of postulates*, viz., the ordinary accepted inter-atomic distances and bond angles. In both cases the ring is the Sachse "armchair," but at the two ends of this armchair there are two possible directions of the glucosidic oxygen bond: one holds in cellulose and the other in alginic acid. Either configuration may pass to the other by virtue of intra-molecular oscillations, from which it follows that the 10·3 period is not the prerogative of cellulose and the 8·7 period is not the prerogative of alginic acid. It is now conceivable that derivatives of either may be found, under the right conditions, to have either period. Neither are these two periods characteristic of β-residues only, for the alginic acid configuration is apparently assumed also by pectin, which is built from α-galacturonic acid residues.

(5) Of the Crystalline-Amorphous Complex. This is a unification of supreme importance to technologists. In general, a fibre is neither purely crystalline nor purely amorphous; it consists of a continuous gradation of chain-bundles of different sizes and degrees of organisation, and the final properties are the expression of the *whole* of this distribution. The regular X-ray diffraction pattern arises from the more crystalline parts of the structure and should not be used to draw unwarranted inferences about the less crystalline parts, whose diffraction effects are embodied in the background and scattering near the centre of the photograph. A particularly striking example of the problem is provided by cotton fabric that has been treated with acid to form hydrocellulose, or over-bleached to form oxycellulose. In both cases the regular diffraction pattern is practically unchanged, though the strength of the fabric is diminished considerably. The reason for this, of course, is that the degradative action is at first confined to the less crystalline parts of the structure.

(6) Of Natural and Synthetic Fibres. Fibre science is the science of chain-molecules and is therefore the same thing, fundamentally, as the science of plastics, except that the latter is concerned with a variety of shapes. Truly synthetic fibres, such as vinyon and nylon, are only drawn-out thermo-plastics that are in more or less thermodynamic equilibrium at ordinary temperatures. At higher temperatures they become rubbery, *i.e.*, develop thermo-elasticity, just as collagen does. By the same token (in reverse) the synthetic rubbers are really fibres when they are stretched. Polyisobutylene, for instance, when stretched by some 1000 per cent., gives one of the loveliest X-ray fibre photographs yet obtained.

(7) Of Depths of Vision. Almost the whole range of vision from the optical level down to the X-ray level has now been "unified" by the development of the electron microscope, the resolving power of the present instruments being of the order of 50 Å. In terms of fibres, this means that we can now distinguish objects no more than a few chain-molecules thick. One of the most thrilling moments in all science must have been when the human eye perceived in the electron microscope the first single molecules ever to be seen—the nucleo-protein molecules that are the units of the tobacco mosaic virus.

SHRINKAGE OF FABRICS DURING RAISING

C. P. Atkinson and C. S. Whewell.

In the course of a long investigation on the raising of textile fabrics, which will be described in a later paper, it was noted that a fabric which contained a nylon yarn in the weft became appreciably narrower and thicker during the raising process. This was at first attributed to the cloth being stretched lengthways, but on repeating the experiment, accurate measurements revealed that the width shrinkage took place without a change in length. Moreover, contraction increased as the raising process was continued. The phenomenon is illustrated by the following example:—

The fabric having a cotton warp and a nylon weft was prepared and raised—measurements of length and width shrinkage being made at suitable intervals during the raising process. Experimental details are as follows:—

Particulars of fabric in loom

Warp: 2/60's cotton; 56 ends per inch; 36 inches wide.
Weft: 1/4·5's W.cts., nylon waste; 80 picks per inch.
Weave: Irregular 8-end sateen reversible.

Routine

The fabric was knotted, scoured for 15 minutes in 3°Tw. soda ash solution, washed-off for a similar period, hydroextracted, air-dried and raised on a single-action card-wire raising machine.

The dimensional charges during raising were as follows:

Mean width before raising	=	61·3 cm.
Mean length before raising	=	102·6 cm.
Mean length after raising	=	103·5 cm.
Per cent. increase in length due to raising	=	0·88

Contraction in width during raising

As a result of the processing, a dense blanket-like cloth is produced which has many of the characteristics of a pure wool fabric. Moreover, it is possible by this method to shrink the cloth and to obtain, in fabrics made from non-felting fibres, the thickness characteristic of raised and milled wool cloths. This shrinkage is presumably due to the raising points not only lifting fibres from the surface of the weft yarns, but also taking hold of the yarn and so bringing the warp threads closer to each other.

No. of Rounds	*Reduction in Width* (%)*
1	5·9
2	8·6
3	9·8
4	10·4
5	11·6
6	13·8
7	13·8
8	14·4
10	15·2
12	17·6
14	18·5
16	20·1
18	21·6
20	22·7
23	24·4
25	25·0
30	27·4

The phenomenon is connected with a combination of fabric, yarn and fibre properties, for it has been found that the shrinkage may be also obtained on cloths of 2/2 hopsack, 2/2 twill or 3/1 sateen weaves having a wool warp, and a woollen spun nylon weft, and also on fabrics made from 100 per cent. nylon waste yarn. All nylon fabrics do not, however, shrink in width during raising, as for example, a 3/1 reversible cloth having a cotton warp (2/60's cotton; 56 ends per inch) and a nylon weft (12 Y.S.; 5 t.p.i.; 34 picks per inch). If however, the nylon yarn in this cloth is replaced by one of approximately the same count but with a strength of 10·6 lbs. instead of 41·35 ozs. (the strength of the yarn previously mentioned) pronounced shrinkage results on raising. The strength of the yarn is, therefore, important and must be sufficiently high. That high yarn strength is not the sole requirement is shown by the results of experiments on the shrinkage of cloths made from strong cotton yarns, for while a nylon yarn of strength 10·6 lbs. is suitable for producing the shrunk cloths, a cotton yarn of the same count and of strength 10·03 lbs. is useless. It appears that the yarn must be made from fibres of adequate length and suitable elastic properties; many of the newer high tenacity fibres may be substituted for nylon. The precise limiting values of the necessary yarn and fibre properties are connected with the particular structure of the cloth.

It is clear that the phenomenon is capable of considerable exploitation, especially in the light of the development of new fibres, for by using strong yarns made from fibres of suitable elastic properties and length, either alone or twisted together with other yarns, in cloths of suitable construction, a very wide range of novel effects may be produced. Further developments and more detailed experimental data will be described in a subsequent paper.

The authors wish to acknowledge the assistance of Dr. A. Selim and Mr. H. Wood of the Textile Department, Leeds University, with some of the experimental work.

* Means of four measurements.

London Section

A BRIEF REVIEW OF THE POLISH TEXTILE INDUSTRY

Substance of a lecture delivered by L. G. Manitius, M.Sc., 28th February, 1945.

It can be assumed that the Polish textile industry started in the last decade of the 17th century. This, of course, does not include the old handicraft, which was for domestic use only, and although practised in olden times, had never been on an industrial scale. Toward the end of the 18th century, after the loss of Polish independence, many people came to the conclusion that the first step to regain it was to create the well-being of the population, and that one of the means to achieve this was to industrialise the country.

Textiles were recognized as one of the most important industries. Specialists were brought from abroad, mainly from Germany, that country being Poland's nearest neighbour. They were granted special privileges as an encouragement to establish workshops. The small town of Lodz was chosen as especially convenient, the water of the river Lodka being found very suitable for the textile industry. The whole population of Lodz at that time (1793) was 191 inhabitants.

Specialists arrived and workshops sprang up like mushrooms after rain. After some time the centre of the new industry moved first to Zgierz, and then to other towns surrounding Lodz, to return at last to Lodz where it has remained ever since. The town grew very rapidly, the result being that the river Lodka—the main reason for choosing Lodz as a textile industrial town—had not sufficient water to supply the factories. Wells had therefore to be sunk, and as time went on these had to be made deeper and deeper.

The population in the year 1793 was 191. It has grown as the following figures show.

1810-20	10,000	1913	506,000
1840	20,000	1938	668,000
1871-8	100,000		

In 1914 Lodz was the centre of the Polish textile industry. This industry was also developed in other towns, such as Pabianice, Zgierz, Zdunska Wola, and Tomaszow in the Lodz neighbourhood. The industry also grew in Bialystok, Zawiercie, Czestochowa, Kalisz and Zyrardow. (The name of Zyrardow comes from the founder Frenchman Girard). In the Austrian part of Poland there was a small textile industry (mostly wool fabric finishing) in Bielsko. In the German occupied part of our country no textile industry was developed.

The following figures indicate the extent of the textile industry before the last war. In 1913 74,000 tons of cotton, and 15,000 tons of cotton waste were processed. From this 61,000 tons of pure cotton fabrics were made, and the remainder was used for mixed fabrics. 40,000 tons of cotton fabrics were exported to Russia. Imports in 1913 from Russia and other countries were 13,000 tons. About 70,000 workers were employed. (The figures apply to that part of Poland which was under Russian occupation before the last war). Production in Poland had to be efficient in order to permit selling in countries in which poverty was widespread.

These conditions changed completely after the last war. As the fabrics now had to be sold in Poland, the quality had to be improved. The change had to be rapid and it was more difficult as Poland received no compensation for damage inflicted by the Germans.

Before leaving Poland, the Germans destroyed or damaged all they could. For instance, when copper was requisitioned, they took away even the smallest copper and brass parts from the machinery, even if it meant destroying the machine concerned. Sometimes they transferred whole factories to Germany. An example was an enamelled ware factory which was transferred to Germany and the copper printing rollers were not forgotten. The Poles resisted such action. One of their greatest successes was achieved with the copper rollers

at Scheibler and Grohmann's in Lodz. There were about 2,000 of them. The Germans did not get one, but that was an exceptional case. Thus the whole industry had to be rebuilt.

The distribution of the textile industry in Poland was as follows:—

1. Lodz and neighbourhood (i.e. Pabianice, Zgierz, Tomaszow, Kalisz, etc.) —the centre of the whole cotton industry and woollen spinning and weaving mills.

2. Bielsk (south-western Poland)—finishing of woollen goods.

3. Bialystok—cotton industry (lower qualities).

In addition there were single mills in Zawiercie (cotton), Zyrardow (cotton and linen), Warsaw (cotton), Leszczkow near Lwow (wool), Sanok (linen), Czestochowa (wool, linen, hemp), Andrychow (cotton).

For the whole of this industry there were two textile schools, one in Lodz which specialized in cotton and hosiery and the other in Bielsk, mainly for wool.

The population of Poland before this war was 35,000,000, i.e. 1·5 per cent. of the world's population. The textile raw materials produced amounted to:—

Wool	(1933)	0·2 per cent. of the world's production
Flax	(1934)	4·4 ,, ,, ,, ,, ,, ,,
Hemp	(1933/4)	3·1 ,, ,, ,, ,, ,, ,,

Imports of Cotton.

	Cotton Tons	Cotton Waste Tons
1928	71,000	5,000
1932	50,000	1,000
1937	72,000	6,000

Sources. 1935

Egypt	7,500 tons
U.S.A.	48,900 ,,
India	6,500 ,,
Elsewhere	4,000 ,,

Sheep Population and Wool Production.

	No. of Sheep	Wool Tons
1930	2,500,000	4,100
1937	—	5,100
1938	3,400,000	—

Wool and Wool Waste Imports.

1928	17,000 tons
1938	27,000 ,,

Sources and Values of Wool Imports 1938.

Australia	1·07 millions of pounds
Great Britain	0.77 ,, ,, ,,
Belgium	0.62 ,, ,, ,,
Argentine	0.54 ,, ,, ,,
New Zealand	0.31 ,, ,, ,,
France	0.28 ,, ,, ,,

Flax. In 1935 Poland's production amounted to 39,000 tons, i.e. 5·2 per cent. of the world's crop. 12,000 tons were exported. 27,000 tons, i.e. 3·5 per cent. of the total world's production were processed.

Hemp. In 1932-6 Poland produced 10,000 tons yearly, i.e. about 3 per cent. of the total world's production.

Jute. Poland imported yearly 11,000 tons i.e. 0·7 per cent. of the world's production.

Rayon. In 1935 Poland produced 5,400 tons and imported 200 tons of viscose. Acetate rayon was not manufactured in Poland.

Cotton. In 1935 the number of cotton spindles in Poland was 1,500,000 and the production of yarn was 63,000 tons (1·1 per cent. of the world's production). The number of cotton looms (in 1936) was 46,600.

Wool. The number of spindles in Poland in 1935 was 948,000. The production of wool yarn for the same year was 23,000 tons or 1·4 per cent. of the world's total. The number of looms (1935) was 13,700.

Linen. The number of spindles in 1935 was 35,000 or 1·1 per cent. of the world's total. This number increased in 1937 to 43,000 or 1·4 per cent. of the world's total. The production of linen yarn at the same time was 12,000 tons or 3·5 per cent. of the world's total. The number of looms was 18,000.

In 1937 Poland had:—

27,200 spindles and 1,400 looms for jute.
4,300 spindles and 100 looms for hemp.
4,400 spindles and 1,900 looms for silk.

The textile industry employed 165,684 workers, i.e. 20·8 per cent. of the total workers in all Polish industries.

The smallness of Polish export trade (not only in the textile industry) entailed the necessity to restrict imports. Consequently efforts were made to increase rayon production and Cotonine. This was obtained from various kinds of flax, inferior qualites of fibre flax and seed flax, as well as hemp. The usual method of preparing cotonine was to boil the fibre in sodium hydroxide, rinse it in hot water, and chlorinate it with gaseous chlorine or hypochlorites.

The industry's attitude towards cotonine, generally speaking, was rather hesitant. The industrialists knew that cotonine would never be able to replace cotton permanently, and it sometimes caused difficulty in production (especially in spinning and finishing). The finishers' opinion was that as long as the amount of cotonine did not exceed 16 per cent. (this amount was suggested by the Cotton Board), there would be no serious trouble. Just before the war the preparation of cotonine was mechanised.

The following is a very brief review of the methods applied in cotton mills in Poland.

For singeing, simple gas flames were mostly used, although some mills used electrically heated plates.

For bleaching the old kier boiling methods and chlorination with calcium or, lately, sodium hypochlorite were usual. All kinds of kiers, from the oldest types, through the Thiess kier to the modern Mather and Platt kiers vertical and horizontal were employed. One of the most modern bleaching departments was in the Widzewska Manufaktura which had horizontal Mather and Platt kiers only. Two factories used the Mohr system which was introduced in Poland in the factory of Mr. Heimann-Jarecki in Warsaw. Later about 1930) Mr. Mohr and his son installed it at I.K. Poznanski's in Lodz. This system was considered suitable for white cloth only. But changes were made at Poznanski's so that the Mohr bleached cloth could be used for white as well as for printed goods. For bleaching hypochlorites only were used.

For mercerization old type machines (with chain stenters) as well as the new chainless (made by Benninger or others) were in use. The chainless mercerizing machines were very efficient, as they easily worked a double layer of cloth.

Dyeing practice did not differ materially from that in other countries. Wetting agents were used wherever necessary.

A method for the continuous vat dyeing of difficultly penetrable fabrics was invented in Lodz. In the first stage the fabric was padded with a very fine suspension of a dyestuff on a Benninger four roller padding mangle, and then passed through two jiggers containing hydrosulphite, sodium hydroxide and a small amount of the same dyestuff as was used for padding.

Poland had few printing machines. Just before this war the biggest printing mill (14 machines) was at I. K. Poznanski's in Lodz. The next in size was at the biggest cotton works in Poland, K. Scheibler and L. Grohmann's. (This factory employed 15,000 workers). It possessed the only 12 colour printing machine in Poland. There were small installations for screen, spray and hand block printing.

TRIPARTITE WORKING PARTIES FOR INDUSTRIES*

Statement made by the President of the Board of Trade in Parliament on Monday, October 15th, 1945.

I am glad to have this early opportunity of giving the House an explanation of the Government's policy of enquiring into the efficiency of our industries by the method of tripartite working parties, and some account of the progress that has been made with the cotton, pottery, hosiery, furniture and boot and shoe industries. I have explained to these industries that, while for a year or two they and other British industries will have no difficulty in selling abroad all they can produce, the special advantage of a seller's market in a period of world shortage will end and a time will come when it will be difficult to find and keep all the markets that we need. We cannot wait until these difficulties are upon us; we must forestall them if we are to be able to cope with them when they arrive. We cannot, therefore, neglect any steps which on the one hand will make our industries more competitive in the markets of the world, and on the other will provide us at home with the best goods at the cheapest price consistent with good conditions for those in the industry. The Government must in one way or another get the best advice it can on what these steps should be. Three conditions are essential; firstly, advice must come from industry itself, because that is where all the past experience resides; secondly, employers and workers should be equally represented because both sides not only have a contribution to make, but also will have to carry out any plans that may be decided upon; and thirdly, the public and Parliament must be satisfied —whatever the recommendations may be—that they are truly in the national interest, and that the two sides of industry have not " ganged up " against the consumer for their own advantage. The Government have decided that these three conditions can best be fulfilled by establishing tripartite working parties composed in equal thirds of representatives of employers and workers and of independent members,, and consisting of persons who will be accepted nationally as an authoritative body.

I am happy to inform the House that I have received the most cordial co-operation from both sides of industry and that the task of setting up working parties for the five industries I have mentioned is now practically completed. I will not go into detail on the composition of these working parties which will be found in the statement that is being circulated in the Official Report, but two points I would like to mention. The first is that we have been fortunate in securing as chairmen of the working parties, Sir George Schuster, Sir Archibald Forbes, Miss Caroline Haslett, Mr. T. P. Bennett and Mr. Andrew Dalgleish. Secondly, there has been a remarkable response from the score or so of engineers, scientists, economists and other persons of standing, who, like the Chairman, have without hesitation agreed to help as independent members, with all the consequent disturbance of their busy lives.

The terms of reference of all these working parties are in common form as follows:—

> To examine and enquire into the various schemes and suggestions put forward for improvements of organisation, production and distribution methods and processes in the industry, and to report as to the steps which should be taken in the national interest to strengthen the industry and render it more stable and more capable of meeting competition in the home and foreign markets.

These terms of reference are wide enough to cover any question of industrial efficiency, but I have made it clear to the Chairmen that matters concerning

* As two important sections of the Textile Industry are covered by the Government's policy, it is felt that the matter should be placed on record in the *Journal*.

LIST OF CHAIRMEN AND MEMBERS OF WORKING PARTIES FOR INDUSTRY

Chairmen and Secretaries	Employers	Trade Unions	Independent Members
Representatives of the Cotton Industry			
Sir George Schuster, K.C.S.I., K.C.M.G., C.B.E., M.C. *Secretary :* Mr. G. J. MacMahon. *Assistant Secretary :* Mr. S. Wilks, c/o Cotton Board, Midland Bank Buildings, Manchester.	Mr. C. B. Clegg (Weaving) Mr. R. C. Reynolds, O.B.E. (Finishing) Mr. A. V. Symons (Merchanting) Mr. W. M. Wiggins, J.P. (Spinning)	Mr. T. Griffin (Finishing) Mr. A. Knowles, J.P. (Spinning) Mr. A. Naesmith, O.B.E., J.P. (Weaving) Mr. A. Roberts, J.P. (Spinning)	Sir Roy Dobson, C.B.E., F.R.Ae.S. (Engineer) Professor E. L. Hirst, M.A., Ph.D., D.Sc., F.R.I.C., F.R.S. (Scientist) Professor J. Jewkes, C.B.E., M.Com. (Economist) Miss A. G. Shaw, M.A., M.I.P.E. (Factory Organisation)
Representatives of the Hosiery Industry			
Miss Caroline Haslett, C.B.E., C.I.E.E., M.R.I. *Secretary :* Mr. J. Wright, Board of Trade, Millbank, S.W.1.*	Mr. P. Bussens Mr. T. W. Kempton Mr. S. F. Peshall, M.C., M.A. Further member to be appointed.	Members to be appointed.	Mr. R. E. Yeabsley, C.B.E., (F.C.A. Accountant) Mr. L. Foyster (Distribution) Professor A. Radford, B.Sc.(Econ.) (Economist) Mr. W. C. Puckey, F.I.I.A., M.I.P.E. (Engineer)

* Temporary address ; Offices, to be set up in the provinces, will be announced later.

the relations between employers and employees, which are dealt with by employers' federations and trade unions, should be considered outside the scope of their enquiries. The point is not mentioned in the terms of reference, but I have told each Chairman that he, himself, and the independent members should have particular regard to the broad national interest involved and to the interest of the consumers. The Chairman, with the consent of his working party, will be at liberty to set up any sub-groups that he considers necessary for examining particular aspects of the problem and to co-opt on to them any persons he considers advisable. I have also said that interim reports should be made upon matters of special urgency and, while undue hurry must not be allowed to spoil the value of the reports, they should be presented as soon as possible. I would hope to get the final reports early in the New Year. These will be published.

The House will appreciate that this is only a beginning and that there will be more of such enquiries.

CHAIRMEN:

Cotton

Sir GEORGE SCHUSTER, K.C.S.I., K.C.M.G., C.B.E., M.C. Public appointments include: Member, Advisory Committee to the Treasury under the Trade Facilities Act, 1921-2; Financial Secretary, Sudan Government, 1922-27; Economic Adviser to the Colonial Office, 1927-8; Finance member of the Executive Council of the Viceroy of India, 1928-34; Chairman, Joint Committee of Enquiry into the Anglo-Argentine Meat Trade 1935-38; Member, Colonial Development Advisory Committee, 1936-38; Liberal National Member of Parliament for Walsall, 1938-45; Director, Westminster Bank, the Southern Railway, Allied Suppliers Ltd. (Chairman); Home & Colonial Stores Ltd. (Chairman), and other companies.

Hosiery

Miss CAROLINE HASLETT, C.B.E., C.I.E.E., M.R.I. Adviser to the Ministry of Labour on women's training; Director, Electrical Association for Women; Past President, Women's Engineering Society; Chairman, Schools Committee of the Ministry of Fuel and Power; member of the Board of Disabled Persons' Employment Corporation.

REPRESENTATIVES OF EMPLOYERS:

Cotton

Mr. C. B. CLEGG. Chairman and Managing Director, E. Clegg & Sons, Ltd., cotton spinners and manufacturers; Chairman, Rochdale and District Cotton Spinners' and Manufacturers' Association; Chairman, Special Wages Committee of the Cotton Spinners' and Manufacturers' Association; member of the Central Committee and Executive of the Cotton Spinners' and Manufacturers' Association.

Mr. R. C. REYNOLDS, O.B.E. Managing Director, Bleachers' Association Ltd.; Regional Representative of the Board of Trade in the North-Western Division from May, 1941 to November, 1944; member of the Cotton Board Post-War Committee.

Mr. A. V. SYMONS. Director, Tootal Broadhurst Lee Company, Ltd., cotton spinners, weavers and merchants; Director, John Walton of Glossop Ltd., bleachers and dyers; member of the Cotton Board since 1943; Director, Manchester Chamber of Commerce; Council member, Cotton and Rayon Merchants' Association.

Mr. W. M. WIGGINS, J.P. Chairman and Director of a number of cotton spinning companies; Past President, Federation of Master Cotton Spinners' Associations, member of the Executive of the Federation of Master Cotton Spinners' Associations; President, International Federation of Master Cotton Spinners' and Manufacturers' Associations; formerly Chairman, British Employers' Confederation; member of the Cotton Board Post-War Committee.

Hosiery

Mr. P. BUSSENS. Chairman and Managing Director, Cooper & Roe, Ltd.; President, Nottingham and District Hosiery Manufacturers' Association; Master of the Worshipful Company of Framework Knitters.

Mr. T. W. KEMPTON. Managing Director, T. W. Kempton, Ltd.; President, Leicester and District Hosiery Manufacturers' Federation.

Mr. S. F. PESHALL, M.C., M.A. Director of N. Corah & Son, Ltd., and Jaska Ltd.; President, National Hosiery Manufacturers' Federation; President, Leicester Chamber of Commerce; Chairman, Board of Trade Regional Board for North Midlands; High Sheriff of Leicestershire and Rutland.

REPRESENTATIVES OF TRADE UNIONS:

Cotton

Mr. T. GRIFFEN. District Secretary, No. 4 District, National Union of Dyers, Bleachers and Textile Workers: member of the Cotton Board Post-War Committee.

Mr. A. KNOWLES. Chairman, Amalgamated Association of Operative Cotton Spinners and Twiners; member of the Cotton Board since 1943; member of the United Textile Factory Workers' Association Committee on the Post-War Reconstruction of the Cotton Industry; member of the Evershed Commission on the Cotton Industry.

Mr. A. NAESMITH, O.B.E., J.P. General Secretary, Amalgamated Weavers' Association; member of the Cotton Board since its inception; member of the United Textile Factory Workers' Association Committee on Post-War Reconstruction of the Cotton Industry and of the Cotton Textile Mission to the U.S.A., 1944.

Mr. A. ROBERTS, J.P. Secretary, Amalgamated Association of Card Blowing and Ring Room Operatives; member of the Cotton Board Post-War Committee; member of the United Textile Factory Workers' Association Committee on the Post-War Reconstruction of the Cotton industry; member of the Cotton Textile Mission to the U.S.A., 1944; member of the Evershed Commission on the Cotton Industry.

INDEPENDENT MEMBERS:

Cotton

Sir ROY DOBSON, C.B.E., F.R.Ae.S. Managing Director, A. V. Roe, Ltd., aircraft manufacturers.

Professor HIRST, M.A., Ph.D., D.Sc., F.R.I.C., F.R.S. Sir Samuel Hall Professor of Chemistry, Manchester University; member of Scientific Advisory Committee, Ministry of Supply.

Professor J. Jewkes, C.B.E., M.Com. Professor of Social Economics, Manchester University since 1936; during the war has served as Director of the Economic Section of the War Cabinet Secretariat, Director-General of Statistics and Programmes in the Ministry of Aircraft Production.

Miss A. G. SHAW, M.A., M.I.P.E. Expert on personnel management and production efficiency; member, Production Efficiency Board of the Ministry of Aircraft Production; associated with the experiments into new methods of mill staffing, etc., now being carried on in the Wye Mill under the auspices of the Cotton Board.

Hosiery

Mr. L. FOYSTER. Director, John Lewis Partnership, Ltd.; Adviser on hosiery to Board of Trade; Hosiery Controller, Board of Trade, 1942-1944.

Mr. W. C. PUCKEY. Director and General Works Manager, Hoover, Ltd.

Professor A. Radford, B.Sc. (Econ.). Head of Department of Economics and Commerce and Director of Social Studies, Nottingham University.

Mr. R. E. YEABSLEY, C.B.E., F.C.A. Partner of Hill, Vellacott & Co., Chartered Accountants; Accountancy Adviser to The Central Price Regulation Committee.

Correspondence

TEXTILE BOOKS

To the Editor, *Journal of the Textile Institute,*
Dear Sir,

I was greatly interested in the very able review of the above subject by Dr. Withers, published in your May issue. My experience may be of some interest in further discussion, in which I cannot participate owing to my house-bound condition during the last two years of illness.

I commenced teaching in 1898, and I published my first book on Weaving, etc., in 1899. The "urge" was that it saved much of the "donkey" work of dictating notes! The little book sold out rapidly, and in the following ten years I published other three books, developing various subjects of instruc-

tion. These also sold well, but more slowly. Nevertheless, they more than paid expenses of publication. (Textile teachers seldom get anything for labour of writing except the advertisement of their existence which is not a negligible reward. If so disposed an author can make more by writing to the *Textile Journals*.)

The last war stopped all such activities, but after its cessation I published a *Textile Specialist Year Book* and monthly journal, covering 10 years. These more than met expenses, but were dependent on the support of advertisers. Before retiring from teaching in 1931, I issued two more books giving digests of the lectures on my favourite subjects, (*a*) Textile Mathematics, (*b*) Wool. But the sale of these has been poor! (A leading English bookseller informed me that he was clearing out technical books because they did not pay the rent of the space they occupied on his shelves. Moreover, the present price of book-binding is prohibitive, leaving little or nothing for the cost of printing.)

As a textile examiner for the last 11 years, I have been admitted to the secret of the paucity of demand. Whereas 45 years ago, the answers consisted of a few bald statements of no great accuracy, the wealth of information in journals, etc., is so great nowadays that the answers have become so voluminous that an examiner's work is very arduous! (I may say that his time is paid on a scale of 50 years ago.)

I found that the old type of teacher was very conservative, he did not mind getting a book and incorporating in his notes any information worth while therein, but he kept secret the existence of the book, as he did not wish his students to know the source of his information! Often these notes were inflicted on students unchanged for a lifetime. Probably the most striking instance of this occurred in Edinburgh University in the Department of Anatomy, where three professors of the name Alex Monro, held sway for 126 years. The first (1720-54) was great and original. His son (1754-1798) was brilliant, but the third was a "dud"! Unfortunately he practised his art for 48 years (1798-1846). To the end he read his grandfather's notes, word for word, regardless of the students shuffling their feet on his saying "when I was in Leyden in 1715, etc." Needless to say no progress can be made with such teaching.

The revision of old books is futile! The researcher is too abstruse to be a successful book author. The teacher is best fitted as he knows what the ordinary individual can comprehend, but unfortunately few are able to write and are at the same time free from the worry of routine work. (Much attention should not be paid to the products of American institutions where lecturers do not get the Ph.D. or its equivalent, without issuing a book. Many years ago I received such a book for review, the words of which were suspiciously familiar. I reached for a book on dyeing from my enormous technical library, and I was amused to see that large sections therefrom had been laid under contribution. However, in the original book logwood was described as chips from a "large" tree, that became in the plagiarist's book transmuted to a "larch" tree. That was probably due to the typist's misapprehension of the dictation.) I agree thoroughly with Professor Morton, that "one good book on a subject is all you need." But that is not so easily got!

90, Channel Street, T. OLIVER.
Galashiels.
11th June, 1945.

UNIVERSAL YARN COUNTS SYSTEM

The Editor, *Journal of the Textile Institute*.

Sir,

As one who has been a writer on the subject of yarn numbering for the past half century, a teacher of the subject one-third of a century, and a City and Guilds Examiner for the past 12 years, I may be permitted to review the matter.

The advocacy of a direct system, specially metric, has sprung from textile testers and research workers, so as to facilitate their work; but a metric system is futile until the Government makes the general use of metric weights and measures compulsory. A direct system is advocated mainly by yarn makers, while an inverse or reciprocal system is favoured by yarn users, because cloth sett and degree of yarn twist are directly proportional to the square root of an inverse yarn count. Moreover, calculation for weight of pieces is easier with an inverse count, because the latter in the denominator can be cancelled against the sett, width or length of the specification in the numerator. Many short-cuts are used in the industries. It is no accident that cotton, worsted, woollen and linen are all reckoned inversely! Then no one system can possibly cover the whole range of textiles from silk to jute.

Unequal sizes of singles in a ply or folded yarn are not often required and therefore the averred advantage of a direct system in such cases is largely imaginary.

Mr. Elkin puts the case in a nutshell, in stating that trade sections will not willingly depart from existing systems, as it means re-educating their employees and re-writing all their records. Mr. Slater says that a student spends too much time learning all these different systems. My comment is that only a fool would do so! The teacher who impresses that sort of drill is not worth his salt, because it is a useless exercise reminiscent of 50 years ago, when learning by rote was in vogue.

Grex is no improvement on the Denier system. By the adoption of the latter system, the silk people at least would not need to change. At any rate the proposal will simply add another system to the manifold complexity, and will serve no useful purpose worthy of the turn-up.

90, Channel Street,
Galashiels, 5/10/45. T. OLIVER.

Review

Whither Plastics? By H. R. Fleck (Temple Press Ltd., Bowling Green Lane, London, E.C.1. 15/- net).

In a book of very modest dimensions the author has given an interesting survey of the sources, present application and possible future uses of plastic materials in industry, science and art. He avoids any unduly optimistic outlook, and in fact warns against it, but discusses the ever-increasing role which plastics are likely to play in the common life of the world in a manner which the general reader can appreciate. In the section on the textile industry attention is given both to the older rayons and to the more recent developments in the field of synthetic fibres. W. H. WATSON.

General Items

Staff

Mr. W. J. Hall, who was released by the Institute in 1941 to take up a post with the Armaments Inspection Department, Ministry of Supply, has now returned to the Institute in the capacity of Technical Officer and Editor. The former General Secretary, Mr. H. L. Robinson, is remaining as Deputy Director, Surplus Equipment and Stores, Ministry of Supply, and the position of General Secretary of the Institute is now held by Mr. H. Ibbetson, who has been in an acting capacity in this office since 1943.

Bolton Branch

The newly formed Bolton Branch of the Institute commenced its activities on Tuesday, 9th October, when the first meeting was attended by more than eighty members. Mr. F. P. Slater, M.C., M.Sc., M.A., F.T.I., gave an interesting paper, entitled "Views on Cotton Spinning," and a stimulating

discussion followed. The meeting was held at the Bolton Technical College, and the Chairman was Mr. H. Bromiley, F.T.I. A report of the lecture will appear in the *Journal* at a later date.

A varied programme of lectures has been arranged by the Branch Committee for the winter session, and subsequent meetings will be held on the second Tuesday of each month. The enthusiasm of the members in this area indicates that they will have a very successful session.

Subscription of members retiring from business

The Council of the Institute has resolved that a member who retires from business by reason of ill health or age may claim a reduced membership subscription at the rate of £1 1s. 0d. a year, as from the commencement of 1946. Any member who wishes to take advantage of this arrangement should make application in writing to the Council.

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

WILLIAM GEORGE MACMILLAN, B.Sc., Ph.D., F.R.I.C.,
Chief Chemist, Indian Jute Mills Association, Research Institute, Calcutta.

JOHN RICHARD HIND, M.Sc., F.R.G.S.,
Inspector of Cordage, Directorate of Aeronautical Inspection, Middlesex.

GEORGE PRIESTLEY, M.A.,
Lecturer in Design and Related Subjects, The University, Leeds.

ASSOCIATESHIP

NORMAN HECTOR POMFRET,
Head Spinning Overlooker, Laburnum Spinning Co. (1920) Ltd., Atherton.

HERBERT ARTHUR HARGREAVES, B.Sc.Tech.,
Technical Assistant, Turner Bros. (Asbestos) Co. Ltd., Rochdale.

REGGIE WALTON, B.Sc. (Hons.),
Chief Chemist, H. Harrisons (Finishers) Ltd., Leicester.

Institute Membership

The following applicants were elected to membership at the October meeting of Council:—

Ordinary.

Arthur Albut, 12, Wharncliffe Road, Frizinghall, Bradford, Yorks. (Worsted Spinning Mill Manager, Fred Ambler Ltd., Frizinghall, Bradford).

William Billing, Furzedown, Clipstone Road, Forest Town, Mansfield, Notts. (Works Manager, Hall & Earl Ltd., Newark, Notts.).

Robert Chambers, Messrs. Greenmount and Boyne, Harolds Cross, Dublin, Eire (Factory Manager).

Harry Armytage Evans, 30, Flockton Road, East Bowling, Bradford, Yorks. (H.M. Forces).

Henry Eyring, Textile Research Institute, Princeton, New Jersey, U.S.A. (Professor of Chemistry, Princeton University).

Martin Raphael Freney, B.Sc., 22, Mandolong Road, Masman, N.S.W., Australia (Officer in Charge, Central Wool Committee Testing House, 17, Randle Street, Sydney).

Leslie Gill, 5, Erskine Road, Mayo Road, Nottingham (Works Manager, Cooper Bros. (Nottingham) Ltd., Haydn Road, Nottingham).

Arthur Percy Godber, 62, Austen Avenue, Forest Fields, Nottingham (Factory Manager, Cooper & Roe Ltd., Eagle Works, Nottingham).

Thomas Haworth, " Auburn Villas," Athlone, Westmeath, Ireland (Bleach and Dye Works Manager, General Textiles Ltd., Athlone).

Robert Higson, 103, Hamilton Street, Atherton, Nr. Manchester (Carder and Ring Overlooker, Fibro Spinning, Tootal Broadhurst Lee Co. Ltd., Bolton).

George Irving Hogg, 35, Pingate Lane, Cheadle Hulme, Nr. Stockport (Temporary Civil Servant (Cost Accountant), Ministry of Supply, Manchester).

Julian S. Jacobs, Textile Research Institute Inc., 10, East 40th Street, New York (Director, Department of Publications and Editor, *Textile Research Journal*).

Irvin Kaye, John Kaye & Sons (Huddersfield) Ltd., Kings Mill, Huddersfield (Works Manager).

Patrick Lenihan, B.A., LL.B., General Textiles Ltd., Athlone, Eire (General Manager).

Kevin Colum McCourt, F.C.I.S., 3, St. Stephen's Green, N., Dublin (Secretary, Federation of Irish Manufacturers Ltd.).

Edmund William Murphy, River View, Valley Road, Bocking, Braintree, Essex (Manager, Warp Knitters Ltd., Eden Vale Works, Westbury, Wilts.).

Alexander Nisbet, The Ropeworks, Newbridge, Co. Kildare, Eire (Works Chemist, Irish Ropes Ltd., Newbridge).

Leslie Peace, " Criollo," Markham Avenue, Rawdon, Nr. Leeds (Designer, Messrs. Wm. Murgatroyd & Co., Moorfield Mills, Yeadon, Nr. Leeds).

William Rae, The Commonwealth Trust Ltd., 65, London Wall, London, E.C.2 (Managing Director).

Eric Rigby-Jones, The Ropeworks, Newbridge, Co. Kildare, Eire (Managing Director, Irish Ropes Ltd., Newbridge).

Edwin Shore, 43, Princess Road, Chadderton, Oldham (Head Carder, Warwick Mill, Oldham Road, Middleton).

William Stephenson, 55, Whitworth Street, Manchester (Gown Manufacturer).

Harold Raymond Stokes, 22, Butterfield Avenue, Templeogue, Co. Dublin (Factory Manager, 98, Lower Clanbrassil Street, Dublin).

Richard Turner, 82, Northfield Road, New Moston, Manchester, 10 (Carder).

Wilfrid Osman Turner, c/o Mrs. Pendlebury, 2, Clifton Drive, Crumpsall, Manchester, 9 (Dyehouse Chemist, I.C.I. Ltd., Dyestuffs Division, Blackley, Manchester).

James Underwood, 270, So. 2nd Street, Bangor, Penna, U.S.A. (Assistant Factory Manager, Julius Kayser Co., 500 5th Avenue, New York, U.S.A.).

John George Walton, Walton Hosiery Co. Ltd., Kirkby Folly Road, Sutton-in-Ashfield (Hosiery Manufacturer).

Junior.

Deryk B. Conquest, 7, Grenfell Drive, Bradford Moor, Bradford (Trainee Manager to firm of woolcombers).

Eric Ramsbottom, " Arden Lea," Church Lane, Mellor, Nr. Blackburn (Designer, Lancashire Silk Mills Ltd., Anchor Mill, Darwen).

Obituary: Mr. A. Yewdall

Alexander Yewdall died on the 19th May, 1945, at the age of seventy-one years. He was born in Leeds and entered the Textile Department of the Yorkshire College—now the Leeds University—in 1891. After obtaining the Diploma, he joined the old-established family business of David Yewdall & Sons, of Calverley and Bramley, woollen manufacturers.

He continued in the business for five years, and in 1899 became an assistant lecturer in the Textile Department of the Yorkshire College under the late Professor Roberts Beaumont. Thus commenced a long association which continued until 1939, when, as lecturer in Cloth Structure and Weaving Mechanism, he retired from active teaching.

Mr. Yewdall served under three professors, Roberts Beaumont, A. F. Barker and A. T. King. During his long career, he won the esteem of a large number of students from all parts of the world for his kindly disposition, his sound experience and ability as a teacher.

His investigations on the finishing processes of the wool textile trade established him as an authority in this field, and he was invited to revise and re-write Beaumont's standard work on "Cloth Finishing." In 1933 he was elected to the Fellowship of the Institute in recognition of his services to textile education and to the industry.

He possessed a very large knowledge of the history of the local woollen industry derived from his forbears and family records, and as a member of the Thoresby Society he had the privilege of contributing the section on "The Records of Mill Practice," in W. B. Crump's book on "The Leeds Woollen Industry, 1780-1820."

Before and after his retirement he acted as one of the assessors for the West Riding County Council's examination in woollen and worsted weaving subjects for technical and weaving institutes.

24th September, 1945. F. PICKLES.

The Institute regrets to announce the death of the following member:—

T. W. WADMAN, Heywood.

Employment Register

The following announcements are taken from entries in our Register of members whose services are on offer. Employers may obtain full particulars on application:—

No. 249—Member, 37 years, married, desires post at home or abroad as Cost Accountant. 15 years' Textile Costing experience, five of which were in Europe. Specialist in installation of Standard Cost methods. Cotton Spinning bronze medallist. Working knowledge of French, German and Portuguese.

No. 250—Young man, 22 years of age. desires position as Assistant Manager or Assistant Superintendent in Knitting Factory. City and Guilds Full Technological Certificate in the Manufacture of Hosiery and Knitted Goods. Worshipful Company of Framework Knitters Gold Medal. Leicester College Diploma in Knitting.

No. 234—Textile Finishers are offered the opportunity of availing themselves of the services of a technical man (Chemist, F.T.I., 40) with a unique experience in the finishing of Rayon and Cotton in piece and yarn, research, management and organisation. Only a position with high responsibility and wide scope of activity will be considered.

No. 204—Young man, 31 years of age, desires position in textile trade with future prospects. City and Guilds Full Technological Certificate in Cotton Weaving. Certificates in Woollen and Worsted Weaving and Finishing. Six years' experience in weaving mill and two years' in finishing mill. School of Accountancy Diploma in Bookkeeping.

No. 251—A.T.I., 34 years of age, desires position as Textile Technologist or Textile Chemist. Full Technological Certificate in Dyeing of Wool, Cotton and Silk. Higher National Certificate in Chemistry. Seven years' experience in Dyeing of Pile Fabrics. Three years' experience in Research and Development work and Technical administrative work on Textiles with Government Department.

No. 252—A.T.I., 38 years of age, desires executive position with large firm of Cotton Spinners, Doublers and Shippers. City and Guilds Full Technological Certificate in Cotton Spinning. Associate of Salford Royal Technical College. Wide experience in continental and world markets, all classes of unprocessed and processed yarns, particularly hosiery.

No. 253—Young man, 29 years of age, A.T.I., desires administrative position in Textile manufacturers either in England or abroad. Several years' experience in production, costing, designing and administration.

Vacancy

ASSISTANT RESEARCH CHEMIST required in textile works in Northern Ireland. Organic, physical or biochemistry desirable as main qualification. Knowledge of plant products an advantage but not essential. The appointment will be for a minimum of three years in the first instance. Applicants should give details of age, education and experience and should state when free to take up the appointment. Box No. 81.

ALPHABETICAL INDEX TO ADVERTISEMENTS

THE JOURNAL OF THE
TEXTILE INSTITUTE

TRANSACTIONS

21—GROWTH CHANGES IN " TENDER " WOOL

By W. R. LANG

I. INTRODUCTION

" Tender " wools are well known in the wool trade, and in certain parts of Australia they are a constantly-recurring phenomenon. Inadequate food supply or unfavourable changes in nutrition, animal ill-health, or certain phases in reproduction are responsible for this defect. The term " tender " is used to denote a noticeably decreased tensile strength at any level in the staple compared with the strength of its normal growth. Practical men judge the " soundness " or otherwise of a wool staple by arbitrary standards based on tactile plucking or flicking. A " tender " level may or may not be accompanied by an evident " break " or change in the number of crimps per inch. The defect is caused by a sufficiently great reduction in the volume-rate of wool production when conditions of nutrition or health do not favour a maintenance of keratin production at the normal level. Superficial microscopical examination had revealed that it was likely that certain fibres responded differently from others when such changes occurred. Since the fleece is produced by two main types of wool follicles, known as Primary and Secondary (Wildman and Carter,[1] and Carter[2])—the discrimination being based on the date of appearance in the embryo and the differences in the accessory glandular equipment—it did not seem unreasonable to suspect that the response of these two follicle types might be different when conditions of reduced wool production pertained. Dry[3] has noted, in a study of the New Zealand Romney fleece and its development, that " it appears therefore that the later it be the turn of the follicle to develop, the greater tend to be the effects of the factors causing a lamb to grow abnormally badly." The primary follicles which appear earlier in the embryo may, in the light of Dry's suggestion, carry over this tendency into adult life, allowing the secondary follicles to suffer a quicker reaction to changed rate of production. Nichols[4] has noted that volume-rate of production changes may be reflected in either length or thickness factors, or in both. If the volume-rate is so reduced that certain fibres must cease growing, the question arises as to the manner of this cessation. Roberts,[5] in a study of cotting in the Welsh Mountain breed, refers to the shedding of certain fibres and their inter-twining with one another and with neighbouring convoluted fine fibres to produce a cotted region. Many of the fibres withdrawn from the distal section of the staple showed terminal bulbs complete with whiplash ends. While this study referred to the Welsh Mountain breed, cotted merino wool occurs frequently in the more arid parts of the Australian wool growing areas side by side with " tender " wools. The question therefore arises as to whether the follicles shed the root bulbs when production ceases or merely fine away the fibres to pointed proximal ends. It is interesting to note in this connection that Hardy and Tennyson,[6] when investigating Corriedale wool fineness, as influenced by the rate of growth, demonstrated that, if a reduction

in diameter occurs without cessation of growth, the new fibres become embedded in the previous growth, and the new growth is visible microscopically.

The main questions with which this paper is concerned are :—

1. The nature of the response in the thickness-rate of wool growth to a decrease in the volume-rate of wool production.
2. The form in which fibres cease production and resume it again at a later period.

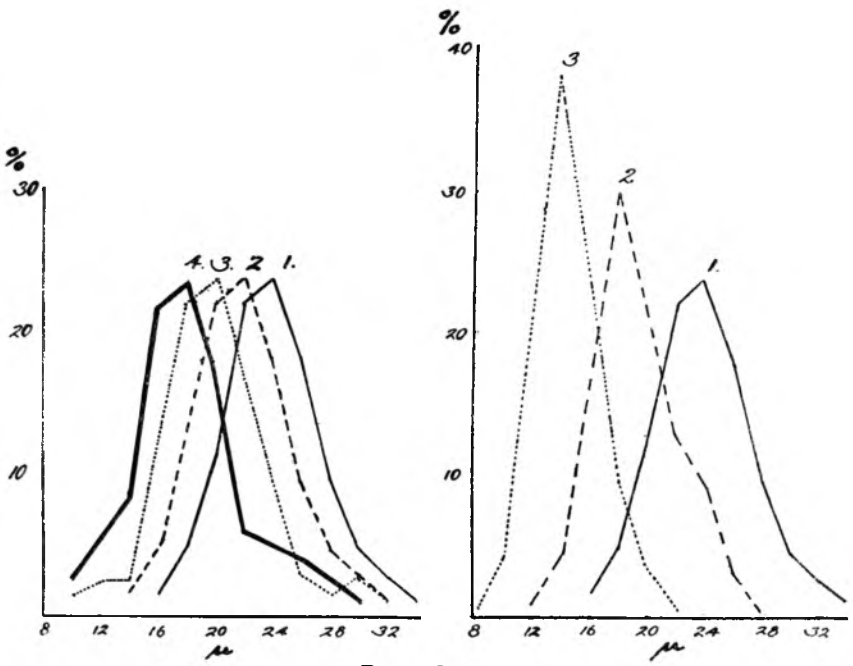

PLATE 1.

(*a*) Fibre thickness frequency distributions, when equal decrements in cross sectional area are made.

Commencing with 1, distributions 2, 3 and 4 are obtained by making decrements of $20\pi\mu^2$, $40\pi\mu^2$, and $60\pi\mu^2$ in each fibre. Fibres below 8 microns are considered to be shed, and are omitted.

(*b*) Fibre thickness frequency distributions when decrements proportional to the area of cross-section are made in each fibre of the original.

Commencing with 1, distributions 2 and 3 are obtained by making decrements of 20% and 40% in each fibre. Fibres below 8 microns are considered to be shed, and are omitted.

Before proceeding to the experimental results, it is advisable to analyse the possibilities inherent in the first of these questions. The fibres may be considered to be essentially long, thin cylinders. The fact that many are elliptical will not alter the validity of this assumption, because, as Bosman[7] has demonstrated, the contour does not alter appreciably with change in fibre fineness. If the volume-rate of production is reduced, the effect may vary in intensity in different parts of the fleece, and even among the fibres composing one small fleece area, for fibres from primary and secondary follicles are intermixed, and both take part in the formation of the small staple units or strands. There are three possible reactions to a decrease in volume-rate of production, namely :—

(i) The thickness-rate only may be affected.
(ii) The length-rate only may be affected.
(iii) Both thickness- and length-rates may be affected, there being a wide variety of combinations possible in this dual change.

In many of the samples examined the growth of the majority of the fibres either ceased or was visibly affected at approximately the same staple level, showing that the effect on length-rate was either equal or the growth rate in length of the faster growing fibres must have been slowed down more than that of the slower growing fibres. In such samples the possible changes in thickness-rate are threefold :—

(i) An equal decrement in area of cross-section for each fibre.
(ii) A decrement proportional to the area of cross-section or the thickness of the fibre concerned.
(iii) A differential response, with a group or groups less favoured, showing greater decrements than the other fibres.

In the first case, the frequency distribution of fibre thickness, as the staple passes from the normal or near-normal growth near the distal portion of the staple to the " tender " region, would tend to change as demonstrated in Plate 1a. The maximum percentage frequency would not increase greatly, and there would be a lag in the movement of the coarser fibre group towards the y-axis compared with the bulk of finer fibres. The coefficient of variation would show a definite increase. This description assumes that if fibres cease growth they do so at minimum thickness and not over a wide range of thicknesses. Even if this assumption is not strictly correct, the general change in frequency distribution curves will still remain sufficiently similar to the above description for ready recognition.

In the second case, with decrements proportional to the cross-sectional area or thickness of individual fibres, the change in the distribution curves will be more drastic (see Plate 1b). The maximum percentage frequency will increase rapidly, since the coarser fibres will more quickly suffer alteration in terms of the fixed class interval of 2 microns and move towards the y-axis more rapidly, the range will narrow considerably, and the coefficient of variation will not be changed significantly.

If, in the third case, the coarser fibres, among which would be likely to be many fibres from primary follicles, should prove to be more favoured than their finer neighbours, there will be an extension of the range, an increase in the coefficient of variation, and a development of a bimodal curve, with the finer mode moving towards the y-axis, as the volume-rate of production decreases. A critical distinction will be the continuance of some or all of the coarser fibres at their former thickness. If some of the finer fibres cease growth, the distribution curve in the " tender " region may show a mean greater than or approximately equal to that of the normal growth. If, on the other hand, the finer group is the more favoured, the coarser fibres would become finer and the range would close, the maximum percentage frequency would increase, and the minimum values would remain stationary until some of the original coarse fibres passed this minimum. Finally, if the favoured group consisted of a wide range of thicknesses, with some, but not all, of the coarser included, together with some of the finest, the effect on the distribution curves in normal and " tender " regions would still remain in essence somewhat similar to those described in the first case. Some of the coarser fibres would remain unchanged. Due allowance must be made in each of the above for cessation in growth of certain fibres, presumably from among the finest.

II. EXPERIMENTAL

A typical " tender " staple may be divided theoretically into three parts—the distal and proximal sections on either side of the " tender " region, and this region itself. The distal section contains those fibres produced before the onset of the defect, which ceased growth, together with the continuous growth, if complete cessation did not occur. In the " tender " region, only the latter are present, while in the proximal section, the new growth and the continuous fibres are represented. The number of fibres in distal and proximal sections are not necessarily equal, for some follicles may not

renew their fibre growth. In this description, it has been assumed that some fibres have ceased growth, and it will be suggested later that, even in mildly " tender " wools, a few fibres do cease production.

Seventy " tender " wools, the majority of which were severe cases of the defect, were collected from many parts of the Commonwealth. These included thirty-seven merino, twenty-four comeback, and nine coarser wools. Since most of the samples were supplied by brokers or were collected from their show floors, no more than a sketchy history was obtained in any case. The complete set was examined microscopically, to identify the fibre ends, in both distal and proximal sections, facing the " tender " region. Twenty samples, in which the " tender " region commenced abruptly, were measured to give the fibre thickness frequency distributions of the distal, proximal and " tender " regions, and a confirmatory set of eleven moderately " tender " wools was treated similarly.

The Nature of the Fibre Ends in the " Tender " Region

A wide range of samples representing all degrees of severity of the defect was examined microscopically under high and low magnification. The stained samples were mounted in Euparal. The orientation of the scale markings was used to identify the particular end of the fibres under observation. Three thousand fibres were examined, attention being paid to the form, the thickness of the fibre towards the end in relation to the thickness of its more normal growth and the persistence of the scale markings as the end was approached. These observations may be summarised as follows :—

(*a*) On the distal side of the " tender " region, 97 per cent. of the ends were terminal or root bulbs, shed by the follicles. They varied in shape from spear-headed to long tuber-like forms. In some cases portion of the inner root sheath still adhered. The cuticular serrations were absent, or were so ill-defined that they could not be detected up to distances of 500 microns from the point of attachment of the bulb, although an average distance was of the order of 100-200 microns. In merino wools shedding appeared to occur when the fibre was less than 14μ, the majority being 8μ. In non-merino wools there was a wide range of thicknesses prior to shedding, the majority being in the 10-12μ region, although there was a number in the 12-20μ group, and some even coarser. Evidence indicated a general trend towards a minimum thickness prior to shedding, the exceptions lying among the coarser fibres of the non-merino wools.

Three per cent. of the base ends of the fibres in this part of the sample were bluntly tapered points without a terminal bulb. More of these were noticed in mildly " tender " wools than in other samples. There is no sign of cuticular serrations, and the common stains failed to indicate that there was any exposed cortex—a fact which would contradict any supposition that these were fibres from which a terminal bulb had been broken.

(*b*) On the proximal side of the " tender " region, all of the fibre ends were clearly new growth, similar to the tips of lamb's wool. The serrations were plainly marked and the points firm and rapidly increasing in thickness.

Fibre Fineness Frequency Distributions

(i) *Sample in which continuous fibres were separated from the discontinuous.*

The ideal sample for this investigation would be a " tender " staple in which the continuous fibres were separated from the distal and proximal discontinuous members, each fibre lying in correct relationship with its former neighbours. In one staple, in which it had been confirmed that the continuous fibres had remained comparatively unaltered by the adverse conditions, whereas the finer group had suffered considerable change in thickness, the fibres of the distal discontinuous group were carefully withdrawn and placed as nearly as possible in their correct relative positions on a black velvet board. When the proximal group had been similarly separated,

Table I. Group of Fibres

Position in original staple	Continuous			Distal			Proximal		
	Mean thickness μ	Standard error	Number measured	Mean thickness μ	Standard error	Number measured	Mean thickness μ	Standard error	Number measured
½ in. from Distal end	25·8	0·37	150	22·9	0·29	200	—	—	—
½ in. from Distal side of "Tender" region ...	—	—	—	20·4	0·24	200	—	—	—
"Tender" region	25·5	0·35	150	—	—	—	—	—	—
½ in. from Proximal side of "Tender" region	—	—	—	—	—	—	18·8	0·21	200
½ in. from Proximal end	23·8	0·24	150	—	—	—	20·7	0·18	200

the continuous growth remained aligned in its original form. Only 1·5 per cent. of the 1,300 fibre lengths were broken during this procedure. These were discarded.

Of the original staple at the distal end :—

22·5 per cent. were continuous ;

77·5 per cent. were confined to the distal section only ; and the equivalent of

74·4 per cent. were renewed in the proximal section.

Measurements of fibre fineness were made at suitable levels in each of the three groups to reveal the nature of the changes in this dimension. Cross-sections were taken transversely across the group and measured at 500 magnification.

The reaction in the thickness factor of the continuous fibres is small compared with that of the finer members which are shed and renewed. The longer term volume-rate reduction does affect the continuous fibres in like degree with their neighbours.

From this it is evident that the continuous growth suffered a negligible decrease in mean thickness, despite the complete cessation of growth of 77·5 per cent. of the fibres of the original staple. Examination of the frequency distributions of each of the above showed a slight drift towards the y-axis in the continuous group, although the minimum value remained at 16μ in each of the three " continuous fibre " distributions. The continuous fibres were likewise of greater mean thickness than those in the distal group, before the onset of the unfavourable conditions. Despite this, it must be recognised that some continuous fibres were initially finer than certain members of the distal group.

(ii) *Mean fineness determinations on " tender " wools showing an abrupt distal edge of the " tender " region without separation of the various groups.*

The samples were mounted from transverse snippings taken from the " tender " region and from positions one centimetre either side of it. The distributions obtained were of several distinct types :—

(*a*) In the first, there was a coarse fibre group, which persisted almost unchanged, while the finer section became distinctly finer.

(*b*) In the second, due apparently to many of the fine fibres ceasing growth, the mean thickness in the " tender " region was actually greater than on either side of the latter region.

(*c*) In the third case, the frequency distribution of the " tender " region showed that there had been a definite decrement, approximately equal, in all fibres. In Plate 2 examples of these three types are given.

(iii) *Mean fineness determinations on mildly " tender " wools.*

Eleven samples treated similarly to (ii) gave distributions falling into categories *a* and *c*, which is as anticipated, since very few fibres would be shed in these wools.

DISCUSSION

When the volume-rate of wool production in the fleece decreases, the follicles may respond in two distinct ways.

In the first, all fibres suffer an approximately similar decrement, and if the decrease in the rate is continued, the finer members of the fibre population eventually cease growth. In merino wools the fibre thickness, when this occurs, is in the 8μ-12μ region, and the majority reach the 8μ level before growth ceases. Except in a few cases, the fibres are shed, carrying with them the terminal bulb and oftentimes portion of the inner root sheath. The exceptions show bluntly-tapered ends, which do not appear to belong to ruptured fibres, since they do not stain with Pauly's reagent or any of the more common stains. In non-merino wools the lower limit of thickness

prior to shedding lies in the 10μ-12μ region, and some fibres cease growth at a much coarser stage. A few shed fibres have measured 20μ and over. This evidence indicates a general trend towards a minimum thickness prior to shedding in both types of wool. In most cases, though not without exception, the frequency distributions of fibre thickness of wools showing equal decrements in all fibres were of a near-normal type.

In the second case, a favoured group of fibres, which included most of the coarser members, appear to remain unaffected, while the majority of the finer bulk undergo a decided decrease in thickness. In some instances this favoured coarser group remained approximately at its original level of production throughout the staple, whereas in a few others the group showed merely a delayed response and frequency distributions in the staple on the proximal side of the " tender " region demonstrated that the maximum thickness values were less than in the " tender " region. Since the coarser fibres are usually the longer, and, hence, those growing with the greatest length-rate of growth, it might be alleged as inaccurate to assume that the portion of these fibres in the " tender " region was grown when the volume-rate was decreasing. However, the majority of examples, including the staple which was dissected into three sets of continuous, distal and proximal fibres, showed that the majority of the coarser fibres remained at an approximately similar thickness level during, and for some time after, the " tender " region had been produced. In four cases listed under " A " (Table II), the continuous fibres have been cleared of the proximal growth for another 3 mms. beyond the " tender " region and the distribution measured. The same results were obtained as in the " tender " region itself. This appears to cover any objection on this count. In any case, the " tender " region was usually of 2-4 mms. in length in the cases measured. The fact that there is one group of fibres which does not respond immediately does not preclude an ultimate reaction if the conditions after the defect do not allow a volume-rate of production equivalent to the original rate. In the example quoted, concerning the staple which was divided into the three components, it will be noted that the mean thickness of the continuous fibres dropped a little in the proximal half of the staple. The distribution shows that the coarser fibres were gradually responding to a new and maintained lower volume-rate. Most of the examples of this type of reaction occurred in wools whose frequency distributions were distinctly non-normal, the coarse fibre group, or " tail," being prominent.

When the new growth is renewed under favourable circumstances, the former frequency distribution appears to be regained by the reverse process to that undergone before. Renewed growth appears in the form of new fibres with pointed tips. In no case examined have the coarse fibres benefited during this increase in volume-rate of production and become coarser than they were originally. In a few cases, as in Plate 2b, the coarse fibres show a decrease—probably the delayed effect assumed earlier.

If the differential response is to be attributed to differences between primary and secondary follicles, there is histological evidence in support of such a distinction. Furthermore, the fact that the group of fibres showing the least response in certain wools has a mean thickness greater than that of the group showing the major change, and is probably mainly the primary fibre group, supports the hypothesis that the primary and secondary follicles may react differently to a change in the volume-rate of production of wool within the fleece. At the same time, it is not true to assume that all the coarser fibres are fibres from primary follicles for a percentage of the finer fibres would be from these follicles. There is a general suggestion that the difference in response is the more marked as the initial size discrepancy between these groups becomes greater.

Table II. Typical examples of the three sets of frequency distribution curves of fibre fineness. Wools in which the "tender" region began abruptly at one level.

Ref.	Type	Mean Thickness			Coefficient of Variation			Standard Error		
		Distal μ	"Tender" Region μ	Proximal μ	Distal %	"Tender" Region %	Proximal %	Distal	"Tender" Region	Proximal
CASE A.										
1	Mer. 64s ...	21·3	19·6	19·9	18·3	23·6	16·0	0·28	0·33	0·23
2	,, ...	19·4	16·6	19·8	19·7	27·7	26·3	0·26	0·31	0·35
3	Cbk. 60s ...	26·2	23·2	32·2	15·3	33·6	20·8	0·26	0·52	0·51
4	,, ...	30·0	26·7	34·0	24·7	31·1	18·5	0·53	0·59	0·45
5	Cbk. 58s ...	23·3	20·7	25·1	29·2	41·3	23·1	0·49	0·61	0·42
6	,, ...	18·7	16·6	17·2	17·1	25·3	22·0	0·23	0·30	0·27
7	,, ...	25·1	21·6	24·5	22·1	30·5	21·2	0·40	0·47	0·36
CASE B.										
8	Mer. 64s ...	17·0	19·3	18·0	22·9	18·6	18·8	0·28	0·26	0·24
9	Mer. 60s ...	21·1	21·8	16·6	16·6	14·6	24·7	0·25	0·23	0·29
10	Cbk. 64s ...	17·5	20·3	22·5	22·3	19·7	15·5	0·28	0·28	0·25
CASE C.										
11	Mer. 70s ...	19·4	18·8	23·5	12·3	18·6	14·1	0·18	0·25	0·24
12	Mer. 60s ...	23·6	19·2	20·5	11·2	14·5	17·3	0·19	0·20	0 26
13	Mer. 64s ...	19·9	17·7	22·3	18·0	21·1	17·0	0·26	0·26	0·27
14	Cbk. 60s ...	24·3	19·5	23·4	16·5	19·5	20·1	0·28	0·27	0·33
15	Cbk. 58s ...	24·0	19·5	23·4	16·5	19·5	20·1	0·28	0·27	0·34

Case A—Coarser fibre group persisting.

Case B—Enough finer fibres have ceased growth to maintain or increase the mean thickness in the "tender" region.

Case C—Definite thickness decrement, approximately equal in all fibres.

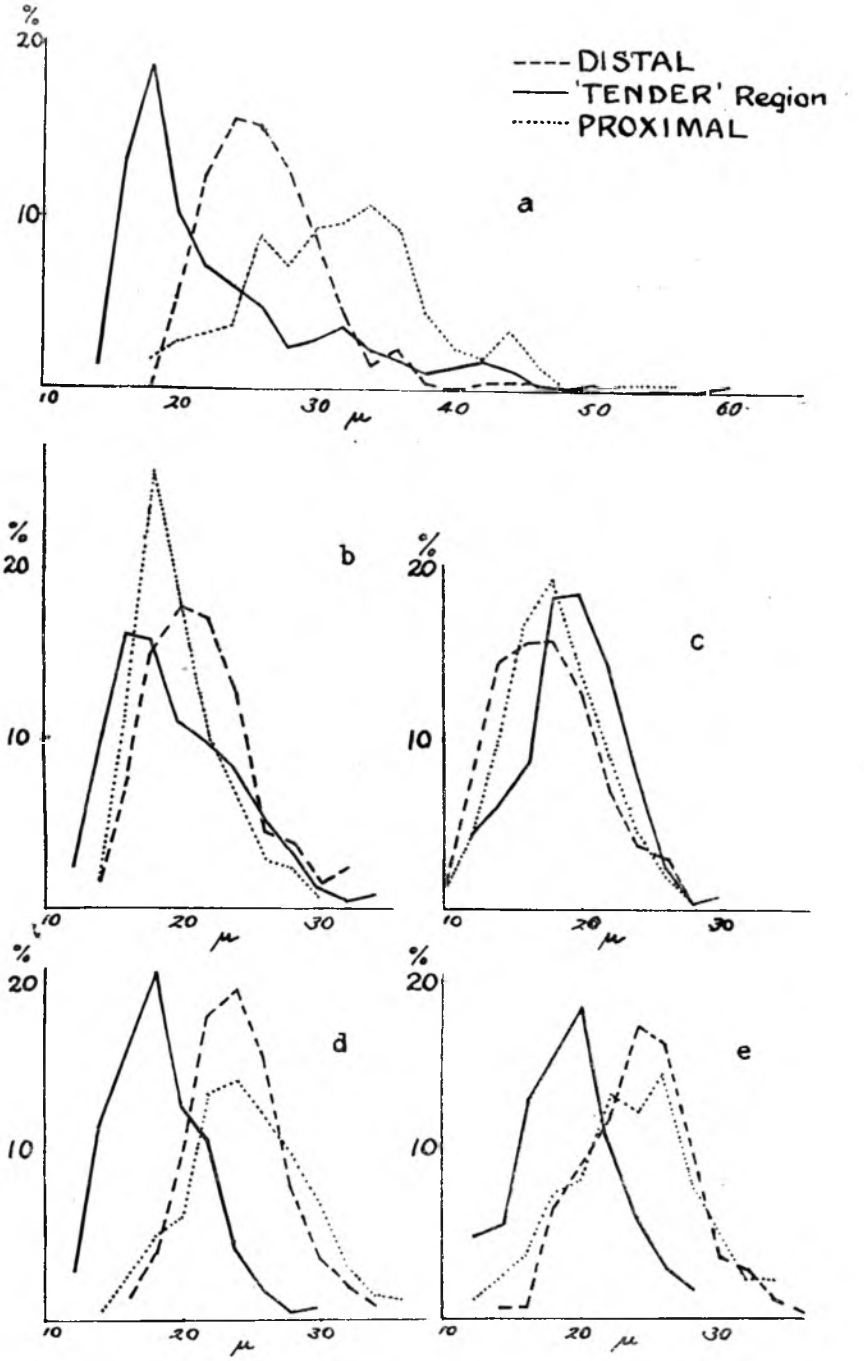

PLATE II

Distributions of fibre fineness in the "Tender" region and on the proximal and distal sides of it. (See Table II).

(*a*) No. 3. Coarser fibre group persisting.
(*b*) No. 1. Coarser fibre group persisting.
(*c*) No. 8. Enough of finer fibres have ceased growth to maintain or increase the mean thickness in the "tender"" region.
(*d*) No. 15. Definite thickness decrement, approximately equal, in all fibres.
(*e*) No. 14. Definite thickness decrement, approximately equal, in all fibres.

SUMMARY

Information has been sought concerning the response in the thickness factor in the fibres composing a staple, in which a "tender" region occurs when the volume-rate of wool production decreases rapidly, and again when the volume-rate is re-established at approximately its original lvel.

Microscopical evidence shows that the majority of fibres ceasing growth do so by expulsion of the terminal or root bulb from the follicle.

Fibre thickness measurements reveal a differential follicular response in certain wools, particularly in those with a marked difference between the coarser and finer fibres. As the volume-rate of production decreases, the coarser group may suffer little change in thickness, whereas the finer bulk undergoes considerable change. In wools with a near-normal type of frequency distribution, all fibres appear to suffer similar decrements in fibre cross-section in the majority of cases examined.

As the volume-rate is again increased, frequency distributions suggest that in most examples the reverse response is usual, i.e., the fine bulk regains its former mean thickness, while the coarse fibres remain comparatively unaffected. In near normal types of distribution all fibres respond in a similar degree.

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Gordon Institute of Technology, Geelong.

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22—AN AUTOMATIC SLIVER AND ROVING REGULARITY TESTER AND AN AUTOMATIC YARN REGULARITY TESTER

By S. L. ANDERSON, B. CAVANEY, G. A. R. FOSTER and J. R. WOMERSLEY

I. INTRODUCTION

In this paper two testing instruments for the rapid measurement of the irregularity of cotton slivers, rovings, and yarns are described. Each of these is a development of the corresponding photographic regularity tester[1] combined with a calculating machine in such a way as to render the measurement and calculation of the irregularity almost completely automatic.

The photographic yarn regularity tester records yarn thickness as a trace on bromide paper, from which the standard deviation is laboriously determined by direct measurement and computation. Measurements extending over two or three leas of yarn are necessary to obtain a representative figure for the standard deviation and as the tester cannot be run at a high speed without introducing errors, several hours are required to obtain a sufficient length of photograph. Making measurements on this and calculating their standard deviation is also a slow process and to obtain an accurate estimate of the irregularity of a sample of yarn would take about twelve hours.

Much of this labour is saved on the photographic roving tester by the attachment for recording the frequency distribution, but this attachment unfortunately limits the speed of the machine and so the testing is still very slow.

The time required to calculate the standard deviation from the photographic trace can be reduced to a few minutes by using one of the integrators described in a previous paper[2]. As there pointed out, the quickest way of using the integrator is to take snap readings of thickness at a number of points along the photograph. In order to obtain the best estimate of the standard deviation from a given number of observations, these readings should be widely spaced, say by an amount corresponding to points a yard apart on the yarn, because adjacent observations are not statistically independent. For this purpose the yarn may be fed intermittently through the testing machine at a high speed, about a yard at a time, and the readings taken while it is at rest. But the photographic record is then unnecessary, for intermittent action makes it possible to control the integrator electrically from the testing instrument and so render the whole process automatic.

The speed of testing can be still further increased by constructing a battery of testers, mounted on a common base, and having a common drive. The complete battery of six yarn testers, as described in this paper, takes 23 observations per minute on each cop, and as 360 observations per cop has been chosen as the standard number, one test samples three leas from each cop and is completed in 16 minutes. In this time each of the six units calculates the sum of the 360 observations of thickness and also the mean square deviation of the observations from an arbitrary zero. From these the standard deviation can be very quickly obtained.

The roving tester works at the same speed, but the observations are spaced about ten inches apart on the roving ; accordingly, one test samples about 100 yards on each of the six ends.

The general principles of design of both instruments are very similar. The design and operation of the roving tester will therefore be described fully and afterwards an account of those parts of the yarn tester which differ from the roving tester will be given.

II. GENERAL DESCRIPTION OF THE AUTOMATIC ROVING TESTER

A diagram of the essential parts of the tester, which is intended to show the general principles of its action and not the actual arrangement of the parts, is given in Fig. 1.

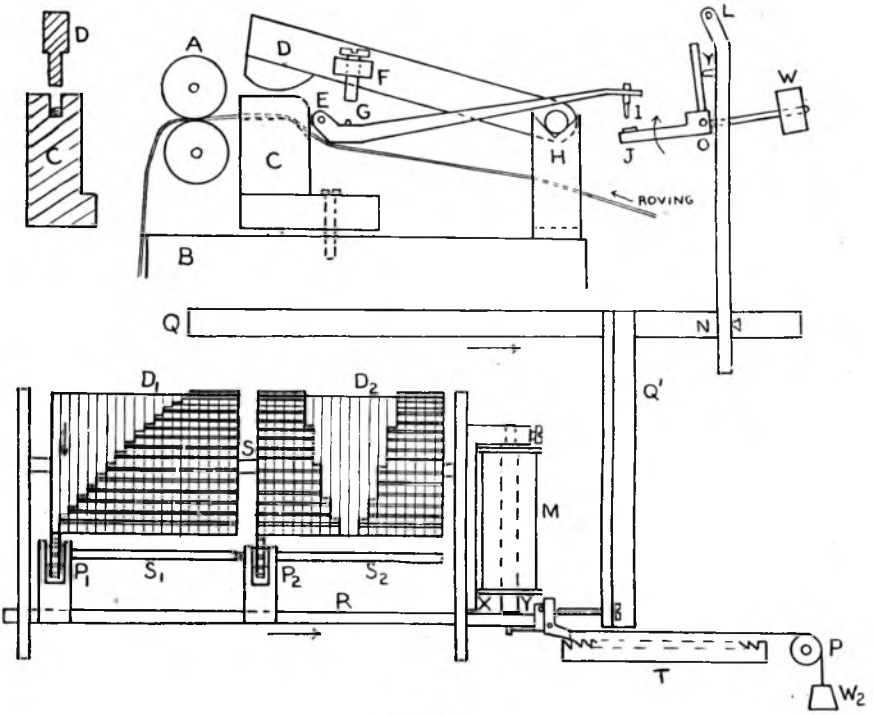


Fig. 1.

The sliver or roving is pulled intermittently, about ten inches at a time, by a pair of rollers A through a rectangular groove in a steel shoe C. While the roving is stationary, the blade D descends and compresses it with a force of 15 lb. into the groove, at the same time depressing a pointer EGI by means of an adjustable stud F, which pushes G downwards. D then rises ready for the next passage of the roving and leaves the pointer set in a position depending on the thickness of the portion of roving that has just been measured. At the end of the pointer is an electrical contact I, which controls the action of the calculating machine shown in the lower part of the diagram.

After the pointer EI has been set, the sliding rod Q, carrying the arm Q′, moves to the right and rotates the long magnifying lever LYN, pivoted at L, and the bell crank lever YOJ, which is caused to follow LYN by the weight *w*. The control rod R of the calculator is made to follow the movement of Q by a weight attached to a cord passing over a pulley P. As soon as J touches I, the magnet M is switched on to stop the rod R. Since Q and therefore J starts from a fixed zero position, the displacement of R is proportional to the thickness of the roving minus a constant amount depending on the initial position of J.

After the magnet is switched on QQ′ continues its forward motion, leaving R behind and allowing the pawl on the end of R to fall on to a rack T ; at the same time the pointer EI is pushed upward by J and is thus set in position for the next observation. When QQ′ has reached the end of its forward stroke, the magnet M is switched off and R completes its movement

until arrested by the next tooth on the rack T. This places the observation in the correct class interval and brings the pinion P_1, which slides along the shaft S_1, opposite the corresponding section of the stepped reckoner D_1 fixed on a shaft S. D_1 is a toothed steel drum, with the teeth cut away in steps to form twenty sections equal in width to the teeth on T and having numbers of teeth 0, 1, 2, etc., up to 19. After the pinion P_1 has been set the shaft S makes one revolution and P_1 is turned a number of teeth equal to the number of the class interval, and therefore proportional to the thickness of the roving. The rod Q then returns to its initial position resetting the calculator. In the meantime the rollers A have pulled through another ten inches of roving ready for the next observation.

After a number of observations, a counter attached to the shaft S_1, which is driven from P_1 by a sliding key and a keyway in the shaft, indicates the sum of the observations. In a similar way a second pinion P_2, controlled by the same rod R, is caused by a suitable arrangement of teeth on the drum D_2 to indicate the sum of the squares of the deviations of the observations from the tenth class interval. (For a reason which will be explained later, the machine actually calculates the sum plus the sum of the squares.) From these values the standard deviation is easily calculated.

The complete machine tests six ends of roving simultaneously and indicates the results on six pairs of counters. The arrangement of the parts on the base is shown in Fig. 2, in which the lettering corresponds with that in Fig. 1 ; the shoes and pointers are on the left and the calculating mechanism on the right. There is only one pair of stepped reckoners, and the six pairs of pinions P_1 and P_2 are arranged round the lower parts of the circumferences of the drums with their control rods R below, as shown in Fig. 2c. The magnets M are connected to the corresponding contacts IJ.

III. THE SHOES AND LEVER SYSTEM

The Shoes

The groove in the lower shoe C is formed by screwing together three pieces of hardened steel as shown in Fig. 3A. This enables the surfaces of the groove to be polished before assembly. The axle of the upper shoe D (Fig. 3, B and C) rests in V's in a bracket H ; it is located sideways by the adjustable collars (8) and (9) and is held firmly in the V's by a wire hook and spring (10). The radius of curvature of the blade is $\frac{5}{8}$ inch. (This radius is half that of the wheels on the Photographic Tester[1]. Since the bottom of the groove in the lower shoe is flat, the length of the small portion of roving that bears the major proportion of the load is then approximately the same as on the Photographic Tester, i.e. about 0·04 inch for roving and 0·08 inch for sliver.) Accurate adjustment of the relative positions of the top and bottom shoes is necessary, because the clearance of the blade in the groove is only 1/1000 inch on either side ; it is also required to replace the shoes by others with different widths of groove. The lower shoe is therefore mounted on a false base on the under side of which are the usual conical hole, V-groove and plane, which rest on three balls fixed to the base B of the machine. The shoe is rotated on this false base until the groove is parallel to the blade, and at the same time the upper shoe is moved sideways until it will fall freely into the groove; it is then set in position by locking the collars (8) and (9). It has been found that, when this has been done for all the sets of shoes, they can be removed and replaced without disturbing the adjustments.

Four sets of shoes are used with grooves $\frac{1}{4}$, $\frac{3}{32}$, $\frac{1}{32}$ and $\frac{1}{64}$ of an inch wide. The depths of the grooves are $\frac{7}{16}$, $\frac{5}{16}$, $\frac{5}{32}$ and $\frac{3}{32}$ inch respectively. The widest groove is used for slivers and the others for rovings of various hank numbers

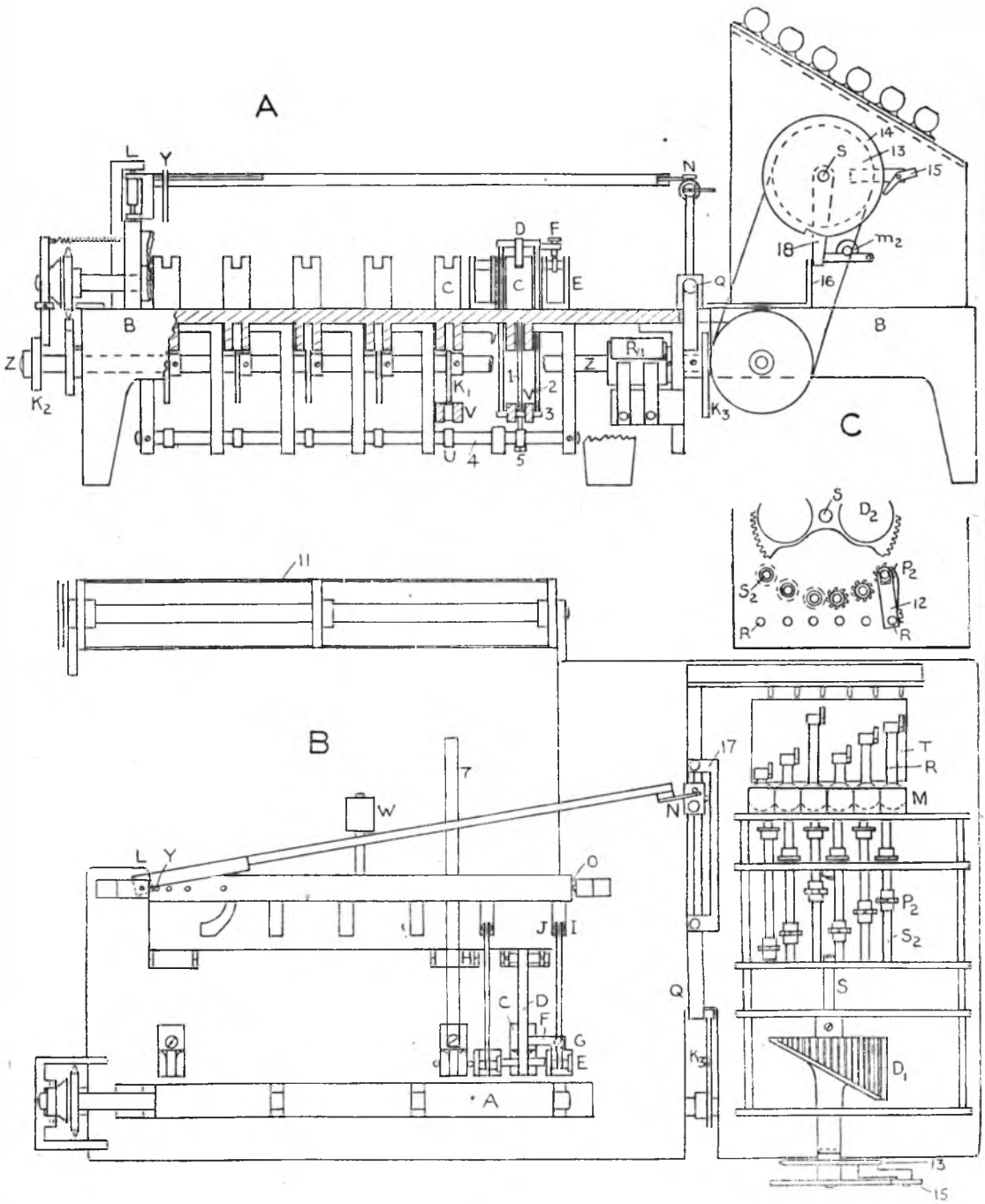


Fig. 2.

A. Front elevation.
B. Plan.
C. Elevation of calculator, showing arrangement of stepped reckoner and pinions.

The roving is led up to the groove by a glass tube (7), Fig. 3B, and is pulled through by the rollers A (Fig. 2) which are driven intermittently through a clutch controlled by the face cam K_2. The roving cannot be taken directly from the bobbin intermittently at high speed ; it is therefore unwound continuously from the bobbin before the test, and allowed to fall as a series of coils into cans. The unwinding is done by a set of rollers driven from the main shaft of the tester ; the unwinding for one test proceeds simultaneously with the actual testing of the previous one. The coils in the finer rovings tend to stick when being withdrawn from the cans ; they are shaken out by passing the rovings over two steel wires fixed to three discs attached to a shaft (11) (Fig. 2), which rotates at about 180 r.p.m. The damage caused by the shaker and guides is negligible as the increase in length of the roving upon passage through the tester is less than 1 per cent.

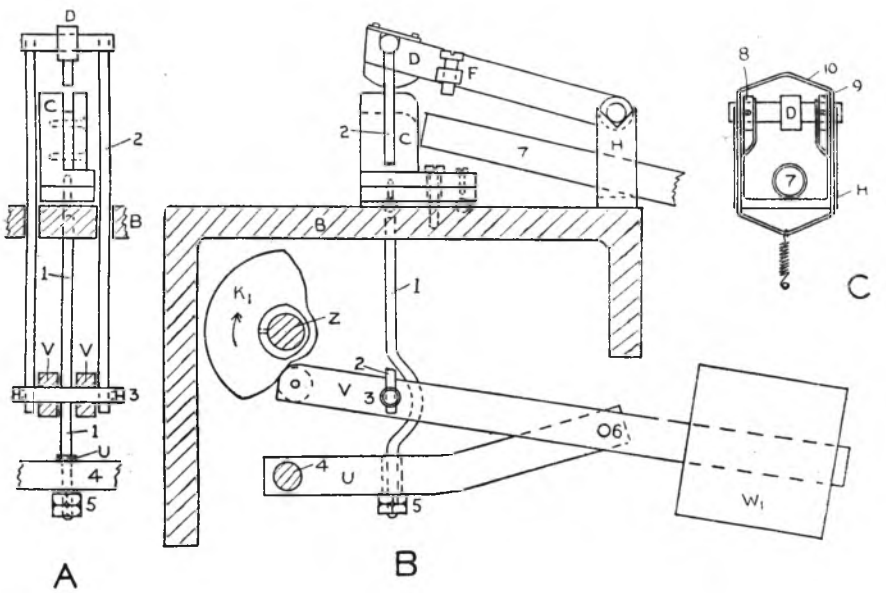


Fig. 3.

The Weighting System

Experiments on the Photographic Roving Tester[2] showed that if the standard deviation of thickness is to be independent of the load on the upper wheel the force applied to compress the roving into the groove must be about 15 lb. or more. The automatic tester is accordingly designed to apply this force to the upper shoe at the moment of measurement. It has also been observed that, when a constant pressure is applied, the thickness of the roving gradually decreases over a period of ten to twenty seconds. It would defeat the object of the automatic tester to take several seconds over each measurement ; it is therefore made to apply the load for a fairly definite time, a little over half a second, and then to remove it, leaving a pointer set to the final thickness obtained during this period.

As the thickness of fine rovings must be measured to within 1/5000 inch, it is important to avoid any appreciable deflection of the base when the load, which on all six units amounts to 90 lb., is applied to the shoes. This is accomplished partly by strengthening the base by the ribs under the shoes (see Fig. 2A) and partly by the lever system illustrated in Fig. 3.

The upper shoe D is linked to a double lever VV by a yoke, (2), which passes through holes in the base. The weight W_1 is carried by V which, in the position shown, pivots about the axle (6) and thus tends to raise the

upper shoe. The weight of W_1 is borne by the lever U, which is pivoted on a fixed rod (4) and rests on the lock-nuts (5) at the end of a steel rod (1) attached to the base at a point exactly under the centre of the shoe. As the cam K_1 rotates, the end of V is depressed and D descends. When D reaches the roving in the bottom of the groove, the yoke (2) cannot descend any farther and V then rotates about (3) to lift the lever U off the nuts (5) and throw the whole load on to the yoke (2) and hence on to the upper shoe and the roving. The load is thus always applied to the base along the same vertical line passing through the point of attachment of the rod (1) and the middle of the lower shoe. Further rotation of the cam allows the end of V to rise, transferring the load from the roving to the lock-nuts and causing the upper shoe to rise. The motion of the shoe is shown graphically in the timing chart, Fig. 5 ; the last portion of the descent and the first portion of the rise are made fairly slow, $\frac{1}{16}$ inch in a quarter of a second, in order to avoid hammering the roving when the pressure is applied and to lower the lever U gently on to the nuts when it is removed.

The Magnifying Levers

The pointer EGI, Fig. 1, is shown in detail in Fig. 4. It is supported in friction bearings formed by two steel balls fitting in conical holes in the ends of the axle and in the sides of the bracket. One side of the bracket is hinged on pivots and the pressure is applied to the bearings by a spring. This pressure is adjusted so that the pointer will just support a 20-gram weight placed at the end I. The tests described later show that the end I of the pointer remains accurately in the position in which it is set by the upper shoe to within 1/1000 inch or less.

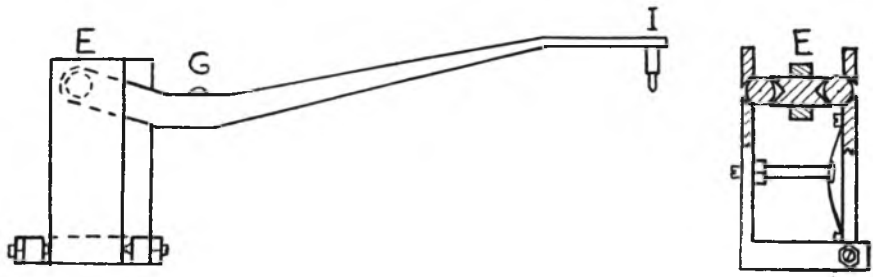


Fig. 4.

The arrangement of the remaining levers will be clear from Figs. 1 and 2.

As soon as the pointer EI has been set, the rod QQ′ is driven outward (i.e. in the direction QN, Fig. 2B) by a cam K_3. It takes with it the lever NL, pivoted at L. A knife edge attached to NL bears against a steel rod Y fixed in a steel bar LO which is free to turn about the axis LO. A tungsten plate J is fixed in a short steel bar projecting from LO and electrically insulated from it, and thus as NL moves the bar LO turns and raises J. It will be seen that the distance which QQ′ moves before the tungsten plate J meets the contact I is proportional to the thickness of the roving, less a constant amount depending on the initial position of J, for if the roving is removed from between the shoes the contact I will fall and touch J *before* D comes into contact with the fixed shoe C. This constant difference, which is a zero correction that has to be applied to the readings of the calculator, can be adjusted by sliding the steel cylinder N along a rod supported above and parallel to QQ′. The details of this adjustment are described later (Section VI).

The magnification is adjusted by putting the rod Y in one or other of the holes in LO ; these give magnifications of 260, 120, 60 and 30. It will

be noticed from the timing chart, Fig. 5, that the upper shoes descend while the rod Q is in its outward position ; at the same time the pointers EI would be pushed down on to the contacts J, but this is prevented by a lever (not shown in the diagrams) and a cam on the cam shaft Z, which push YOJ back to its zero position immediately after Q has completed its outward stroke, and hold it there until Q has returned to zero.

IV. THE CALCULATING MECHANISM

The general principle of the calculator has been discussed in an earlier paper[3] and has also been explained in Section II of this paper. Details of its construction are given in Fig. 2B, where it is drawn in plan with the top and the second stepped reckoner removed. It consists of five brass plates bolted together to form four compartments, two for the reckoners and two for the chains driving the counters, which are mounted on the top cover plates as shown in Fig. 2A.

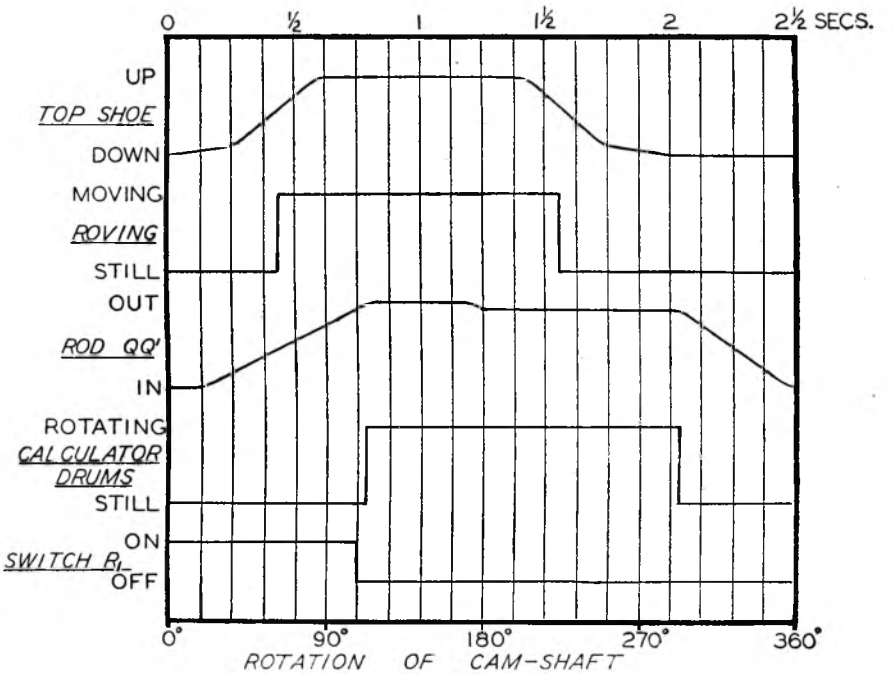


Fig. 5.

The stepped reckoners are steel drums 4 inches in diameter with teeth $\frac{3}{16}$ inch pitch. The pinions P_1 and P_2 are of brass with 9 teeth ; they are moved along their shafts S_1 and S_2 by brass fingers (12), Fig. 2C, attached to the control rods R, and they are prevented from over-running by click-springs, which are adjusted to hold them in the correct position to engage, without jamming, the first tooth of the drum when it rotates.

The positions of the control magnets M are indicated in Fig. 2B ; their actual shape is drawn in Fig. 1. They are each wound with 2,600 turns of No. 34 D.S.C. copper wire. The distances of both poles, X and Y, Fig. 1, from the control rod can be adjusted. These clearances were at first made two or three thousandths of an inch, but the permanent magnetism was sometimes sufficient to stop the rods, and it was found that a much wider clearance of roughly 1/100 inch was close enough to enable the magnets to stop the rods practically instantaneously. The weights W_2 are 230 grams each.

The rack T, Figs. 1 and 2B, is a hardened steel plate with teeth $\frac{3}{32}$ inch wide cut across it. Parallel to it and just above the control rods is a glass plate with six paper scales graduated in divisions equal to the teeth on the rack. These enable the positions in which the rods stop to be observed.

It will be seen from the timing chart, Fig. 5, that the calculator drums have to make one complete revolution, occupying exactly half a cycle of the machine, and then remain stationary for the other half cycle. A sprocket wheel (13) Fig. 2A, is loose on the shaft S of the drums and is driven through 2 : 1 bevels and a chain from the cam-shaft Z. The sprocket carries a pawl (15) which engages a single tooth in the disc (14) fixed to the shaft S. The sprocket also tends to drive the disc and hence the drums through a light friction clutch, but a stop (16) prevents the rotation of the drums by means of a finger (18) fixed to the shaft and also lifts the pawl over the tooth in (14). A pawl on the rod Q moves the stop clear just at the end of the forward stroke of Q. The drums then commence rotating, and, soon after, Q slides back just far enough to restore the stop, which arrests the drums after exactly one revolution.

The numbers of teeth in the sections of the first stepped reckoner D_1 are 0, 1, 2, 3 . . . 19, and on D_2 they are equal to $\frac{1}{2}[(m-10)^2+(m-10)]$, where m is the number in the corresponding section of D_1. As explained in the earlier *Memoir*[3], this arrangement is adopted in order to reduce the maximum number of teeth, which is now 45, whereas it would be 100 if the number were made equal to $(m-10)^2$. Since the number of teeth on each of the pinions, P_1, P_2, is 9 and there is a 4 : 1 reduction gearing between the shaft S_1 and its counter and a 2 : 1 between S_2 and its counter, the numbers of revolutions made by the counters during a test are :

$$\text{Revolutions by counter of } S_1 = \frac{\Sigma m}{4\times 9} = \frac{\Sigma m}{36}$$

Revolutions by counter of

$$S_2 = \frac{\Sigma\frac{1}{2}[(m-10)^2+(m-10)]}{2\times 9} = \frac{\Sigma(m-10)^2+\Sigma(m-10)}{36}$$

The standard number of observations is $n=360$, so that, by a suitable insertion of decimal points, the differences, A and B respectively, between the final and initial readings of the counters become

$$A = \frac{1}{n}\Sigma m$$

and

$$B = \frac{1}{n}\Sigma(m-10)^2 + \frac{1}{n}\Sigma(m-10)$$

$$\text{But the (standard deviation)}^2 = \sigma^2 = \frac{1}{n}\Sigma(m-10)^2 - \left(\frac{\Sigma m}{n} - 10\right)^2$$

$$= B-(A-10)-(A-10)^2$$

This may be written in the more convenient form

$$\sigma = \mathrm{B} - [(\mathrm{A}-9{\cdot}5)^2 - 0{\cdot}25]$$

The calculation of the standard deviation from this formula is facilitated by a table of the values of the term in brackets prepared from a table of squares.

Sufficient accuracy is obtained by having four-figure counters reading to the nearest tenth of a revolution to indicate A, and three-figure counters reading to the nearest revolution to give B.

V. THE ELECTRICAL CIRCUIT

The magnet coils M (Fig. 1) have a resistance of about 50 ohms, and thus require a potential of 15 volts across them to give a current of 0·3 amp. An attempt was made to use the contact J (Fig. 1) as a simple switch making the current through the magnet, but the rate of increase

of current in the coils when the switch was closed was too slow to give accurate results.

For a given final steady current the initial rate of rise of the current is proportional to the applied voltage, and so the applied voltage was increased to 200 volts and a resistance put in series with the magnet. The contact IJ could then no longer be used as a simple switch, as the sparking was considerable, and the contacts soon became fouled. Each contact IJ was therefore connected in the grid circuit of a gas-filled relay (Osram, type G.T.1), the magnet M being in the anode circuit.

The circuit is shown in Fig. 6, in which the connections to one magnet and gas-filled relay only are given; the switching arrangements on the left of the diagram are common to all six units and the magnets and relays on the other five units are wired in parallel with the one shown.

When the machine is running the magnetic relay m is closed, thus connecting the circuit to the 200 volt supply. The rotary switch R, which is mounted on the cam-shaft 2 (Fig. 2A) is arranged to close when the rod QQ′ (Fig. 1) is at rest in its zero position. During its outward stroke the contacts IJ are at first open and the grid-bias of -20 volts prevents the flow of anode current. As soon as one of the contacts is closed the grid is

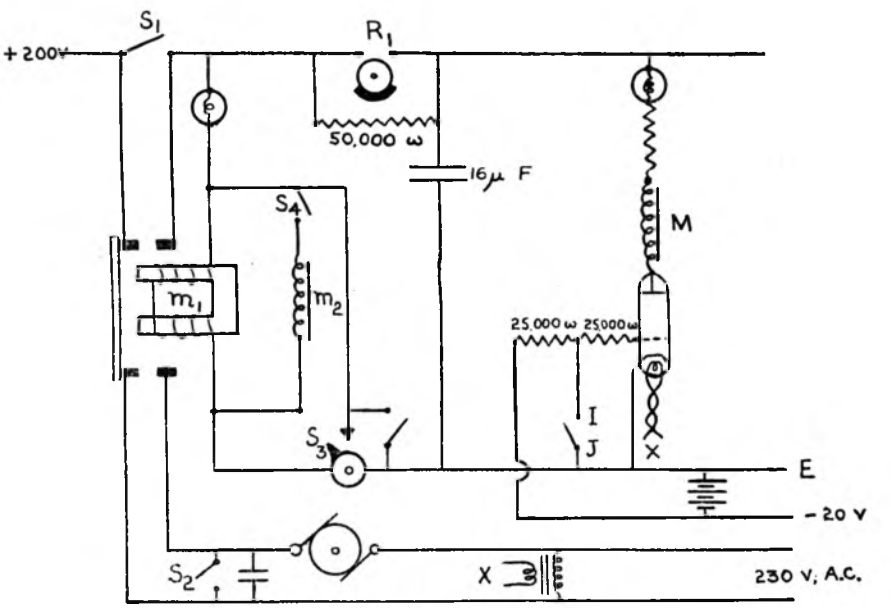


Fig. 6.

earthed and current flows through the corresponding magnet. In series with each magnet is a 240 volt, 100 watt tungsten filament lamp and a fixed resistance of 270 ohms. This arrangement allows a surge of about 0·6 amp. immediately after shorting the grid and then reduces the current to 0·27 amp. when the lamp heats up.

Just before the rod QQ′ completes its outward stroke the rotary switch R switches off all the magnets and allows the control rods of the calculator to slip forward as explained in section II.

The switching arrangements shown on the left of Fig. 6 make the operation of the tester more convenient.

The self-locking relay m_1 switches on both the motor and the D.C. supply to the magnets M when the press-button S_1 is depressed. The machine then continues running until m_1 is short-circuited by the switch S_3, which is operated by a ratchet wheel that moves one tooth every 20

revolutions of the calculator drums. S_3 is set before each test so that it closes after the required number (usually 360) of observations. As the machine over-runs more than one cycle after switching off the motor, it is necessary to provide another magnet m_2 in parallel with m_1 to stop the calculator immediately. This magnet is mounted on the end plate of the calculator (see Fig. 2A), and holds up a small armature; when it is switched off the armature falls and obstructs the movement of the stop (16) and so prevents further rotation of the calculator. When required, the machine can be run without the calculator by leaving the switch S_4 open. Since S_3 is driven from the calculator it is possible to stop the machine in the middle of a test to piece up a broken end without affecting the counting of the observations.

VI. THE ROVING TESTER IN USE

The procedure followed in an irregularity test on a sample of roving will now be described in detail.

After rovings have been unwound from the bobbins into cans, they are pushed through guides (7) Fig. 2B, with a piece of wire and threaded through the grooves with tweezers. With switches S_2, S_3 and S_4, Fig. 6, all open, the machine is started by pressing S_1. The positions in which the control rods stop is observed and, if necessary, the magnification is altered by moving the rod Y, Fig. 2, into another of the holes in OL, until the observations spread over at least six class intervals. The zero of the instrument is also moved to bring the observations into the middle of the range of the calculator by sliding the cylinder N along its rod and then locking it in position. Finally the lever that pushes YOI back to its zero position is adjusted to suit the position of N. The machine is stopped as required during these adjustments by a push-button in parallel with the switch S_3, Fig. 6.

The counters are next read, S_3 is set to make 360 observations, S_4 closed and the machine started by pressing S_1. At the end of the test the counters are again read and the position of N is noted on the scale (17), which is graduated in divisions equal to the teeth on T (Fig. 2B).

The top rollers are then removed to stop the feed, and the rovings are removed from the grooves which are cleaned free from fly. (This fly is so loose that, during the actual test, the bottom of the groove is kept clear by the passage of the roving.) N is then moved back to bring the zero readings within the range of the calculator, the machine is started again, and the positions in which the control rods stop are observed to the nearest tenth of a class interval. Let this be z for one of the rods, Z the corresponding position of N, and T the position of N during the actual test. Then if A and B are the differences between the final and initial readings of the counters, the mean thickness of the roving is

$$A + (T - Z) - z - 0{\cdot}5$$

The $0{\cdot}5$ is introduced because it is convenient to have the divisions on the scales above the control rods, R, to correspond with the edges of the teeth and to number them with whole numbers. The calculator, however, treats all observations which are less than one division behind the mth tooth as being m, whereas their mid position on the scale is $(m - 0{\cdot}5)$.

The standard deviation σ is calculated with the aid of the table from the formula already given :

$$\sigma^2 = B - [(A - 9{\cdot}5)^2 - 0{\cdot}25]$$

and is finally expressed as a percentage of the mean thickness.

When the highest magnification is being used, it is necessary to take a zero reading before and after each test, but with the lower magnifications one reading is sufficient.

Usually there are no stoppages due to broken ends except when dirty rovings are being tested in the $\frac{1}{64}$ in. grooves. Small pieces of seed

jam in these grooves and cause an abnormally high reading of thickness. If this is detected immediately, the machine is stopped by pressing the switch in parallel with S_3, Fig. 6; the seed is then removed and the test continued. One high reading has only a small effect on the result, but in cases of doubt the result on the unit affected is rejected.

VII. PERFORMANCE OF THE ROVING TESTER

Accuracy of the Calculator and the Magnifying Levers

The accuracy with which the magnets stop the control rods was first observed by running the machine on the lowest magnification without roving. The rods always stopped in the same position to within less than a tenth of a class interval, i.e. to within less than 1/100 inch. The total over-run of the rods was next measured by turning the machine over very slowly by hand and then running it at full speed. The over-run was about a fifth of a class interval.

In order to find the magnitude of the errors in the magnifying levers, readings were taken without roving at the highest magnification. The standard deviation of 47 observations on one rod was 0·18 interval and the extreme range 0·7 interval. Since the magnification is 260, this corresponds to a range of 1/4000 inch at the shoes. Its effects are to cause an error in the mean thickness of the roving due to the error in the zero reading and to make the measured standard deviation a little too large. The error in the mean can be made negligible by averaging a few zero readings, while the effect on a standard deviation of 1 interval is to increase it by 0·015; a correction could, if required, be applied to allow for this increase in the few cases when the standard deviation is as low as 1 interval. At the lower magnifications the errors can be ignored.

The Shoes

It is not essential that the six units of the tester should give identical results on the same roving, for the measurement of the standard deviation of thickness depends in any case upon arbitrary conditions such as twist, hank number and width of the groove, and the mean result on all six units can be regarded as that which would be obtained under certain average conditions. Inequalities in the units would however be very inconvenient, as it is sometimes unnecessary to test as many as six ends, and it is an advantage to be able to perform the calibration against weight per unit length, discussed later, on one or two units only.

These inequalities may be due to differences in (1) the maximum force on the roving, (2) the time of application of the force, and (3) the widths of the grooves and blades.

The load on the upper shoe was adjusted for each unit by moving the weight (W_1, Fig. 3) until it balanced a 15 lb. weight suspended from a cord passing over a pulley and attached to the shoe. The effect of possible variations in this force upon the standard deviation was measured by testing six ends of sliver or roving at the normal load and also with the load increased by about 3 lb. This was done for each size of groove, and the effect of increasing the load was to decrease the percentage standard deviation by amounts varying from 2 to 5 per cent. of itself. Since the possible differences between loads on the shoes are very much less than 3lb. it is not likely that they will cause any appreciable differences in the measured standard deviations.

The time of application of the load can be increased by lowering the lock nuts (5), Fig. 3. These are normally adjusted so that the lever V just lifts when the upper shoe descends into the empty groove. It was found that lowering them sufficiently to increase the time by at least 50 per cent. had only a small effect on the percentage standard deviation.

The equality of the units was then investigated directly. Six cans of roving were put up and a full test performed. The test was repeated five

times on further lengths of roving from the same cans with the cans interchanged in such a way that each can was tested once on each unit. A 2-hank roving gave the following results with the $\frac{1}{32}$ inch shoes:

No. of unit	1	2	3	4	5	6
Mean thickness on the six cans ...	16·74	17·51	16·97	17·60	17·22	17·68
Mean % S.D. on the six cans ...	13·25	13·10	13·69	13·29	13·52	13·11

Grand mean % S.D. = 13·33.

An analysis of variance on the individual per cent. standard deviations gave:

Source of variance	Sum of squares	Degrees of freedom	Variance
Between units	1·65	5	·33
Within units	8·56	30	·285

The variance between units is only very slightly greater than the residual within units, showing that the differences between units are of no importance.

Similar results were obtained with the $\frac{3}{32}$ inch and $\frac{1}{4}$ inch shoes, but with the $\frac{1}{64}$ inch shoes the variance between units was 2·3 times the residual, which is just below the 0·05 level of significance. This is probably the best that can be done with the fine grooves and blades, and, since the residual variance may be regarded as a measure of the inaccuracy of the estimate of the standard deviation obtained on one unit, the fact that the variance is not significantly greater than the residual means that the differences, if any, between units are not sufficient to cause a serious loss of accuracy.

Calibration: The Correlation of Thickness with Weight

In the paper on the Photographic Roving Regularity Tester[2] it was shown that, because there is a high correlation between the thickness measured on that tester and the weight per unit length of the roving, it is possible to convert the standard deviation of thickness to that of weight by multiplying by a conversion factor obtained by weighing a comparatively small number of short lengths of roving whose thickness has previously been measured on the tester.

As the method of pressing the roving into the groove is different on the automatic tester, it remains to see whether a satisfactorily close correlation is still obtained.

The method employed is the same as on the Photographic Tester except that it is necessary to use a different means of identifying the portions of roving that have been measured. The rollers A, Fig. 1, are removed, and an ebonite " pen " is supported on a bracket just in front of one of the lower shoes, Fig. 7. The pen is a piece of ebonite an inch long and a quarter of an inch wide. Two shallow holes are drilled near its ends and these are joined by a fine groove scored with a knife. The ebonite is filed away on either side of the groove to leave a fairly narrow edge ; this edge is just below the level of the bottom of the groove in the shoe. The two holes are filled with Indian ink, and a spring attached to the upper shoe presses the roving down on to the pen when the shoe descends. This makes a fine mark across the roving. The distance of the mark from the point of contact of the blade on the upper shoe with the roving is found by putting a piece of coarse yarn in the lower shoe and placing specks of rouge in various positions on the edge of the blade. The rouge only marks the yarn when it is close to the point of contact and by approaching this point from each side and measuring from the rouge marks on the yarn to the pen mark the distance is obtained to within less than a millimetre.

The calibration is carried out by two observers ; one pulls the roving by hand through the shoe about ten inches at a time and the other notes the class intervals in which the appropriate control rod (R, Fig. 1) stops. Ten observations are made in this way and then a few yards of roving are pulled through and the process is repeated until 100 measurements have been made.

Eighth-inch lengths are cut from the portions of roving that have been measured between the shoes on the apparatus described in connection with the photographic tester[2]. They are weighed on a torsion balance.

Tests on a wide range of rovings gave correlation coefficients between weight and thickness varying from 0·93 to 0·99.

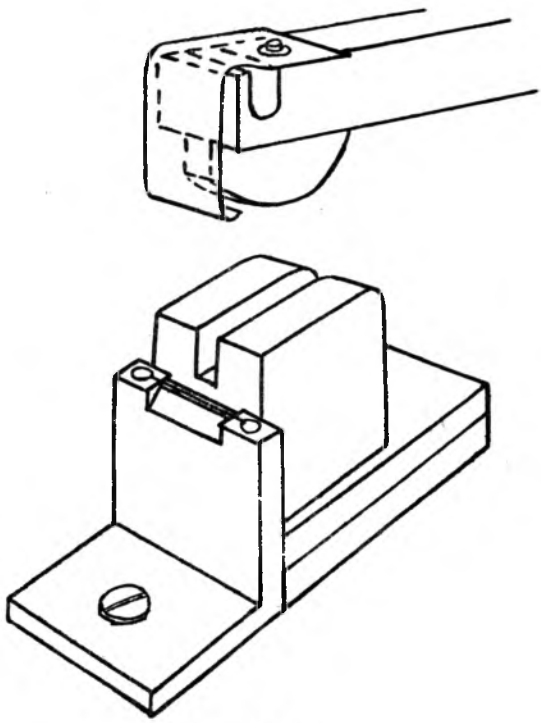


Fig. 7.

VII. THE AUTOMATIC YARN TESTER

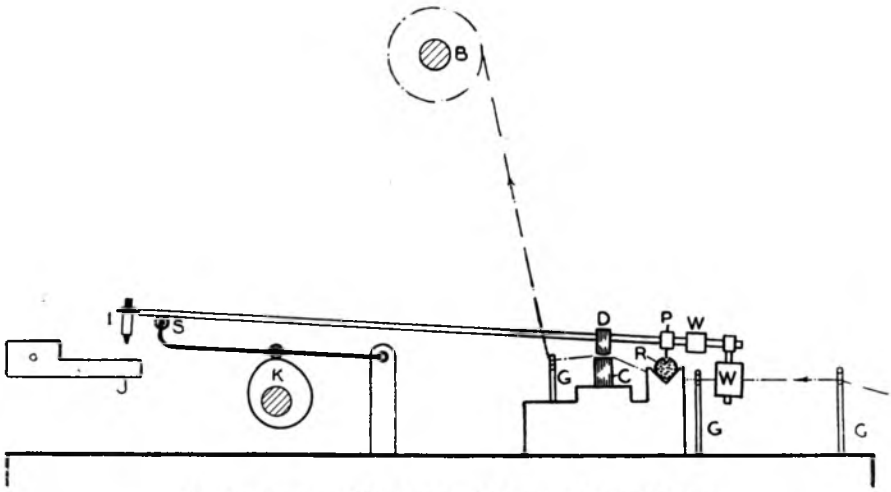
The yarn tester is practically identical with the roving tester except for the method of measuring the yarn thickness. As on the photographic yarn regularity tester the thickness is measured between two steel shoes under a light pressure. The arrangement of one measuring unit is shown in elevation in Fig. 8. On the tester six of these units are set up parallel to one another $2\frac{1}{2}$ inches apart and occupy the space corresponding to the rollers (A), shoes and pointers in Fig. 2.

The yarn (Fig. 8) passes through guides G, over the fixed shoe C and is wound on a shaft B. A ball drag before the first guide tensions the yarn. The upper shoe D is fixed to a brass rod PD which is prolonged to I by a light aluminium tube and carries the tungsten contact point at I. The whole upper shoe system pivots on two steel needles P which rest in a conical hole and V-groove in a glass rod R fixed to the base of the instrument. The hole and groove are formed by pressing a steel chisel and a steel point fixed in a holder into the glass rod after softening it under a blow-pipe.

It is necessary that the contact points I should be electrically connected to the base of the machine. This is done by a fine wire attached to each shoe system at a point near the steel needles P.

The system is balanced so that the upper shoe rests on the yarn with a pressure of 2·5 grams. This is done by hanging a known weight at the correct position behind P, adjusting the weights W until the system is in neutral equilibrium, and afterwards removing the known weight.

The shaft B is driven through a clutch controlled by a cam so as to wind the yarn intermittently about a yard at a time. While the yarn is passing through, the upper shoes are lifted clear by a rod S driven by a cam K, which also lowers the shoe on to the stationary yarn to make a measurement. The speed of lowering is about $\frac{1}{4}$ inch per second, so that the effect of the inertia of the lever system on the pressure on the yarn is negligible. The shoe remains resting on the yarn while the lower contact J moves up to meet I. When necessary the factor for converting the standard deviation of thickness to that of weight is found by a method similar to that already described for rovings. The yarn is marked in the same way, except that the spring which presses the yarn on to the pen is mounted on a separate lever, which is depressed at the right time by a cam mounted on the same shaft as the cams K (Fig. 8).



Note on the Magnetic Clutch Integrator

The automatic yarn tester was at first fitted with the magnetic clutch integrator described in a previous paper[3]. It is perhaps worth while stating that this integrator is capable of sufficiently accurate results, and was used on the tester for some considerable time. Its disadvantage for routine testing is that small but appreciable corrections have to be applied for the overrun of the integrating discs. These corrections vary somewhat from time to time and the integrator has therefore to be calibrated at regular intervals. This disadvantage would be greatly reduced if the integrator could be run at a lower speed. Further, on testing machines where only the mean of the observations is required, this type of integrator is usually more than sufficiently accurate, and has in fact proved quite useful for this restricted purpose.

The instruments were constructed in the B.C.I.R.A. Instrument Workshop. The authors wish to acknowledge a great deal of valuable advice from the Workshop staff.

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[1] Anderson, Cavaney, Foster, and Gregory. *Shirley Inst. Mem.*, 1945, **19**, No. 11.
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ABSTRACTS

1—FIBRES AND THEIR PRODUCTION

(B)—ANIMAL

Wool: Discolouration. M. L. Botha. *Fmg. in S. Africa*, 1945, **20**, 367-368. A brief review of established facts concerning the occurrence and characteristics of canary stain, golden colouration, green and red colouration, pink rot, and colouration due to external causes, e.g. soil and vegetation peculiar to South African conditions W.

Skinfolds in Merino Sheep: Effect in Leather Industry. J. C. Bezuidenhout. *Merino Breeders' J.*, 1945, **7**, No. 2, 27. The developed skin is useless to the tanner. Rippled pelts are difficult to handle and to dewool, cannot be used for lining boots and shoes and cannot be stitched in a sewing machine. W.

Karakul Wool. P. D. Rose and Ors. *Fmg. in S. Africa*, 1945, **20**, 373-376. A short description is given of the growth and characteristics of the Karakul fleece. In 1944-1945, 36,832 bales of Karakul wool were sold in Union ports, and the classification of this product should now receive attention. Suggestions are made for preparing and classifying the fleeces according to colour and length, and for packing and marking bales. W.

Development Controversy: Question of Uniformity. T. B. Jordaan. *Merino Breeders' J.*, 1945, **7**, No. 2, 14-15. Highly-developed merino stud sheep cannot have the same degree of uniformity as plain-bodied loose-woolled sheep, because the stud breeder supplies types to suit different localities and clients. Uniformity is more common in wild life species than in improved strains; plain-bodied sheep owe their uniformity to the laws of nature. W.

British Sheep and Wool: Suggestions for Improvement. F. H. Brewitt and N. Fawcitt. *Wool Rec.*, 1945, **67**, 1008-1009; *Farmer & Stockbreeder*, 1945, **59**, 920. Suggestions for improving the British wool clip were made at a conference held on 8th June, 1945, at the Midland Agricultural College, Sutton Bonington, under the chairmanship of Prof. H. G. Robinson, Principal of the College. F. H. Brewitt spoke on the care and maintenance of wool, stressing the unsatisfactory manner of preparing some British wools for the market, and the baneful effects of bloom dips and of the use of tar for marking sheep. N. Fawcitt spoke of the marked deterioration of sheep breeding in the Midlands during the past 30 years, due mainly to cross-breeding to obtain smaller mutton. British wools contained too many sorts, as compared with competing types from New Zealand. In Britain a closer contact between flockmasters and manufacturers was desirable, and more culling of flocks should be practised. Tribute was paid to the pure breed sheep societies. W.

Merino Fleece: Quality and Weight. H. S. Major. *Queensland Country Life*, 1945, **10**, No. 40, *Merino Suppl.* p. 8. The present tendency to produce coarser wool on merinos is adversely criticised. Such clips have increased weight of wool per sheep, but at the cost of uniformity and compactness of the fleece. Environment has a greater influence than breeding on the quantity and quality of wool. W.

Merinos: Wrinkle and Development. "Old Hand." *Pastoral Rev.*, 1945, **55**, 264-265. Wrinkle and development are not identical, wrinkly sheep not necessarily having the loose skin which is the main feature of development. Wrinkle without development is associated with blowfly attack, weak general constitution, and low wool yield; it is inherent, and difficult to breed out. The big fronts and horseshoe tails on developed sheep can be increased by selec-

tion and breeding, but are mainly brought about by nourishment. A developed animal of either sex with loose skinfolds is not likely to give other than plain-bodied stock if the wool on the tip of the folds is as long as on other parts of the body, or nearly so. E. N. Roberts' opinion that development is caused by the excessive crowding of fibres on the skin (these *Abs.*, 1945, A 1) applies only to the right type of development. W.

(C)—VEGETABLE

Brazilian Delfos and Stoneville Cottons: Yields in Ribeirão Preto. I. Ramos and M. V. de Morais. *Bragantia, S. Paulo,* 1943, **3**, 553-595. Lines of various cottons selected by Harland have been tested in a number of localities in the State of São Paulo. The average four-year yield of the Delfos and Stoneville selections was 18·3 per cent. higher than that of the standard variety, the actual differences varying between 13·8 per cent. and 28·9 per cent. The variations in yield from one year to another were very great and the various causes responsible for this are discussed. The annual variations were somewhat less pronounced in most of the Delfos selections than in the control variety and some selections varied less than others; several selections exceeded the control in four successive years, the best being line 38/1418. The Stoneville selections, though yielding somewhat less than the Delfos selections, were also well above the standard in average yield and their annual fluctuations were also less; line 38/1709 yielded more than the standard in all years but one and had unusually high lint percentage. C.

Peruvian Tangüis Cotton: Selection. S. C. Harland. *Bull. Inst. Cott. Genet., Lima, Peru,* 1944, No. 1, 98 pp. The Tangüis variety, predominant in Peru, originated from a single plant of *Gossypium barbadense* found in a crop of *G. hirsutum*. Tangüis was originally resistant to *Verticillium* wilt and was high-yielding. The lint was long, coarse and white, and the ginning percentage very high. In the course of its spread through Peru, the variety became very mixed and breeding work to establish a superior type was started in 1940. The initial material for breeding consisted of 22,000 single-boll samples. These were reduced to 2863 by eliminating those with lint less than 1¼ in. long or of bad colour. A single row of 11 plants was raised from each boll in 1940-1, rows which fell below fixed standards for lint length, boll weight, ginning percentage or yield being rejected. Subsequent rejection of rows with bad lint colour reduced their number to 41, from which 200 plants were selected. Seed from these was sown in a replicated trial. In 1942, correlation studies showed that selection for lint length, boll weight, ginning percentage and yield had been effective even on single rows of 11 plants. A considerable all-round improvement was obtained in the variety. The 200 strains under trial were reduced to 43 on the basis of the above four characters and also on fineness and colour of lint. These 43 strains formed the basis of the first two commercial multiplications of seed distribution by the Institute. For further breeding, the best 10 strains were taken, 10 plants from each, the selection being on much the same lines as previously. Of the 100 plants so tested, 63 were retained for bulk multiplication. It is intended to continue breeding in this way, so that successive distributions of seed will displace older types, and deterioration through admixture and crossing will be minimized. A study was made of the errors involved in estimating lint length by a commercial grading method and by measurement of halo length on combed seeds. In an appendix some genetical data are given. In crosses with Sea Island, Tangüis is shown to carry dominant genes for hairiness (H^{TA}), yellow corolla (Y) and yellow pollen (P). C.

Russian Cotton: Cultivation and Breeding. E. Morgenroth. *Kühn-Archiv,* 1943/44, **60**, 315-336 (through *Plant Breed. Abstr.*, 1945, **15**, 148). An historical study, based on Russian sources. C.

Cotton Plants: Resistance and Selection in Belgian Congo. *Rept. of* 1940-41, *Inst. Agron. Congo Belge,* 1943, 152 pp. (through *Plant. Breed. Abstr.*, 1945, **15**, 118). A study of the resistance of various lines of cotton to stigmatomycosis at Bambesa showed some resistant trees, but the progeny of 145-C-53 still gave, in practice, the greatest yield of second grade cotton. A wilt-resistant plant A6, supposedly from 270, was discovered in 1940 and the recent reports on the progeny are promising. At Gandajika, experiments were made on the resistance of lines of cotton to *Dysdercus*. The F_2 were least subject to attack, possibly owing to their rough capsules. The Triumph types were more resistant

than the U4 types. The results of experiments at Bambesa in selection, hybridization and multiplication are recorded and of selection at Gandajika. C.

Empire Cotton Crops: Production, 1943-44. Empire Cotton Growing Corporation. *E.C.G.C. 24th Rept. Admin. Council,* 1945, 18 pages; Summarised in *Textile Weekly,* 1945, **36**, 64-68. Particulars of acreage and yield, climatic conditions, and prices obtained are recorded, and a table summarises the crops obtained (400 lb.) in the 16 main Empire fields (excluding India) for the years 1933-34 to 1943-44. A quick recovery from the decline of recent seasons is anticipated. C.

Cotton: Cultivation in Argentina. A. Banfi. *Boletin Mensual, Junta Nacional del Algodón, Buenos Aires,* 1943, Nos. 101-102, 459-466. A discussion of the work on weed control and cotton tillage carried out at West Point (Mississippi) and of similar work at the Stoneville Experimental Station, Mississippi (Delta Branch Experiment Station). It is pointed out that, in view of the similarity of the regions, the general conclusions should be applicable to cotton cultivation in the Chaco territory. C.

Cotton Plant: Variety Trials in Argentina. *Boletin Mensual, Direccion de Algodón, Argentina,* 1944, Nos. 107-108, 120-148. An account is given of the work carried out in 1943 at the Experiment Station of Presidencia Roque Saenz Peña, Chaco. Variety trials were carried out with 23 varieties, including various Deltapine, Stoneville, Coker, and other cottons. The work also included studies of time of sowing, distances between rows and plants, method of sowing, bedding, fertilizers, germination, etc., and multiplication of selected varieties. C.

Tanguis Cotton: Selection Work in Peru. A. Verdejo. *Boletin Mensual, Junta Nacional del Algodón, Buenos Aires,* 1943, Nos. 103-104, 553-558. The organisation of La Molina Experiment Station, Peru, is briefly described and an account is given of the work of the department of vegetable genetics on the improvement of Tanguis cotton by selection. Characteristics considered in the selection work, such as weight of seed cotton per plant, earliness, ginning out-turn, weight of 100 seeds, weight of seed cotton and fibre per boll, classification of fibre, resistance to wilt, etc., are discussed and indications are given of progress being made. Charts for recording the results are shown. C.

Bollworm: Control. J. C. Gaines. *J. Econ. Entomol.,* 1944, **37**, 723-727 (through *Exp. Sta. Rec.,* 1945, **92**, 814). In two experiments involving field-plot treatments with various insecticides (1942), basic copper arsenate and lead arsenate seemed more effective than other insecticides tried; cryolite was effective until the latter part of the period, during which time the number of showers was greatest. The gains in yield from use of various insecticides in tests of the preceding seven years are tabulated and discussed. Calcium arsenate proved profitable against the bollworm, but not as profitable as some other insecticides. Cryolite was effective against bollworms, but yields were reduced when weevils occurred in injurious numbers. Lead arsenate was more effective than cryolite against weevils, and more so against bollworms than calcium arsenate; when used for both weevil and bollworm control, the yields were higher than when either of the other materials was used exclusively. In 1942 basic copper arsenate proved the most effective of any insecticides used against bollworms; the high yields from use of this material appeared to be due partially to the presence of copper. The two treatments resulting in highest gains were basic copper arsenate and alternate applications of calcium arsenate and lead arsenate in a schedule of treatments for both weevil and bollworm control. When bollworms occurred alone high gains were also made with cryolite and lead arsenate. C.

Cotton Aphid: Control with Rotenone and Nicotine. J. C. Gaines. *J. Econ. Entomol.,* 1944, **37**, 728-729 (through *Exp. Sta. Rec.,* 1945, **92**, 813). Calcium arsenate-sulphur-rotenone mixtures were effective in preventing the increased development of aphids on cotton that occurred when the arsenate alone was applied, but they were not as effective in aphid control as alternating applications of calcium arsenate with arsenate containing 2 per cent. nicotine sulphate. On the most fertile soils, where several applications of the arsenate are almost always needed for insect control, the latter procedure should be profitable; on upland soils, where fewer applications are needed, a single

"clean-up" application may be relied upon to control aphid infestation in those years when it becomes serious. C.

Cotton Seed: Argentine Production and Utilisation. *Boletin Mensual, Junta Nacional del Algodón, Buenos Aires,* 1943, Nos. 103-104, 541-549. Tables and graphs are given showing Argentine cotton seed production, quantities of seed utilised industrially, and productions of crude oil, cake and meal, husks, linters, etc., in the years 1930-1942, inclusive, and monthly productions in 1942 of seed, cake and meal, linters, etc., and of crude, neutralised and refined oil and margarine. In 1942, total seed production amounted to 155,016 tons, of which 129,921 tons were used industrially, resulting in the production of 18,046 tons of crude oil, 49,036 tons of cake and meal, 47,578 tons of husks and 5,784 tons of linters. C.

Argentine Cotton: Production in 1942-1943. *Boletin Mensual, Junta Nacional del Algodón, Buenos Aires,* 1943, Nos. 103-104, 539-540. Argentine cotton production in the 1942-43 season reached a record figure of 328,921 tons of seed cotton, from which 107,890 tons of fibre and 205,350 tons of seed were obtained. The area under cultivation was 336,470 hectares. The area for cotton cultivation in the 1943-44 season is estimated at 405,000 hectares. Tables are given showing the distribution of productions and areas in the various provinces and territories. C.

Cotton: Cultivation in Argentina. *Boletin Mensual, Junta Nacional del Algodón, Buenos Aires,* 1943, Nos. 103-104, 575-597. The history of cotton production in the Argentine Republic is briefly reviewed and tables are given showing acreage, production and yield in the period 1909-10 to 1942-43, acreage and production by provinces and territories, and details of the acreage, production, yield, gins installed and working, ginning out-turn, monthly ginning results, and quality of fibre produced in each of the cotton-growing territories and provinces in recent years. Production in 1942-43 amounted to 328,921 tons of seed cotton, yielding 107,890 tons of fibre. C.

Cotton: World Production. *Boletin Mensual, Junta Nacional del Algodón, Buenos Aires,* 1943, Nos. 103-104, 564-574. The early history of cotton cultivation, the influence of the invention of ginning, spinning and weaving machines in the eighteenth century, the predominance of the United States, recent increases in cotton production in other countries, the influence of the world depression of 1929, the influence of United States cotton policy, and post-war prospects, particularly probable expansions of cotton cultivation in Asia, Africa and South America, are discussed. Tables and graphs are given showing world production and acreage and world production by countries in the period 1919-20 to 1942-43; acreage, production and yield in the United States in the seasons 1899-1900 to 1942-43; and acreage, production and yield in India, China, Russia, Egypt, Brazil, Peru, Mexico, Uganda, Korea, Sudan, Turkey and other countries in the seasons 1921-22 to 1942-43. C.

Cotton Production Research: American Programme. F. J. Welch. *Mississippi Sta. Rept.,* 1945, 103 pp. (through *Exp. Sta. Rec.,* 1945, **93**, 35). Included in this report are statements of the titles and objectives of the current active projects on Federal, State and private funds classified as follows: (1) Breeding, genetics and improvement of varieties; (2) cotton variety testing work and geographic distribution of varieties; (3) the genetic, technical, and economic aspects of cottonseed production; (4) soil fertility and the use of fertilizer in cotton production; (5) cotton disease control and seed treatment for better germination of improved varieties; (6) cotton insect and pest control; (7) cultural methods and mechanical operations; (8) general farm management problems and practices and marketing and distribution problems; (9) ginning and other preparations for the market; (10) cotton fibre analysis in relation to cotton utility as a basis for breeding and production, for improvement of ginning, for better and extended utilization, and for standardization and classification; (11) foreign competition and demand; (12) domestic price policies and programmes. C.

(D)—ARTIFICIAL

Kelp: Production; History. V. J. Chapman. *Nature,* 1945, **155**, 673-674. A brief account is given of the history of the kelp trade, particularly in Scotland and France, and the recent formation of the Scottish Seaweed Research Association is mentioned. C.

Wood Pulp: Production for Rayon. A. G. Arend. *Silk J. Rayon World*, 1945, **21**, June, 31-32, 38. A simple account is given of the production of wood pulp and of the chemical characteristics of pulp for rayon. C.

Alginate (Seaweed) Rayon: Production and Properties. J. B. Speakman. *Nature*, 1945, **155**, 655-657. The development of methods of spinning Ca alginate and alginic acid rayons is described, and the production of alkali-resistant products by treatment of these rayons with basic acetates of Cr and Be or with formaldehyde is discussed. The properties of alginate rayons, particularly the calcium member, are noted and examples are mentioned of applications in which novel effects are obtained by making use of the alkali-solubility of Ca alginate yarns. C.

Synthetic Fibres: Recent Developments and Future Uses. R. Bouvet. *Amer. Dyes. Rept.*, 1945, **34**, 187-188, 193. A general discussion of recent developments in synthetic fibres and their use in fabrics of the future. C.

Fiberglas Textiles: Potentialities. G. Slayter. *Amer. Dyes. Rept.*, 1945, **34**, 189-190, 193. The production of glass fibres is briefly described and the properties of the fibres, particularly dimensional stability and resistance to moisture, fire, mildew, alkalis, acids, etc., are discussed. Uses in Fiberglas insulation and filter fabrics and as reinforcement for plastics are reviewed, and uses of Fiberglas fabrics coated with synthetic rubbers and resins are mentioned. Possible future uses, particularly as decorative materials, are suggested. Fiberglas fabrics are not suitable for use as wearing apparel or upholstery fabrics or for other applications where they would be subjected to repeated flexing or friction. C.

Glass Yarns and Fabrics: Production. Frederick Marsden. *"Times" Trade & Engineering*, 1945, **57**, June, 10-11; July, 11. A straightforward account is given of the spinning of glass filaments in Scotland, the properties of spun glass yarns, and the uses of glass fabrics. C.

Bleached Pulps: Preparation from Douglas Fir. H. E. Peterson, M. W. Bray and G. J. Ritter. *Paper Trade J.*, 1945, **121**, *TAPPI*, 13-18. Exceptionally strong, bleached pulps were made from Douglas fir by purification of neutral sulphite semi-chemical pulps by the holocellulose method. A yield of 57 per cent. of bleached pulp, having an α-cellulose content of 87 per cent., was obtained. The α-cellulose recovered amounted to approximately 50 per cent. of the moisture-free weight of the wood. Test beater strength data indicated that the bursting strength of this highly purified pulp was much higher than that of sulphite and considerably higher (approximately 18 per cent.) than that of unbleached kraft pulp made from an identical sample of the wood. The high yield of α-cellulose and its viscosity (43·0 centipoises in cuprammonium solution) indicated that little degradation of the cellulose had resulted from its preparation. Owing to the hemicelluloses present, the bleached pulp hydrated very rapidly in the test beater, requiring only approximately 20 min. to attain the maximum bursting strength. Further processing to a condition approximating that required for greaseproof or glassine type of paper was accomplished without loss in bursting strength. Removal of various amounts of the hemicelluloses by extraction with caustic soda solutions of varied concentration changed the physical properties of the pulp and increased its whiteness. By such a treatment the pulps developed strength more slowly to lower bursting and tensile strengths, but showed an increase in resistance to tear. The data indicate that pulps equal in strength to those prepared from spruce by the same method, can be made from Douglas fir. C.

Pulps: α-Cellulose Content; Determination. R. Axling. *Svensk Papperstidn.*, 1944 **47**, 602-604 (through *Chem. Abstr.*, 1945, **39**, 2402[9]). The α-cellulose content of pulp is determined in Sweden either indirectly or gravimetrically as resistant α-cellulose. The results obtained by the two methods are not identical, the discrepancy becoming the greater, the lower the viscosity of the pulp. Neither the method of degradation nor that of purification is responsible for the difference. The values determined indirectly are in direct relation to the actual yields obtained in the manufacture of rayon and staple fibre. However, purchasers of dissolving pulp specify the α-cellulose content determined according to some gravimetric method. The values thus obtained do not correspond to the rayon yield which the pulp will give. The lower the viscosity of the

pulp, the greater will be the discrepancy. This fact is of commercial importance because pulps of low viscosity will appear to have low α-cellulose content, whereas they actually represent qualities which are far more expensive to manufacture. C.

Pulps: Suitability for Cellulose Acetate Production. G. Jayme and U. Schenck. *Cellulosechemie*, 1944, **22**, 54-56 (through *Chem. Abstr.*, 1945, **39**, 2402[5]). In a method of determining the suitability of pulps for the production of cellulose acetate the rasped fibre is treated with glacial acetic acid at 90° for 3 hours, cooled, filtered, and washed with acetic acid until the filtrate is colourless. This activated residue is then acetylated with a mixture of acetic acid, sulphuric acid and acetic anhydride under carefully standardized conditions with thermostat control, which are described in minute detail. At the end of the acetylation period, the turbidity of the solution is measured by means of an auxiliary part of the Pulfrich photometer. The value obtained is termed the "initial turbidity value." The turbid solution is then centrifuged at 3,000 r.p.m. for 5 min., and poured from the residue and this operation is repeated three times (or until the turbidity of the solution remains unchanged). After centrifuging, the turbidity is again determined and this value is termed the "final turbidity value." The undissolved residue is filtered, washed successively with acetic acid and water, dried, and weighed. The difference between the initial and final turbidity values and the magnitude of the undissolved residue indicate whether or not the pulp is suitable for acetate formation. However, the gross differences between different pulps are well shown by the final turbidity value alone. C.

Cellulose: Acetylation. F. A. Bertuzzi, S. A. Suarez, O. Elizaga and R. Kamachi. *Rev. facultad quim. ind. agr.* (Univ. nacl. litoral Santa Fé, Argentina), 1940-1941, **9**/**10**, 63-70 (through *Chem. Abstr.*, 1945, **39**, 2647[7]). Data are presented on the effects of variation in time and temperature on the acetylation of cellulose and of variations in concentration of the catalytic agents and of time on the hydrolysis of the polyacetate. The process is predicted on the assumption that the best method of preparing a moderately acetylated cellulose consists of over-acetylation and subsequent hydrolysis to the desired product. Cotton (5 g.) is added to 20 c.c. of acetic acid containing 0·2 c.c. of sulphuric acid (d. 1·84). In the course of an hour 13·8 c.c. of acetic anhydride are added. The temperature is kept between 10° and 40°. When all the cellulose is dissolved (a clear liquid) hydrolysis is effected with 29 c.c. of a mixture of 90 c.c. of water and 10 c.c. of sulphuric acid (d. 1·84). Precipitation of the di-acetate takes place during 12 hours on addition of water with strong agitation. In seven acetylations the acetyl content (expressed as acetic acid) varied from 60·1 per cent. for 150 min. to 67·8 per cent. for 1,365 min. It required 1,680 min. for complete disappearance of the fibres at 20° and only 50 min. at 60°. In the hydrolysis for 12 hours at 40°, 55·8 per cent. acetyl resulted with 1 c.c. of catalyst and 42·8 per cent. for 5 c.c. Samples acetylated for 12 hours at 40° were immediately hydrolysed with caustic soda for various lengths of time. After 130-310 min. the content of acetic acid was 64 per cent.; after 370 min., 65·2 per cent.; after 1,450 min. 46·9 per cent. Maximum solubility in acetone (96·6 per cent.) was obtained for diacetate prepared by acetylation at 60° for 50 min. C.

Cellulose: Structure and Reactions in the Viscose Process. R. Bartunek. *Cellulosechemie*, 1944, **22**, 56-63 (through *Chem. Abstr.*, 1945, **39**, 2401[5]). Based on laboratory and industrial experiments, the hypothesis is advanced that, as the result of the stratified fibrillar and fine structure of cellulose, diffusion processes are retarded. In viscose formation, mercerization is retarded because the aqueous caustic soda solution, as it penetrates the fibre, becomes reduced in strength. Xanthate formation is slowed down because of the difficulty of carbon disulphide diffusion, and the treated fibre dissolves only when the swelling pressure within the fibre layers is sufficiently great to rupture those outer layers which swell very little or not at all. Rapid methods of testing are described in detail. The lignin number is determined by treatment of the fibre with 13 per cent. nitric acid at 40° and colorimetric comparison of the yellow colour with a standard solution of potassium dichromate and permanganate. The degree of bleaching of a pulp may be measured in terms of

a carefully standardized microscopic staining reaction with malachite green. "Carbolated-gentian violet" (von Fram's stain), which is fixed by acid groups of the fibre, is used for measuring the carboxyl groups and the degree of injury due to oxidation. Xanthate viscosity and degree of polymerization are determined by a standardized laboratory xanthation procedure which is described in detail. Methods of determining "resistance to mercerization" and "resistance to xanthation" of a pulp are described. The "resistance toward viscose formation" for a pulp is the average of these two. Data showing the influence of the hemicellulose content of alkali steeping liquors on the magnitude of "resistance to mercerization" are presented. Correlations between degree of polymerization and "resistance toward viscose formation" are shown graphically and discussed. C.

Viscose: Effect of Atmospheric Oxygen. O. Samuelson. *Svensk Papperstidn.*, 1944, 47, 597-601 (through *Chem. Abstr.*, 1945, **39**, 2402[2]). The degradation of viscose as a result of intimate contact with air was followed by viscosity measurements of the viscose and of the cellulose regenerated from it. The degradation could not be traced to catalytic effects of metal salts. Attempts to prevent the action of atmospheric oxygen by the addition of glucose and sulphite failed. When preparing viscose on a laboratory scale, the influence of the atmospheric oxygen is suitably eliminated by dissolving the xanthate in an atmosphere of nitrogen. On a mill scale, the common procedure of dissolving the xanthate in large quantities in the usual equipment will probably prevent any serious degradation. However, since attempts are being made to improve the properties of viscose by intensified mechanical treatment, it is not impossible that a stage may be reached where dissolving of the xanthate in an atmosphere of nitrogen will become necessary to exclude the harmful effects of atmospheric oxygen. C.

PATENTS

Cellulose Ether Films and Filaments: Wet-stretching. E. I. Du Pont de Nemours & Co. and W. J. C. Amend. B.P.569,878 of 2/6/1943: 13/6/1945. A method for improving the physical properties of products produced by shaping and coagulation of alkaline aqueous solutions of an alkali-soluble, water-insoluble cellulose ether, e.g. methylcellulose, comprises wet-stretching in the presence of urea, as for instance up to 100 per cent. If desired the urea may be included in the alkaline aqueous solution of the cellulose ether. Alternatively, the urea may be introduced into the wet coagulated cellulose ether shaped article prior to or during the wet-stretching operation. In general there should be 5-30 per cent. of urea associated with the methylcellulose when the stretching takes place. As a rule, stretching about 30 or 33 per cent. in any given direction increases the tenacity in that direction about 75 per cent. C.

Crimped Viscose Rayon: Production. Courtaulds Ltd. and W. R. Weigham. B.P.570,159 of 18/11/1943: 25/6/1945. A process for the manufacture of crimped continuous or discontinuous filaments of relatively high tenacity from viscose consists in coagulating the viscose filaments in a spinning bath containing dilute sulphuric acid and sufficient metallic sulphates to delay the decomposition to cellulose hydrate, withdrawing the filaments so produced from the spinning bath while they still contain at least 7 per cent. of xanthate sulphur calculated on the dry cellulose, the xanthate sulphur being determined by a specified method, stretching the filaments in the presence of hot dilute acid at a temperature of at least 60° C., maintaining the thus-stretched filaments under tension in the same or a further acid bath at a temperature of at least 60° C. until the decomposition of the cellulose xanthate to cellulose hydrate is substantially completed and the filaments are substantially free from xanthate sulphur and subsequently relaxing the filaments in the presence of water, preferably hot water. C.

Protein Filaments: Production. Courtaulds Ltd. and R. L. Wormell. B.P. 570,205 of 12/2/1942: 27/6/1945. A process for the production of threads by extruding a solution of casein or the like protein substances is characterised in that hardening of the filaments is carried out in a bath containing formaldehyde and ammonia or hexamethylene tetramine, which may be added to the coagulating liquid. Hexamethylene tetramine may be mixed with the protein solution before it is extruded into the coagulating liquid. C.

Centrifugal Spinning Bucket. American Viscose Corporation. B.P.570,284 of 6/12/1943:29/6/1945 (Conv. 30/4/1943). An arrangement providing improved means for ejecting wound packages or cakes comprises in combination a centrifugal spinning bucket, a package-supporting member reciprocable in the bucket, a hub depending from the bucket, one or more grooves extending axially along the periphery of the hub and communicating with one or more apertures through the bottom of the bucket and reciprocal means for reciprocating the package-supporting member lying within the grooves and within the external periphery of the hub. The hub may have a central bore for the reception of a solid shaft to drive the bucket. The reciprocal means may be one or more rods that slide within the grooves and are secured to a collar. The rods preferably have their external surfaces flush with the peripheral surface of the hub and are arranged to extend during normal rotation of the bucket for the entire length of the grooves. C.

Non-fibrous Cellulosic Pellicles. British Cellophane Ltd. B.P.570,433 of 16/7/1943:6/7/1945 (Conv. 22/8/1942). A softened, non-fibrous cellulosic pellicle contains a softening agent which comprises a water-soluble organic sulphoxidate having the formula $X:S:O_n$, where n is 1 or 2, and X represents one or two organic radicals having a $-C-S-$ link. The non-fibrous cellulosic pellicle may be of regenerated cellulose or a lowly-substituted cellulose ether. Impregnation with an aqueous solution of the softening agent is preferably carried out while the film is in the gel state, but may also be applied to films which have been dried and subsequently wetted again. Sheets or films produced in this way retain their flexibility for long periods, and are suitable for use as wrapping materials for cotton textile articles. C.

Staple Fibre Cutting Device. American Viscose Corporation. B.P.570,475 of 1/12/1943:9/7/1945 (Conv. 13/1/1943). In a device for cutting staple fibres comprising a knife, a shear member having at least one portion adapted to serve as a cutting base in co-operation with the knife and having at least one portion not so adapted, and means for imparting continuous motion to one of the members relative to the other to effect cyclical juxtaposition of the cutting and non-cutting portions of the shear member with respect to the knife to effect intermittent cutting, means are provided for withholding the knife from contact with the shear member during a substantial part of the periods of juxtaposition of the non-cutting portion of the shear member with respect to the knife and also during some of the periods of juxtaposition of the cutting portion of the shear member with respect to the knife. The knife may be normally withheld from contact with the shear member and interposed into cutting relationship therewith at any desired juxtaposition of the cutting portion of the shear member to the knife, and such interpositions may occur at any desired regular or irregular interval. In this way any desired frequency of cutting, regular or irregular, may be obtained without changing the periodicity of the cyclic relative movement between the knife and the cutting and non-cutting portions of the shear member. C.

Albuminous Fibres: Hardening and Tanning. R. Signer (Berne). B.P. 570,572 of 15/1/1942:12/7/1945. A method of increasing the strength of artificial albuminous fibres in which, before and after a mechanical elongation of the fibre, a hardening operation is carried out, the two hardening operations being effected by chemically different hardening means, is characterised in that the first hardening operation is effected with the alkaline fibre, and the second with the neutral or acid fibre. Advantageously, the first hardening may be effected with the dry spun and dried fibre by means of gaseous hardening means, and the second hardening by means of liquid hardening means. For example, a dry spun alkaline casein fibre is treated with gaseous formaldehyde, then with acid, and washed, and is then elongated to double its length and treated with a chromium salt solution. C.

Cellulose Derivative Yarns: Stretching. British Celanese Ltd. and F. B. Hill (Celanese Corporation of America). B.P.570,588 of 7/6/1943:13/7/1945). A process for the stretching of artificial yarns, foils and similar materials having a basis of an organic derivative of cellulose during their passage through wet steam or hot water under pressure, comprises passing the materials in non-slipping contact with a positively-driven feed device, then into an end chamber containing water under a pressure higher than that of the wet steam or hot

water and at a temperature at which it is inert to the materials, thence directly into a stretching chamber containing wet steam or hot water, and from the stretching chamber into non-slipping contact with a second positively-driven feed device which withdraws the materials from the stretching chamber at a rate greater than that at which they are fed into the end chamber, whereby they are stretched to a predetermined degree. C.

Vinyl Resin Filaments: Dry Spinning. American Viscose Corporation. B.P.570,590 of 24/6/1943: 13/7/1945 (Conv. 30/10/1942). Filaments having an elastic character approaching that of rubber are produced by extruding a solution of a vinyl resin and an elasticiser in a volatile solvent through a spinneret into an evaporative atmosphere, the elasticiser being used in an amount ranging from 25 to 45 per cent. of the combined weights of the resin and elasticiser. The elasticiser is an organic liquid having a high boiling point and containing one or more ether, ester, ketone or aldehyde groups. Specified elasticisers include dibutyl sebacate, *o*-nitrodiphenyl oxide and triethyleneglycol di-2-ethyl butyrate. C.

Rayon Wet-spinning Apparatus. Courtaulds Ltd. and R. S. Jones. B.P. 570,618 of 6/10/1943: 16/7/1945. In the production of artificial thread by the wet spinning process in which the thread after leaving the spinning bath is passed over at least one godet and is led by means of a reciprocating funnel into a certifugal spinning box, the funnel is suspended loosely by a support situated approximately in the same horizontal plane as the centre of gravity of the funnel. For instance, the top of the funnel may be provided with a heavy ring of metal, so that the centre of gravity of the whole lies in a horizontal plane passing through a part of the cone of the funnel, and the funnel is then passed through a ring supported by the funnel bracket until that part of the funnel in which the centre of gravity lies rests on the ring. Other methods are also outlined. With such an arrangement, if the lower end of the funnel is for any reason moved away from the centre line in which lies the axis of rotation of the box, the pull of the thread, as it passes down the funnel into the box, tends to bring the end of the funnel into the centre again. C.

Crimped Protein Filaments: Production. R. H. K. Thomson and Imperial Chemical Industries Ltd. B.P.570,631 of 20/10/1943: 16/7/1945. A process for the production of crimped casein or vegetable globulin filaments comprises stretching the wet insolubilised filaments, retaining the filaments in the stretched condition while subjecting them to raised temperature and treatment with formaldehyde, and thereafter withdrawing the tension and effecting the shrinkage of the thus treated filaments to the desired degree of crimp by immersing them in hot water. C.

Rayon Filaments and Threads: Stretching. British Celanese Ltd. B.P. 570,646 of 27/7/1943: 16/7/1945 (Conv. 29/7/1942). In the stretching of textile material in the form of filaments or threads while travelling under the influence of moist steam, the material is passed in non-slipping contact with a positively driven feed device, then into an end chamber containing water under pressure and thence directly into a stretching chamber containing moist steam under a pressure lower than that of the water in the end chamber, and the material is withdrawn from the stretching chamber at a rate greater than that at which it is fed. A suitable form of apparatus is described. The process is particularly applicable to the production of threads having a basis of cellulose acetate or other cellulose ester or ether, or other synthetic material, e.g. a linear polyamide, of high tensile strength. C.

Plasticized Polyamide Compositions. E. I. Du Pont de Nemours & Co. B.P.570,649 of 19/9/1941: 17/7/1945 (Conv. 10/10/1940). Compositions comprising synthetic linear polyamides are plasticized with polyphenols containing at least two hydroxyphenyl nuclei separated by a chain of at least six carbon atoms, which chain may contain also oxygen or other atoms, contiguous with the carbon atoms in the phenyl nuclei. The chain of atoms separating the hydroxyphenyl nuclei is preferably a polymethylene chain containing 8-20 C atoms. Examples of suitable polyphenols are 1: 10-di-(*p*-hydroxyphenyl)-decane and 1: 12-di-(*p*-hydroxyphenyl)-octadecane, and phenolated fatty acid esters.

The compositions may be used for the production of yarns, films, tubes, rods, etc., and as impregnating and coating compositions. C.

Protein Filaments and Films: Production. E. I. Jones, W. A. Caldwell and Imperial Chemical Industries Ltd. B.P.570,686 of 24/9/1943: 18/7/1945. A process for the production of filaments, threads, films and the like by the extrusion of protein solutions, includes the step of passing the continuously advancing filaments, threads, films or the like through one or more baths which include an aqueous emulsion or an aliphatic lubricant comprising an oil, fat or wax before collecting them together from the coagulating bath or any subsequent treatment bath from which they would otherwise leave in a sticky or plastic condition. C.

Alkali Metal Cellulose Xanthate: Production. British Cellophane Ltd. B.P. 570,687 of 24/9/1943: 18/7/1945. A process for the production of alkali metal cellulose xanthate comprises the steps of mixing alkali metal cellulose with an excess of carbon bisulphide in such proportions as to form a slurry and passing the slurry through a reaction zone. By heating the slurry to a temperature in the range 45° – 110° C. during its passage through the reaction zone, it is possible to carry out the xanthation reaction in a period of 1-20 min. The slurry should be maintained under a pressure exceeding the vapour pressure of the carbon bisulphide at the highest temperature to which the slurry is heated. After the reaction, at least a part of the unreacted carbon bisulphide may subsequently be separated from the alkali metal cellulose xanthate. Suitable apparatus is described. C.

2—CONVERSION OF FIBRES INTO FINISHED YARNS

(A)—Preparatory Processes

Cotton Carding Engine: Speeds; Effect on Production and Yarn Quality. E. B. Grover and G. H. Dunlap. *Textile Research J.*, 1945, **15**, 97-162. A detailed report is given of investigations of the effect of changes in speeds and settings of various working parts of cotton cards on card production, and the associated influence on yarn quality. Data are presented showing the effects of the changes on yarn strength, yarn appearance, waste, power consumption, neppiness, fibre strength, fibre length, relation of fibre strength to yarn strength, and sliver uniformity. The following conclusions are drawn: (1) By increasing the over-all card speeds, the production may be increased by as much as one-third, with a corresponding increase in waste and in power consumption, and a drop of not over one-third of a grade in yarn appearance. (2) By increasing the flow of cotton through the card without increasing the cylinder speed, as by increasing doffer speed, sliver weight, or lap weight, the production may be increased by more than one half, with reduction in waste, in power consumption per pound of cotton carded, and usually a drop of not more than one-third of a grade in yarn appearance. (3) In either of the above cases there is no significant change in yarn strength. (4) Method (2) appears to be preferable to (1) but, with low grades of cotton, or when high waste removal is desirable, a combination of the two methods might prove advantageous. (5) A direct relationship exists between the speeds of the cleaning members of the card (licker-in, cylinder and flats) and the amount of waste produced. Peak power demand should not be increased as a result of using high over-all card speeds, as represented by cylinder speeds of 225 r.p.m. for group or line drives. C.

Saco-Lowell Graphic Sliver Tester. *Textile Recorder*, 1945, **63**, July, 38-40. An illustration is given of an autographic sliver regularity tester, examples are reproduced of the traces obtained by its use and their interpretation is discussed. C.

Cardroom Dust Removal System. *See* Section 8G.

(B)—Spinning and Doubling

Mule Starting Handle Lock. A. Fairbrother and T. Howarth. *Textile Weekly*, 1945, **35**, 630-632. Diagrams are used to explain the action of a new mule lock (Patent application No. 10,996 of 1944) in which a trigger device has to be consciously unlocked before the stopped mule can be started again. The mule can not only be stopped in any position, but prevented from accidental starting. The device has the approval of the Joint Standing Committee on Accident Prevention and also of the Factory Inspectors. C.

Spinning Mules: Lubricating. J. S. Haydock. *Textile Weekly*, 1945, **36**, 82, 84, 86. Various measures for the improvement of working conditions at the mill of Messrs. Abraham Stott & Sons Ltd., Busk, Oldham, are mentioned and, in particular, illustrations are given of a wiping-down motion, a grease gun and a pad to prevent splashing of oil from spindle bolsters, which have been adopted to reduce the hazard of mule spinners' cancer. C.

Threlfall's Mule Wiping-down Motion. Richard Threlfall Ltd. *Textile Weekly*, 1945, **36**, 306-308. An illustrated description is given of a new wiping-down motion for mules which has the following special features: (1) the motion is positively driven by a band or rope from the back-shaft; (2) it runs automatically on the roller beam; and (3) the traverse is reversed automatically by means of right- and left-handed ratchets with case-hardened pawls. C.

Ring Doubling Frame: Operation; English and Scotch Systems. *Textile Mercury & Argus*, 1945, **113**, 45-46. A simple explanation is given of the differences between the English and Scotch systems of ring doubling. These are found principally in the size and shape of the water trough and the position of the guider rollers, the yarns being kept under water for a longer period in the Scotch system. C.

Ring Frame Spindle, Ring and Traveller: Interaction. *Textile Mercury & Argus*, 1945, **113**, 152-3, 155, 157, 160, 161. A practical spinner discusses, with the aid of diagrams, the interaction of spindle, ring and traveller in ring spinning, and their influence on tension in the yarn. C.

Mule Room: Fire Prevention. *See* Section 8B.

(C)—Subsequent Processes

The Split Drum Winder. *Wool Rec.*, 1945, **68**, 152-156. Points to be observed in maintenance and running are given. Although adversely criticised in comparison with some other types of winding machinery, its advantages are low first cost, simplicity and small degree of effort required to maintain it in good working condition. Hints are given on the setting of the drum, cradle, metal tongue, tensioning device, conditioning apparatus, and feed bobbin pegs. W.

Patents

Paper Yarns: Production. J. H. Watson and H. E. Anderson. B.P.570,109 of 22/6/1943: 22/6/1945. Paper yarns, strings and the like are produced by cutting stabilised paper into narrow strips and spinning in accordance with the usual practice. Stabilised paper is produced by impregnating the wet paper web, in the paper making operation, at a point beyond the second wet press, but before the drying of the paper with a solution of resin-forming materials, and effecting condensation or polymerisation of the resin subsequent to the drying of the paper, the percentage of resin being about 2½-3 per cent. of the weight of the paper. The paper may be produced from Manilla fibres or wood pulp or mixtures thereof, or from other vegetable fibres or mixtures thereof. C.

Carding Engine Condenser Drum Drive. Platt Brothers & Co. Ltd., I. Marsden and T. Chantler. B.P.570,129 of 18/12/1943: 22/6/1945. A mounting and drive for the surface drum of a carding engine comprises drum bearing and driving means located within the drum and shaped so as to provide clearance at both ends of the drum for bobbin flanges to extend at least substantially to the axis of the drum. C.

Double-sided Sliver Spinning Machine. Fairbairn Lawson Combe Barbour Ltd. and W. S. Suffern. B.P.570,610 of 3/12/1943: 13/7/1945. A double-sided spinning machine for spinning yarn directly from sliver is provided with a platform or gangway along the centre immediately above the cylinders which drive the flyers or spindles at either side, the platform being so arranged that a worker can pass along the machine from end to end above and behind the spindles on either side. Stands or holders are mounted along the machine at suitable distances apart which support the sliver cans in a position in which they incline outwards towards the sides of the machine. The sliver can, or the portion near the bottom of the can is made from transparent material or fitted with a transparent portion so that the amount of sliver in the can can be ascertained by visual inspection as the worker passes along. A step or steps may be slidably mounted on a light bar or rail so that they can be moved easily from point to point along the front of the machine. C.

High-tension Fibre Opening and Cleaning Apparatus. F. Dunkerley, F. Aldington, A. Waddington and H. S. Butterworth. B.P.570,777 of 3/2/1944: 23/7/1945. Apparatus for opening and cleaning fibres in preparation for spinning comprises a passage through which a flow of air is created and which is bounded by inner and outer walls that form electrodes that can be connected to opposite polarities of a suitable source of electricity at 500 to 90,000 volts. Means may be provided to cause the air flow to swirl in the passage and to alter its direction on reaching the end of the passage. A compartment may be provided below the end of the passage to receive foreign matter or trash which separates from the fibres. C.

Ring Frame Yarn Feeding Mechanism. Ernest Scragg & Sons, Ltd. and A. Davenport. B.P.570,794 of 29/2/1944: 23/7/1945. Yarn feeding mechanism for a ring doubling or like frame includes a pulley having formed in its periphery a zig-zag V-shaped groove with a slot below in which the yarn lies. The pulley is mounted on a spindle having upon it a plate provided with a projecting stud which engages in a complementary hole in the pulley and thus imparts rotation to the pulley, the shaft being hollow and internally screw-threaded so that the pulley is held on the shaft by a headed screw screwed into the end of the hollow shaft. C.

3—CONVERSION OF YARNS INTO FABRICS

(A)—Preparatory Processes

Abbott Automatic Pirn and Cone Winding Machines. "Benlow." *Silk J. Rayon World*, 1945, **21**, July, 30-31. *Textile Recorder*, 1945, **63**, July, 46-48. Illustrated descriptions are given of the Abbott Machine Co.'s pirn and cone winders with travelling spindle systems. The machines are now being produced by Messrs. Thomas Holt Ltd., Rochdale. C.

(C)—Weaving

Lancashire Loom: Adjustment for Weaving Difficult Rayon Fabrics. J. H. Strong. *Textile Mercury & Argus*, 1945, **113**, 127, 129. The writer stresses the importance for good "cover" of the angle at which the reed meets the weft at the beat-up. He prefers a loom on which it is possible to alter the setting of the rocking rail, but if this shaft is fixed the necessary adjustment can be made, with some caution, by raising or lowering the back rest. C.

Loom Tackler's Tools. *Textile World*, 1945, **95**, No. 1, 74-75; No. 2, 122-123; No. 6, 110-111. An illustrated account is given of measuring tools, wrenches and hand tools (hammers, saws and gauges) that should be in the loom tackler's equipment. C.

"Mellor" Beam Weighting Motion. John Smalley Ltd. *Textile Mercury & Argus*, 1945, **113**, 15, 17, 20. An illustrated description is given of a new beam weighting motion (Patent application No. 6,548 of 1944), in which a set of 1 to 5 leaf springs (carriage type) is mounted on rollers between a part of the loom frame and a strong steel rod that carries a ruffle on which the rope, chain, wire or strap coming from the beam ruffle is taken up. The rod and its ruffle are held by a ratchet wheel and catch and the original position is marked by a pointer. As weaving proceeds the ratchet wheel is moved forward tooth by tooth, the catch being released by pulling a lever. This catch is fulcrumed on the loom frame and a swing link with adjustable weight uses the same fulcrum. This is the only weight that has to be lifted in order to alter the warp tension, but it is quite near the floor. C.

Broken Picks in Weaving: Causes and Remedies. W. Middlebrook. *Textile Manufacturer*, 1945, **71**, 292-293. Practical hints are given on loom setting to overcome broken picks in weaving. C.

Jacquard Harnesses: Adaptation by "Casting Out." J. H. Yates. *Textile Manufacturer*, 1945, **71**, 276-9, 324-8. For bulk production it is best to fit a Jacquard loom with the most suitable harness, but if frequent changes have to be made in the cloth it is inconvenient to keep on taking down and replacing the harness. The difficulty is overcome, within limits, by "casting-out" so as to eliminate the difference in width at the harness and in the reed when the harness sett and the count of the reed vary. The author illustrates by examples how this may be done, with special reference to border patterns, figured squares, and spot, stripe and all-over designs. C.

Shuttle Speed: Control. A. Sumner. *Textile Manufacturer,* 1945, **71**. 269-270. The writer reviews the various factors that affect the speed of the shuttle so that it either does not complete its flight in the allotted time or is picked too vigorously from one side. Practical hints are given for correcting bad picking. C.

(D)—KNITTING

Hosiery Machinery and Fabric Developments. *Wool Rec.,* 1945, **67**, 1086-1087. The interlock machine is likely to be wider, with a correspondingly increased number of feeders. New methods of knock-off have eliminated lininess in plain loop fabric produced on latch needle machines, and given an improved texture of stitch. Automatic machines are now being used for stamping, e.g. with the utility mark, and for splicing cutting in the inside of hosiery. Knitted fabrics are being printed to an increasing extent, especially on cotton interlock fabric. Interlock has been developed for cotton fabric gloves, which are cut from tightly-knitted fabric, shrunk in a caustic soda solution, and then washed off, sueded and pressed. W.

(G)—FABRICS

Jappe Rayon Fabric: Weaving. J. H. Strong. *Textile Mercury & Argus,* 1945, **112**, 747-749. The jappe rayon fabric is described as a plain cloth of the taffeta type, but having more picks per inch; a typical quality has 150-den. viscose rayon warp and weft, 84 ends and 76 picks per inch, and is 42 in. wide in the reed, 41 in. in the loom-state cloth and 40 in. when finished. Practical hints are given on weaving the cloth. C.

Rayon Fabrics for West Africa: Design. *Silk J. Rayon World,* 1945, **21**, June, 22-23, 35. Illustrations and particulars are given of some headkerchief, Keta and other dress cloths that are now popular in the West African market. C.

Cotton Bags: Production in Argentina. *Boletin Mensual, Junta Nacional del Algodón, Buenos Aires,* 1943, Nos. 101-102, 483-488. Difficulties experienced in the disposal of the low-grade portion of the Argentine cotton crop are discussed and it is suggested that this could be used to produce fabric to replace imported jute burlap for bags and sacks for flour, sugar and other products. The advantages of cotton bagging are pointed out. Progress in the establishment and equipment of a government factory for the production of cotton bags is reported. C.

Reversible Furnishing Fabrics: Designing. W. Haigh. *Textile Manufacturer,* 1945, **71**, 232-234. Particulars are given of a simplified method of laying out a design on point-paper preparatory to cutting the jacquard cards for weaving reversible furnishing fabrics. The usual labour of inserting the weaves on the point-paper diagram is avoided. Specific examples are explained with the help of illustrations. C.

PATENTS

Stocking Toe: Knitting on a Circular Machine. George Edwards & Sons, Ltd. and A. L. Hunt. B.P.569,727 of 31/5/1943:6/6/1945. A method of knitting the toe part of a stocking on a circular machine consists in knitting by reciprocating motion on a complement of the total number of needles (the needles of such complement being disposed in successive tricks), progressively reducing preferably at each course the number of needles in operation for a predetermined number of courses, then progressively increasing the number of needles in operation to a smaller number than the initial complement, then progressively reducing the number to the same number as that to which the original reduction was made and finally progressively increasing the number to the original complement. C.

Warp Knitting Machine Stop Motion. K. Rehák. B.P.569,757 of 14/9/1943: 7/6/1945. In a warp knitting machine the usual sinker bar has associated with it a series of spring fingers extending the width of the fabric. These fingers are of appropriate width and spacing according to the size of fault on occurrence of which the machine is to be stopped, and they are so arranged as to be pressed, each time the sinker bar moves over the needle bar, against the needle bed over which the fabric passes. If a fault has occurred, the spring finger opposite the point of occurrence makes contact with the needle bed and is arranged to close, by so doing, an electric circuit, and thereby to bring about stoppage of the machine. C.

Winding Machine Package Raising Means. Arundel Coulthard & Co. Ltd. and F. Ridgway. B.P.569,765 of 15/9/1943: 7/6/1945. In a yarn winding machine of the type in which the yarn package is revolved by surface contact with a rotating drum, there is provided, between the handle by which the package is manipulated and a part upon the cradle carrying the package, a one-way clutch which when the handle has been moved to lower the cradle on to its driving drum, allows the part to move freely without moving the handle, while the package builds up, and when the handle is moved to raise the package from the drum (i.e. to effect knock off), grips the part and moves the package to a predetermined distance from the drum, the arrangement being such that the clutch allows the cradle to rise as the package increases in diameter without altering the distance which the periphery of the package is raised from its driving drum at the knock off. C.

Yarn Package Mounting. British Celanese Ltd. B.P.569,791 of 1/10/1943: 8/6/1945 (Conv. 2/10/1942). A yarn package mounting comprises a cone-shaped member having a fixed axis, a pivoted arm carrying a second cone-shaped member and adapted to bring it into co-operating relationship with the the first member so as to hold a tubular yarn support between the members, and means for retaining the tube when the second cone-shaped member is swung away from the first. In order that the package may be free to rotate when mounted it is preferable to make the two cone-shaped members coaxial with one another in the package-holding position, and freely rotatable, e.g. by being mounted on ball bearings. The retaining means for supporting the tube during loading or unloading may conveniently take the form of an extension of the movable cone-shaped member (i.e. the one mounted on the pivoted arm) adapted to extend along a substantial part of the length of the inside of the tube. It is convenient to make this extension conical in shape and non-rotatable. C.

Knitting Machine Jack and Needle Beds. C. Koppel (Robbinsville, New Jersey, U.S.A.). B.P.570,116 of 20/7/1943: 22/6/1945. A knitting machine having needle or needle and jack supporting parts provided with channels in which such needles, jacks and the like slide, is provided with means for preventing accumulation of foreign matter in the channels and upon the needles and jacks consisting of openings, formed in the body in the bottoms of the channels in positions to be traversed by substantial portions of the needles and jacks, the openings providing scraping edges across the channel bottoms across and in contact with which the needles and jacks move and through which openings the foreign matter escapes. C.

Fabric Bags: Continuous Production. Selectus Ltd. B.P.570,147 of 9/8/1943: 25/6/1945 (Conv. 15/8/1942). A method for the continuous production of fabric bags provided with draw-strings for closing them, comprises tubular weaving of the bags, in combination with plain weave for the bottoms, and the introduction as weft, by means of a second shuttle, of a draw-string near the end of each of the bags, the weft material of the second shuttle being left floating as far as the next repeat and divided midway when the individual bags are cut, the draw-string being introduced in a weave, the weft thread of which is guided in such a manner as to skip at least two, e.g. four, consecutive warp threads. In order to prevent fraying of the upper part of the bag, the weave near the mouth of the bag is made in the style of a calico weave. C.

Knitted Fabric: Production. B. N. and J. M. Cole. B.P.570,180 of 2/6/1943: 26/6/1945. In the production of knitted fabric by rotary knitting wherein thread is fed to and knitted by needles occupying a varying portion of the needle circle and, without being cut, is excluded from being knitted over the remainder of the needle circle so that it would normally form a float across the excluded part, a predetermined measured length of "float" thread commensurate with the number of needles in the said portion is drawn from the thread supply and is knitted up by needles of the said portion. Preferably thread running from the supply is knitted by the needles of the portion at every second rotation and a length of the excluded thread is supplied to the needles at every intervening rotation. This method may be used with splicing, plating and similar mechanisms and with mechanism for the production of stocking or like blanks fashioned by a convergent gap. C.

Selvedge Thread Supporting and Tensioning Means. C. H. Baddeley. B.P. 570,301 of 9/9/1943:2/7/1945. Each selvedge thread bobbin is separately supported by means secured to or forming part of the loom and tensioned by passing more or less around a brake roller or wheel. The means for supporting the selvedge bobbins comprises a framework provided with a number of spindles and the tensioning device may consist of a framework within which are mounted a number of freely revoluble rollers, means being provided for adjusting or varying the rollers relative to each other. C.

Pile Fabric Loom. W. T. Picking. B.P.570,377 of 22/5/1943:4/7/1945. A loom for weaving pile fabrics is provided with longitudinal pile wires, means for raising the pile warps, looping them over the pile wires and lowering them again, in combination with co-ordinated driving gear for the beat-up sley and for the raising and lowering means for the pile warps and for the means for inserting an upper and lower shot of weft whereby the pile warps are raised, looped over the pile wires and lowered again to a position which permits the upper shot of weft to be inserted above them and the lower shot of weft below them, so that one complete row of two-shot fabric is produced during one complete (forward and backward) movement of the sley, or one complete row of three- or four-shot fabric is produced during two complete movements of the sley. C.

Strand Winding Machine. F. B. Dehn (Synchro Machine Co., Rahway, U.S.A.). B.P.570,408 of 15/6/1943:5/7/1945. A machine for winding tape, wire, ribbon, thread, etc., comprises in combination with a capstan shaft, a first power means driving the shaft, a capstan wheel mounted on the shaft, and a winding mechanism, including a winder shaft and a second power means for driving the winder shaft, means for connecting and disconnecting the capstan shaft and the first power means, and means for controlling the connecting means to disconnect the capstan shaft from the first power means during the decelerating period of the winder shaft. C.

Shuttleless Loom Weft Carrier. C. H. Baddeley. B.P.570,457 of 9/9/1943: 9/7/1945. In a weft carrier for shuttleless looms a shank is secured to the customary flexible metal tape, a flange projects beyond the shank on its front side, the flange having an orifice for the passage of weft, and a taper swelling is provided above and below the flange. The shank may be split and provided with means for attachment to the tape. A porcelain eyelet or the like may fit within the orifice. C.

Yarn Guide Mounting. Arundel, Coulthard & Co. Ltd. and F. Ridgway. B.P.570,534 of 4/10/1943:11/7/1945. In a yarn winding machine of the type in which a yarn guide is reciprocated by a cam along each package being wound and in which the shafts carrying the cams are rotated through means which give varying speeds to the cam, a rubber or like resilient mounting or bushing is provided for each yarn guide so that the guide is free to the extent allowed by the resilience of the bushing or mounting to throw over to a varying extent at reversals according to its speed of reciprocation, whereby an increase in the variations in the length of traverse of the guide is obtained, with the result that the yarn reversal points are more widely distributed at the ends of the package and the latter is given softer ends. C.

Automatic Warp Stop Motion. H. R. Hilfiker, H. Hilfiker and F. Dürst (Zürich, Switzerland). B.P.570,639 of 25/10/1943:16/7/1945. In an automatic warp stop motion for a loom two rows of metal riders are moved transversely to the direction of the warp threads and beneath them, the riders being pivotally arranged at regular intervals on an articulated conveyor and each provided with a contact device. The riders are capable of being tipped in the direction contrary to that in which they move and their respective upper parts project beyond rows of brushes, which, pointed upwards, are arranged on both sides of the conveyor. Arranged above the warp threads and transversely to their direction is a pipe which is constantly moved to and fro by a crank and which, from a series of nozzles, blows air under slight compression on to the warp threads, so that any broken threads are blown from among the others on to the rows of brushes and held there, by which action those riders of the moving conveyor which touch broken threads are checked and tipped backwards, thus activating an automatic stopping relay via the contact device provided for this purpose. C.

Circular Knitting Machine Pouch Compensating Mechanism. Wildt & Co. Ltd. and H. H. Holmes. B.P.570,759 of 11/10/1943:20/7/1945. In a circular knitting machine adapted to produce pouches in knitted fabric or articles, pouch compensating mechanism is arranged to enable the fabric tensioning member or device to be restored to its normal position at any stage of its operative movement, and means are provided to retain the member or device in this position and to release the latter when again required for use. Preferably, the mechanism is adapted for operation manually, and the said means consists of an automatically operable, machine-controlled retaining member or catch for holding the tensioning member or device in the inoperative position, and subsequently releasing it at an appropriate time for further operation. Details are given of an illustrative embodiment of the invention as applied to pouch compensating mechanism in which a body with a fabric engaging formation is mounted on a vertical supporting rod so as to enable it to descend when operative to apply tension to the fabric. C.

4—CHEMICAL AND FINISHING PROCESSES

(A)—Preparatory Processes

Surface-active Electrolytes: Tensimetric Analysis. J. M. Preston. *J. Soc. Dyers & Col.*, 1945, **61**, 165-166. A method for the determination of an anion-active substance in terms of a known cation-active substance, or conversely, depends on the formation of a complex between anion- and cation-active substances which is accompanied by a sharp change in the surface tension. During a titration the changes in surface tension are followed by observing the pressure required to force a steady stream of air bubbles through the solution in the titration vessel. Neutral salts affect the end point, but in a regular manner which can be allowed for by making a blank determination. A typical titration curve is shown, together with a photograph and a diagram of the apparatus. The method has been found to be applicable to oleic acid soaps, Lissapol C, Teepol, Calsolene Oil HS, Lankropol, Fixanol, Lissolamine A, Gemex A and Gemex C, as well as a number of pure surface-active materials and, in a modified form, to some direct dyes. C.

(B)—Boiling, Scouring, Degumming and Washing

Silk Net Materials: Preparation and Finishing. *Silk and Rayon*, 1945, **19**, 781-782, 877, 883. A general account is given of the degumming, bleaching, and finishing of silk net for use in veilings, trimmings and haberdashery. C.

(D)—Milling

Wool Felting: Theory. (1) S. A. Shorter. *J. Soc. Dyers & Col.*, 1945, **61**, 172-173. (2) A. J. P. Martin. *ibid.*, 173-174. (1) In a previous paper Martin (these *Abs.*, 1945, A112) confused Shorter's theory of milling (*J. Soc. Dyers & Col.*, 1923, **39**, 270) with earlier theories, and with that of Arnold (*Text. Forschung*, 1929, **11**, 143). (2) Regret is expressed that the theories of Arnold and Shorter were confused. The theory of Arnold apparently envisages "creeping" of the fibres even against some tension, and that of Shorter only when the fibres are slack. A diagrammatic representation is given of the theory of Shorter and that of Martin, the latter being a loop locking mechanism. They differ radically in the part played by the root ends of the fibres. W.

Milling. D. R. H. Williams. *Wool Rec.*, 1945, **68**, 237-243. A non-technical explanation of the factors necessary for efficient milling, and of the changes which occur in a fabric during the process, with special reference to the advantages of the Williams-Peace combined scouring and milling machine. An improved model, in which the front of the machine is brought out 6 in. and the depth decreased by 9 in., has been successfully used for certain milled worsteds, with a considerable saving in time over ordinary milling. An adjustable all-metal knock-off board is being made for the larger 18 in. roller combined machine, and the use of a plastic bottom roller to work with the hard rubber-covered top roller is being investigated. Figures are quoted showing the excess moisture remaining in different fabrics after wringing on the combined machine, on an ordinary wringer, and after hydro-extracting. W.

Crushing and the Double Scour. *Wool Rec.*, 1945, **68**, 108-112. Reference is made to Williams' article on crushing and the double scour (these *Abs.*, 1945,

A15), which confuses the fact that a fabric must be either clear or milled. This distinction, which is not affected by the degree of milling, is illustrated by the finishing of cloth for demobilised men, and of khaki baratheas. It is suggested that the use of weights on the lid of the trough during scouring on the combined scouring and milling machine must produce a milled fabric which cannot be compared with one which is scoured on the ordinary scouring machine. W.

(I)—DYEING

Pad-Steam Continuous Dyeing Process. P. L. Meunier. *Amer. Dyes. Rept.*, 1945, **34**, 206-210. The pad-steam dyeing process involves (1) deposition of a vat dye on the fabric by the pigment-padding procedure, (2) drying the padded fabric, (3) padding again with a solution containing sodium hydrosulphite and caustic soda, plus an auxiliary material, such as common salt or sodium formaldehyde sulphoxylate, to suppress migration of the dye, and (4) steaming the fabric for less than 1 min. at 212° F. Rigid exclusion of air is necessary during the steaming. At the conclusion of these four steps, which can be operated continuously, the fabric is oxidised by any of the conventional processes to regenerate the vat dye in its insoluble form, and then finished by the customary soaping, rinsing and drying. Suitable equipment is described and shown in a diagram and photograph. Necessary precautions are outlined and details are given of a specific procedure illustrating the operation of the process. The full range of vat dyes may be applied continuously in pastel to very deep shades to a wide variety of fabrics by this process. Appearance, colour yield and fastness properties of the dyeings are at least equal to the best commercial work by current methods. Various difficulties are eliminated in this new process and costs are reduced. Two modifications of the process, in which small liquid boosters are included in the steaming chamber, are described. One of these, the pigment-pad, steam-and-liquid booster process, differs from the basic process only in the use of the liquid boosters. The other, the reduced-pad, steam-and-liquid booster process involves (1) reduced padding of the fabric, (2) development in the steam chamber with auxiliary liquid boosters, and (3) oxidation, soaping, rinsing and drying. C.

Jute and Cotton Union Fabrics: Dyeing. A. Ellis. *Textile Weekly*, 1945, **36**, 34, 36, 38. Practical hints are given on the dyeing of jute and cotton mixtures, with special reference to means for adjusting the wide difference in dye affinity, e.g. by mercerisation and by the use of " neutral " acid dyes. Suitable dyes are named. C.

Nylon Textiles: Dyeing. Imperial Chemical Industries Ltd. *Textile Weekly*, 1945, **36**, 30, 32, 38 (from pamphlet " *The Dyeing of Nylon Textiles* "). Directions are given for the application of Duranol, Dispersol and Solacet dyes to nylon textiles. C.

Rayon: Level Dyeing. *Silk and Rayon*, 1943, **17**, 570-572, 810-812; 1944, **18**, 320-322, 890-893, 1222-1225; 1945, **19**, 105-106. A broad review is given of the factors that influence the levelness of rayon in dyeing, under the headings (1) sizing, (2) crêpeing and dulling, (3) dyeing viscose rayon, (4) faults in cellulose acetate fabrics, (5) use of soaps in preparatory processes, (6) uses of sulphonated fatty alcohols, and (7) wetting-out agents that give even dyeing and protection to viscose rayon. C.

Rayon Fabrics: Dyeing. P. J. Choquette. *Amer. Dyes. Rept.*, 1945, **34**, 211-214. A review of recent developments in the application of vat dyes, leuco esters of vat dyes and naphthols to spun rayon blends, and in the dyeing of high tenacity rayons, cellulose acetate, casein fibre (Aralac), Vinyon polymers, glass fibre, nylon, and mixed-fibre fabrics. C.

Viscose and Acetate Rayons: Dyeing. H. G. Scull and H. De Witt Smith. *Silk and Rayon*, 1945, **19**, 656-658, 771-4, 784. A report of a lecture to the Canadian Association of Textile Colourists and Chemists, giving a useful summary of modern methods for dyeing (1) viscose and (2) acetate rayon materials.

Azo Dyes: Steric Hindrance of Resonance. *See* Section 8G. C.

Bemberg Rayon: Characteristics, Dyeing and Finishing. W. L. Ashby. *J. Soc. Dyers & Col.*, 1945, **61**, 167-171. The manufacture of Bemberg rayon is outlined and the characteristics of Bemberg yarns and fabrics, particularly those of interest to the dyer and finisher are described. The dyeing of Bemberg

fabrics with direct, Soledon, vat and azoic dyes, printing with various types of dyes and by various methods, and finishing operations are discussed. C.

Dye Solutions: Anomalous Polarographic Waves. O. H. Müller. *Electrochem. Soc. Preprint*, 1945, **87**, No. 31, 417-438. In the polarographic analysis of many, but not all, dyes representing reversible oxidation-reduction systems, in addition to the "regular" wave with a half-wave potential equal to the E'_0 of the system, a small wave, the anomalous wave, was found at a more positive potential. The separation of these waves varied with different dyes and was largest in the thiazines; it decreased under a variety of conditions in a similar way as anomalies (deviations from Beer's law) found in spectroscopic studies of such dyes, and thus suggests a common cause. In very dilute solutions only the anomalous polarographic wave was obtained, which reached a limiting height at concentration of about $10^{-4}M$. At higher concentrations the second, "regular," wave formed and increased without limit; the sum of the two waves was proportional to the concentration of the dye. A peculiar relationship between the height of the anomalous wave and the drop-time of the dropping mercury electrode was found, pointing to a correlation between the polarographic results and known effects of dilution on potentiometrically determined potentials. The results are discussed in connection with Brdička's hypothesis of selective adsorption of the leuco form of the dyes. Included in this study are illustrations of: (*a*) the polarographic behaviour of an oxidation-reduction system in which the reductant is much less soluble than the oxidant; (*b*) the effect of temperature on semiquinone formation; and (*c*) the effect of ethyl alcohol on the diffusion current of reversible dyes. C.

Dyeing and Drying Operations: Time and Temperature Control. F. S. Ward. *Canadian Text. J.*, 1945, **62**, No. 10, 34-36, 50. On all open dye-baths the basic principles of instrument control are location of the temperature-sensitive bulb (which should be subjected to as good circulation as possible) and determination of valve size. Time and temperature control problems are discussed on machines for top dyeing (Longclose), yarn dyeing (Hussong), piece, raw stock and package dyeing, cotton and rayon dyeing, and hosiery dyeing. The use of automatic control equipment on drying machines is also described. W.

Dyeing Coarse English Wool. *Dyer*, 1945, **94**, 63-65, 103-104. Before dyeing unscoured coarse English wool, the fleeces are torn up by hand; all twist must be removed from the tail, or penetration is incomplete. Some dyers keep the tail portion separate, even if the stock is to be dyed black. The hand tearing process is slow, but it is difficult to dye whole fleeces, or to pass them through fearnoughts and teazing machines. Chrome colours are principally used, and, if necessary, fast to milling acid dyes for shading the chrome; the use of a degreasant helps in attaining levelness. For black, an after-chrome dye of the PV type is most suitable; logwood extract is sometimes used, applied to chrome-mordanted stock, but the stock is usually dusty when dry, or may turn out a greyish-black due to over-chroming if a high percentage of impurities is present. A greyish batch may be used in a blend, or re-dyed with a coal-tar chrome colour capable of being taken up by over-chromed fibre, e.g. Alizarine Red WS. For deep brown, Metachrome Brown BR and Metachrome Olive Brown G are recommended, and the dyeing method is described. For dark blue, Solochrome Dark Blue R is often used; Cyanine Navy Blue 2 RNX and Coomassie Navy Blue 2 RNS are suitable for rich, deep blue, but not if there is subsequent heavy milling in soap solution. Sulphate of ammonia is one of the most useful exhaustants. The problem is discussed of making salting colour additions without producing marked unlevelness. Unlevelness may also be due to faulty liquor circulation through the stationary load. W.

All-wool Materials: Two-colour Dyeing. F. Townend. *J. Soc. Dyers & Col.*, 1945, **61**, 144-150. Methods for producing two-colour effects on mixtures of chlorinated and normal wool are discussed. Traditional techniques using colloidal dyes are described, the choice of dye being of major importance. New methods use crystalloidal dyes (level dyeing acid dyes and chrome dyes) with retarding agents (Lissatan AC and Taninol WR). The behaviour of crystalloidal dyes depends on their basicity and the mechanism of the production of the results is explained. With level dyeing acid dyes, the retarding

agent (Lissatan AC or Taninol WR) is added to the normal sulphuric acid dyebath; with dyes fast to wet processing, the retarding agent slows down the dyeing to such an extent that a stronger acid than acetic is necessary to give good exhaustion; 1 per cent. sulphuric acid used as the starting addition gives satisfactory dyeings, even with acid milling dyes. W.

Dyeing: Use of Automatic Control. *Dyer,* 1945, **93,** 491-495. Accurate temperature control is important in certain dyeing and finishing operations, particularly in vat dyeing, where boiling may not be applied or only at the later stages. In such exact work a variation of one or two degrees affects the result. When a cold fabric is introduced into the dye liquor, circulation and input of steam do not necessarily establish immediate temperature equilibrium and "cold pockets" may exist. The variation may be overcome by co-relating a temperature recorder with the steam input, but it is safer to supplement this with multiple-point recording resistance thermometers fitted close to the vat, when any cooling-down effect can be instantly rectified. The resistance thermometer is described. W.

(J)—PRINTING

Screen Printing Apparatus. A. Laszlo. *Textile Manufacturer,* 1945, **71,** 301-2, 345-8. The modern process of screen printing is described, with particular emphasis on its mechanical aspects. Improvements appear to be required in the following directions: (1) use of extruded steel or light metal for the screen print frames, (2) making up the table from standard sections, (3) interposing high-speed dryers between stationary mechanised screens of varied colours, (4) use of stainless steel foils, (5) mechanisation of screen washing, drying and transport, (6) application of time-and-motion study in sample printing, and (7) drying by hot air ducts and nozzles. C.

(K)—FINISHING

Cloth Opening Machines. *Silk J. Rayon World,* 1945, **21,** June, 25-26. Illustrations are given of recent models of cloth scutchers (Mather and Platt; Foxwell-Dungler), and cloth guiders and expanders (Foxwell; Farmer Norton; Mather and Platt). C.

Wet Processing Machines. *Textile Recorder,* 1945, **63,** July, 49-51, 67. An illustrated account of modern machines for crabbing, blowing, fulling, milling, mangling, filling, washing and stretching wool, cotton and other fabrics. C.

Nylon Fabrics: Weaving and Finishing. P. D. Atwood. *Amer. Dyes. Rept.,* 1945, **34,** 184-186. The elasticity, inherent shrinkage and ability to take a "set" of nylon fibres are discussed, and it is shown how these properties influence the weaving and finishing of nylon fabrics and make close process control essential. Effects of the low moisture regain and high filament strength of nylon are also discussed. The results of setting treatments are explained, and reference is made to "heat finishing," a method of finishing which involves subjecting the nylon to high temperature (over 400° F.) dry heat for a few seconds and results in improved handle, draping qualities and resilience. C.

Synthetic Resins: Application to Cotton Goods. D. H. Powers. *Amer. Dyes. Rept.,* 1945, **34,** 191-193. A discussion of possibilities of the use of synthetic resins, including various new types, for improving the strength of cotton yarns and for the production of improved coated materials and improved cotton suitings, blankets, outer garments, washable goods, industrial fabrics, tentage, and goods with durable lustrous and other finishes. C.

Cotton Marquisette Netting: Finishing with Cellulose Derivatives. J. E. Goodavage. *Amer. Dyes. Rept.,* 1945, **34,** 232-233, 240. The development of cotton marquisette insect netting is reviewed, characteristics required in netting for use in tropical areas are outlined, and methods of applying finishes of the cellulose hydroxy ethyl ether (Ceglin) and alkaline cellulose solution (Celfon and Kopan) types, together with pigments and fungicides, are described. Details are given of the physical and performance requirements and methods of testing specified by the Philadelphia Quartermaster Depot. C.

Urea and Melamine Resins: Application in Finishing. A. D. Nute. *Amer. Dyes. Rept.,* 1945, **34,** 230-231. The use of urea-formaldehyde and melamine-formaldehyde resins to obtain crease resistance, shrinkage control, fabric stabilization, increased wet strength, improved handle, etc., in textile

fabrics is discussed and specific examples are quoted to show the superiority of the melamine resins for such purposes. Notes are given on the methods of application. C.

Polythene: Properties. F. C. Hahn, M. L. Macht and D. A. Fletcher. *Ind. Eng. Chem.*, 1945, **37**, 526-533. The structure of polythene is briefly described and the influence of microcrystalline structure on physical properties is outlined. Mechanical and electrical properties, thermal characteristics, and resistance to water, solvents and chemicals are shown in tables and graphs and are discussed. The grade of polythene developed for electrical uses has an average molecular weight of 1,800-20,000, is tough and flexible over a wide range of temperatures, has an extremely low power factor and dielectric constant, along with high resistivity and high dielectric strength, and is very resistant to water and chemicals. The compatibility of polythene with rubber and similar materials is discussed and graphs are given showing the effect of additions of polythene on the properties of certain rubber formulations. The chief uses of polythene are for insulation and for the production of protective coatings on metals, chemical equipment, cloth, paper, concrete, etc. Coatings can be applied from solution or emulsion, by the melt method, or by the flame spraying method. C.

Wool Piece Goods. (I) Scouring and Milling. (II) Dyeing. (III) Finishing. (I) J. C. Schofield. *J. Soc. Dyers & Col.*, 1945, **61**, 90-91. (II) S. L. Peel. *ibid.*, 91-92. (III) G. K. Seddon. *ibid.*, 92-94. (I) Most woollen goods can be scoured at low temperatures by using soda ash only, some of the fatty acids in the oleine used being saponified. An excess of soda ash is present, but neutralisation may occur only as far as the formation of bicarbonate at which *p*H the detergent action may not be most powerful. The time required for the removal of impurities is discussed. Oleines are being challenged by emulsifiable mineral oils. Considerable modifications in milling machines have been introduced. The advantages of the Williams-Peace combined scouring and milling machine are noted. Since the process is continuous, the wash-down after scouring can be hot, and milling commences with the cloth at 40° C. when the fibres are swollen, resulting in a saving of milling time. Open-width treatment during scouring and washing-off instead of a rope form eliminates many faults and gives improved pieces. (II) Dyes and dyeing methods are described for all-wool (or recovered wool) pieces, and for pieces containing either a cotton warp, or blended cotton, or both. (III) A description of the methods used in finishing fine worsted pieces, at a works where lifting and carrying are reduced to a minimum, and where the production of 100-120 pieces per day includes both mixture cloths and goods for piece dyeing. The use of a cropping machine adjacent to the tenter saves production osts per piece in bulk work. Developments in the blowing, damping and ressing processes are also described. The use of the Merrow sewing machine s recommended. W.

Cord and Ribbed Cloths: Processing. *Dyer*, 1945, **94**, 15-16. Ribbed worsted cloths for women's wear cause difficulties in wet or dry finishing. The cloths are yarn-dyed, often in very delicate colours. Stains should be removed before scouring, as cleaning at a later stage may cause distortion. Scouring in rope form is recommended; passing the pieces through a spout (generally of wood) directly before entry into the scouring rollers bunches the cloth to form a cushion under the top roller; this prevents marking of the cloth and promotes better scouring, since the liquid forced backwards by the squeezing action passes through the spout and the cloth. The scour must be short, and times and amounts of material giving satisfactory results for two pieces in the dolly are stated. The cloths are hydro-extracted and dried, lightly steamed to restore the ribbing, thoroughly shrunk, dried naturally, and finally pressed on the back only. W.

Unshrinkable Wool. W. J. P. Neish and J. B. Speakman. *Nature*, 1945, **156**, 176. A recent process for making wool unshrinkable synthesises an organic polymer on the surface of the fibres (B.P.567,501; these *Abs.*, 1945, A212). A high degree of unshrinkability is also obtained by the use of inorganic polymers. When flannel is treated with a solution of silicon tetrachloride in carbon tetrachloride, a vigorous reaction takes place between the adsorbed water of the wool and the silicon tetrachloride, a siliceous deposit

being formed on the surface of the fibres. As a result, the treated fabric shrinks much less than the corresponding untreated fabric on milling. W.

(L)—PROOFING

Dimethylglyoxime-Copper Rot-proofing Agent: Application. A. C. Neish, G. A. Ledingham and A. G. Mackey. *Canadian J. Res.*, 1945, 23 F, 198-201. Copper was fixed in jute, coarse cotton, and woollen fabrics by dipping the test materials for 2-5 min. in a 0·5 per cent. aqueous solution of dimethylglyoxime at 90°-100° C., and then immersing them in 5 per cent. copper acetate at room temperature for 5 min. The treated fabrics were odourless, remained pliable, and were dyed a khaki colour. As determined by soil burial tests this treatment proved more effective than treatment with copper naphthenate. C.

Mildew-proofed Sandbags: Testing. V. P. Giddings, Jr. *Amer. Dyes. Rept.*, 1945, 34, 220-221. The results of tests of treated cotton osnaburg and jute burlap samples by an accelerated soil burial test using a composted greenhouse soil composed of sand, loam, and horse manure, outdoor weathering tests, and laboratory tests involving inoculation with *Chaetomium globosum* before and after accelerated weathering, demonstrated the merits of treatment with copper compounds. Copper naphthenate, cuprammonium, and copper ammonium fluoride treatments appeared to give the most satisfactory results. Outdoor service tests on actual sandbags confirmed, in general, the rating of the treatments by accelerated methods. Some differences in the relative standings of the three copper treatments were indicated, and other copper compounds, such as copper "tallate," oleate and resinate, appeared better than in the accelerated tests. The addition of creosote in copper naphthenate and other copper treatments increased their service life in outdoor exposure tests. C.

Water-repellent Fabrics: Production. *Textile Weekly*, 1945, **36**, 276-280. Methods introduced since 1943 for rendering textiles water-repellent are briefly reviewed, with special mention of Patnode's application of organic silicon compounds, use of wax-aluminium dispersions, and Du Pont's "Zelan" (quaternary ammonium salt) treatment. C.

Rot-proofed Cotton Fabrics: Soil Burial Test. Termite-resistant Textiles: Testing. *See* Section 5C.

Copper Naphthenate Proofed Cotton: Tendering. A. E. Bartlett and M. Goll. *Amer. Dyes. Rept.*, 1945, 34, 225-227. In a study of the catalytic effect of Cu on the oxidation of cotton duck, cotton twine, and jute roving, samples treated with copper sulphate, and with copper naphthenate alone and in combination with various additives such as linseed oil and oxidation inhibitors, were exposed to oxygen at 115° C. and to ultra-violet light in the Fade-o-Meter, and losses in tensile strength were determined. The results show that copper sulphate promotes tendering. Copper naphthenate, however, does not appear to promote tendering and may, on the other hand, when compounded with other materials which contribute beneficial mechanical effects, actually act as protection against oxidation as well as against microbial attack. C.

Copper Naphthenate Proofed Cotton Fabrics: Mildewing. C. H. Bayley and M. W. Weatherburn. *Amer. Dyes. Rept.*, 1945, 34, 247-248. A report is given of observations of the growth of fungi on cotton fabric treated with copper naphthenate, and of the effects of leaching, artificial weathering, waterproofing wax and mercuric naphthenate on the growth of certain fungi on treated fabrics. The data show that *Chaetomium globosum* and *Metarrhizium glutinosum* are completely inhibited by contents of 0·3 per cent. and 0·5 per cent. Cu as copper naphthenate, respectively, whereas the growth of *Aspergillus niger* is not inhibited at concentrations as high as 0·8 per cent. A potent cellulose-destroying species of *Penicillium* isolated from the soil grows readily on samples of cotton fabric containing 0·3 per cent. Cu both with and without wax. The activity of this organism and also that of *A. niger* is inhibited by the presence of 0·3 per cent. Cu in the form of copper naphthenate plus 0·1 per cent. of Hg in the form of mercuric naphthenate. C.

Jute Hessian: Rot-proofing. L. H. Bryant and S. Smith-White. *Fibres, Fabrics & Cordage*, 1945, 12, 31, 33-34, 71-74 (through *Chem. Abstr.*, 1945, 39, 2654[4]). Over 2,500 individual tests were made on sand-filled bags treated with various chemicals as a prevention of rotting of the jute hessian. Copper oleate-creosote and copper thiocyanate gave the best results as regards micro-

biological rotting and resistance to leaching. Copper acetate-tannin treatments were superior to many in the above respects, and, in addition, gave the greatest measure of protection against sunlight weakening. The "Perenox," the several "Cuprox," and basic carbonate treatments leach badly over a long period and do not maintain their initial high degree of protection. These methods and the copper thiocyanate are also subject to "dusting" in dry weather where the hessian is subject to free movement. Their chief advantages are ease of application and cheapness. Chromium tannin treatment gives low protection against microbiological attack, and the method of application is complicated. Cuprammonium treatment leaches badly, gives less protection against rotting than the best of the other treatments, and is wasteful and obnoxious in use. Tannin-copper is unsatisfactory as regards leaching. Copper oleate in kerosene leaches badly and is generally inferior to the copper oleate-creosote treatment. C.

Insect Pests of Wool Stored in Bulk: Large-scale Control. *Australia: Council Sci. Ind. Res.*, 18th Annl. Rep., 1944, p. 16. As the result of experiments started in 1941 (see also C.S.I.R.'s 16th and 17th Annl. Repts., 1942, pp. 15-16 and 1943, pp. 16-17), the following recommendations are made for the treatment of wool stores infested with clothes moths: (*a*) For greasy wool, "middle oil 43" should be applied to the standing stacks, at the rate of one pint per bale, with specially-designed spraying equipment. This should preferably be done soon after stacking. (*b*) For scoured wool, 90/190 solvent naphtha, saturated with a pure grade of naphthalene at about 70° F., should be applied in the same way and at the same rate. (*c*) For both greasy and scoured wool, commercial "whizzed" naphthalene should be spread on top of each tier of bales in the course of construction of the stack, at the rate of about 1 lb. per double dump. The estimated cost varies from 2d. per bale for the cheapest to 5d. per bale for the most costly treatment. W.

PATENTS

Hat Manufacture: Use of Composite Felts. G. M. Rickus and Ors. (to Hat Corp. of America). U.S.P.2,355,598 of 8/8/1944 (through *Chem. Abs.*, 1945, **39**, 200). Non-fur fibres, e.g. cotton, are treated with an acid and a chlorite, and then mixed with fur fibres. On the mixture being felted, the treated non-fur fibres accumulate in the interior of the fabric. W.

Chlorinated Paraffin Textile Lubricant: Composition and Application. G. P. Crowley, T. E. Thompson and Imperial Chemical Industries Ltd. B.P.569,701 of 6/9/1943: 5/6/1945. Textile materials consisting of or containing wool, recovered wool or other animal hairs or artificial wool, alone or in admixture with cotton or rayon staple fibre, or textiles of regenerated cellulose or cellulose esters or ethers are lubricated, in the form of loose fibres, sliver, yarn or fabric, or in any intermediate form, by applying prior to or during mechanical processing, such as carding, combing, spinning, winding, knitting or weaving, a lubricant consisting of or containing one or more chlorinated paraffin hydrocarbons containing from 10 to 22 carbon atoms and from 2 to 7 chlorine atoms in the molecule. The chlorinated paraffins may be used alone or mixed with neat's foot oil, olive oil, oleine or wool grease. They may be thinned down when necessary by the addition of diluents such as kerosene. In some cases aqueous emulsions may be used. C.

Cloth Drying Unit. Mary Dalglish, Margaret C. Cook and J. Dalglish (trading as John Dalglish & Sons) and K. S. Laurie. B.P.569,706 of 7/9/1943: 5/6/1945. A cloth drying unit for use in stenters comprises the combination of upper and lower boxes with air-ejecting openings, upper and lower air heaters arranged along the outer sides of the boxes, reservoirs for heated air above the upper heaters and below the lower heaters, and upper and lower fans sucking from the reservoirs and delivering to the boxes, the arrangement being such that each fan maintains a circulation of air directed transversely inwards from the fan and through the associated upper or lower air-ejecting box against the cloth, thence outwards beyond the adjacent side of the box and through the upper or lower air heater at that side to the reservoir from which the fan sucks. Upper and lower transverse ducts lead inwards into the boxes and fan openings are provided at the outer ends of the ducts. Four motor-driven fans and four air heaters are provided. C.

Thermoplastic Cellulose Ester Fibres: Application in Felt Production. British Celanese Ltd. B.P.569,738 of 19/7/1943:6/6/1945 (Conv. 7/8/1942). A self-sustaining sheet of felted fibres is formed from a dispersion of fibres of an organic ester of cellulose of low acidyl content in admixture with non-thermoplastic fibres, e.g. wood, cotton, linen or other vegetable fibres, and the cellulose ester fibres are bonded to the non-thermoplastic fibres. The bulk of the water is removed from the dispersion while employing a screen as a foundation for the sheet, and the cellulose ester fibres are bonded to the cellulose fibres by the application of heat and pressure. The cellulose ester fibres may contain effect materials, such as pigments, lakes and dyes, as well as filling materials and fire retardants. C.

Disazo Dyes: Production. A. H. Knight, W. E. Stephen and Imperial Chemical Industries Ltd. B.P.569,770/1 of 2/12/1943:7/6/1945. (1) Disazo dyes are made by diazotising an aromatic monoamine of the benzene series carrying in the *p*-position to the amino group a group X.CO.NY– (X being a monochloro- or monobromo-alkyl radical of one, two or three carbon atoms and Y is a hydrogen atom, or an alkyl group of not more than six carbon atoms, or a cyclo-alkyl group) and optionally substituents such as alkyl, alkoxy and halogen, but devoid of hydroxy, sulpho, aminosulphonyl and sulphone groups, coupling one molecular proportion of the diazo compound so obtained in acid medium with 1-amino-8-naphthol-4-sulphonic acid or with 1-amino-8-naphthol-3:6- or -4:6-disulphonic acid to produce a monoazo compound, diazotising an aromatic monoamine of the benzene or naphthalene series which may carry substituents, but is devoid of halogenoacylamino groups, and coupling one molecular proportion thereof in alkaline medium with the aforesaid monoazo compound, the components being so chosen that the final dye does not contain more than three sulphonic acid groups. The dyes dye wool from an acid bath in various shades of grey or blue or black. The dyeings have in general very good fastness to severe washing and sulphur stoving, and good fastness to milling, potting, perspiration and light. (2) Disazo dyes are made by diazotising a primary arylamine of the benzene or naphthalene series which contains at least one halogen atom or one of the groups carboalkoxy, carboxy and carbamyl, wherein the hydroxy of the carboxy and the hydrogen of the carbamyl group may optionally be replaced by hydrocarbon residues or substituted hydrocarbon residues, but which is devoid of nitro, acidylamino, aminosulphonyl, sulpho and sulphone groups, coupling one molecular proportion of the resulting diazo compound in acid medium with 1-amino-8-naphthol-3:6- or -4:6-disulphonic acid to produce a monoazo compound, diazotising an arylamine of the general formula X.CO.NY.R.NH_2, where R stands for a *p*-phenylene residue, which may contain simple azo dye substituents, e.g. methyl or methoxy, but contains no aryloxy or sulphonic acid substituent, X stands for a monochloro- or monobromo-methyl group, and Y stands for alkyl (C_1 to C_6) or cycloalkyl, and coupling one molecular proportion thereof in alkaline medium with the aforesaid monoazo compound. The dyes may be used for dyeing animal fibres, e.g. wool and silk. They give blue and black shades on wool which have very good fastness to severe washing, milling and light. C.

Regenerated Cellulose Materials: Treatment to Reduce Water Imbibition. Courtaulds Ltd., H. J. Hegan and E. H. Sharples. B.P.569,818 of 17/9/1943: 11/6/1945. A process for reducing the water imbibition of cellulose hydrate products, such as regenerated cellulose fibres, filaments, yarns and films, comprises subjecting products containing between 30 and 40 per cent. of water and between 70 and 60 per cent. of cellulose to the action of heat in a closed vessel. The heating is conveniently carried out at a temperature of 140-160° C. for a period of 10-30 min. C.

Stencil Printing Apparatus. A. E. Hills. B.P.569,901/7 of 8/11/1943: 13/6/1945. (1) Apparatus for producing coloured patterns on fabric by a substantially continuous method in which the fabric with stencils is traversed from a supply point to a take-up point past spraying means, comprises a conveyor screen and a suction chamber across which the conveyor screen is traversed, to which conveyor screen the fabric is caused to cling by suction applied through the conveyor screen while the screen carries the fabric and stencils past the spraying means. The fabric is conveyed through the colour-applying zone in a substantially vertical plane, the dyes being sprayed on to the fabric through the stencils, and the fabric is preferably moved continuously. (2) A method of

printing fabrics consists in traversing the fabric from a supply roll to a take-up roll so that there is a track of the fabric travelling across the space between such rolls, spraying colour on to one side of the track through stencils carried directly by the track and exposing the other side of the track to suction during the colour spraying. In carrying the invention into practice it is preferred to employ the apparatus described in (1). C.

Fluoranthene Derivatives: Application in Ultra-violet Light Absorbing Transparent Materials. British Celanese Ltd. B.P.569,920 of 16/6/1943: 14/6/1945 (Conv. 23/6/1942). Compositions having a basis of a film-forming polymer, such as a cellulose ester or ether, regenerated cellulose, a synthetic resin or rubber or a rubber derivative, are made opaque to ultra-violet light by incorporating therein fluoranthene or a derivative of fluoranthene. The fluoranthene compound may be incorporated in films, foils or filaments by adding it to the solutions from which they are prepared or may be applied as a coating to the preformed articles. C.

Weather-proof Coated Fabrics: Production. British Celanese Ltd. B.P. 569,979 of 21/7/1943: 18/6/1945 (Conv. 5/8/1942). Weather-proof coating compositions are caused to adhere to textile fabrics, including aircraft fabrics, by first applying to the fabrics a base coating having a basis of cellulose acetate or other organic ester of cellulose having a low acidyl content, i.e. containing from about 1·5 to 2·0 acidyl radicals per $C_6H_{10}O_5$ unit. The cellulose ester is applied to the fabric in solution in a suitable volatile solvent or mixture of solvents which may contain plasticisers and natural or synthetic resins. The coating applied over the base coating composition to increase the weather-proof and/or weather-resistant properties may have, as the main film-forming constituent a cellulose derivative capable of strong adhesion to the ester of low acidyl content, and may contain any of the solvents, plasticisers or resins employed in the base coating. Coating compositions containing rubber and rubber derivatives may be applied over the weather-resistant cellulose derivative coating. C.

Porous Surfaces: Coating with Cellulose Derivatives. British Celanese Ltd. B.P.570,005 of 19/7/1943: 19/6/1945 (Conv. 7/8/1942). A process for providing a material or article which is porous or has a rough surface with a suitable foundation for a coating of a water-resistant cellulose derivative, comprises coating the surface with an organic ester of cellulose of low acidyl value, e.g. cellulose acetate of acetyl value about 40-45 per cent. expressed as acetic acid, the ester being applied in the form of an aqueous paste so as to fill the superficial pores or depressions of the surface and provide a smooth surface for the water-resistant cellulose derivative. The latter, which may be, for example, cellulose acetate of acetyl value 53-56 per cent. expressed as acetic acid, is applied in the form of a solution in a volatile solvent or mixture of solvents, which may also contain a synthetic resin and one or more plasticisers. Wood, ceramic materials, and fibrous materials, e.g. paper and fibre board, may be coated in this way. C.

Metal Body Detecting Means for Fabrics. William Whiteley & Sons, Ltd. and H. Lumb. B.P.570,063 of 25/12/1943: 20/6/1945. An arrangement for detecting the presence of metal bodies in fabrics is characterised in that there are provided, on each side of the path of the travelling fabric, a pair of suitably spaced or insulated contacts each connected to one end of an electric circuit, opposite contacts on each side of the fabric being connected to opposite ends of the circuit. The contacts are so disposed that if a metal body should be adherent to or present on either face of the fabric it will bridge the pair of contacts on that side and thus close the circuit to give an alarm or to initiate stoppage of the traverse of the fabric before it enters the machine through which it is to be passed. If a metal body has penetrated right through the fabric it will bridge the contacts on opposite sides of the fabric and, as these are connected to opposite ends of the electric circuit, the circuit will thereby be closed. C.

Smoulder-proof Ammunition Bags: Production. Tootal Broadhurst Lee Co. Ltd. and H. Potter. B.P.570,135 of 22/2/1941: 25/6/1945. Bags to contain an explosive charge and comprising a mixture of animal and vegetable fibres are characterised by the feature that the fabric has been made more smoulder-proof by treatment with an aqueous acidic substance which is either removed by washing with water or is volatile at the temperature of combustion of the fabric,

and final rinsing with water. The fabric may comprise a mixture of wool or silk with cotton or viscose rayon and may be treated with an aqueous solution of hydrochloric acid or lauryl pyridinium bromide (Fixanal). C.

Kapok Fleece Thermal- or Sound-insulating Material: Production. P. Evans and Kapok Ltd. B.P.570,182 of 15/7/1943:26/6/1945. A process of producing a thermal or sound-insulating material, comprises introducing within a loose mass of kapok fibres, the components of a synthetic resin without substantially altering the loose state of the fibres and forming the resin *in situ*, without the application of pressure on the fibres, thereby bonding the individual fibres together to form a voluminous non-felted mass. Prior to the immobilisation of the fibres by the bonding material, the fibrous mass must not be completely wetted or saturated by any liquid material. When mixing dry powders with the fibres it is advantageous to oil the fibres lightly before mixing. Formaldehyde vapour may be passed through masses of fibres which have previously been mixed with powdered phenol or urea, or fibrous masses may be treated with phenol vapour or aniline vapour and then with formaldehyde vapour. C.

Weft Straightening Device. Tootal Broadhurst Lee Co. Ltd. and L. C. Nield. B.P.570,399 of 27/4/1943:5/7/1945. Apparatus for straightening the wefts of woven fabrics consists of means of gripping the travelling web on opposite sides at two points which lie on a line normal to the warp threads and direction of displacement of the web, means to apply equal and opposite forces to the gripping means, and a feeler on each side of the web acting adjacent to the gripping means, the operation of the weft straightening device being controlled by displacement of either feeler. The control device may be combined with the weft straightening mechanism by forming the gripping means as a pair of rollers, the axes of which are inclined to the line of the warp threads, each pair of such rollers engaging one selvedge of the fabric web, means being provided to rotate the rollers of one pair at a different peripheral speed from the rollers of the other pair whenever a lateral deflection of a selvedge edge of the web occurs. C.

Synthetic Elastomer Felt-like Material. Vol Crêpe Ltd. and J. E. Woolley. B.P.570,410 of 16/6/1943:5/7/1945. A felt-like material is composed of finely comminuted wool, hair or other animal or vegetable fibres, reclaimed rubber or a synthetic elastomer, with or without a proportion of natural rubber, and a solid or liquid expanding or inflating agent or agents. Suitable synthetic elastomers include polymers and copolymers of butadiene or chloroprene, synthetic elastene polymers of the olefines and copolymers of olefines with a hydrocarbon compound having a conjugated system of alternate single and double bonds and having at least one olefine linkage, thioplast condensation products of ethylene polysulphide, and polymers of vinyl chloride or vinyl acetate. C.

Drying Machine. Lister Brothers Ltd. and L. F. Broad. B.P.570,541 of 11/10/1943:11/7/1945. A drying machine for use in laundries and textile mills has three sections, one comprising a chamber divided into two compartments, in one of which the air is hot and dry and in the other cooler and humid, means arranged both within and without the chamber for supporting means for conveying the textiles through a sinuous path into, through and out of the chamber, a second section housing a cylinder in which textiles may be dried under conditions of high air temperature and low humidity, a third section housing a cylinder in which textiles may be tumbled and partially dried, or alternatively completly dried, under conditions of low air temperature and high humidity, means for driving the conveying means, means for drawing air from the outside through one compartment of the first section and driving the air in part through a branch duct leading to the third section and to the atmosphere and in part through a main duct leading to the second compartment of the first section and into a duct leading to the second section and from thence to the second compartment of the first section, means for heating the air passing through the main duct, and further means for heating the air passing through the branch duct to the third section. C.

Animal Fibres: Anti-shrink Treatment. J. L. Raynes, F. M. Stevenson and Stevensons (Dyers) Ltd. B.P.570,582 of 12/7/1945. Animal fibres are treated with a dilute aqueous solution or dispersion of a stannous compound (1-2 per cent. on the weight of the material) at 70°-100° C. and *p*H 5-7, and then

either with a nitrogen-chloro compound or with an alkali metal or alkaline earth metal hypochlorite or hypobromite, as claimed in B.P.569,730 (these *Abs.*, 1945, A). The reducing action of the stannous compound renders the fibre more susceptible to attack by the halogen compounds, thus producing a high degree of unshrinkability. The addition to the hypohalite solution of certain metallic salts, e.g. magnesium sulphate, calcium chloride or acetate, barium chloride or acetate, or zinc sulphate, gives a definite impetus to the reaction, and also offers a simple method of *p*H control. W.

Nylon Fibres: Dyeing. Courtaulds Ltd. and J. H. Macgregor. B.P. 570,602 of 18/11/1943: 13/7/1945. Nylon fibres containing an insoluble condensation product of formaldehyde and cyanamide or a derivative thereof can be dyed with a direct cotton dye from an acid dyebath with a considerably enhanced rate of absorption. The insoluble condensation product may be incorporated in the nylon fibres by treating the fibres with an aqueous solution containing formaldehyde and cyanamide or a derivative thereof, either as such or in the form of a soluble pre-condensate, and subsequently heating to convert the condensation product into the insoluble form. Cyanamide derivatives which may be used are dicyandiamide, melamine, guanidine, biguanide and dicyandiamidine or alkyl, hydroxyalkyl or aryl substitution products of guanidine, biguanide and dicyandiamidine. The dyeings obtained are of extremely good wash fastness. Nylon fibres, particularly in the form of fabric, treated in this way, lose more or less of their characteristic "soapy" handle. C.

Raised Fabrics: Production. Courtaulds Ltd. and C. P. Atkinson. B.P. 570,696/7 of 28/10/1943: 18/7/1945. (1) A process of obtaining raised fabrics of improved handle and appearance includes the steps of treating fibres of cotton, wool, regenerated cellulose or casein with an intermediate resin, subjecting the fabric containing the fibres to a raising operation and thereafter converting the intermediate resin into the insoluble form by heating. The intermediate resin may be applied to the fibres in fibre, yarn or fabric form. Resins obtained from cyanamide and formaldehyde, urea and formaldehyde, and glycerine and phthalic anhydride are suitable. (2) A process of improving the handle and appearance of raised fabrics comprises treating a fabric containing fibres of cotton, wool, regenerated cellulose or casein with an intermediate resin of cyanamide and formaldehyde, converting this intermediate resin into the insoluble form by heating and then subjecting the fabric to the raising operation. C.

Animal Fibres: Anti-shrink Treatment. J. L. Raynes, F. M. Stevenson and Stevensons (Dyers) Ltd. B.P.569,730 of 6/6/1945. Goods consisting wholly or partly of wool are treated with a dilute aqueous solution of permanganate and then with an aqueous solution or suspension of a nitrogen-chloro compound, or with a dilute aqueous solution or suspension of an alkali metal or alkaline earth metal hypochlorite or hypobromite. A metallic salt added to the hypochlorite or hypobromite solution helps the reaction, and also offers a simple method of *p*H control. The process, which may be carried out in almost any type of machine, may be combined with a bleaching treatment. A high degree of controlled unshrinkability is obtained. The fibres are evenly treated and show no loss of protein matter. The desirable natural properties of the wool are retained even on repeated washing, and levelling in subsequent dyeing is facilitated. W.

Printing Colours: Preparation. Compagnie Nationale de Matières Colorantes et Manufactures de Produit Chimique du Nord Reunies Etablissements Kuhlmann. B.P. 570,742 of 11/6/1940: 20/7/1945. A siccative glycerophthalic resin is ground with a pigment and the pigmented mixture thus obtained is emulsified in water by means of a suitable emulsifying agent, e.g. a water-soluble cellulose derivative, to obtain a printing preparation. The resin may be ground with the pigment dry, or in the presence of a water-insoluble solvent for the resin. The particles of pigment are thus perfectly surrounded by the resin, and the product gives decorative effects which are very fast to washing and rubbing. Printing rollers may easily be cleaned after working by washing with hot water. C.

Fabric Drying Apparatus. Hunt & Moscrop Ltd. and J. Sharpe. B.P. 570,774 of 24/12/1943: 23/7/1945. An open-width fabric drying machine is divided into two chambers by a horizontal partition plate extending across the machine, the conveyor carrying the fabric through the machine passing first through the top chamber and back through the bottom chamber in such a manner that the fabric travels on the top side of the conveyor, round the bend and back on the underside to which it is held by suction. The division plate substantially doubles the effective drying length of the machine. C.

Fabric Heating or Stoving Apparatus. Hunt & Moscrop Ltd. and J. Sharpe. B.P. 570,775 of 25/12/1943: 23/7/1945. In apparatus for stoving or applying heat to fabrics, particularly impregnated or coated fabrics, of the type in which the fabric is suspended from poles or passes over top and bottom sets of rollers, heating air is circulated by two fans or two sets of fans, one situated at one side of the apparatus to deliver air into the space above the poles or the top set of rollers, and the other situated at the other side of the apparatus to deliver the air below the bottom of the loops of fabric, thereby creating two circulations of air which intermingle to some extent at the centre of the apparatus from where the fans withdraw the air for recirculation. Banks or batteries of heated tubes, preferably finned or gilled, are arranged in the air ducts through which the air passes from the fans and further banks or batteries may be provided above the steel poles or top set of rollers and below the bottom loops of the fabric or the bottom set of rollers. These tubes may be heated by steam, hot water, gas, electricity or any other way and the supply of heat thereto may be thermostatically controlled. C.

5—ANALYSIS, TESTING, GRADING AND DEFECTS

(A)—Fibres

Alginic Acid Filaments: X-Ray Structure. W.T. Astbury. *Nature*, 1945, **155**, 667-668. A well-orientated X-ray diagram has been obtained for alginic acid fibres at ordinary humidity. The unit cell contains four mannuronic acid residues and perhaps four water molecules. Through the cell two chain molecules run in opposite directions, one through the corners and the other through the middle of the (010) face, as in cellulose. On drying the fibres intensively the *a*-axis decreases and the X-ray pattern deteriorates, but the change is completely reversible on exposure again to the atmosphere. From dryness to wetness the cell dimensions are: $a = 7{\cdot}7_5 - 8{\cdot}7$A., b (fibre axis) $= 8{\cdot}7$A., $c = 10{\cdot}6$A. The space group is probably Q^3 ($P2_122_1$), but it approximates to Q^4 ($P2_12_12_1$). The evidence from X-ray analysis is all in favour of the pyranose formula for alginic acid. Presumably the cellulose and alginic acid configurations are alternatives derivable from common postulates, and the Sachse strainless ring in the so-called "armchair" form constructed to the appropriate dimensions suffices for both cellulose and alginic acid. The difference lies simply in this, that there are two possible directions of the bonds joining C_1 and C_4 to the glucosidic oxygens, and the flatter arrangement is found in cellulose and the other in alginic acid. Fibre photographs of pectin are of the alginic acid type. C.

Cotton Fibres: Measurable Characters; Variation with Position on Seed Surface. R. L. N. Iyengar. *Indian J. Agric. Sci.*, 1944, **14**, 311-314. Observations have been made on cotton fibres from 4-locked bolls picked from a single plant of Co. 2. The surface of the seed was divided into six regions, namely, (1) micropylar end, (2) region close to the raphe, (3) right, (4) left and (5) back of the raphe, and (6) the chalazal end. It was found that at the micropylar region the fibres are thinly populated, short and very mature, have the highest fibre weight, standard fibre weight, fibre diameter, fuzz diameter and strength, and are most firmly attached to the seed. At the chalazal end the fibres are very densely populated, are longer and less mature, have smaller fibre weight per cm., standard fibre weight, fibre diameter and strength and are less firmly attached to the seed. Generally speaking, the values at the other regions are intermediate. C.

Synthetic Fibres: Composition, Structure and Properties. W. D. Appel. *Modern Plastics*, 1945, **22**, No. 9, 155-158, 194. The compositions, structures and properties of the various types of synthetic fibres are discussed and compared with those of cotton, silk and wool. Available data are summarised in

tables showing dimensions and configurations, tensile strength, extensibility, recovery on unloading, modulus of elasticity, relative stiffness, relative toughness, density, and effect of temperature. Moisture regain curves are also shown. C.

Textile Fibres: Moisture Relations. *Silk J. Rayon World,* 1945, **21**, July, 35-37, 42. A useful summary of knowledge on the moisture regain of fibres, its variation with atmospheric conditions and its influence on physical properties. C.

Textile Fibres: Tensile Behaviour. R. Meredith. *J. Textile Inst.*, 1945, **36**, T 107-T 130. C.

Argentine Cotton: Quality. *Boletin Mensual, Junta Nacional de Algodón, Buenos Aires,* 1943, Nos. 101-102, 457. Details are given of the quality of Argentine cotton, according to grade and staple, classified during July and August 1943. A decline in quality compared with previous months is noted. The average grade is No. 3 and the average length 24-25 mm. About 12 per cent. of the cotton classified in August was of grades E and F. C.

Argentine Cotton: Quality. *Boletin Mensual, Direccion de Algodón, Argentina,* 1944, Nos. 107-108, 119. A preliminary report is given on the quality of the 1943-44 crop, based on classifications made up to March. Up to this month 68·3 per cent. of the fibre was of grades A and B, and 51·24 per cent. had a length of 24 mm. C.

Cotton Linters: Determination of Foreign Matter Content. *Fibres,* 1945, **6**, 43-44. A method of determining the amount of foreign matter in cotton linters is described which involves heating a weighed sample to 115° C. in a porous earthenware vessel impregnated with concentrated hydrochloric acid, breaking up the fumed material, brushing through a 50-mesh sieve and weighing the material which does not pass through. This is the foreign matter and it can be examined by passing consecutively through sieves of increasing fineness by means of which it may be fractionated into fine and coarse hull, seed, boll, stems, etc. Some typical results are presented, and the advantages and disadvantages of this method, compared with visual examination by experts, are discussed. C.

Nylon Fibre: Structure. G. Champetier and Jeanne Bonnet. *J. chim. phys.*, 1943, **40**, 217-223 (through *Chem. Abstr.*, 1945, **39**, 2653[5]). A fibre of polyhexamethylene adipamide was examined microscopically and by X-ray diffraction patterns at different degrees of drawing. The X-ray patterns showed the presence of a crystal structure in the undrawn polyamide and that these crystal elements became increasingly orientated as the fibre was elongated. The lack of high elasticity, as is found in stretched rubber, was attributed to H-bond formation between C=O and NH groups of neighbouring chains. An identity period of 17·3 A. was determined from the diagram taken near the breaking point and agrees with the calculated value for a hexamethylene adipamide unit. Examination in polarized light revealed the presence of a network surface of 5μ maximum diameter within the fibre. These features disappeared with high orientation and the fibre showed nearly total extinction at right angles. C.

Wool Fibres: Measuring Scaliness. J. Menkart and J. B. Speakman. *Nature,* 1945, **156**, 143. Mercuric acetate and benzoquinone make wool unshrinkable by modifying the elastic properties of the fibres, and not by attacking or masking the surface-scale structure (these *Abs.*, 1945, A112). Single fibres are suspended, root end downwards, from a tension-measuring device, and rubbed longitudinally in soap solution between the rubber surfaces of the lepidometer (these *Abs.*, 1943, A35 and this *J.*, 1945, **36**, T91), the maximum tension developed by the creeping fibre being taken as a measure of its scaliness. The "violin bow" method (this *J.*, 1931, **22**, T339) gives similar results. These and the lepidometer results do not agree with those of Bohm (thes *Abs.*, 1945, A347), owing probably to his use of glass for friction measurements. A possible explanation of his observation that the coefficients of friction (towards root and towards tip) are nearly alike for fibres treated with mercuric acetate or benzoquinone and far apart for untreated fibres, may be found in terms of Rudall's model (private communication). This model, orignally devised to explain why untreated fibres migrate when they are rubbed longitudinally between wet glass plates, consists of a wooden

ratchet provided with rubber "scales"; when the model is pushed towards the "root" end on glass, the friction is less than in the direction of the "tip," owing to the different configurations adopted by the edges of the "scales". Since cross-linking reactions increase the resistance of wool fibres to deformation, the differential frictional effect will be correspondingly reduced on glass, if the scales of the fibres behave in the same way as those of the model; the difference in friction would, however, still be observable on flexible surfaces. W.

Australian Fleece Wools: Some Analyses; Review. M. Lipson and U. A. F. Black. *J. and Proc. Roy. Soc.*, New South Wales, 1945, **78**, 84-93. About 200 fleece wool analyses are reviewed with regard to the properties of the fleece components, and their effect on the yield of clean wool. The dirt content was the most variable factor, and moisture content the least. Crossbred wool contained less wax and dirt, but rather more suint than merino, and gave higher wool yields. Fellmongered wool contained little suint. Wax and dirt had little affinity for moisture, whereas suint was very hygroscopic (a yellow "oily" sample had a very high suint and moisture content). Different types of dirt had almost the same density, and their apparently different effects on yield were probably due to false impressions of the amount present owing to different particle sizes. When vegetable matter was present, its effect on yield varied with the type, owing to differences in relative weights; only "shive" had high wax and moisture contents. W.

Wool Classing and Branding: Standardisation. "Jason." *Pastoral Rev.*, 1945, **55**, 343-344. Arguments for and against standardised wool classing and branding are reviewed and discussed. A decision should be made on the question of standardising classing and branding for all Australian States. Reference is made to a brochure issued by the W.A. Wool and Produce Brokers' Association, in collaboration with the W.A. State Wool Committee, in which suggestions for the preparation of wool clips are briefly but effectively outlined. W.

Wool Quality: Assessment. E. H. B. Lefroy. *Queensland Country Life*, 1945, **10**, No. 40, *Merino Suppl.* p. 3. Visual examination is inadequate for assessing wool quality, and the use of the microscope in testing stud rams is advocated. The value of much Australian wool is being debased by attempting to combine fibre thickness and softness of handle. Broad crimp is frequently associated with fineness. Softness and fineness are very closely, if not absolutely, related. W.

(B)—YARNS

Nylon Yarns and Fabrics: Effect of Wet Finishing on Properties. *Amer. Dyes. Rept.*, 1945, **34**, 146-156. A report is given of investigations of the effects of time and temperature of immersion on the tensile and impact strengths, extensibility, energy absorbing ability, resilience and compressibility, abrasion resistance, regain, and dyeing properties of nylon yarns and fabrics. The effects on yarn strength and extensibility are shown graphically. No serious losses in strength were observed as a result of immersion in water at temperatures up to 212° F. for periods of up to 30 min. Load-extension curves indicate that extensions are higher for samples subjected to higher immersion temperatures. Energy-absorbing ability of the yarns increases with increase of immersion temperature. The effects of preliminary treatments on the behaviour of nylon are discussed and experimental results are quoted to show that the effects of previous treatments can be eliminated by a proper chronological choice of wet treatments. By suitable wet treatment it is also possible to improve compression resistance and recovery or resilience properties and to increase resistance to abrasion. Wet finishing treatments also result in increased moisture regain and steaming of nylon results in the production of deeper shades on subsequent dyeing. The practical importance of these results is indicated. C.

Yarns: Resistance to Abrasion. W. J. Hamburger. *Textile Research J.*, 1945, **15**, 169-177. A method is described for predicting the inherent abrasion resistance of textile materials substantively by the use of load-elongation diagrams of mechanically conditioned specimens. Immediate and delayed deflections are discussed as they affect the energy coefficient (ratio of deflection to load). It is shown that the properties desirable in materials subjected to repeated stress

application are (1) low modulus of elasticity, (2) large immediate elastic deflection, (3) high ratio of primary to secondary creep, (4) high magnitude of primary creep, and (5) high rate of primary creep. The results of tests of shrunk nylon, unshrunk nylon, acetate and viscose yarns on the Taber Abraser are considered and from the rate-of-destruction curves durability coefficients (ratio of cycles to per cent.-loss-in-strength) are obtained. Correlation is established between durability coefficients and energy coefficients for the four yarns. C.

Rayon Yarns and Cellulosic Materials: Chemical Characterization. C. C. Conrad and A. G. Scroggie. *Ind. Eng. Chem.*, 1945, **37**, 592-598. The hydrochloric acid-ferric chloride hydrolytic and catalytic oxidation method developed by Nickerson has been modified and applied to the characterization of a number of rayon yarns and cellulosic raw materials. The amount of carbon dioxide evolved from the cellulosic material is compared with the amount evolved from glucose to obtain an estimate of the "accessibility" of the material. Details of the procedure are given and methods of calculating accessibility from the carbon dioxide evolution data are explained. The accessibility of cotton linters and wood pulps, in most cases, decreases with increasing α-cellulose content. The accessibility of regenerated cellulose yarns decreases with increasing crystallinity number, as calculated from intensity measurements of X-ray diffraction patterns. To a certain degree this confirms the contention that the accessibility measurement is chiefly a measure of amorphous cellulose. C.

Thread Bundles: Strength; Statistical Theory. H. E. Daniels. *Proc. Roy. Soc.*, 1945, **183** A, 405-435. A group of parallel threads of equal length, clamped at each end so that all threads extend equally under tension, is called a bundle, and the maximum load which the bundle can support is called its strength. A study is made of the probability distribution of the strength of bundles whose constituent threads are sampled randomly from an infinite population of threads in which the probability distribution of strength is known. The relation between the strength of a bundle and the strengths of its constituent threads is first discussed, and results are stated for bundles so large that the proportions of threads of different strengths approach their expectations. The properties of the probability distribution of bundle strength are next developed in detail, attention being confined to the case where all threads have the same load-extension curve up to breaking point. Finally, the asymptotic behaviour of the distribution for large numbers of threads is studied, and it is shown that in the commonest cases the distribution tends to assume the normal form. C.

Yarns: Examination for Quality. "Questor." *Wool Rec.*, 1945, **67**, 1006-1007. The subjective appraisement of the levelness of yarns wrapped on cards is quick, but liable to personal bias. The winding tension should be the same for each yarn, with even spacing between the wraps. Judgment should not be confined to one person. If yarns are judged in pairs, each observer should judge five pairs. For a comprehensive examination, each observer should judge the cards several times, once for each attribute, e.g. hairiness, loftiness, etc. W.

(C)—FABRICS

Clothing Fabrics: Wear Resistance. H. S. Hall and E. R. Kaswell. *Textile Research J.*, 1945, **15**, 178-189. A survey is made of literature on wear, resistance to wear, and factors affecting wear, with emphasis upon wear by abrasion. Brief descriptions are given of machines and methods of measuring the resistance to wear of textile and similar materials. C.

Rot-proofed Cotton Fabrics: Soil Burial Test. J. D. Dean, W. B. Strickland and W. N. Berard. *Amer. Dyes. Rept.*, 1945, **34**, 195-201. A report is given of a study of the influence of type of soil, method of burial, soil moisture content and temperature, and other factors on soil burial tests. A standard procedure was developed using a composted soil at a temperature of 85° F. and moisture content of 30 per cent., and horizontal burial of specimens at depths greater than one inch. Since tests have shown that repeated burials in the same soil led to increases in rotting rates, the practice of conducting all tests in beds of fresh soil was adopted. The time of standard soil burial required to cause a loss of 80 per cent. in strength of a treated fabric is recommended as a measure of the

rot-proofing value of the treatment. Results are given for cotton osnaburg treated with copper naphthenate and with two other commercial proofing compounds. A resistance value of 42 days was found for the copper naphthenate-treated sample. The use of this material as a control-fabric in tests of other treatments is recommended, any marked departure of this fabric from the resistance number of 42 days indicating unreliable testing conditions. In trials of cotton sandbags under conditions of natural exposure, rot-proofing treatments that have consistently shown high resistance numbers have given the best results in service. C.

Termite-resistant Textiles: Testing. G. Becker. *Textilberichte*, 1942, **23**, 523-527, 573-577 (through *Brit. Abstr.*, 1945, C, 25) Attack on six acetate and viscose rayons, cotton, and plastic-impregnated fabrics by starved and fed *Calotermes flavicollis*, Fabr. (20 nymphs and 10 workers per 5×5 cm.^{2} of sample), were measured in terms of the average surface area of the sample destroyed (*A*) and the mean number of surviving termites (*S*). Results are tubulated for 24° and 80 per cent. R.H., 24° and 97-98 per cent. R.H., 28° and 80 per cent. R.H., and 28° and 97-98 per cent. R.H. The average *S* values for all the samples were 23, 18, 15 and 4 after exposure for 4 weeks, and 14, 13, 6 and 1 after 8 weeks. The increasing order of *A* was cotton, acetate, viscose, plastic-impregnated fabrics for termites fed on filter paper and mould mycelia. The value of *A* for hungry termites was much greater than for fed termites; the order was cotton, acetate, plastic-impregnated, viscose, but *A* for cotton and acetate rayon were similar. The major part of the destruction occurs in the first four weeks. A fabric is to be regarded as termite-resistant if there is little or no visible attack on a 5×10 cm.-sample by 120 insects after 8 weeks under tropical conditions of temperature and R.H. C.

Cloth Strip Cutter. J. H. Kettering and A. S. Cooper. *Amer. Dyes. Rept.*, 1945, **34**, 249. A device for cutting cloth into strips of predetermined width and winding them into rolls consists of a number of electric scissors mounted between suitable tension bars on a platform with a motor, speed-reducer and wind-up beam. Photographs and notes on the construction and operation are given. C.

Electronic Apparatus: Use in Textile Testing. N. H. Chamberlain. *J. Soc. Dyers & Col.*, 1945, **61**, 161-162. The use in textile testing of photo-electric methods and methods depending on the measurement of electrical capacity is discussed. A general-purpose photo-electric photometer is briefly described and its various uses are outlined. Reference is made to apparatus for the electrical determination of regain which consists essentially of a simple de Sauty condenser-resistance bridge with series compensation for condenser loss, the bridge being supplied with an alternating voltage at a radio frequency (1·5 megacycles per sec.) generated by a triode valve oscillator, and the frequency controlled by a quartz crystal. The output from the bridge is amplified by two amplifying stages of conventional design, and the amplifier output is read by means of a Cambridge high frequency rectifier-voltmeter. C.

Dyed Textiles: Fastness; Testing and Expression. H. A. Ehrman. *Amer. Dyes. Rept.*, 1945, **34**, 255-256. Colour fastness is considered in relation to end uses of textiles, and methods of test, ratings, and terminology are discussed. The following recommendations are made: (1) Test methods should simulate end uses. They should yield reproducible and comparable results in the hands of different laboratories and should be uniformly applied. (2) Specific methods of test should be supplemented by systems of rating to coordinate and evaluate test results; such ratings should be uniformly applied irrespective of the type of fibre, weave, pattern or dye. (3) Ratings should be interpreted to the user of the fabric by a single system of terminology equally applicable to the several kinds and types of colour fastness and easily understood and retained. (4) That terminology should be uniform for all textile products without distinction either as to type of fibre, weave, pattern, dye or end use. (5) The terminology should denote classes of colour fastness rather than over-all grades for the textile product. The system should provide room at the top for several superior grades to be developed in the future. Representatives of

all branches of industry have recommended the terms excellent, very good, good, moderate, fair and poor. C.

Work Shirts and Overalls: Analysis. M. B. Hays, L. S. Joiner and D. C. Caudill. *J. Home Econ.*, 1945, **37**, 100-105 (through *Exp. Sta. Rec.*, 1945, **93**, 105). Fifteen brands each of work shirts and overalls were studied. Weight per square yd., and warp and weft counts did not show much variation within each of these two groups of garments, but the strength of the materials, as determined by the grab method, and the resistance to abrasion varied widely. In general, the whole garments contained relatively large amounts of non-fibrous material, showing that the fabrics were starch-finished during manufacture. Fastness to light (Fade-Ometer) and to laundering were generally good, as shown by laboratory tests, but these tests did not predict very well the colour-fastness in actual service where the garments were observed to fade. The materials in two brands of shirts and two of overalls shrank considerably on laundering. In some cases garment shrinkages were higher than those of the fabrics, indicating some stretching during garment manufacture. Shrinkage was not excessive, however, in most of the garments. As a group, the chambrey shirts were less resistant to abrasion than were those made from other types of fabric. The bib overalls and dungarees were more resistant than the shirts. Twill weave pocket linings were more resistant to abrasion than those of plain weave heavy muslin. From observations of garments after laundering, the buttons would soon need to be replaced on the shirts, but the overall fasteners, and riveted buttons did not rust and probably would give satisfactory service. Laundering produced some reduction in breaking strength but not enough to reduce the usefulness of the fabrics unduly. C.

Textiles: Consumer Needs. W. E. Coughlin. *Amer. Dyes. Rept.*, 1945, **34**, 253-254, 256. A brief account is given of the work of the Good Housekeeping textile laboratory, which includes the study of consumer needs, the checking of claims and performance of advertised products, and the investigation of new textile products. The need for closer collaboration between garment manufacturers, converters, dyers, retailers, etc., is emphasized. The inadequacy of present test methods and the need for correlation of laboratory tests with performance in use are pointed out, work at present being carried out is discussed, and suggestions are made for further studies. The need for more factual information of the type that gives the consumer better guides to buying is also pointed out. C.

Textiles: Labelling. H. F. Herrmann. *Amer. Dyes. Rept.*, 1945, **34**, 234-236. A survey of the arguments for and against informative labelling from the point of view of (1) the consumer, (2) the retailer, (3) the distributor and converter, (4) the dyer, printer and finisher, (5) the garment manufacturer, (6) the dye manufacturer, (7) the cleaning industry, (8) government control agencies, and (9) the American Association of Textile Chemists and Colourists. C.

Woven Textile Fabrics: Testing. Standards Association of Australia. No. CL. 1, 1945, 15 pp. The terms "state," "weight" and "moisture content" are defined. The standard physical and chemical methods cover the preparation of test samples, the determination of weight, thickness, number of threads per inch (except for patterned fabrics), twist, thread counts, tensile strength, elongation, sizing and finishing materials (qualitative and quantitative tests), fibre mixtures (quantitative analysis), relaxation shrinkage, and fastness of dye (general evaluation and fastness to light, laundering and perspiration). W.

(D)—Other Materials

Moulded Phenolic Plastics: Creep Properties at Elevated Temperatures. W. J. Gailus and D. Telfair. *Modern Plastics*, 1945, **22**, No. 9, 149-154, 192. An account is given of investigations of the creep behaviour of moulded phenolic plastics at approximately 192° F. Tension creep data up to 1,000 hours are reported, and recovery data up to 250 hours. Values of modulus of elasticity were obtained at the beginning and also at the end of the 1,000-hour tests. The materials investigated included moulded phenolics with wood-flour, chopped canvas (rag), cotton cord, asbestos and mica fillers, unfilled phenolic resin and two types of paper laminate (both cross-laminated). The results show that the

total creep in 1,000 hours and the creep rate depend to a considerable degree upon the type of filler used in moulded phenolic plastics. The creep of materials containing inorganic fillers is much less than that of materials with organic fillers of the cellulose type. Continued heating has great effects on the creep properties of phenolic plastics. Extension due to load is largely compensated by contraction due to shrinkage. Cellulose-filled materials give evidence of a very extensive amount of shrinkage. The long-time tensile strength at 192° F. varies roughly from 18 to 25 per cent. of the short-time tensile strength at room temperature, depending on the filler used. Modulus of elasticity in tension increases 25 to 50 per cent. after continued heating at 192° F. for 1,000 hours, depending on the type of filler used. The straight line relation of the log-log plot apparently best expresses the relation between stress and creep rate for the mineral-filled phenolics but the hyperbolic sine method is better suited as a simple method of expressing this relation for the cellulose-filled phenolics. C.

Conditioning Room for Testing Glued Specimens. R. S. Burnett and A. L. Merrifield. *Mechnical Engineering,* 1945, **67**, 475-476. Specified temperature and humidity conditions for evaluating glue by plywood and block shear tests are tabulated and a conditioning room for the wood and glued samples is described. The room is constructed with a wooden framework of 2 × 2-in. strips, the exterior of this framework being covered with $\frac{1}{8}$-in. Masonite board and the interior lined with 26-gauge galvanised sheet metal which is soldered at the joints. The interior dimensions of the room are 9 ft. × 6·5 ft. × 7 ft. high. A narrow tight fitting door is provided. The air in the room is circulated by means of an electric fan. A hygrothermograph is used to record the temperature and relative humidity. The temperature of the room approximates 80° F., and the relative humidity varies between 31 and 38 per cent. Under these conditions, the wood and glued samples attain equilibrium with approximately 6·5 per cent. moisture calculated on an oven-dry basis. The relative humidity of the room is controlled by means of flaked calcium chloride contained in a Solway "Air Dryette" which consists of a triple V-shaped wire basket supported on the edges of a glass dish. The saturated calcium-chloride solution drips from the flakes in the basket container and is caught in the glass dish. In this way the wet surface of the flakes continuously presents a large area of saturated solution for maintaining moisture equilibrium in the room. It is also quite probable that the dried wood stock stored in the room serves as a buffer in absorbing or gradually releasing moisture. These two factors are believed to be responsible for the successful operation of the conditioning room. C.

Phenolic Plastic Laminates: Strength; Effect of Temperature. P. Norelli and W. H. Gard. *Ind. Eng. Chem.*, 1945, **37**, 580-585. Tensile, compressive, and shear characteristics in the temperature range -55° to 200° C. are reported for typical phenolic laminates. The yield strength, ultimate strength, modulus of elasticity in tension, ultimate strength in compression, and ultimate strength in shear at -55°, -20°, 0°, 25°, 75°, 150° and 200° C. are also reported. The data show that the tensile, compressive, and shear strengths of phenolic laminates are inversely proportional to temperature, and that the cellulose-filled materials are more sensitive to temperature change than their mineral-filled counterparts. The rate of loss of strength as a function of temperature increases above room temperature for the cellulose-filled laminates, but decreases for the mineral-filled materials. Evidence of this variable change is supported by thermal expansion data for a typical laminate. The thermal expansion curve is shown to have a transition point at a temperature well within the range at which the accelerated change in physical properties seems to take place. C.

Plastics: Analysis. H. Barron. *British Plastics,* 1944, **16**, 339-348, 460-464; 1945, **17**, 56-62. The following schemes for the identification of plastics are set out in the form of tables, with information about a large number of products. (1) Burning test; (2) Fluorescence in ultra-violet light; (3) Specific gravity and specific volume in cubic inches per lb.; (4) Behaviour on dry distillation; (5) Decomposition products on dry distillation; (6) Classification according to saponification number; (7) Classification according to N, S, P, and Cl content; (8) Scheme of qualitative analysis based on solubilities; for opaque, homegeneous or laminated products; (9) Ditto for clear solid plastics,

without fillers. Methods for determining phenol, cresol, formaldehyde, nitrogen, furfuraldehyde, urea, thiourea, camphor and other plasticisers, and calcium stearate and other fillers are described and also tests for characterising cellulosic, acrylic and methacrylic and polyvinyl plastics. C.

Plastic Materials: Impact Strength. D. A. Shinn. *Modern Plastics*, 1945, **22**, No. 11, 145-152, 184, 186. Izod and Charpy impact data showing the effect on impact properties of temperature variations within the range -67° to 158° F. are presented for several thermoplastic and thermosetting plastic materials. Additional data for notched and unnotched specimens, edgewise and flatwise tests, directional effects, laminated specimen tests, and the effect of moisture content are also given. In general, an increase in temperature increases the impact energy absorption, but some materials exhibit scarcely any change due to temperature variation. There is no definite correlation between the Izod and Charpy test, but in general a material giving relatively good values as measured by the Izod test would be rated approximately the same by the Charpy test, both in the relative amounts of impact energy absorbed and in the notch sensitivity when expressed as the ratio of notched to unnotched impact values. No relationship has been established between the impact strength and either the tensile or flexure properties. Comparisons are made between the impact energy and the energy absorbed during a bend test, but the data have no direct correlation because of the differences in the effects of paper, cloth and wood fillers on the impact properties. C.

Quaternary Ammonium Compounds: Determination. A. S. Dubois. *Amer. Dyes. Rept.*, 1945, **34**, 245-246. Various methods for the determination of high-molecular quaternary ammonium compounds in solution and on fabrics and paper are briefly described. C.

7—LAUNDERING AND DRY-CLEANING

(A)—Cleaning

Soap Solutions: Detergent Power Test. George Heron. *Textile Manufacturer*, 1945, **71**, 253-255. Details are given of a detergency test, including particulars of the apparatus and of the method for preparing the standard soiled cloth. As in other tests, the whiteness of the cloth is measured before and after soiling and washing, with a Pulfrich photometer, the white standard being barium sulphate. Washing is continued until two successive readings on the photometer are the same. On the assumption (Rhodes and Brainard, 1929) that a unit of dirt diminishes the whiteness by 1 per cent, the number of units of dirt remaining is given by $n = \{\log (\text{final whiteness}/\text{original whiteness})\}/\log 0{\cdot}99$. Typical values of n are tabulated for washings with water, Lux, sodium oleate, Igepon T and sodium cetyl sulphate. The special purpose of the author, however, is to indicate a new basis for evaluating detergent power after having obtained such data. Rhodes and Brainard applied the Freundlich adsorption isotherm but the author exposes a fallacy in this application. He assumes that the energy of attachment (ϵ) between the adsorbed dirt particle and its support is distributed at random between zero and infinity and that the number of particles, N is very large, and then applies the Maxwell-Boltzmann law of distribution to obtain a term $\mu\epsilon$ (μ, a constant) which is regarded as a precise measure of detergent power. The relative value of n from the photometric readings, unity being assigned to the initial value before washing, gives the fraction $N\epsilon/N\{=(1-n_{\text{rel.}})\}$, which is required for the calculation of $\mu\epsilon$. When unity is assigned to water for the value of $\mu\epsilon$, other values are sodium cetyl sulphate 5·92, Lux 3·92, sodium oleate 2·63 and Igepon T 3·57. C.

Trichlorethylene: Use. H. A. Leveson. *Dry Cleaning and Dyeing J.*, 1945, **6**, 163. Practical notes are given on the satisfactory working conditions for the operation and maintenance of trichlorethylene dry cleaning plants. La.

Lot System Improvements. P. C. Trimble. *Dry Cleaning and Dyeing J.*, 1945, **6**, 168-173. Particulars are given of the lot system adopted by an Indianapolis dry cleaning firm. The method of invoicing and ticketing is described and also the method of assembly in the racking department. La.

Claims and Complaints. P. B. Mack. *Dry Cleaning and Dyeing J.*, 1945, 7 (2), 19, 31. Claims and complaints in dry cleaning are discussed under three headings: (1) Customers' faults, (2) manufacturing defects, (3) dry cleaners' faults. The examples given are typical and well known, and include a method of distinguishing brown stains caused by tannin present in beverages from scorch marks with which they are sometimes confused. La.

Dry Cleaning Factories: Fire Protection. W. J. Richardson. *Dry Cleaning and Dyeing J.*, 1945, 7, 3, 10-11, 21, 29. The causes of fire in dry cleaning plants are discussed in considerable detail and methods of protection are outlined. La.

PATENTS

Phosphatic Detergent Briquettes. H. G. C. Fairweather (Mathieson Alkali Works, New York). B.P.570,171 of 17/2/1943: 26/6/1945. Briquettes for use in mechanical washing operations consist essentially of controlled proportions of sodium silicate, water and either trisodium phosphate or sodium carbonate compounded at a temperature at which the mixture is fluid. Where desired, both trisodium phosphate and sodium carbonate may be incorporated in the mixtures. Advantageously, various water conditioners such as tetrasodium pyrophosphate, sodium tetraphosphate and sodium hexametaphosphate, or various surface active agents or both, may be included without deleteriously affecting the physical structure of the resultant briquette. Examples are given showing the ranges of permissible proportions of the various constituents. C.

Sulphated Fatty Alcohol Cleaning Composition. L. T. Edwards (British Disinfectant Co.). B.P.570,666 of 25/6/1943: 17/7/1945. A composition for cleaning textile and fibrous materials comprises an aqueous solution of a sulphated fatty alcohol to which free ammonia has been added. The composition may also contain methylene blue for enhancing whiteness, and an essential oil, hydrogenated phenol or other ingredient capable of stabilising the product. C.

8—BUILDING AND ENGINEERING

(A)—CONSTRUCTION AND MAINTENANCE OF BUILDINGS AND PLANT

Adhesives: Testing. Fred Wehmer. *Mech. Engineering*, 1945, **67**, 380-382. The author briefly reviews methods of testing the bond strength of adhesives and describes a special assembly with which test panels can be briskly flexed under pressure at temperatures down to −95° F. Speciality adhesives for aircraft construction are mentioned, including rubber latex-derivatives. One application is in adhesive tape. C.

Polyamide Resins: Characteristics and Applications. A. G. Hovey. *Modern Plastics*, 1945, **22**, No. 9, 125-126, 192. A general account is given of the characteristics of polyamide resins formed by the reaction of ethylene-diamine with dimerized and trimerized linoleic and linolenic acids, and of the uses of these resins in hot-melt coating and heat-sealing materials, lacquers, and wood sealers. Various war uses and miscellaneous applications are also mentioned. Moisture-vapour transfer data are quoted for glassine coated with polyamide resin. C.

Control Instruments: Applications in Textile Mills. J. L. Coburn. *Amer. Dyes. Rept.*, 1945, **34**, 217-220. Instruments for measuring and recording *p*H, electrolytic conductivity, speed, temperature and humidity, and their use for control purposes in textile mill processes are discussed. The use of instruments in textile laboratories and in textile power plants is also briefly discussed. C.

Electronic Motor Control Devices: Principles and Applications. B. J. Dalton. *Gen. Elec. Rev.*, 1945, **48**, No. 5, 12-17. The author explains the principles involved in electronic motor control and gives brief descriptions of various applications, including applications to lathes and tyre-building, steel strip reeling, and milling machines, and for the maintenance of a constant rate of loading on a testing machine. C.

Metallic Electronic Devices: Electrochemical Processing. A. Korbelak. *Electrochem. Soc. Preprint*, 1945, **87**, No. 34, 475-484. Electrochemical methods used for the processing of metals and non-metals used in the manufacture of electronic devices, including electrodeposition, electrolytic cleaning, electropolishing and electroburning, are reviewed. The electrostatic coating of

glass tubing is outlined, and a brief description is given of an electrochemical laboratory for the electronics industry. C.

Flame-resistant Cellulose Acetate Moulding Compositions: Properties. Marie Bentivoglio and B. E. Cash. *Modern Plastics*, 1945, **22**, No. 10, 102-104. A table is given showing the physical properties of the Lumarith CA series of flame-resistant cellulose acetate moulding materials, together with those of standard Lumarith X cellulose acetate materials. When tested for flammability by method D 635-41T, of the American Society for Testing Materials, the flame-resistant products are classified as self-extinguishing. They have higher tensile and flexural strengths and lower deformation under load than the standard materials of the same impact strength. Although their plastic flow temperatures are high, the flame-resistant materials resemble in their injection moulding behaviour cellulose acetate materials of two to three flow steps softer. The softer flowing members of the series show some tendency toward surface bloom which, however, would not be noticed under normal service conditions. C.

Flame-resistant Glass Cloth-Melamine Laminate: Production. L. C. Chesley and P. C. Fuller. *Modern Plastics*, 1945, **22**, No. 10, 136-140, 190. An account is given of the development of a flame-resistant glass cloth base-melamine resin laminate, and of the method of production and machining equipment and techniques. The material has outstanding electrical and physical properties and very high arc resistance, and is used for electrical insulation. C.

Laminants and Coatings: Characteristics and Applications. F. B. Speyer. *Paper Trade J.*, 1945, **121**, *TAPPI*, 3-6. Lacquer coatings and methods of applying them to paper, plastic, metal and other surfaces are discussed. Tables are given showing materials used in resinous formulations, properties to be considered in evaluating formulations, and surfaces to which adhesion is commonly sought. The formulation of hot melts for use either as coatings or as laminants is also discussed, a classification of hot melts is presented, and the advantages of hot melts over solution coatings are pointed out. Pressure-sensitive adhesions, solvent-active adhesives and fusion-type adhesives, for use in the production of laminated materials are discussed. A table is presented showing relationships between different resin types and surfaces and properties imparted by resins, and notes are given on methods of attaining various desirable properties. C.

Micarta 444 : Properties. E. Perry. *British Plastics*, 1945, **17**, 279-282. Micarta 444 is a hot forming laminated phenolic plastic which when heated rapidly to about 135° C. passes through a stage of considerable flexibility and when cooled to ordinary temperatures recovers its average physical properties. The hot forming procedure is briefly discussed. Drawing and shaping of the material are possible without a draw-ring. This plastic has a tensile strength up to 13,000 lb. per sq. in., a flexural strength of 19,000 lb. per sq. in. and a compressive strength of 30,000 lb. per sq. in. Unlike most of the thermoplastics it does not become as brittle as glass at temperatures below zero. Tables are given showing the properties of Micarta 444 in comparison with those of woods and metals. C.

Pulps: Suitability for Reinforced Plastics. S. L. Schwartz, J. C. Pew, and H. R. Meyer. *Paper Trade J.*, 1945, **121**, *TAPPI*, 18-20. Strong, tough, resin-filled, pulp-reinforced phenolic plastics containing 40 per cent. resin, based on the total moisture-free weight, were made from a variety of chemical pulps. A table is given showing the properties of the pulps and of the plastics containing them. The strength properties of the plastics were not dependent on fibre length or pulp-sheet strength. Thus black maple pulps whose fibres were only a quarter the length of spruce fibres were found to be suitable for the production of strong plastics. Contrary to what might be expected, the plastic flow and the required moulding pressure of the various chemical pulp-resin combinations were not markedly influenced by the fibre length. Mechanical and semichemical pulps were also found suitable for pulp plastics though, in general, these plastics were inferior in strength to those of chemical pulps. In most of these plastics, however, the plastic flow of the pulp-resin combinations and the water resistance of the resultant plastics excelled those obtained with chemical pulps. Modification of the pulp by mechanical and chemical

treatment prior to filling with resin, and the addition of a non-cellulosic constituent, glass fibre, were used to secure pulp plastics of altered characteristics. C.

Pulp and Paper: Applications in the Plastics Industry. D. T. Jackson. *Paper Trade J.*, 1945, **120**, *TAPPI*, 257-262. The application of pulp and paper in plastics can be divided into three main divisions. (1) The fibre is used as a raw material and is converted by chemical action into a thermoplastic material, e.g cellulose acetate. (2) The fibre is mixed with or is used in the form of paper as a filler. (3) Paper is coated or impregnated to confer special properties required for packaging. The first two types of application are briefly considered, and the production of laminated plastics is studied in greater detail. The selection of paper for laminates is discussed and impregnating, laminating, and moulding or post-forming operations are described. The properties and uses of laminates are described. Plywood-paper combinations, pulp preforms and resin filled fibre, and possible future developments are briefly discussed. C.

(B)—Fire Prevention

Mule Room: Fire Prevention. *Textile Weekly*, 1945, **36**, 178-182. Practical advice is given on points that need careful attention in the driving and lubrication of mules in order to reduce the risk of fire. C.

(C)—Steam Raising and Power Supply

"Arkon" Boiler Draught Recorder. Walker, Crosweller & Co. Ltd. *Textile Weekly*, 1945, **36**, 140-142. A brief description is given of an instrument of the bell float type for measuring and continuously recording air flow, and its value in raising the efficiency of boiler plant is discussed. The instrument is contained in a cylinder 8 ins. wide with the recording drum exposed to view in the upper part. The height varies according to the capacity required. C.

Watertube Boilers at Sea: Operation. W. Gregson. *Mech. World*, 1945, **118**, 302-4. Practical advice is given on the operation of watertube boilers. The points which need attention to effect good service are summarized. These include tube cleanliness, water treatment and oil firing. La.

(D)—Power Transmission

Fatty Acids: Lubricating Power. F. P. Bowden, J. N. Gregory and D. Tabor. *Nature*, 1945, **156**, 97-101. The authors review recent fundamental studies of the lubrication of metal surfaces by fatty acids, under the headings (1) effect of chain length, (2) film thickness, (3) effect of temperature, (4) nature of the underlying surfaces, (5) lubricating properties of metal soaps, and (6) mechanicism of boundary lubrication. C.

Textile Machines: Electric Driving. E. Howlett. *Textile Manufacturer*, 1945, **71**, 227-231; 271-273; 317-319. (1) The writer summarises the characteristics of the drives for the opening machines, cards, cardroom machinery, mules, ring spinning and doubling frames, winding, warping, dressing and sizing machines, looms, and all the machines of a calico bleaching, dyeing, printing and finishing plant, and indicates suitable types of electric motor to meet the requirements. (2) The characteristics of d.c. and a.c. motors commonly employed in textile fabrics are reviewed. (3) Costs are worked out. C.

White Metal Bearing Alloys: Frictional Properties. D. Tabor. *J. Applied Physics*, 1945, **16**, 325-337. A report is given of experiments on a typical lead-base bearing alloy which consists of a soft matrix in which are dispersed numerous hard crystallites. Measurements of the friction were made at room temperature and above for clean and for lubricated surfaces. Comparison with a special alloy consisting of the matrix material alone, showed that the hard particles played no appreciable part in the basic frictional and wear properties of the bearing alloy. It is suggested that the frictional behaviour of the bearing alloy is determined essentially by the properties of the matrix material itself although in practical running operations there may be other properties which determine the suitability of the alloy for use in bearings. Similar experiments are described on a typical tin-base bearing alloy and a corresponding tin-base matrix alloy. C.

(E)—Transport

Factory Hoists: Electric Driving. H. V. Green. *Gen. Elect. Rev.*, 1945, **48**, 39-46. The operating characteristics of the following types of motors and controls

are expressed graphically in terms of hoist performance:—A.C. types: (1) High-torque squirrel-cage, (2) wound-rotor induction, (3) wound-rotor and mechanical load brake, (4) wound-rotor using counter-torque lowering, (5) wound-rotor and single-phase dynamic lowering, (6) wound-rotor with unbalanced 3-phase dynamic lowering, (7) wound-rotor and d.c. dynamic lowering, (8) wound-rotor and thruster load brake; D.C. types: (9) series-wound and mechanical load brake, (10) series-wound and dynamic braking lowering; and (11) a new "Maxspeed" type in which a d.c. generator, provided with a "cross-flux" exciter and driven by a.c. or d.c. current, supplies power to the hoist motor. C.

Mill Transport Appliances. H. E. Reed. *Textile World*, 1945, **95**, No. 5, 97-102. An illustrated account is given of various appliances for moving goods in the horizontal or vertical plane or both, including overhead conveyors for yarn cones or heavy beams. A table indicates which appliances are most suitable for particular packages and accessories commonly found in textile mills. C.

(F)—Lighting

Fluorescent Lamps: Availability. Electric Lamp Manufacturers' Association. *Textile Weekly*, 1945, **36**, 138. A list is given of the range of fluorescent lamps that will soon be available for industry. The popular 80-watt 5-ft. lamp will be supplemented by smaller lamps for domestic purposes and local illumination. C.

Fluorescent Lighting Systems: Cost. S. D. Lay. *Electrical Review*, 1945, **136**, 948-950. The writer tabulates and expresses graphically the cost of lighting by means of 200-w. gas-filled lamps in "Glassteel" diffusers, in comparison with 80-w. fluorescent lamps in simple back-plate reflectors, under various systems of charging for the current and for a range of burning hours. The comparison is greatly in favour of fluorescent lighting. C.

(G)—Heating, Ventilation and Humidification

Cardroom Dust Removal System. Andrew Machine Construction Co. Ltd. and Atmospheric Control Ltd. *Textile Weekly*, 1945, **36**, 119-124. An illustrated account is given of a patented system for mitigating the nuisance of dust in cardrooms. It is said to be the result of studying the production of dust at the card by means of powerful beams of light, and to aim at the collection and removal of the dust at the points of origin. The carding engine is surmounted by a hood which draws in air at the minimum rate of 2,000-2,500 cubic ft. per minute to carry off the dust and fly. Integral with the hood, centrally above the card, is an automatically cleaned separator, and another hood extends from each side of this device to receive the dust rising from the doffer on the one side and the taker-in on the other. The dust-laden air is drawn through the separator by an electric fan and the clean air is returned to the room. The accumulation of dust and fly in the separator is continuously removed from the filter surfaces and may be carried away by suction. The droppings under the card may also be removed by suction and lodged directly in a bag in the waste cellar. Only ¼ h.p. is extended in drawing in the large volume of air and filtering it per card. C.

Patents

Scale Formation: Prevention. J. E. Edwards and Imperial Chemical Industries Ltd. B.P.568,000 of 13/8/1943: 13/3/1945. This invention relates to the prevention or delaying of precipitation from waters containing hardness and the prevention of scale formation in water systems by the addition of small quantities of a certain aminocarboxylic acid alone or together with soluble polyphosphates, of which the most important is sodium hexametaphosphate and polyhydric phenols. La.

Water: Treatment. Permutit Co. Ltd. B.P.569,899 of 4/11/1943: 13/6/1945 (Conv. 9/12/1942). In the treatment of water by passage through a base exchange material and then through an acid exchange material to effect softening and the removal of dissolved solids, a single passage through a bed of each material will reduce the dissolved solids to a low value. For some purposes, however, an extremely low content of dissolved solids is desirable. This is achieved in this invention by successively treating given volumes of water by repeatedly passing each volume through the two beds until the required low concentration is obtained. This may be determined by conductivity tests. The volume of water and the capacity of the two beds is

adjusted so that regeneration is required after the first passage and before the last passage of the volume of water. The entire process may be automatically controlled. By this process the capacity of the two materials is increased over that obtained when operating the single passage procedure. La.

Air Filtering and Conditioning System. A. E. Griffiths (Smethwick) Ltd., J. S. Moss and F. Bernard. B.P.569,930 of 23/9/1944: 14/6/1945. In an air filtering and conditioning system comprising a fan or blower, a filter rotatably mounted and surrounding the rotor of the fan or blower through which the lower portion of the filter travels and means for automatically replenishing the water in the sump, the water is drained away from a point lying above and within the portion of the filter immersed in the sump. The height of the water in the sump may be varied by means of an outlet pipe, one end of which draws off liquid at a fixed height, whilst the other end of the pipe can be raised or lowered to govern the height of the liquid level in the sump. C.

Bimetal-element Hygrometric Apparatus. N. R. Davis and Sun-Vic Controls Ltd. B.P.570,416 of 9/12/1943: 5/7/1945. Hygrometric apparatus comprises two bimetal elements, coupled with indicating, recording or control means (e.g. a strip of muslin) whereby water may be evaporated from the surface of one of the elements, and a screen to prevent or reduce radiation of heat between the bimetal elements. The means for evaporating water from the one element are arranged to cause evaporation of water also from the supporting means for the element and thereby to reduce the deflection of the element due to heat transmitted to it through the supporting means in dependence on the ambient temperature. C.

Rust-preventing Lubricating Oils and Greases. H. Moore and Petroleum Inventions Ltd. B.P.570,500 of 18/8/1943: 10/7/1945. Rust or anti-oxidation and anti-corrosive properties are imparted to mineral or fatty lubricating oils and greases by the addition of a small quantity, e.g. 0·2 to 5 per cent., of the zinc salt of a naphthene sulphonate. C.

9—PURE SCIENCE

Cellulose Acetate: Poly-molecularity and Mechanical Properties. A. M. Sookne and M. Harris. *Ind. Eng. Chem.*, 1945, **37**, 478-482. Measurements have been made of the tensile strength, ultimate elongation and folding endurance of films prepared from a series of cellulose acetate fractions and blends. When the mechanical properties are plotted against the intrinsic viscosities (or relative weight-average degrees of polymerization), the results for the fractions and different blends fall on separate curves. In contrast, when the mechanical properties are plotted against the number-average degrees of polymerization, the results for the fractions and all of the blends fall approximately on a single curve for each property. The results are qualitatively consistent with the hypothesis that the mechanical properties of blends are the weight averages of the properties of their components: $\text{Property}_{\text{blend}} = \Sigma\, w_i P_i / \Sigma\, w_i$ where w_i is the weight of the molecular species with a mechanical property P_i. The results emphasize the importance of the determinations of the number-average degree of polymerization in studying commercial polymolecular materials. C.

Sulphur: Photo-chemical Reactions with Lipins, Soaps and Cysteine. A. Steigmann. *J. Soc. Chem. Ind.*, 1945, **64**, 119-120. The effects of liming gelatin raw materials and cystine, the reactions of colloidal sulphur with soaps and oleic acid, and the behaviour of cystine and cysteine in presence of colloidal sulphur and acid thiosulphate solutions are discussed and their importance for the study of photographic sulphur sensitisers is indicated. It is suggested that the photographic sensitising process in presence of cystine and thiosulphate is a hydrogen-dehydrogenation process and a chain reaction with many possible stages, where sulphurous acid or a sugar of the gelatin reduces cupric copper or ferric iron to cuprous copper or ferrous iron. These reduce cystine to cysteine, and this reduces the labile sulphur of thiosulphate to hydrogen sulphide or polysulphide, which eventually forms sensitising silver sulphide specks; then the reaction starts again. C.

Dyes: Absorption Spectra. G. N. Lewis. *J. Amer. Chem. Soc.*, 1945, **67**, 770-775. Six great classes of dyes, namely, triphenyl-(or diphenyl)-methane, xanthene, acridine, diphenylamine, oxazine and thiazine, and azine dyes, are

brought together into one family, and it is shown that the wave length, λ, of the main absorption band of any member of the family is determined by two rules. The first, theoretical, states that λ is always greater the greater the fraction of the characteristic positive charge on the auxochromes. The second, empirical, states that the effect upon λ of various groups is additive. Thus a number of additive constants are obtained, from which λ can be calculated, and which are all qualitatively consistent with the theoretical rule. However, in the acridine dyes the calculation applies, not to the first band, but to the second band. With this proviso, a table of observed and calculated values shows that with the new dyes of the given family λ can be predicted with an average error of not more than $3m\mu$. C.

Ishihara Colour-blindness Test: Evaluation. L. H. Hardy, G. Rand and M. Catherine Rittler. *J. Optical Soc. America*, 1945, **35**, 268-275. A critical study shows that the Ishihara test for colour-blindness fails to give more than a superficial evaluation of the state of an observer's colour vision. It can be utilized as a good rough screening test for red-green colour blindness, but in so doing most of the plates could be discarded. The results obtained are dependent to a large extent upon the illuminant used, and this fact militates against the deuteranomalous observer. The test gives neither an adequate qualitative (type of defect) nor quantitative (extent of defect) diagnosis, and may give a wrong diagnosis. Results obtained by this test should be discounted unless verified by other modern types of tests. C.

Spectrophotometry and Colorimetry: Illuminating and Viewing Conditions. A. C. Hardy. *J. Optical Soc. America*, 1945, **35**, 289-292. Illuminating and viewing conditions for spectrophotometry and colorimetry are discussed in relation to surface characteristics, consideration being given to materials having (1) identical surface characteristics, (2) slightly dissimilar surface characteristics, and (3) large differences in surface characteristics. Reference is made to such problems as the matching of textile and other materials having different surface characteristics, and investigations of changes in colour of plastic materials on weathering. It is pointed out that of the various modes of illumination and observation that have been used, the one that is least sensitive to variations in surface characteristics employs substantially normal illumination and substantially diffuse observation, and makes use of an integrating sphere for this purpose. It is suggested that, if there is to be a standard mode of illumination and observation, the specification should require substantially normal illumination of the sample and substantially complete collection of the light reflected by the sample. C.

Intensity Rain Gauge. J. M. Sil. *J. Sci. Instruments*, 1945, **22**, 92-94. A description is given of an instrument recording intensity of rainfall against time on a daily chart wound on a clock drum as ordinarily used with self-recording meteorological instruments. The rain is successively collected in one of three receivers over a period of 1 min.; floats in these receivers operate a common pen arm. Performance figures are given; the instrument is sensitive to 0·02 in. of rain per hour. C.

Photo-electric Cells: Fatigue; Influence of Illumination. A. Sommer. *Electronic Engineering*, 1945, **17**, 504. Causes of fatigue or change in sensitivity of photo-electric cells are discussed. Three cases, (*a*) photo-cells exposed to light in open circuit, (*b*) vacuum photo-cells in closed circuit, (*c*) gas-filled photo-cells in closed circuit, are considered and indications are given of the maximum currents that can be taken for any length of time. C.

Filter Papers; Gas Flow through —. L. C. Verman and K. A. Nair. *J. Sci. Ind. Res. (India)*, 1945, **3**, 452-459. Tables are given showing pressure drop at various rates of flow of air through five types of filter paper, and pore diameter, paper thickness, bulk density and fibre density data and Reynolds' numbers at highest rate of flow. The following equation is deduced

$$\Delta p = F\frac{8(at+bF^m+c)^2\eta}{r^2t(1+4\xi/r)(1-\omega/\delta)}$$

where Δp is pressure drop, t is thickness of paper, r = effective pore radius, ω is bulk density of paper, δ is paper fibre density, η is viscosity of air, ξ is slip coefficient or mean free path of air molecules, F is rate of flow of air, and a,

b, *c* and *m* are constants. Calculated curves of Δp and experimental points show fairly satisfactory agreement. C.

Plastics and Elastics: Electrophysical Properties. L. Hartshorn. *British Plastics*, 1945, **17**, 99-106, 186-192. The effectiveness of plastics and elastics as insulating materials is judged by their ability to support large voltage gradients and to store large amounts of electrostatic energy with the minimum dissipation of energy. These qualities are usually measured in terms of dielectric strength, conductance, dielectric constant and power loss. These properties are discussed and it is shown that they have important connections with the chemical and physical structure of the materials and with their uses. Non-polar and polar materials are considered, and curves are given showing the dielectric constant and loss tangent of various heat-hardened resins and polar thermoplastics as functions of frequency and temperature. C.

Hemicellulose: Extraction. I. A. Preece. *Biochem. J.*, 1944, **38**, 402-408. Hemicellulose preparations made by methods involving extraction of woody tissues with aqueous sodium hydroxide are mixtures containing materials resistant to chlorination and others which are rendered soluble in sodium sulphite solution by this treatment. The two types have tentatively been designated cellulosan and encrusting hemicelluloses. The possibility of separately extracting encrusting hemicelluloses following simple delignifying methods, not necessarily leading to holocellulose production, has been studied. Tables are given showing (1) the influence of progressive alternation of chlorination and alkaline extraction of willow sawdust on the yield and composition of wood residue and crude cellulose and the solubility of furfuraldehyde-yielding components, (2) changes in yield and composition of crude cellulose, and in the solubility of furfuraldehyde-yielding components of willow sawdust, resulting from various alkaline pretreatments, (3) the influence of a single pretreatment with ethanolic caustic soda (without chlorination) on the solubility of furfuraldehyde-yielding components of willow sawdust, (4) the influence of pretreatment with ethanolic caustic soda, with or without subsequent treatment involving chlorination, on the extraction of furfuraldehyde-yielding materials, (5) extraction of furfuraldehyde-yielding material from crude cellulose, and (6) loss of furfuraldehyde during final preparation of cellulose. The results show that rigid differentiation of encrusting and cellulosan hemicelluloses is not possible by the methods studied. Both fractions show graded ease with which they can be rendered soluble in aqueous solvents. C.

Ester Wax: Application in Microtomy. H. F. Steedman. *Nature*, 1945, **156**, 121-122. Many of the disadvantages of paraffin wax as an embedding medium can be overcome by using compositions ("ester waxes") in which diethyleneglycol stearate is the main ingredient. A particular advantage is that the ribbon of sections can be flattened on stain solutions which easily penetrate the ester wax. Methylene blue and erythrosin are recommended for staining and counterstaining. Cellosolve mixtures are useful for stripping methylene blue and xylene is recommended for dissolving the ester wax. C.

Red Leaf Indian Cotton Plant: Genetics. K. Ramiah and B. Nath. *Proc. 31st Indian Sci. Congr., Delhi* 1944, Pt. III, p. 163 (through *Plant Breed Abstr.*, 1945, **15**, 107). The red colour in the leaves of *Gossypium hirsutum* may occur uniformly over the whole of the upper surface, in which case it behaves as a Mendelian character; or in patches on both the leaf surfaces associated with a curling or crumpling of the leaf, the latter condition being considered to be a result of jassid attack. The former effect may be a desirable character as it causes extra earliness in the plant. C.

Indian Cotton Plant: Genetics. *Progress Rept., Cotton Genetics Research Scheme, Indore*, 1943-44, 27 pp. (through *Plant Breed Abstr.*, 1945, **15**, 106-107). A report is given of progress in work on the genetics of the lintless mutants, Nandyal lintless (*G. arboreum*) and Viramgam lintless (*G. herbaceum*), genetical studies on fuzz grades in *G. hirsutum*, a large-scale yield trial with bulks from X-ray progenies, an attempt to evolve a homozygous 5-lock boll type in *G. arboreum*, and studies of petal spots, a green spotless mutant, red leaf, jassid resistance, wilt and breeding for wilt resistance, the potentialities of different ecotypes of *G. hirsutum* with regard to combination of economic characters,

and crossing of the doubled hybrids *G. arboreum* × *G. Thurberi* and *G. hirsutum* × *G. Raimondii* with *G. hirsutum*. C.

Bombyx neustrica L. Caterpillar: Fluorescence. R. G. Busnel and A. Drilhon. *Compt. rend. soc. biol.*, 1941, **135**, 1009-1011 (through *Chem. Zentr.*, 1944, i, 165, and *Chem. Abstr.*, 1945, **39**, 2148[7]). At the posterior end of the malpighian tubule of the caterpillar *Bombyx neustrica L.* is located a yellow, intensely yellow-green fluorescent catabolite with a wide band at 5150 A. This substance is found in highest concentrations during the larval state. During the spinning of the cocoon the substance is excreted as a yellow, strongly fluorescent powder. It is neither riboflavin nor pterin, but riboflavin is present in appreciable amounts. The powder is purified by successive treatments with acetic acid, 55 per cent. methyl alcohol, chloroform and acetone, yielding uric acid-like crystals. Even though positive tests for purines are obtained with Denigès and the murexide tests, the substance cannot be uric acid or an ordinary purine for neither of them shows fluorescence. It contains a carbohydrate, probably a pentose. It is insoluble in organic or inorganic solvents in which pigments usually are soluble; strong acids destroy it when heated, and the fluorescence disappears. It is unstable to heat but stable to visible and ultra-violet light. Caterpillars of *Bombyx chrysorrhœa L.* did not contain this substance even though large amounts of riboflavin were detectable. C.

Termite Repellents: Investigation. G. N. Wolcott. *Science*, 1945, **101**, 444. Tests have shown the value of heavily chlorinated or brominated compounds of phenol for preventing the attack of most susceptible woods by the West Indian dry-wood termite *Cryptotermes brevis* (Walker). Copper pentachlorophenate has a superior repelling effect. Sulphates, nitrates, chlorides, bromides and acetates of Zn, Fe(ic), Cd and Sb are less effective. Minute amounts of some Hg salts produce an initial effect comparable with that of Cu compounds but in the course of weeks or months, termites are able to eat the treated woods with impunity. The effects of treatment of the wood with phenol disappear even more rapidly. When phenolic glue is used in plywood, the termites usually begin feeding where the glue holds the sheets together. Fluorene, phenanthrene, fluoranthene and pyrene have more lasting effects. Combination of some of these organic compounds with the repellent metals should prove very effective repellents. Heavy chlorination of naphthalene and combination with metals might also result in the production of superior termite repellents. C.

Metal Dialkyl Dithiocarbamates: Fungicidal and Phytocidal Properties. M. C. Goldsworthy, E. L. Green and M. A. Smith. *J. Agric. Res.*, 1945, **66**, 277-291. A report is given of experimental studies of the fungicidal and phytocidal properties of some metal dialkyl dithiocarbamates. The soluble sodium salts and selenium, copper and mercury salts were all phytocidal to all the various plants used, but the iron, zinc and silver salts varied in this respect. The lead salts did not injure any of the plants. Apparently iron and zinc salts become changed by weathering. The dimethyl derivatives appeared in general to have the greatest fungicidal value, and the dibutyl derivatives the least. The lead salts appear the most promising from all standpoints. All the metal dialkyl dithiocarbamates were compatible with hydrated lime and lead arsenate. Tests with the iron dimethyl dithiocarbamates indicated that this metal derivative retained its fungicidal efficiency when combined with bentonite or nicotine sulphate and bentonite but not with bentonite flocculated with lime. Field tests of ferric dimethyl dithiocarbamate for the control of fruit scabs and leaf spot are reported. C.

Cellulose: Fermentation by Thermophilic Bacteria. L. Enebo and H. Lundin. *Svedberg Anniv. Vol.* 1944, 438-455 (through *Brit. Abstr.*, 1945 A III, 326). One of the main hindrances to technical utilisation of cellulose fermentation is the low concentration of the products and the inhibition of fermentation by their accumulation. However, it should be possible to concentrate the fatty acids formed in many fermentations by freezing out water from solutions of the calcium salts. Normal cellulose fermentation is possible in beet pulp media by bacteria the activity of which towards artificial cellulose media is completely inhibited by carbohydrates. C.

Starch: Hydrolysis and Fermentation by a Yeast. L. J. Wickerham, L. B. Lockwood, O. G. Pettijohn and G. E. Ward. *J. Bact.*, 1944, **48**, 413-427

(through *Brit. Abstr.*, 1945, A III, 322). Wheat mash cultures of *Endomycopsis fibuliger* gave unsatisfactory saccharification. When used alone in the saccharification and alcoholic fermentation of wheat mash, bread cultures of various strains produced 13·2-54·0 per cent. of the theoretical yield of alcohol; when such cultures were used in association with *Saccharomyces cerevisiae* 63·7-78·3 per cent. of the theoretical yield was obtained. Bran cultures, 3 days old, of 7 strains gave 58·1-74·8 per cent. of the theoretical alcohol yield. Alcohol yields by *S. cerevisiae* from similar malt-saccharified mashes averaged 80 per cent. of the theoretical. The use of *E. fibuliger* cultures for hydrolysis of starch in the butylene glycol fermentation gave total yields of butylene glycol, ethyl alcohol, and acetylmethylcarbinol equivalent to the yields obtained with malt-saccharified mashes. More alcohol was produced in mashes saccharified by *E. fibuliger* than in malt-saccharified mashes. C.

Proteolytic Enzymes: Activity; Micro-photometric Rate Determination. P. C. Zamecnik, G. I. Lavin and M. Bergmann. *J. Biol Chem.*, 1945, **158**, 537-545. A micro-titration method for the measurement of enzymatic proteolysis is described in which a photometric determination of the end point is substituted for a visual one. Titration of an amino acid or peptide is carried out with alcoholic hydrochloric acid in a 90 per cent. acetone medium containing naphthyl red as an indicator. A Wratten filter 77, transmitting in the 5400 to 5500 A. region, is used and light, after passing through the micro-titration cell, strikes a single barrier copper-copper oxide photronic cell. The current developed in the photronic cell is measured by a sensitive galvanometer. At the point where the *p*H causes the indicator to change from yellow to red, the amount of light transmitted through the cell decreases abruptly. In a test of the precision of the method it was found that $2{\cdot}8 \times 10^{-8}$ mole of leucylglycine can be titrated with considerable accuracy. Applications are reported. Sources of error and methods of reducing them are discussed, particular attention being called to the possibility of errors resulting from the formation of split-products which are better buffers than the original substrate. C.

Cellulose, Cellulose Derivatives, and Nitrating Acid: Analysis. S. N. Danilov. *Trans. All-Union Conf. on Anal. Chem.*, 1944, **8**, 204-219 (through *Brit. Abstr.*, 1945, C, 25). (1) To determine the reducing power of a cellulose, a sample is allowed to react for 15 min. at 80° with a known volume of a solution of 7CuO, $2SO_3$, $5H_2O$ (from copper sulphate and sodium carbonate) in aqueous ammonia, the solution being prepared and the oxidation performed in an atmosphere of hydrogen. Sulphuric or hydrochloric acid and ferrous ammonium sulphate are added to the oxidised solution and unoxidised ferrous ion is titrated with 0·04N.-potassium permanganate. (2) To determine the degree of oxidation of a hydroxycellulose, the sample is oxidised with chromium trioxide in phosphoric acid and the amounts, X, of oxygen consumed and, Y, of carbon dioxide formed are determined. The ratio $4400X/33Y$ is called the degree of oxidability; it is 100 for cellulose and the smaller the more oxygen and the less hydrogen the sample contains. (3) To determine the degree of xanthation of viscose, a solution of the viscose is neutralised with acetic acid and shaken with chloroacetonitrile; the group ·CS.SNa is thus transformed into ·CS.S.CH_2.CN. The nitrogen content of the reaction product is determined; it is the higher the more xanthate groups there are per 100 glucose units. (4) When analysing nitrating acid in the manufacture of cellulose nitrate, useful information is obtained by blowing out nitrogen oxides by means of carbon dioxide. When the ratio water: sulphuric acid in the acid is low, blowing out raises the amount of substances reducing potassium permanganate; when it is greater than 1, blowing out lowers the reducing capacity. (5) Organic substances in the nitrating acid are determined by oxidation with potassium permanganate or chromium trioxide and by measuring the amount of carbon dioxide formed. From the ratio of oxygen consumed to carbon dioxide produced the nature of the organic substances can be estimated. C.

Starch: Determination by Diastase Method; Effect of Preservatives. C. F. Poe and B. P. Jukkola. *Food Res.*, 1944, **9**, 338-340 (through *Brit. Abstr.*, 1945, C, 35). The starch recovery is decreased by addition of more than 2 g. of sodium chloride to a 3-g. sample and is 87·4 per cent. for 5 g. of sodium chloride. Potassium nitrate, boric acid and borax have little effect when more than 2 g.

are used. Sodium benzoate has the greatest effect, giving a recovery of 80 per cent. in amounts greater than 3 g. C.

DDT Insecticide: Colorimetric Micro-determination. H. A. Stiff and J. C. Castillo. *Science,* 1945, **101**, 440-443. Details are given of a colorimetric method for the micro-determination of DDT which depends on the development of a red colour when this insecticide is heated in an anhydrous pyridine solution containing xanthydrol and solid potassium hydroxide. The reaction is sensitive to as little as 10μg and will detect small differences in concentration within the range of 10 to 200μg. C.

Barley Globulins: Separation and Molecular Weights. O. Quensel. *Thesis, Uppsala,* 1942, 97 pp. (through *Brit. Abstr.,* 1945, A II, 176). Salt extracts of barley, prepared and purified by a variety of methods were examined in the ultracentrifuge. The globulin fraction proved to be a mixture of four components, distinguished as α, β, γ and δ, and having respective sedimentation constants 2·49, 6·21, 8·30 and 12·0. Fractions α and γ, present in approximately equal amounts, are the predominant components. Fractions rich in β can be obtained by fractional dialysis and by precipitation with carbon dioxide, whilst 15 per cent. saturation with ammonium sulphate causes precipitation principally of β, but contaminated with α. A clear separation of α and γ is not possible by fractional dialysis, but the proportion of γ can be reduced by dialysis against 2M-sodium chloride; the proportions of α and γ can also be modified by varying the *p*H of the external liquid. Partial-saturation (40 per cent.) with ammonium sulphate precipitates a mixture of α, β and γ, but subsequent 70 per cent.-saturation precipitates α and γ. A useful degree of separation of these two is also possible by means of the centrifuge. The complete method for preparing fractions rich in α-, β, and γ-globulins involves a combination of these treatments. Further, but still incomplete, separation of α and γ is possible electrophoretically, the isoelectric points of α, β and γ being 5·0, 4·9 and 5·7, respectively. The molecular weights of α and γ calculated from diffusion constant determinations are 26,000 and 166,000. The molecular weight of γ from sedimentation equilibrium determinations is 173,000 and 160,000 for solutions poor and rich respectively in this fraction. Molecular weights of β and δ are about 100,000 and 300,000, respectively. The principles of ultra-centrifugal examination of solutions are reviewed, and the theory underlying the determination of molecular weights by ultracentrifugal methods and of diffusion constants in solutions containing several components is discussed at length, the relevant mathematical considerations and equations being given. C.

Divinyl Rubbers: Chemical Characterisation. A. I. Yakubchik, A. A. Vasil'ev and V. M. Zhabina. *J. Appl. Chem. (U.S.S.R.),* 1944, **17**, 107-113 (through *India Rubber J.,* 1945, **108**, 525-526). The specimen, 2-3 gm., is ozonised in 1 per cent. solution in chloroform at −20° C., the ozonide is decomposed by hot water and formic acid and formaldehyde are determined in the solution. Each molecule of $H{\cdot}CO_2H$ or $H{\cdot}CHO$ formed is derived from one vinyl group. To obtain a high percentage of vinyl group in polymerised butadiene, sodium is the most effective alkali metal catalyst and 22° C. is a better reaction temperature than 60° C. C.

Furane Derivatives: Technical Applications. H. Seymour. *Indust. Chemist,* 1945, **21**, 289-292. The author summarises the applications of the technical "furans," viz., furfuraldehyde, furfuryl alcohol, tetrahydrofurfuryl alcohol and hydrofuramide, in plastics, as fungicidal, flotation and wetting agents, and as anti-static yarn dressing agents. C.

Lignin: Utilisation. H. F. Lewis. *Chem. and Eng. News,* 1945, **23**, 1074-1080. The author calls attention to the enormous quantities of lignin that are wasted annually. He calculates that American pulp and paper mills burn or run to the sewers about 2½ million tons and sawmill waste is equivalent to 7½ million tons, whilst agricultural by-products (pea vines, bagasse, straws, cotton stalks) are equivalent to about 28 million tons. The utilisation of these wastes and the effluent disposal problems are reviewed with special reference to pulping and the saccharification of wood for fermentation to alcohol. The physical properties of various lignins are recorded and a summary is given of the literature on aromatic compounds that have been isolated by distillation, hydrogenation and other processes. Uses of lignin in the adhesives, briquetting, ceramic, dyeing, plastics and other industries are reviewed. The author sums

up the problem of the utilization of lignin by saying that if the annual output of phenolformaldehyde plastics were displaced by lignin resins and all coal tar chemicals (dyes and perfumes and medicinal and flavouring agents) replaced by derivatives from lignin, only 38 per cent. of the lignin lost in sulphite pulp liquor alone would be saved. C.

Petroleum Products: Utilisation in Industrial Processing Materials. J. C. Dean. *Chem. and Eng. News*, 1945, **23**, 1164-1167. The author reviews the utilisation of petroleum products by industry apart from their uses as fuels, lubricants or sources of fine chemicals. He deals with (1) paraffin wax, of which the American output is more than 700 million lb. per annum, (2) microcrystalline waxes, war demands for which were more than 120 million lb. in 1943, (3) wax emulsions, for waterproofing, sizing of paper, dressing of yarns, etc., (4) petroleum by-products, such as naphthenic and sulphonic acids, (5) rust preventives, and (6) non-compounded oils, such as medicinal paraffins, "white oils," rubber compounding agents and insect repellents. C.

Polymers: Solubility and Fractionation. R. L. Scott. *J. Chem. Phys.*, 1945, **13**, 178-187. The free energy relations for heterogeneous molecular weight distributions developed by Scott and Magat are applied to problems of solubility and fractionation. Critical conditions for solubility are obtained. A rigorous expression for the solubility is derived, although certain approximations are made to facilitate calculation, and to permit extension to polymers which are part "gel." Following the same methods the thermodynamic equilibria involved in fractionation are described by mathematical expressions which permit a comparison of the extraction and precipitation methods. The effectiveness of fractionation is shown to be strongly dependent upon concentration. C.

Seaweed Colloids: Terminology and Application. C. K. Tseng. *Science*, 1945, **101**, 597-602. The writer reviews the chemistry of the various seaweed colloids that are now being utilised, and proposes a tentative grouping of the "phycocolloids" into (1) water-soluble ethereal sulphates (e.g. agar, carrageenin and fucoidin) which are akin to the mucilages, (2) soluble reserve glucosidic carbohydrates (e.g. laminarin), which occupy a position similar to that of starch in land plants, and (3) the alkali-soluble polyuronides (e.g. algin), which are analogous to pection. Various seaweed products are related in a "family tree" on this basis. C.

Shellac: Recent Developments and Uses. B. S. Gidvani. *J. Oil & Col. Chemists' Assoc.*, 1945, **28**, 83-91. The composition of shellac is discussed and a review is given of recent developments in the production of dewaxed lacs, lacs of reduced colour, lac-nitrocellulose and lac-ethylcellulose lacquers, and of lac esters and other derivatives, which can be used as plasticisers, as components of cements, adhesives, polishes, sizes, waterproofing compositions, etc., and for the production of rubber-like materials and resins. The use of shellac for moulding purposes is also briefly discussed. C.

Surface and Interfacial Tensions: Measurement by Vibrating Jet Method. C. C. Addison. *Phil. Mag.*, 1945, [vii], **36**, 73-100. Details are given of a simplified practical and mathematical technique designed to bring the vibrating jet method within the scope of routine laboratory work. The method is extended to include liquid/liquid interfaces, and previous work on freshly formed surfaces is summarized. C.

Protein Mixtures: Electrophoretic Analysis. G. R. Cooper. *J. Biol. Chem.*, 1945, **158**, 727-728. The results of experiments with swine serum indicated that the concentration of constituents in a mixture of proteins cannot be evaluated by simple integration of the electrophoretic pattern. In studies of solutions containing various percentages of electrophoretically homogeneous bovine serum albumin and horse serum globulin in barbital buffer containing various amounts of sodium chloride, percentage composition was calculated from the area outlined by drawing a line following the middle of the Philpot-Svensson pattern curve and the middle of the base-line. The values determined experimentally by direct integration of the patterns agreed well with the known composition of the mixture, and indicate that correct analyses in buffers of low ionic strength can be made by simple integration of the diagrams. With swine serum in barbital buffer of *p*H 8·6 and 7·8, insignificant variations in percentage composition were observed with change in ionic strength. C.

Polymers and Solvents: Free Energy of Mixing. R. L. Scott and M. Magat. *J. Chem. Phys.*, 1945, **13**, 172-177. The theories of Flory and Huggins for the free energy of mixing of a homogeneous chain polymer of uniform molecular weight with a single uniform solvent are extended to the case of a polymer mixture of varying chain lengths (e.g. rubber) with a mixture of solvents. By making assumptions similar to those made by Huggins, and utilizing familiar statistical mechanical methods, the partial molal free energy of mixing of the solvent is found to be $\blacktriangle F_0 = RT[\ln\phi_0 + (1-\phi_0)(1-1/m_N) + \mu(1-\phi_0)^2]$, where ϕ_0 is the volume fraction of solvent, m a simple function of the number average molecular weight, and μ a constant characteristic of the polymer-solvent mixture (consisting largely of a heat term, but also including γ, the coordination number of the rubber segments). By assuming that a mixture of two solvents behaves like a new homogeneous liquid a method of calculating μ for such mixtures is developed. C.

Membrane: Permeability; Theory. I. Bloch. *Bull. Math. Biophys.*, 1944, **6**, 85-92 (through *Sci. Abstr.*, 1945, **48** A, 57). A plane membrane is considered as a potential barrier for the molecules diffusing through it. Some simple assumptions are made about the form of the potential barrier and the differential equation describing the diffusion is set up and integrated. The membrane permeability is determined in the case of a potential function which is constant within the membrane and zero outside. C.

Gelatin: Sedimentation Constants and Molecular Constitution. H. Mosimann and R. Signer. *Svedberg Anniv. Vol.*, 1944, 464-473 (through *Brit. Abstr.*, 1945, A III, 316). Two fractions of gelatin, of molecular weight 89,000 and 16,200, have been characterised by determination of sedimentation constants in the ultracentrifuge. The former (HFI) consists of lattice-type molecules, and the latter (VI) of short straight- or branched-chain types of molecules. After fractionation, HFI still shows polydispersion, whilst VI appears quite uniform; this finding agrees with previous determinations of acid-binding capacity of the two fractions. C.

Polymers: Viscosity, Sedimentation and Diffusion. R. Simha. *J. Chem. Phys.*, 1945, **13**, 188-195. Expressions for the mean square separation of chain ends of long chain molecules and modifications of the formula for an ideal coil are discussed. On the basis of these and of the hydrodynamic theory of intrinsic viscosity, an interpretation of the modified Staudinger rule is offered. It relates the exponent a of the molecular weight to a flexibility parameter p of the chain in a given solvent, varying between zero and one. By means of the frictional ratio f/f_0 the sedimentation constant s and the diffusion constant D, respectively, are connected with the degree of polymerisation in terms of p. The limiting dependence of sedimentation and diffusion rate upon molecular weight for a straight chain and an ideal coil is also found in this manner. A comparison shows satisfactory agreement between values for p found from intrinsic viscosity and those determined from sedimentation or diffusion rates, for certain cellulose esters and starch derivatives. Effects of solvent and of inhomogeneity in respect to molecular weight are discussed briefly. C.

Torque-type Microviscometer. E. R. Weyer. *Science*, 1945, **101**, 521. A simple device is described which permits rapid, accurate viscosity determinations on volumes of less than 0·1 ml. Measurements are made in terms of resistance to the torque developed by a small synchronous, self-starting electric clock motor. Under a uniform AC potential (110-v., 60-cycles) the motor develops a definite amount of power which is sufficient to maintain its own phase relationship with the AC current, plus an additional force, sufficient to overcome the torque resistance of a viscous fluid. When electrical resistance is introduced, however, a point is reached where the current is insufficient to maintain a synchronous relationship. The motor is mounted in such a position that its rotor turns in a horizontal plane. A cylindrical platform (1 to 2 cm. in diameter) is made from lucite or other plastic rod, and is mounted in concentric fashion on the rotor. A similar stationary member is held by bracket above the rotating platform and is provided with a screw mechanism to vary the clearance between the two members. A variable radio-type resistor is connected in series with the motor, and a small neon lamp is provided, to scan stroboscopically the speed of the rotor. The specimen is introduced between the opposed surfaces and the motor is started with no resistance in the circuit. Resistance is then cut in slowly while observing the stroboscopic pattern of the

rotor. In the light of the neon lamp it will appear stationary; as the end point is reached this rotor pattern suddenly breaks. The resistor dial is then correlated with data derived from determinations upon fluids of known viscosity. C.

Visco-elastic Materials: Capillary Flow; Elastic Recovery in —. A. C. Merrington. *Nature,* 1945, **155**, 669. The existence of an "elastic end effect" which is related to the recovery or swelling of a column of visco-elastic material issuing from a capillary has previously been discussed. Elastic recovery normally starts at the actual capillary end, but it has now been observed that at high stresses, corresponding to velocities of one or two metres per second, recovery is delayed. The delay becomes more pronounced if the velocity is increased further. With certain solutions the onset of this delay coincides with a kink in the flow curve, indicating a sudden increase in the rate of flow. Possible explanations of these anomalies are briefly discussed. C.

Fading Test Light Sources: Intensity Measurement. R. Kocherhans. *Textilberichte,* 1943, **24**, 439-441 (through *Sci. Abstr.,* 1945, **48** A, 97). The relative merits of thermo- and photo-electric methods for the measurement of spectral energy are compared. The latter is preferred, and a circuit involving the use of a high-vacuum K cell (sensitivity 3μA/lumen) is described. Data for measurements of natural daylight from November, 1941, to October, 1942, are tabulated and examined statistically. C.

Hydrogen Peroxide: Photochemical Formation from Water. C. N. Chari and M. Qureshi. *J. Indian Chem. Sci.,* 1944, **21**, 97-102 (through *Chem. Abstr.,* 1945, **39**, 2031[5]). The photochemical formation of hydrogen peroxide from water with zinc oxide as a sensitizer has been studied in sunlight and artificial ultra-violet, and visible light. The yield of hydrogen peroxide is increased by the presence of certain organic compounds which presumably act as stabilizers. Of the nine organic substances employed, phenol was found to be the best. An increase in the amount of zinc oxide produces an increase in the reaction rate, which approaches a limit at constant light intensity. An increase in the *p*H of the solution also favours the production of hydrogen peroxide. Light of wave length between 4000 and 4700 A. is effective, as well as ultra-violet radiation; this indicates that the photosensitive range of zinc oxide extends into the visible region. Of several samples of zinc oxide tested, that prepared by ignition of the carbonate has the greatest activity. C.

Azo Dyes: Steric Hindrance of Resonance. J. S. P. Blumberger. *Rec. trav. chim.,* 1944, **63**, 127-133 (through *Chem. Abstr.,* 1945, **39**, 2066[8]). In a large number of vicinally substituted azo dyes derived from 1-amino-4:8- (and 6:8-) naphthalenedisulphonic acids and 1-hydroxy-4-naphthalenesulphonic acid, the substitution is usually accompanied by a marked hypsochromic effect. This is explained by the difficulty of existence of a coplanar position between the benzene ring and the azo group, with consequent lack of resonance between them. A similar hypsochromic effect in compounds with an *o*-Me group when comparing *p*-nitrophenylazo-anilines and *o*-toluidines is ascribed to steric hindrance of the coplanar position of the amino groups and the benzene ring. The hindrance of the coplanar position of the two rings hinders simultaneously the development of the specific properties of the benzidine dyes: the direct dyeing power for vegetable fibre. The molecule can be considered as if it had fallen apart into two halves, which, like the other monoazo dyes, only adhere to animal fibre. C.

Aniline Vapour: Ultra-violet Absorption Spectrum. N. Ginsburg and F. A. Matsen. *J. Chem. Phys.,* 1945, **13**, 167-171. The absorption spectrum of aniline vapour has been photographed in the first and second order of a 3-m grating spectrograph. The strongest bands appear as doublets and on the basis of these, a tentative analysis is made and compared with available Raman data. C.

Compact Source Projection Lamp. H. K. Bourne. *J. Sci. Instruments,* 1945, **22**, 107-110. The 250 W mercury vapour compact source lamp is a small, concentrated light source with a high intrinsic brilliancy. It consists of a strong transparent fused silica bulb, approximately spherical in shape, containing two tungsten electrodes a few millimetres apart, between which the arc operates. This quartz bulb is sealed into an outer glass envelope or is mounted in a metal housing to protect it from draughts. The current is led to the electrodes by vacuum-tight seals made by fusing thin molybdenum foil strips into the quartz tubes which form extensions of the bulb. The bulb contains a small quantity

of mercury which is vaporized completely during normal operation of the lamp and produces a pressure of approximately 20 atm. The bulb also contains a mixture of argon and neon at a low pressure to facilitate the ignition of the arc. The discharge is initiated by an auxiliary electrode located adjacent to one of the main electrodes and connected through a high resistance to the remote electrode. Details of the operation and optical characteristics are given, and the energy distribution is compared with that of tungsten filament and carbon arc lamps. Compared with the tungsten filament lamp, the compact source lamp radiates a smaller proportion of its energy in the infra-red region. It is an excellent source for photographic purposes and can be used in place of small carbon arcs and tungsten filament projector lamps in optical projection instruments and scientific apparatus. The average life is 500 hours. C.

Illuminants for Colorimetry: Properties. Total Radiators: Colours. H. G. W. Harding. *Proc. Phys. Soc.*, 1945, **57**, 222-238. The colours of total radiators are discussed and methods of estimating the colour-temperature to be assigned to a colour not on the locus of the colours of total radiators are outlined. The filter method of calibrating tungsten lamps at the National Physical Laboratory is described, and an indication is given of the probable accuracy of the calibration. An acount is given of the history and properties of the three standard illuminants A, B and C recommended for colorimetry by the Commission Internationale de l'Eclairage in 1931. Other illuminants, such as the equal-energy illuminant E, are mentioned, and their colours are compared with those of daylight. C.

Optical Surface-finish Meter. Pitter Gauge and Precision Tool Co. Ltd. *Engineering*, 1945, **160**, 26. Illustrations are given of an instrument (the "P.V.E. Critic") for the examination of fine reflective surfaces by the production of interference fringes. The microscope part can be fitted with a camera. Defects are revealed by distortions in the fringe patterns. One illustration shows the effect of a scratch 0·00003 in. deep in a lapped surface. C.

Euclid's Optics. H. E. Burton. *J. Optical Soc. America*, 1945, **35**, 357-372. A first translation into English of Euclid's essay on the mathematics of optics. C.

High Polymers: Molecular Weights; Determination by Light Scattering. P. M. Doty, B. H. Zimm and H. Mark. *J. Chem. Phys.*, 1945, **13**, 159-166. The determination of the molecular weights of large molecules by measuring the turbidity of the solution and the change in index of refraction with concentration is discussed. The apparatus and its calibration, and the technique used, are described. Molecular weights of polystyrene and cellulose acetate fractions obtained by this method are compared with values obtained from osmotic pressure measurements. The effect of polymolecularity is discussed. C.

Human Retina: Change from Trichromatic to Dichromatic Vision. H. Hartridge. *Nature*, 1945, **155**, 657-662. Reference is made to the confusion of yellow with white, and blue with black when test objects of small size are under critical examination, and to Kōnig's explanation that, for objects of small size examined by the fovea centralis, trichromatic vision is replaced by dichromatic vision. Evidence has recently been produced that the change occurs not only at the fovea centralis, but practically all over the useful retina, and further evidence on this point is given, together with other facts concerning the appearance of the colours of small objects, in a report of studies of the effect of angle of view, importance of area of test object, effect of eye movements, effect of simultaneous presentation, spatial effect, overlap, and effects of brightness of illumination of the test object, adaptation, depth of tint of test object, shape of test object, pupil diameter, colour of background and colour of test object. The nature of the dichromatism is considered and hypotheses of the change from tri- to di-chromatic vision are critically discussed. It is shown that a hypothesis which fits the facts is that for objects subtending small visual angles the brain centres for green and blue are linked together and are connected with the sense organs responding to green rings, while at the same time the sense organs responding to blue rays are temporarily put out of action. The nervous level of the mechanism is discussed. C.

Ishihara Colour-blindness Test: Comparison of Editions. L. H. Hardy, Gertrude Rand and M. Catherine Rittler. *J. Optical Soc. America*, 1945, **35**, 350-356. A comparison of the average scores and the range of scores for the different types of colour-defective people does not reveal marked differences in

the 5th, 7th and 9th (British reprint) editions of the Ishihara test in spite of the changes made in the number of plates, and in the plates themselves, some of which are improved and others are made less effective. The most significant difference is in the results for the protanomalous and protanopic types of observers due to the improvement of the plates of Series 1 in the 7th and 9th editions. Properly administered, the three editions of the Ishihara test afford a good rough device for screening colour-defective from colour-normal individuals if a performance score of 60 is taken as the critical score. A critical score cannot, however, be established for the 10 Ishihara plates reproduced in the American Optical Co.'s test. No analysis as to type or extent of colour defect can be based on performance scores. The plates of Series 6 as reproduced in the 5th edition are the best for classifying type of red-green defect, those of the 9th edition the next best, and those of the 7th edition the poorest for this purpose. Nothing seems to be gained by doubling the number of plates as is done in the 7th and 9th editions. Other things being equal, plates bearing two digits afford better tests of colour defect than those having only one digit. C.

Alternating Field Induction Flow Meter. A. Kolin. *Rev. Sci. Instruments,* 1945, **61**, 109-116. An electromotive force is induced in a fluid moving in a pipe at right angles to a magnetic field. This effect can be used to measure magnetic fields by maintaining a known flow or to measure the discharge of a fluid through a pipe by maintaining a known magnetic field. The flow of poor electrolytic conductors like tap water can be measured as well as the flow of mercury. Details and diagrams of the apparatus are given. A modification of the apparatus for the purpose of measuring the velocity distribution and fluctuations of the instantaneous velocity in large channels, comprising a minute magnet with attached electrodes, is described. C.

Hot-wire Anemometer: Calibration and Characteristics. T. A. Steeves, A. E. Chadderton and W. H. Cook. *Canadian J. Res.*, 1945, **23**, F, 192-197. The authors describe a sensitive hot-wire anemometer and its calibration by a method involving the delivery of air at a constant rate through a precision gas meter to a small draught tunnel of known cross-section. The air motion could be adjusted to represent side-, up-, or down-draughts. The anemometer readings were independent of the direction of air flow and the orientation of the instrument at velocities in excess of 10 ft. per min. At lower velocities separate curves were obtained for different instrument orientations and directions of air movement. Air flows as low as 1 ft. per min. can be estimated with useful accuracy provided the direction of air movement is known. C.

Metal-covered Silica Fibres: Production and Mounting. P. K. Kichlu and B. M. Anand. *J. Sci. Ind. Res.* (India), 1945, **3**, 497-506. A detailed description is given of a procedure for drawing silica fibres, metal-coating them and mounting them in Einthoven string galvanometers. In the drawing operation a silica rod is attached to the lower end of an elastic rubber band, the upper end of which is tied to a support. Another silica rod is kept vertically some distance lower down with the upper end strongly heated by an oxygen-gas flame. The upper silica rod is moved down to the tip of the lower rod, and, as soon as it makes contact and begins to melt, the upper rod is released carrying with it a long fine fibre. Metal-coating is carried out by the sputtering method. C.

Cellulosic Material: Radio-frequency Dielectric Properties. W. C. Dunlap, Jr., and B. Makower. *Proc. Amer. Phys. Soc., Berkeley, Cal.*, July 22, 1944 (through *Sci. Abstr.*, 1945, **48** A, 67). Measurements were made of the permittivity ϵ and specific σ conductivity (a.c. and d.c.) as functions of moisture content (1·5-21·6 per cent. temperature (1·5°-39·8° C.), frequency (18 kc/s-5 Mc/s), density (0·792-1·45 g./cm.^{3}) and particle size (small and medium) of dehydrated carrots. Permittivity increases little with moisture content up to 6-8 per cent.; above this region ϵ increases rapidly. Increase of temperature increases both ϵ and the rate of change of ϵ with moisture. At 1·15° C. there is no detectable change of total σ with increase in moisture until 6-8 per cent. is reached; above this region the variation becomes exponential. At higher temperatures this apparent discontinuity disappears. Particle size has little effect upon ϵ or σ, for a given bulk density. Increase of bulk density increases ϵ and total σ uniformly on a log-scale for all frequencies. C.

Human Body: Heat-regulating Response to Temperature and Humidity. S. Robinson, E. S. Turrell and S. D. Gerking. *Amer. J. Physiol.*, 1945, **143**, 21-32 (through *Bull. Hygiene*, 1945, **20**, 409-410). Experiments are described on the extreme atmospheric conditions compatible with maintenance of the body's thermal equilibrium. Five acclimatized subjects were examined. The temperatures ranged from 23-50° C. (73-122° F.). Humidities ranged from 29-76 per cent. R.H. at the lowest temperature to 15-44 per cent. at the highest temperature and experiments were also made at 91° F., 95 per cent. R.H. Air velocity was 180 ft. per min. The walls and other boundary surfaces were at the air temperature up to 86° F. but slightly cooler at higher air temperatures, e.g. 2·3° F. cooler at 122° F. In some experiments the men wore U.S. Army jungle uniforms, and in others only "shorts." In each environment the men were sitting at rest and also walking a treadmill. Experiments lasted for 2-6 hours. An index of the physiological effect was obtained from weighted values of heart rate, skin temperature, rectal temperature and rate of sweating. Working in "shorts" the men maintained thermal equilibrium from the 2nd to the 6th hour at 93° F., 91 per cent. R.H. or 122° F., 21 per cent. R.H. when their metabolic rates were 188 Cal. per sq. metre of body surface per hour. With metabolic rates of 130 Cal./sq. m./hr., equilibrium was maintained at 95° F., 96 per cent. R.H. or 122° F., 32 per cent R.H. Men at rest in "shorts," with metabolic rate 46 Cal./sq. m./hr. maintained equilibrium at 97° F., 97 per cent. R.H. or 122° F., 34 per cent. R.H. C.

Sound Waves in Rooms: Investigation. P. M. Morse and R. H. Bolt. *Rev. Modern Physics*, 1944, **16**, 69-150. Results obtained in the study of sound waves by geometrical acoustics are summarised, the general principles underlying wave acoustics and the way in which these principles clarify and supplement the geometrical results of the earlier workers are discussed, recently-obtained solutions to some of the problems of wave acoustics are outlined, and problems still awaiting solution are indicated. The chapter headings are as follows:—(1) Introduction, (2) Geometrical Room Acoustics, (3) General Aspects of Wave Acoustics, (4) Acoustic Impedance, (5) Steady-state Sound in Rectangular Rooms, (6) Transient Sound in Rectangular Rooms, (7) Perturbation Calculations for Rooms of Various Shapes, (8) Free-wave Calculations for Rooms having Random Wave Motion. C.

Hæmocyanin Electron Shadow-micrographs. R. C. Williams and R. W. G. Wyckoff. *Nature*, 1945, **156**, 68-70. Illustrations are given of electron micrographs obtained by the oblique deposition of metallic chromium or gold on the particles in some hæmocyanin preparations. The gold preparation shows single and clusters of hæmocyanin molecules against the pebbly background of a collodion substrate. Another illustration shows that it is possible to strip the gold replicas from a microscope slide by the collodion technique and mount them for electron microscopy on a polished glass surface. This provides a less pebbly background and the particles stand out more clearly. C.

Sampling Technique: Rôle of Statistical Theory. G. A. Barnard. *Nature*, 1945, **156**, 208. It is pointed out that statistical methods of assessing trial results have been developed largely in the field of biological problems, often subject to the limitation that the size of the sample has to be determined at the outset. In many recent industrial applications the size of the sample could be made one of the variables under investigation so that statistical theory enters into the experimental process itself rather than play a passive role until the results have been accumulated. In many inspection problems the statistical tests are direct generalizations from the classical theory of games (e.g. the problem of the "Ruine des Joueurs"), in the qualitative case, and the continuous measurement case corresponds with a linear diffusion problem with fixed absorbent boundaries. C.

Cuprammonium Solution Photometric Recorder. E. H. Brown and J. E. Cline. *Ind. Eng. Chem., Anal. Edn.*, 1945, **17**, 284-285. Details and diagrams are given of a photometric instrument developed to record continuously the concentration of bivalent copper in ammoniacal copper solution used for absorbing oxides of carbon. The copper solution flows through the annular space between two concentric tubes in an all-glass light-absorption cell surrounding a light source operated on stabilized voltage. The light transmission is

measured by a recording potentiometer in circuit with a barrier-layer photocell. C.

Polarograph: Manipulation. S. Matthews. *J. Soc. Dyers & Col.*, 1945, **61**, 164-165. The author explains briefly the principles underlying the use of the Polarograph. C.

Acetate Buffer Nomogram. W. C. Boyd. *J. Amer. Chem. Soc.*, 1945, **67**, 1035-1037. A nomogram is presented for use as a guide in the making up of buffer mixtures of sodium acetate and acetic acid varying in ionic strength from 0·005 to 1·50 and of *p*H varying from 3·5 to 6.0. C.

Nierenstein Indicator. M. Nierenstein. *Analyst*, 1945, **70**, 213. 2-Hydroxy-quinomethane is colourless in solution at *p*H 2·7 and shows a gradual increase of purple colour to *p*H 3·7. The colour change in this region is sharper than that of any indicator previously described. In view of the close relationship between 2-hydroxy-quinomethane and purpurogallin, it is suggested that the latter, which is more easily prepared, should be investigated, for it, too, may prove a useful indicator. The best method of preparation is outlined. The colouring matters of gall, being glycosides of purpurogallin, may also prove useful indicators. C.

Chlorine and Chloramine: Determination in Water. A. T. Palin. *Analyst*, 1945, **70**, 203-207. A method is described for determining and differentiating between free chlorine and chloramines in water by the use of *p*-aminodimethylaniline. The method is based on the following facts—(1) iodine and chlorine in equivalent amounts give the same colour with *p*-aminodimethylaniline; (2) when the water is buffered to a suitable *p*H, chlorine, but not chloramine, gives a red colour with *p*-aminodimethylaniline. In the presence of potassium iodide, and at the same *p*H, the red colour due to chloramine develops. Colour development in both reactions is instantaneous. The sample is mixed with the buffer solution and a solution of *p*-aminodimethylaniline and the colour is matched by running standard iodine solution into a control tube containing the same amounts of buffer and *p*-aminodimethylaniline. Potassium iodide is then added to the sample tube and the colour matched by further addition of iodine to the control tube. Interfering substances and the effects of *p*H are discussed. Modified procedures for use in the routine control of water chlorination and the determination of chlorine or chloramine available at the *p*H of the water are outlined. C.

Copper: Polarographic Micro-determination. C. Carruthers. *Ind. Eng. Chem., Anal. Edn.*, 1945, **17**, 398-399. Details are given of a method for the determination of small quantities of Cu which is based on precipitation with salicylaldoxime and polarographic determination of the amount of salicyl-aldoxime removed by the cupric ions. From 0·1516 to 0·6029 mg. of Cu can be determined with an error of about 1 to 3 per cent. and 3·8 to 15·2 μg with an error of about 3 per cent. Na, K, Ca, Mg and ferric-ions do not interfere, but Zn interferes strongly. C.

Copper, Arsenic, Lead, Zinc and Iron: Photometric Determination. N. Strafford, P. F. Wyatt and F. G. Kershaw. *Analyst*, 1945, **70**, 232-246. Details are given of a scheme for the successive determination of minute amounts of Cu, As, Pb, Zn and Fe in a single 2-g. sample of organic material. Separation of the individual elements is achieved by solvent extraction of metallo-organic complexes, and the final determinations are carried out photometrically. Under the given conditions the method is specific for As, Pb and Fe. Bismuth interferes with the determination of Cu, and Cd is included with the Zn. Conditions are described for eliminating these interferences, and for determining Bi, Ni and Cd if desired. Data are presented to show the accuracy and reproducibility of the results obtained. C.

Iron: Micro-volumetric Determination Using Silver Reductor. A Colson. *Analyst*, 1945, **70**, 255-256. Diagrams are given of a reductor and titration vessel suitable for the determination of 0·1 to 1·0 mg. of iron in a final volume of about 5·0 ml., smaller apparatus for the reduction and titration of less than 0·1 mg. of Fe in about 0·2 ml. of solution, and a micro-burette for the accurate delivery of volumes not exceeding about 0·4 ml. Procedures for the

determination of 0·1 to 1·9 mg. and less than 0·1 mg., respectively, of Fe by titration with standard ceric sulphate solution after reduction are described. Results of test determinations of Fe in pure ferric chloride and results of macro- and micro-determinations of Fe in refractories are reported. C.

Dye Intermediates: Chromatographic Separation and Analysis. F. R. Cropper. *J. Soc. Dyers & Col.*, 1945, **61**, 162. Applications of chromatography to the separation of 1- and 2-aminoanthraquinones, the determination of anthracene in coal-tar and coal-tar distillates, and the determination of impurities in dye intermediates, are described. C.

Fats and Oils: Analysis. Committee on Analysis of Commercial Fats and Oils, American Chemical Society. *Ind. Eng. Chem., Anal. Edn.*, 1945, **17**, 336-340. A progress report. The work included studies of the determination of thiocyanogen values, the fat stability test, the insoluble bromide (hexabromide) test, determinations of congeal point and unsaponifiable matter, colour standards and a colour comparator, and a stirring device. In the determination of thiocyanogen values, the use of carbon tetrachloride was found to be undesirable, except possibly in the case of high melting fats which are difficultly soluble in the regular reagent. Increases in the quantities of reagent and potassium iodide are recommended. An improved fat stability test procedure is described. The hexabromide method was found to be inexact and unreliable. Further work is required on most of the subjects studied. C.

Formaldehyde: Spectrophotometric Determination. C. E. Bricker and H. R. Johnson. *Ind. Eng. Chem., Anal. Edn.*, 1945, **17**, 400-402. A spectrophotometric method for the determination of formaldehyde depends on the production of a purple colour with chromotropic acid. A recommended procedure is described and data are given showing the effects of sulphuric and chromotropic acid concentrations, temperature, and heating time on the reaction. The effects of various interfering substances are discussed. The method is rapid and accurate. As little as 1 μg. of formaldehyde in 1 ml. of solution can be detected. C.

Hydroxyl Groups: Determination. C. L. Ogg, W. L. Porter and C. O. Willits. *Ind. Eng. Chem., Anal. Edn.*, 1945, **17**, 394-397. Macro- and semi-micro-procedures for determining the hydroxyl content of hydroxylated fatty acids and alcohols are described in which an acetylating solution of one volume of acetic anhydride in three volumes of pyridine and a hot-water hydrolysis of the excess acetic anhydride are used. Titration of the resulting acid is carried out using an internal indicator. For coloured solutions a potentiometric method is used and a modified iodine flask has been designed which permits the electrometric titration to be made in the reaction vessel. Groups such as primary and secondary amines, and sulphydryl, which contain active hydrogen and form acetylated products not hydrolysed by hot water, and compounds which undergo condensation to produce hydroxyl groups, such as aldehydes, interfere. C.

Jute Cellulose: Determination by Use of Sodium Chlorite. P. B. Sarker and H. Chatterjee. *Science and Culture*, 1945, **10**, 340-342 (through *Chem. Abstr.*, 1945, **39**, 2871[2]). The authors propose a new method of determining fibre cellulose (α-cellulose and hemicellulose) in jute, based on the action of sodium chlorite in acid solution. Finely cut jute (2 g.), defatted with alcohol-benzene is treated for 4 hours at 60-90° with a 3·5 per cent. solution of sodium chlorite and maintained at *p*H 4-5 by glacial acetic acid. The suspension is then filtered through a glass filter crucible, washed with cold water until free from sodium chlorite (starch-iodide test), treated with 3 per cent. sodium bisulphite and again thoroughly washed. The crucible is dried in a water bath under reduced pressure to avoid the appearance of a yellow colour. In a sample of jute, cellulose + lignin total by this method was 100·83; by Cross and Bevan 84·35; by chlorine dioxide 96·76; by Norman and Jenkins 89·57 per cent. C.

Pine Oils and Terpene Solvents: Moisture Determination. V. E. Grotlisch and H. N. Burstein. *Ind. Eng. Chem., Anal. Edn.*, 1945, **17**, 382-383. Details are given of procedures for the determination of moisture in pine oils and terpene solvents which are variations of the procedure described by Smith,

Bryant and Mitchell, using the Karl Fischer reagent. Pine oils are titrated directly with the reagent. With turpentine, pinene, and related terpene hydrocarbons, excess pyridine is used to prevent the formation of precipitates. Typical results are given. Results for pine oils are in general in agreement with results obtained by the reflux distillation method. C.

Pulp: Analysis for Soluble Sulphates and Chlorides. Technical Association of the Pulp and Paper Industry. *Paper Trade J.*, 1945, **121**, *TAPPI*, 1-2. Details are given of procedures for the determination of the small quantities of water-soluble chlorides and sulphates normally existing in pulp, which have been approved as *TAPPI* Tentative Standard T229m-45. C.

Sugar: Determination with Copper and Ferricyanide Reagents. R. L. Weintraub and L. Price. *Smithsonian Misc. Collections*, 1945, **104**, No. 10, 17 pp. (through *Chem. Abstr.*, 1945, **39**, 2467[9]). The iodometric determination of reducing sugar by the reagent containing sodium carbonate, Rochelle salt, and copper sulphate is subject to error caused by the presence of ammonium sulphate and chloride, sodium citrate, dihydrogen phosphate, benzoate, carbonate, chloride, sulphate, fluoride and nitrate, magnesium chloride and sulphate, potassium phosphate, oxalate, hydrogen phosphate, acetate, and chloride, calcium chloride, citric acid, sulphuric acid and caustic soda in quantities that are likely to be present. The extent of error thus introduced was studied for each compound. All these compounds, except ammonium sulphate, potassium chloride and potassium sulphate, but with lead salts in addition, are likely to interfere with the iodometric determination of reducing sugar when potassium ferricyanide is the reagent used to oxidize the sugar. Differences in the effects of some of these compounds upon the oxidation of various sugars are so great as to suggest the possibility of devising selective reagents through their use. C.

Tyrosine: Determination. L. E. Thomas. *Arch. Biochem.*, 1944, **5**, 175-180 (through *Chem. Abstr.*, 1945, **39**, 2774[5]). A colorimetric method for the determination of tyrosine is described which is based on the red coloured compound formed by the action of α-nitroso-β-naphthol on tyrosine in hydrochloric acid containing a small amount of nitric acid. Values of 3·98, 6·03 and 3·58 per cent. are reported for edestin, casein, and tobacco mosaic virus, respectively. C.

Ammoniacal Solutions: pH. Georgette Gallin. *C. r. Acad. Sci.*, 1944, **218**, 550-551 (*Chem. Abstr.*, 1945, **39**, 2687[7]). The *p*H values of four ammonia solutions 0·010N. to 0·101N. were determined at 18-56°. The *p*H decreases gradually up to 45°, where a sharp decline occurs which continues to 50°. Between 50 and 52° a sharp rise occurs followed by a diminution at 52-56°, comparable to that at 18-45°. C.

Alkali-cellulose: Preparation and Etherification. S. N. Ushakov and N. V. Orlova. *J. Applied Chem.* (U.S.S.R.), 1944, **17**, 193-203 (through *Chem. Abstr.*, 1945, **39**, 2871[6]). Mercerisation of cotton linters by 20 per cent. alkali leads to complete formation of alkali-cellulose within the first 20 min. In the ageing process the reactivity of alkali-cellulose is almost unchanged, but its cuprammonium viscosity suffers a severe drop; as a result of this, ethylcellulose prepared from such cotton has a somewhat higher solubility in organic solvents. Ethylation of alkali-cellulose aged in the presence of potassium chloride leads to a product more soluble in benzene-alcohol than usual; at the same time the amount of etherification is also somewhat higher. Benzylation with benzyl chloride, even in non-aged alkali-cellulose, leads to soluble products having a high order of substitution, if a high concentration of alkali is used in the benzylation process. Addition of ethyl chloride in several portions leads to a superior product. Ethylation of alkali-cellulose mercerised by 50 per cent. alkali gives a product of higher solubility and degree of etherification than occurs with 20 per cent. alkali mercerisation. Lowering of final alkali concentration in the reactor in the etherification step gives products more viscous than usual. C.

Starch and Glycogen: Structure and Enzymic Saccharification. K. Myrbäck and L. G. Sillén. *Svensk Kem. Tid.*, 1943, **55**, 294-308 (through *Chem. Zentr.*, 1944, i, 531-532 and *Chem. Abstr.*, 1945, **39**, 2247[2]). It was assumed

that the growth of a glycogen or starch molecule in a solution of glucose-1-phosphoric acid (Cori ester) containing phosphorylase proceeds in such a way that, in the presence of a saccharide nucleus of any chain length, an entering glucose unit becomes attached through its reducing group to the OH on the fourth C of a unit in the chain. It was also assumed that there exist two types of phosphorylase and that each one synthesizes (or decomposes) only one type of glycosidic link. Various investigators have found similar end-group contents in preparations of very different viscosities, viz., two types of glycogen with 9 per cent., or more rarely 6 per cent., end groups and starch with 4·5 per cent. end groups. This was presented as evidence that with a given ratio of the probability of branching to the probability of chain-lengthening (γ), the degree of branching (b) actually tends towards a definite average value. From the end-group content of the more common glycogen, b (number of points of branching/total number of units in chain) was calculated to be 0·09 and for the less common glycogen, a value of 0·045 was obtained. For a mixture of 20 per cent. unbranched amylose and 80 per cent. amylopectin b=0·056. The quantity of maltose that could be split from glycogen and starch by β-amylase was calculated and the conclusion is reached that the decomposition limit for side chains may be 0-1 or 1-2 units. Meyer obtained 47 per cent. maltose from glycogen and after weak hydrolysis 53 per cent. The authors conclude that the molecular size was reduced sufficiently by this acid hydrolysis so that the enzyme could reach all of the decomposable end groups. For glycogen γ was calculated to be 1:98 and for amylopectin 1:283. C.

Carbohydrate Methacrylic Esters: Preparation and Properties. R. H. Treadway and E. Yanovsky. *J. Amer. Chem. Soc.*, 1945, **67**, 1038-1039. The preparation and properties of glucose pentamethacrylate, maltose octamethacrylate, dextrin trimethacrylate and starch methacrylate are described. C.

$\alpha\beta$-Dinitronaphthalenes: Reduction. H. H. Hodgson. *J. Soc. Dyers & Col.*, 1945, **61**, 171-172. The preferential mono-reduction of the α-nitro group in a heteronuclear $\alpha\beta$-dinitronaphthalene by acid stannous chloride and of the β-nitro group by alkaline sodium sulphide are explained from the standpoint of the resonance theory on data based on absorption spectra. The mechanism of reduction of a nitro group by sodium sulphide is discussed. C.

Plastics: Production and Application in Russia. S. N. Ushakov. *British Plastics*, 1945, **17**, 48-53, 107-112. The development of plastics production in the U.S.S.R. is reviewed, with special attention to (1) cellulosic products, (2) phenolic resins and substitutes for phenol, (3) lignin products, (4) vinyl, styrene and acrylic polymers, (5) bitumen and albumen products, and (6) education and scientific publications. C.

Polystyrene: Manufacture and Application in Plastics. Stanley Booth. *British Plastics*, 1945, **17**, 130-136, 172-181, 200-206. A useful summary of the chemistry of styrene and its polymerisation, the molecular linkings in and molecular dimensions of polystyrene, and the physical properties and moulding of polystyrene plastics. Some 90 references are cited. C.

Proteins: Reaction with Formaldehyde. H. Fraenkel-Conrat, Mitzi Cooper and H. S. Olcott. *J. Amer. Chem. Soc.*, 1945, **67**, 950-954. When proteins were treated with 4 per cent. formaldehyde at 70° and at *p*H 3·5 to 4·0, the resultant products, after thorough washing, contained amounts of formaldehyde that ranged from 7 per cent. for gliadin to 0·7 per cent. for silk fibroin. The amounts of aldehyde bound by most of the proteins were greatly in excess of those equivalent to the amino or even to the total basic groups. A correlation was observed between the sum of the basic and the amide groups of proteins and their capacity to bind formaldehyde. These results suggest that the primary amide groups, together with the basic groups, are responsible for a great part of the aldehyde bound by proteins under the conditions used. This conclusion was supported by a comparison of the aldehyde-binding capacities of proteins or polypeptides modified or prepared in such a manner as to contain maximal or minimal numbers of the reactive groups. Polypeptides of glutamic acid or glycine and the polyamide, nylon, also bound very little aldehyde, which indicates that the carboxyl, and peptide or secondary

amide groups do not react to an appreciable extent. A polypeptide containing many amide groups (polyglutamine) combined with more formaldehyde than did any of the proteins investigated. C.

Vinyl Copolymers: Distribution of Chain Lengths and Compositions. W. H. Stockmayer. *J. Chem. Phys.*, 1945, **13**, 199-207. The instantaneous distribution of chain compositions and chain lengths in vinyl copolymers is obtained in a simple form valid for long chains. The compositions of chains of a given length are normally distributed about the mean value, with a standard deviation which can be calculated from experimentally observable quantities. The distribution of chain lengths intimately resembles that for simple polymers. C.

Crystalline Solid: Area Determination. H. M. Cassel. *J. Chem. Phys.*, 1945, **13**, 249. In the method described by Harkins and Jura it is assumed that the contact angle at the liquid-crystal-vapour boundary is zero. However, the point has been overlooked that under this condition capillary condensation between the contracting crystals is inevitable. Consequently, in the treated powder, groups of particles may stick together, held by the capillary forces of the liquid. Even the immediate cohesion of adjacent crystals may cause inseparable clusters to form. The results of various investigations of effects of this kind indicate that in the described procedure an indefinite reduction of the immersed film area has to be expected. On the other hand, if capillary condensation is not accomplished the assumption of perfect wettability cannot be true. In that case, the heat of emersion per unit area would be smaller than anticipated and, again, the surface area would be underestimated. Such troubles would be avoided if it were possible to measure the thermal effects of particles individually coated and individually dropped into a liquid. C.

Vacuum Drying Apparatus. A. R. Kemp and W. G. Straitiff. *Ind. Eng. Chem., Anal. Edn.*, 1945, **17**, 387-389. A vacuum drying apparatus for unstable polymeric materials employs elevated temperatures and a constantly changing inert atmosphere to accelerate the drying process and at the same time protect the material against oxidation. Details of the construction are shown in a diagram. Curves are given showing the effect of temperature on the rate of removal of water, acetone and benzene from smoked sheet rubber. It is pointed out that the drying process depends principally upon diffusion rather than evaporation from the liquid phase. C.

High-temperature, High-pressure Rheometer. H. K. Nason. *J. Applied Physics*, 1945, **16**, 338-343. A description is given of a modified Bingham-type rheometer, designed for operation at temperatures up to 500° F. and at pressures up to 2,000 lb. per sq. in. Interchangeable orifice plates permit wide variation of shear conditions. With this instrument flow properties may be studied under conditions approximating to those encountered in the actual moulding or extrusion of thermoplastics. Typical results are presented for cellulose acetate, polystyrene and polyvinyl resin plastics, and correlation with practical experience is pointed out. The instrument is slow, and this limits its usefulness for other than research investigations. C.

Cellulose Acetate-Butyrate: Viscosity and Molecular Weight Relations. J. W. Tamblyn, D. R. Morey and R. H. Wagner. *Ind. Eng. Chem.*, 1945, **37**, 573-577. The relations between the molecular weights of fairly homogeneous fractions of cellulose acetate-butyrate and the viscosity function $\ln \eta_r/c$ (determined in acetone and acetic acid) are given for the two cases: (*a*) the limiting value as $c \longrightarrow 0$, known as intrinsic viscosity; (*b*) the value at $c = 0{\cdot}25$ g. per 100 c.c. The establishment of a relation using the latter figure permits the determination of the viscosity-average molecular weight without recourse to extrapolation to zero concentration. On degrading samples of heterogeneous (unfractionated) cellulose acetate-butyrate by heat, ball milling, and ultra-violet light, it was found that the $\ln \eta_r/c$ values and the number-average molecular weights (from osmotic pressure) are also related by equations similar in form to those obtained on fractions. A means is thus at hand for obtaining the more useful number average of heterogeneous cellulose acetate butyrate from a single viscosity measurement. It is pointed out that the establishment

of a simple relation between these quantities for any polymer depends on the kinetics of the polymerization or degradation process and its effect on distribution curves. C.

Complex Materials: Rheological Properties; Classification. M. Reiner. *J. Sci. Instruments*, 1945, **22**, 127-129. The behaviour of complex materials under strain is often described in terms of dashpots and springs coupled in series and parallel (the analytical method). A brief history of this method is given and various simple combinations ascribed to St. Venant, Bingham, Schwedoff, Kelvin, Burgers and Schofield-Scott Blair are described. In some cases frictional forces are also introduced to describe plastic phenomena. Structural formulæ constructed from combinations of these elements are proposed and their interrelationship is shown in tabular form. Many rheologically complex properties can be classified in this way, but dilatancy and strength are excluded. C.

Nitrocellulose Solutions: Flow Birefringence. J. J. Hermans. *Rec. trav. chim.*, 1944, **63**, 25-31 (through *Chem. Abstr.*, 1945, **39**, 2242[7]). Equations obtained previously give values that agree satisfactorily with experiments described in the literature. The experimental evidence supports the model of flexible, randomly kinked molecules. Curves are given for antipolysaccharide, citrus pectin, and nitrocellulose in butyl acetate and cyclohexanone solutions. C.

Viscous Elastic Systems: Hysteresis and Shear-stress Diagrams. H. Umstätter. *Kolloid Z.*, 1943, **105**, 182-190; 1944, **107**, 81-86 (through *Chem. Abstr.*, 1945, **39**, 2241[9]). (1) Space diagrams based on the Maxwell equation are given to show the change in shearing stress and viscosity with changing velocity gradient and relaxation time. The flow curves show that the results obtained for the middle range of shearing stress are less reliable than those for very high or low stresses. This is due to a hysteresis phenomenon and not to inaccuracies of the measuring methods. The space diagrams indicate that the hysteresis loops are characterized by the lack of residual viscosity (thixotropy) and the lack of coercive force (yield value) which can occur only in case of liquids. The hysteresis loops of solids show in the stress-strain diagram a permanent deformation and have a definite yield value (flow strength). The fundamental property of matter from a structure-mechanical viewpoint can be derived from three basic constants: the shearing elasticity, time of relaxation, and minimum thickness of layers. (2) By integration of Newton's viscosity equation it is possible to arrive at a stress-time function that can be utilized for elastic shear deformations. Space diagrams are given for typical materials such as metal, rubber and rayon based on the stress-shear-time of relaxation equation. Viscous elastic solid bodies show a residual shearing and a coercive shearing stress. The shear-stress equation permits an accurate definition of plasticity. C.

Wool: Action of Alkalis. (1) Sub-division of the Combined Cystine into Two Fractions Differing in their Rate and Mode of Reaction with Alkalis. W. R. Cuthbertson and H. Phillips. *Biochem. J.*, 1945, **39**, 7-17. Only about half the total combined cystine of wool is converted by alkaline solutions into combined lanthionine. The rate of conversion increases with increase of *p*H and rise of temperature. When the remaining half of the combined cystine is decomposed by alkaline solutions, each molecule gives rise to two molecules of combined α-amino-acrylic acid. The rate of decomposition is slow at *p*H 8, but increases as the *p*H increases and the temperature rises. Nearly all the combined cystine is converted into combined lanthionine when wool is treated with solutions of potassium cyanide. An examination of the hydrolysates of alkali-treated wools has failed to provide evidence of the formation of $-SNH-$ and $-CH=N-$ cross-linkages, and intact alkali-treated wools do not contain free aldehyde groups which will combine with *p*-bromophenylhydrazine. It has been confirmed that the total sulphur of wool, undamaged by light or by detergent solutions, can be accounted for as cystine and methionine sulphur. W.

Wool: Action of Alkalis. (2) Identity of the Lanthionine-forming and Bisulphite-reactive Fractions of the Combined Cystine of Wool. H. Lindley and H. Phillips. *Biochem. J.*, 1945, **39**, 17-23. The combined cystine of wool has been divded into two equal fractions called (A + B) and (C + D) which

differ in their mode of reaction with weak alkalis and sodium bisulphite. Fraction (A + B) gives combined lanthionine when the wool is treated with alkalis, and thiol and *S*-cysteinesulphonate groups when the wool is treated with sodium bisulphite. Fraction (C + D) is converted into combined α-aminoacrylic acid by alkalis and also by warm solutions of sodium bisulphite, but does not react with sodium bisulphite at room temperature. Each fraction of the combined cystine has been divided into two subfractions, A yielding lanthionine more rapidly and at lower alkalinities than B. Subfraction A yields water-labile thiol and *S*-cysteinesulphonate groups, whereas the thiol and *S*-cysteinesulphonate groups derived from subfraction B are water-stable. Subfraction D is converted to combined α-aminoacrylic acid by alkalis and sodium bisulphite more readily than is subfraction C. No significant difference has been found between the reactivities towards weak alkalis of unstretched wool fibres and wool fibres stretched 30 per cent. W.

Wool: Action of Ethylene Sulphide. S. Blackburn and H. Phillips. *J. Soc. Dyers & Col.*, 1945, **61**, 203-204. Wool fabric (*a*) untreated, (*b*) reduced with thiolacetic acid, and (*c*) bisulphited, was treated for varying periods of time with ethylene sulphide and water vapour at 50° C., as described by Barr and Speakman (these *Abs.*, 1945, A69). The disulphide-sulphur of (*a*) decreased with increase of time of treatment; there was no appreciable amount of thiol-sulphur. The thiol- and disulphide-sulphur contents of (*b*) diminished rapidly with increase of time of treatment; the percentage of polymer taken up was greater than for (*a*). (*c*) no longer gave thiol-sulphur on hydrolysis, but the disulphide-sulphur diminished only slowly with increase of time of treatment; the amount of polymer taken up was smaller than for either (*a*) or (*b*). These results provide evidence that the ethylene sulphide reacts with the disulphide cross-linkages of the wool. W.

Sheep Maggots. J. B. Cragg. *J. Min. Agric.*, 1945, **52**, 161-164. Six types of blowfly may be associated with strike in Great Britain, the main pest being the greenbottle, *Lucilia sericata*. The causes of strike are surveyed, also preventive measures (dipping and crutching). A dressing which has been largely used in North Wales with good results consists of (by volume) Lysol (5 parts), commercial carbon tetrachloride (4 parts), household paraffin (9 parts) and steam-distilled pine tar oil (2 parts), 1 part of this mixture being added to 4 parts of water. The dressing should also be poured over the wool clippings to kill maggots which are present. Promising results have been obtained with a dip containing D.D.T., but much more experimental work is necessary before it can be finally recommended for use. The efficiency of D.D.T. and other new insecticides will depend partly on the way in which they are applied, and it is conceivable that jet or spraying apparatus will ultimately replace the dipping bath. W.

Farm Stock Insecticides. J. A. Munro. *J. Econ. Entom.*, 1944, **37**, 350-351 (through *Brit. Chem. Abs.*, 1945, B III, 114). A wettable sulphur-nicotine (99 : 1) dust mixture gave promising results in control of sheep ticks in a small flock of sheep. W.

X-Rays: Principles and Application to Industrial Inspection. "Engineer-in-Charge." *Mech. World*, 1945, **118**, 291-4. A general account of the production and control of X-rays and their application to industrial inspection. La.

PATENT

High-frequency Heating Moisture Content Determining Apparatus. Marconi Instruments Ltd. and W. B. Bartley. B.P.569,889 of 26/7/1943 : 13/6/1945. Apparatus for determining the moisture content of a porous, or granulated or particulated substance includes means for applying high frequency electrical energy to the substance and means for ascertaining, as a function of the loss of weight in the substance during such application, the moisture content thereof. The high frequency energy may be applied by means of a solenoid coil, condenser plates, or a resonant cavity device. By this method of heating it is possible to drive off the moisture rapidly without charring or otherwise impairing the substance. The power loss to the substance decreases as the moisture is driven off and the stages of drying can be followed by measuring the amount of power being lost. C.

Thin-boiling Starch: Production. A. E. Staley Manufacturing Co. (Decatur, Illinois, U.S.A.). B.P.570,364 of 29/7/1942: 4/7/1945 (Conv. 9/3/1942). A process for the production of a suspension containing a thin-boiling starch comprises suspending native starch in an aqueous solution of mineral acid containing a hexavalent chromium compound. Products are obtained having a very low content of soluble matter and which yield a predictable fluidity predetermined by the amount of hexavalent chromium compound used. C.

10—ECONOMICS

British Cotton Industry: Reorganisation; Government Policy. *Bd. Trade J.*, 1945, **151**, 377; *Textile Weekly*, 1945, **36**, 300. The Government policy on the cotton industry, as presented by the President of the Board of Trade (Sir Stafford Cripps) to a conference in Manchester on August 11th, is reproduced in full and a brief report of the meeting is recorded. C.

British Cotton Spinning Industry: Labour Reorganisation. *Bd. Trade J.*, 1945, **151**, 378-379; *Textile Weekly*, 1945, **36**, 302-305. Reports are given of a conference on August 11th between the President of the Board of Trade (Sir Stafford Cripps) and representatives of Lancashire employers and operatives on labour conditions in the spinning industry. The employers proposals on wage changes, and on the appointment of a Commission to consider technical questions are reproduced in full, followed by the views of the Trade Unions on the essential factors in the recruitment and maintenance of an adequate labour force, and the President is reported as welcoming the hopeful outlook of the conference. C.

British Textile Trade with Australia: Prospects. *Silk and Rayon*, 1945, **19**, 878-880. Statistics are given of the textile imports by Australia and of the United Kingdom's share in 1937-38. Rayon exports for 1942 are also recorded. Directions in which the British share might be improved are discussed. C.

British Textile Trade with Sweden: Prospect. *Textile Weekly*, 1945, **36**, 258-260, 368-370. A review is given of the balance of trade between Sweden and Great Britain, based on statistics for 1936-1938. The balance in favour of Sweden was more than £11 million per annum and it is argued that British textile firms should strive after a larger share of exports of made-up goods and haberdashery. C.

Cellulose Plastics: Production in United States. *Modern Plastics*, 1945, **22**, No. 9, 109. Production figures are given for nitrocellulose sheets, rods and tubes, and cellulose acetate sheets, rods and tubes and moulding compositions for the years 1938-1943, and the months, January-August, 1944. Total production of nitrocellulose plastic products increased from 9,487,926 lb. in 1938 to 14,042,348 lb. in 1943, and production of cellulose acetate plastic products from 14,224,797 lb. to 54,386,181 lb. in the same period. C.

Cotton Piece Goods: Production and Export. *Economist*, 1945, **149**, 162-163. The present contrast between the raw cotton surplus and the inadequate manufacturing capacity of the textile countries is discussed, with particular emphasis on Britain's labour shortage. The following tabulation of the production and exports of cotton piece goods in 1937/38 is made from national statistics and discussed. C.

Indian Cotton Industry: Organisation. *Indian Textile J.*, 1945, **55**, 230-232. The Indian cotton industry is said to include about 400 mills with more than 10,030,000 spindles and 200,000 looms, consuming 4,800,000 bales of cotton and employing more than 500,000 people. In 1941-42 the mills produced 4,494 million yards of cloth. To maintain this "flourishing state" after the war the writer feels that some measure of rationalisation is necessary but he strongly condemns a proposal to float an All-India organization embracing all the mills in one combine. C.

Man-made Fibres: Development and Prospects. *"Times" Trade & Engineering*, 1945, **56**; March, 9; April, 9; May, 9; and June, 9. A broad review is given of the technical and economic aspects of the development of man-made fibres, as a chapter in a series entitled "Looking Ahead." C.

Raw Cotton: Prices and Government Policy. *Textile Weekly*, 1945, **36**, 105. An American tabulation of cotton prices (usually "spot") ruling in the chief world markets early in May, 1945, is reproduced and compared with the con-

trolled prices on the Liverpool market. Attention is called to the disparity and in view of crop returns the conclusion is drawn that if control is relaxed cotton prices must decline overseas or advance in this country. C.

Rayon Staple: Development; Effect on American Cotton Production. M. R. Cooper and H. G. Porter. *Textile Weekly*, 1945, **36**, 114, 116, 170, 224-228, 262-266 (from Report of the U.S. Dept. Agric., Bureau of Agricultural Economics). The authors review the output, consumption and price history of rayon, and especially rayon staple and the newer synthetic forms, during recent years, and discuss the probable reaction of rayon on American cotton production. C.

Textile Wholesale Prices, May, June, July, 1945. *Bd. Trade J.*, 1945, **151**, 270, 318, 371. The index numbers for May, June and July are, respectively, Cotton, 160·6, 162·0, 162·9; Wool, 184·1, 184·1, 184·1; Other textiles, 138·6, 138·6, 138·6; All articles, 168·4, 170·0, 170·8 (1930 = 100). C.

United Kingdom Imports, 1938-1944. *Bd. Trade J.*, 1945, **151**, 365-369. Total imports for the years 1938-1944 amounted in value to £919·5, 885·5, 1152·1, 1145·1, 996·3, 1232·6 and 1306·2 millions. Retained imports (including munitions for the years 1939-1941) included the following, valued at 1935 prices:

	(*a*) Production (Million sq. yds.)	(*b*) Exports (Million sq. yds.)	$\frac{b}{a} \times 100$		(*a*) Production (Million sq. yds.)	(*b*) Exports (Million sq. yds.)	$\frac{b}{a} \times 100$
United Kingdom	3,250	1,654	50·9	China ...	870[2]	64	7·3
Continent ...	7,520	1,500[1]	20·0	India[2] ...	4,130	127[3]	3·1
United States	8,360	278	3·3	Japan ...	4,000	2,412	60·3
Canada[2] ...	230	5	2·2	U.S.S.R. ...	3,670[2]	200	5·4
Brazil ...	900	5	0·5	Other countries	1,600	—	—

[1] Includes internal trade; [2]Linear yards; [3]By sea only, excluding Burma.
Statistics for weight are converted to sq. yds. at the rate of 4½ sq. yds. per lb.

Classification	1938	1939	1940	1941	1942	1943	1944
	£'000	£'000	£'000	£'000	£'000	£'000	£'000
Cotton, raw and waste ...	33,741	36,363	41,047	23,547	34,918	28,792	23,725
Wool, raw, waste and rags ...	26,540	29,429	43,102	13,525	17,444	11,504	21,459
Silk, raw, waste and rayon waste	1,857	1,515	1,941	651	184	216	228
Other textile raw materials ...	10,025	10,014	9,174	4,976	5,220	5,053	5,499
Cotton yarns and manufactures	3,092	2,359	1,487	842	347	983	661
Wool yarns and manufactures	3,571	3,436	1,215	17	75	164	297
Silk and rayon yarns and manufactures	5,192	4,112	714	48	78	524	1,087
Manufactures of other textiles	4,779	6,284	8,291	2,421	2,936	2,317	4,539

Wool Textile Trade Barriers. Association of Wholesale Woollen Merchants Ltd. *Economist*, 1945, **149**, 165. A summary is given of an analysis of the conditions in which 45 countries are willing to import wool textiles. It is shown that 32 of the countries have adopted quantitative restrictions during the 1930's and that the average duty payable abroad on British cloth increased by 139 per cent. between 1912 and 1939. Examples of vexatious additional restrictions are given, and the Association makes suggestions about simplification and standardisation for discussion in future negotiations for trade agreements. For example, cloths having an admixture of silk or mercerised cotton for decorative purposes should be classed as all-wool goods provided that the silk or cotton content is not more than 5 per cent. by weight. C.

Argentine Cotton Spinning Industry: Activity in 1942. *Boletin Mensual, Junta Nacional del Algodón, Buenos Aires*, 1943, Nos. 101-102, 466-482. Further progress in the spinning industry in 1942 is reported. By the end of the year, 26 cotton spinning mills were in operation. The total number of spindles increased to 387,664, of which 386,800 were ring and 864 mule spindles. Consumption of raw cotton in 1942 amounted to 57,055,836 kg., of which 54,174,601 kg. were Argentine grown and the rest imported. Production of cotton yarn reached the high record of 49,722,333 kg. Average counts were 14·53. Tables are given showing the position of cotton textiles in the Argentine market, and cotton spinning mills and cotton consumption in recent

years, classification of spinning mills according to number of spindles, spindle activity and yarn production, distribution of cotton consumed according to length, grade, and country of origin, monthly consumption and production figures for 1941 and 1942, yarn production according to type and counts, stocks of raw cotton in spinning mills, number of operatives, wages and salaries, and cotton textile exports. C.

11—INDUSTRIAL WELFARE, INDUSTRIAL PSYCHOLOGY, AND EDUCATION

Chlorinated Naphthalene (Halowax) Dermatitis: Occurrence. N. Strauss. *Rev. Gastroenterology*, 1944, **11**, 381 (through *Bull. Hygiene*, 1945, **20**, 408). A clinical report is given of a fatal case of Halowax dermatitis due to inhaling the fumes. The literature on other cases is reviewed. The author emphasises that if a worker with such chlorinated naphthalenes develops jaundice or dermatitis he should be excluded from any further contact with the fumes or with carbon tetrachloride and related solvents. He should be placed on a diet rich in protein and given several transfusions of whole blood or plasma. C.

Cotton Dust Fever: Occurrence and Symptoms. W. L. Ritter and M. A. Nussbaum. *Indust. Med.* (Chicago), 1944, **13**, 966, 968, 970 (through *Bull. Hygiene*, 1945, **20**, 330). The authors report that workers in cottonseed oil mills are prone to develop "dust chills" on reaching home after the first day's work. There is headache, slight fever and possibly nausea and vomiting. After working for a week or so, some immunity is acquired, but even "immune" workers may get the feverish chill if the mill is particularly dusty, or if they have to handle low-grade cotton. The fever is attributed to an endotoxin in the dust liberated by *Aerobacter cloacae*. [It is pointed out that the condition is not that gradual development associated with cardroom dust.] C.

Cottonseed Oil Mill Workers' Byssinosis: Occurrence. W. L. Ritter and M. A. Nussbaum. *J. Indust. Hyg. Toxicol.*, 1945, **27**, 47-51 (through *Bull. Hygiene*, 1945, **20**, 406-7. It is the custom in the cottonseed oil mills of Mississippi to weed out workers who complain of asthma. By searching among former workers the authors found 12 negroes who had developed the trouble, and on taking two of them to an oil mill, both became asthmatic, one very severely. The 12 men were examined thoroughly without finding any characteristic or suspicious changes, even by means of X-rays. At a mill, another group of 26 men who had been exposed to the dust for at least 20 years were also examined by means of X-rays, but no chest abnormalities were discovered. The conclusion was drawn that although byssinosis could not be established as a clinical entity allergic persons may develop hypersensitivity to cotton dust and become asthmatic in the dusty atmosphere. The authors express surprise, however, at the absence of pulmonary signs in the X-ray picture. In actual fact there is more absenteeism in the rooms where the oil is expressed than in the dusty rooms. So far, no claim for compensation for byssinosis has been allowed in the United States. C.

Cotton Operatives: Training. (1) A. H. Seymour. (2) J. Baines. *Textile Mercury & Argus*, 1945, **113**, 123-124; 147, 151, 163; *Textile Weekly*, 1945, **36**, 214. Reports are given of lectures and discussions at a conference on the "Training of Operatives, with Special Reference to Cotton Spinning," under the titles (1) Training for Industry, (2) Cotton Labour Training Problems and their Solution. C.

Hazardous Chemicals: Labelling. Manufacturing Chemists' Association (U.S.A.). *Chem. and Eng. News*, 1945, **23**, 992-994. A "Guide for the Preparation of Warning Labels for Hazardous Chemicals" is reproduced, with several examples. Signal words are "Danger," "Warning" and "Caution," and these are accompanied by a word or phrase to indicate the hazard (e.g. "Flammable," "Harmful dust," etc.), precautionary hints (e.g. "Do not get in eyes") and first-aid instructions if advisable. C.

United States Textile Research Institute Laboratory. W. B. Foulk. *Textile Research J.*, 1945, **15**, 190-193. An account is given of the adaptation of the 34-roomed Baker mansion at Princeton for use by the Textile Research Institute. The converted mansion will provide, in addition to library and office facilities, adequate laboratory facilities for 24 research workers. C.

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