



# The Journal of the **TEXTILE INSTITUTE**

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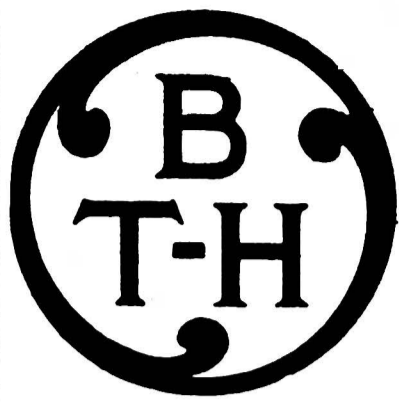
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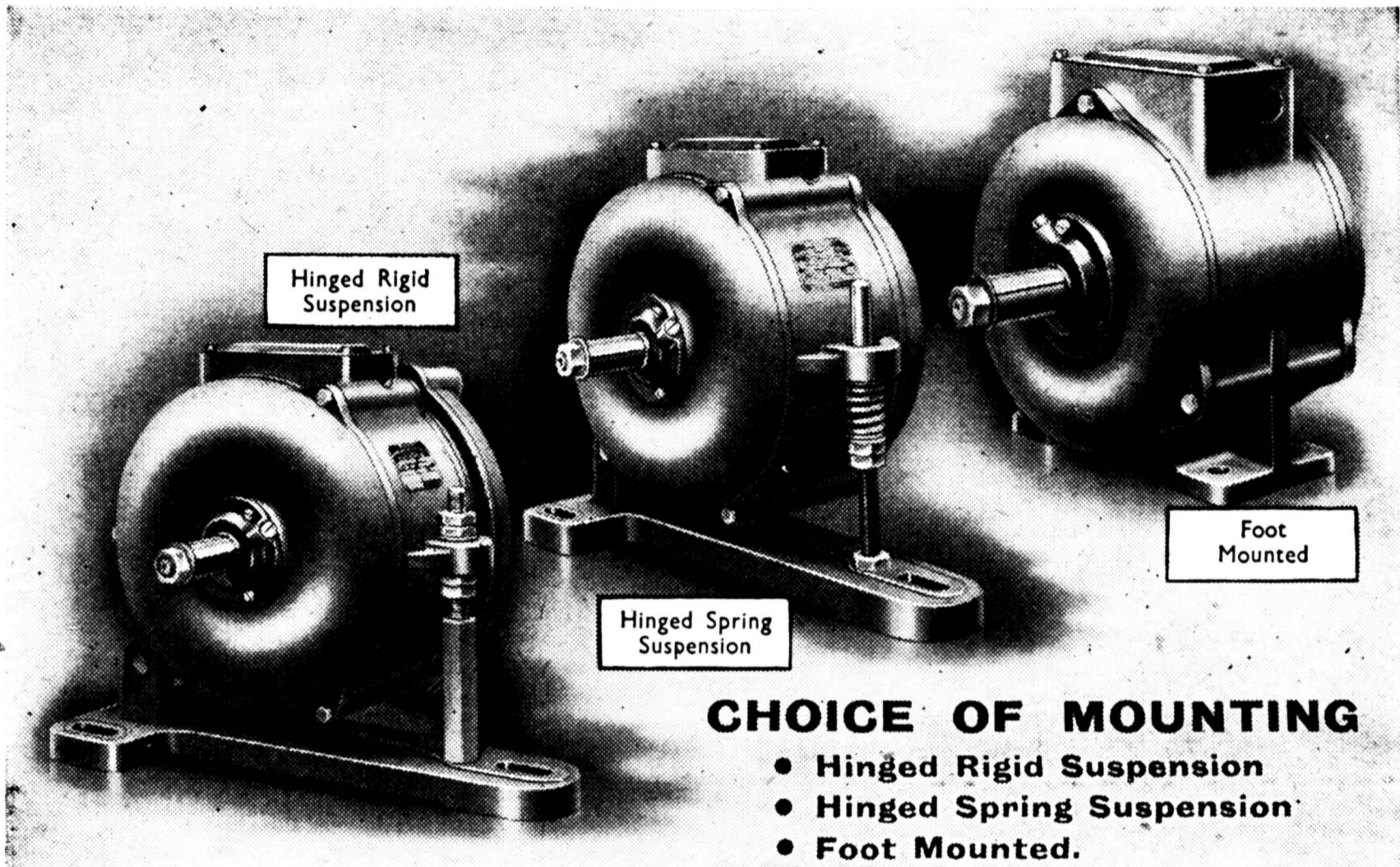
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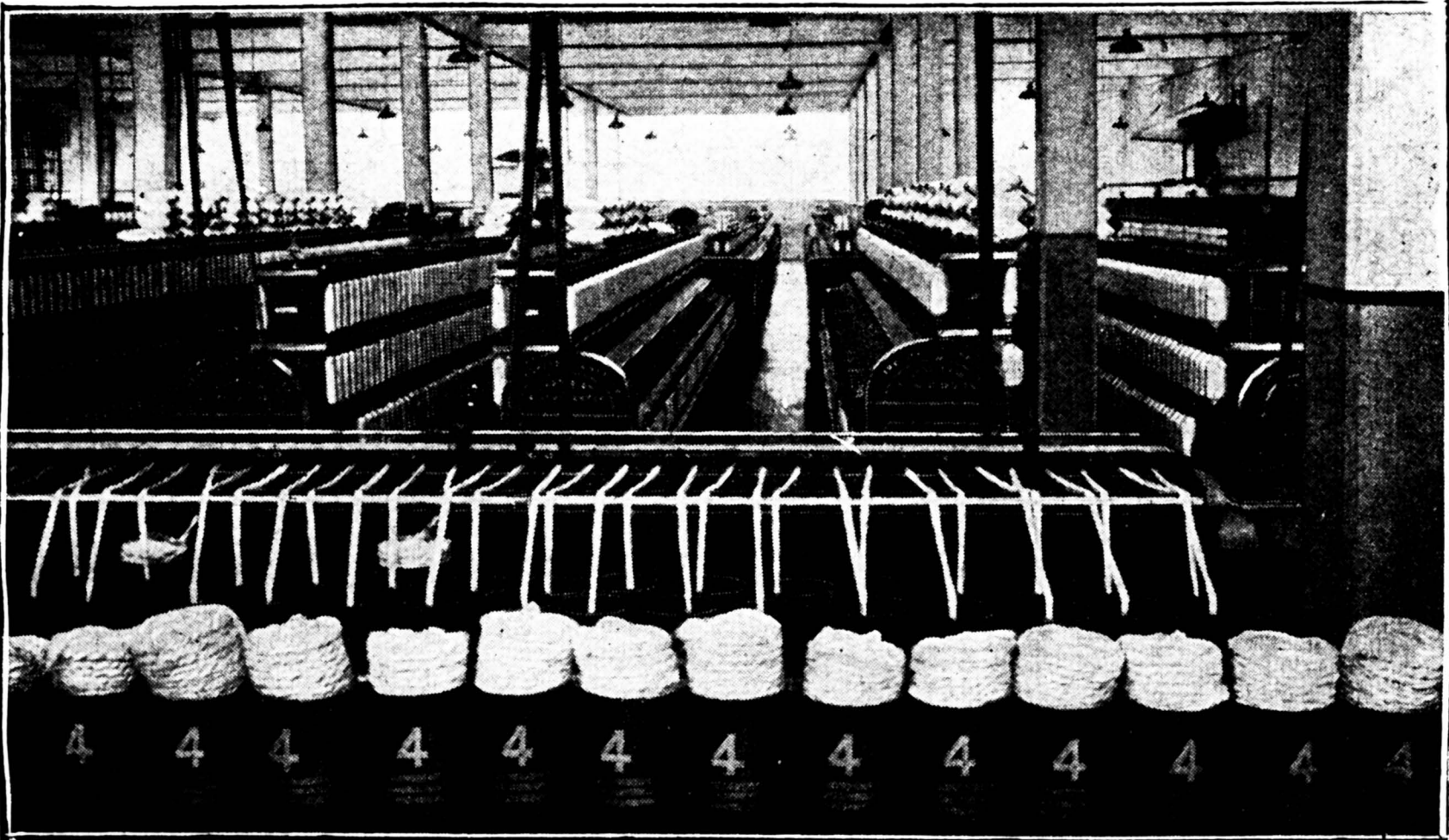
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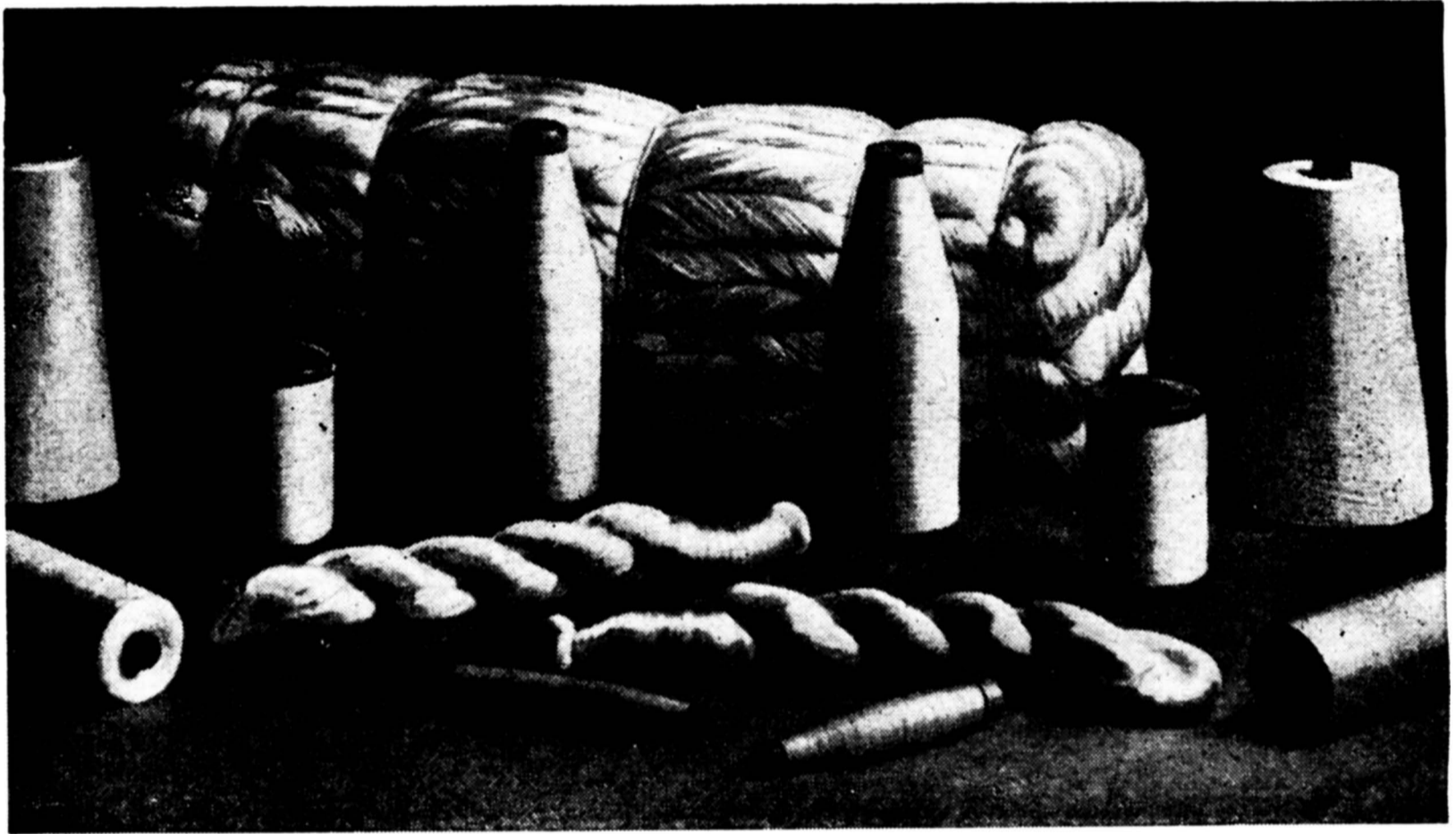
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# THE JOURNAL OF THE TEXTILE INSTITUTE

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## PROCEEDINGS

### Lancashire Section MODERN WINDING METHODS

By F. NASMITH, F.T.I.  
(Universal Winding Company)

*Lecture to the Lancashire Section, 14th May, 1943.*

Winding is essentially a non-productive process although it is a very important operation and can improve quality and provide economic returns in subsequent processes. It must be admitted that from the last spinning spindle until the loom, the operations that take place are non-productive. It is necessary to recognise this fact before one can understand the reason for the developments in winding machinery.

Formerly the crude machines employed in the mills were merely used to place the yarn on a suitable container, either a pirn or bobbin, or a double-flanged bobbin, so that it could be utilised as a supply to the shuttle or the warping headstock. Subsequently it was appreciated that there was something more in winding than putting yarn on to a support or container and, of course, as stated earlier, it was recognised that winding itself was not a productive process and was really slowing down the job which was to manufacture fabrics or produce other saleable and usable materials.

The urge, therefore, to the winding machinist, was to produce high speed machinery which would get the yarn on to the container as quickly as possible, but it was soon recognised that there were other factors which had to be taken into consideration. In the first place, the quality of the yarn had to be maintained, and if the treatment was too severe in the winding processes such yarn suffered strain and, further, in other cases it did not deliver properly when utilised as a supply. For example, unless a pirn utilised in the shuttle is wound properly it will slough off and cause trouble. It was also recognised that by taking proper care and utilising modern machinery the yarn could be so treated and so prepared that it could become a first class economic factor in carrying out further processes. For example, yarn wound on a cone and utilised in a cone creel as a supply to a warping headstock gives a better warp with more regular tension than is possessed by a warp wound from double flanged bobbins, and moreover, is wound at a much higher speed. The yarn from the cone, of course, is taken over the apex. Further, weft when it is properly rewound on to a pirn or bobbin, owing to even delivery, will produce very much better selvages than weft yarn taken direct from the cop which is uneven in delivery. Also you have the added advantage that the perfectly wound longer length of yarn on a pirn—sometimes as much as three times the length that can be found in an ordinary weft cop—reduces the number of stoppages of a loom to replenish the weft which is all to the good and also tends to improve the quality of fabric produced.

Therefore, it will be appreciated that the problem of the winding machinist was first to increase the speed of winding, but he also appreciated the fact that if he improved the quality of the product turned out by his winding machines he would be helping ultimate processes and a considerable economic advantage would be gained. In the detail that will be given in this paper it will be shown that these considerations have certainly been taken into account.

In order to meet the demand for speed and at the same time maintain the quality and strength of the yarn the Reece roll was invented. The Reece roll is an entirely new method of guiding or traversing the yarn on to a package while at the same time driving the said package. It is either made of metal or plastics and is formed with crossing helical grooves, the invention lying in the method in which the crossing points are constituted in order that an even traverse of the yarn is secured from end to end of the roll. By the elimination of the eight parts which are embodied in a reciprocating motion not only have winding speeds up to as high as 900 yards per minute been secured but the cost of upkeep of the machine has been reduced materially. Recently a census was taken of some 5,000 spindles that had been working for some years in this country and it was found that the yearly cost of upkeep of a machine of this type was less than 8d. per year per drum.

Another advantage of the Reece rotary traverse roll is that the method of guiding the yarn in helical grooves safeguards it from abrasion despite the high winding speed. The yarn does not leave the groove until it is actually taken up by the package. The guiding surface of the roll in contact with the yarn is moving at practically the same rate and in the same direction as the yarn, and frictional contact between guiding surface and yarn is, therefore, entirely eliminated. The advantages of this method of guiding the yarn are obvious when compared with the effect on yarn of a reciprocating yarn guide which is stationary relative to the direction of yarn travel and reciprocates approximately at right angles to that direction.

Often in conventional types of reciprocating traverse drum winders, as the winding package builds up the increasing weight of yarn adds pressure to the inner yarn layers which gives rise to packages of uneven density. In rotary traverse roll winding, the package is not mounted directly over the driving roll but bears on the back of the roll. In consequence, as a package builds up there is no increase of pressure on the inner yarn layers. There is no need to emphasize the importance of even density cones in promoting regularity of yarn delivery to knitting and warping machines.

The supply for modern high speed winding machines is most frequently a spinning tube or bobbin with yarn delivery over the tip or nose. Since overend yarn delivery with the supply at the correct distance from the first guide imposes practically no basic yarn tension, a controllable even tension is applied to each end of yarn. This is easily adjustable to conform with yarn counts, and is maintained only at the minimum value necessary to wind a satisfactory package. Such positive control of yarn tension ensures that yarn quality is not impaired despite high winding speeds.

Yarn clearing during single end winding is now generally recognised as a valuable economic factor in the efficiency of subsequent processes. This operation is something more than slubbing in that it involves both yarn inspection and rectification. All slubs, thick places, and untidy knots are removed from the yarn so that wound packages as near perfection as possible are supplied to the next processes with obvious beneficial results. A reduction in the number of stoppages during warping and weaving means a lessening in the stoppages of a large number of ends, an efficiency factor not always fully appreciated.

Yarn clearers must be necessarily of precision construction capable of setting to fine limits in accordance with the closeness of clearing required. A well-known double yarn clearer gives good results, an accurately set needle-type clearer is followed by a blade type clearer. The former removes lint and fluff

from the yarn and as this falls from the yarn it is prevented from getting into the package by the second clearer blades. The setting of the blades of the rear clearer ensure that a consistently even quality of yarn is wound.

The constant repetition of certain manipulations by a winding operative, such as those involved in the replenishment of supply tubes and bobbins, occupies the major portion of the working time of such operatives. Consequently winding machinists have given much consideration to time-studies of the various movements which operatives make in tending a modern winding machine. The result is reflected in machine design, in the accessibility of spindle starting handles, and in the provision of self-threading yarn guides, all with the object of reducing manipulative times. Clearly if an operation is done 1,000 times a day, and a second can be saved per operation, the result reflected in more winding is of appreciable value.

The factors mentioned serve to illustrate how the textile machinist has provided high winding speed machines which also safeguard the quality of yarn and wound packages. Needless to say, machines are built on sound engineering science, and these have kept pace with winding performance. Moreover, the textile engineer is naturally constantly seeking to improve his machines and increase their scope of usefulness. For example, the rotary traverse winder is particularly suitable for winding packages for machine dyeing in package form because of the uniform soft density of packages which can be wound on this type of winder. A machine dyer requires cones and cheeses of shorter traverse than normal, particularly in fine yarn counts. The textile engineer was able to meet this demand by fitting a stop at the crossing point of the helical grooves of the Reece roll to produce dyeing packages of the required short traverse.

There is another factor that is now having an effect on the industry and particularly on the winding engineer. It is concerned with the number of winding spindles that one operative can attend to, and it has brought forth—just as it did in the weaving industry some years ago—automatic machinery. There is undoubtedly a trend at the present time to provide automatic machinery for winding. How far this will go, and how far it can go, remains to be seen, because from investigations that have been made, certain yarns wound in various packages show no return for winding them on automatic machines. As a matter of fact some automatic machines show no advantage in use, but all the same in mass production of some classes of yarn automatic winding machinery will, it is believed, become increasingly used. In respect of certain of these machines it is interesting to note that electricity is becoming more and more favoured. For example, in one automatic pirn winding machine which has been introduced and is running satisfactorily in mill operations, the replenishing change is effected by the use of electromagnetic solenoids which are brought into operation instantly in the required sequence by suitable switch gear.

It is quite likely with our increasing knowledge of the use of magnetic and electric forces we shall see in winding machinery a greater use of such forces, both electric and possibly pneumatic forces. Undoubtedly in the future, it will be essential to employ mechanics with wide engineering knowledge rather than the ordinary type of mechanic hitherto employed who are almost blacksmiths and certainly not of much use in dealing with precision machinery. It has been quite definitely established that it pays to employ expert mechanics or machine overlookers to attend to precision machinery.

In reviewing modern winding machinery mention should be made of the part played by winding machines in the contribution of the industry towards the war effort. In addition to the well-known standardised processes in the doubling and weaving branches of the trade engaged in the production of uniform cloths, webbing, tent ducks, tyre fabrics, parachute cloths and cords, winding machines have been called upon to produce packages from materials for purposes which are perhaps less well known but vitally important from a war standpoint. For instance, oil filters of petrol engines needed a filter cheese

of cotton yarn to counteract the harmful effects of grit and dirt. Winding machines produced a satisfactory filter cheese. Electrical cables needed in enormous quantities need covering with yarn and armoring with a wire sheath. Single and multiple end winding machines provide the necessary braiding packages. Nylon yarns required winding to make parachute shroud cords and parachute fabrics, an example of a new yarn being successfully handled by the adaptation of existing types of winding machines. Similarly, winding machines have been adapted for the successful handling of glass yarns for incorporation in important war materials still on the secret list. These are but a few of the war calls made on winding machinery which have been successfully answered.

With regard to the future of winding machinery, certain well-defined pointers are already apparent despite the fact that our activities are wholly directed to the prosecution of the war effort. The subject of automatic weft winding machines has already been referred to, and no doubt considerable developments in the provision and use of such machines will take place in the immediate post-war period. Important aspects of this development are the provision of continuous supply for automatic winders, the standardization of the weft packages produced, and the high winding speeds provided by these machines. One automatic weft winder is operating in mills at a spindle speed of 5,000 r.p.m. It is, however, still a moot point as to whether automatic pirn winding will be successful in every case and will show an economic advantage. This is a question that has been discussed many times, and even at the moment a report is being prepared in regard to the position.

Then there is the trend towards longer yarn length packages both for weaving as well as warping. Long length pirns, as already stated, mean fewer loom stoppages and increased weaving performance. Warping from cone supply is practically a semi-automatic operation carried out at high speed, and there is no doubt that high speed warping will be generally adopted throughout the industry as soon as machinery becomes available. It must be remembered, however, that if high speeds are to be obtained in warping, there must be changes in the type of beam and warping headstock that will be available to secure such high speeds. For example, it is no use trying to run a high speed warping headstock with a Lancashire barrel beam having proportions of a 4½" barrel and an 18" flange. The beams that will have to be used to get the best results are those with measurements of 10" to 12" barrel and 28" and 30" flange.

In the doubling industry, high speed winding preparation for doubling will become universally practised. Modern systems of winding for doubling include what is termed dual-process winding. The principle of this is that high speed single end winding usually on to cone is followed by multiple end winding on to cone or cheese to be used as supply for the doubling frame. Yarn is cleared and pieced in the first process of single end winding, hence practically all stoppages are restricted to single end winding with a minimum loss of production effect on doubled yarn preparation as a whole. The single end cones from the first stage of dual-process winding contain very long continuous lengths of yarn as perfect as it is humanly possible to make from spinners' cops. The use of these as supply to multiple end winders in the second stage of dual process winding increases efficiency considerably, and the multiple end wound cone or cheese provides the Twister with a similar trouble-free supply which also helps to improve the twister output. The dual process of winding disposes very effectively of the vexed question of bunch knots which are almost non-existent in doubled yarns made by this system. As is well known, the absence of bunch knots is particularly advantageous in sewing threads and similar yarns.

Big developments will occur in the synthetic field, and already there are several new yarns ready for commercial use in the post-war period, such as nylon, Aralac, vinyon, and Casein type yarns including wool-like varieties. Such yarns introduce new problems to textile winding machinists because of characteristic yarn properties possessed by the new fibres different in degree

or nature from those possessed by older yarns. For example, nylon is distinguished by high tensile strength, high elasticity and recovery power, pronounced cutting effects on expensive knitting machine parts, and an uncommon liability to effects of static electricity.

The cumulative effect of these properties so far as winding machines is concerned is that sizing and oiling have to be resorted to in order to discount the ill-effects of these properties, and a preferred type of winding package is used for most satisfactory results. The textile engineer has produced a new machine for sizing during winding of nylon yarns, and modified existing machines to oil and wind these yarns into pineapple cone ready for subsequent use in knitting and weaving.

Whatever calls upon him the post-war period may make, the winding machinist will be ready to provide either improved existing machines or entirely new creations as his contribution towards the well-being and advancement of the industry.

**Typical Productions of Modern Winding Machines**

*Single end Winding*—On a Rotary Traverse Roll Machine.

Packages wound—Warping Cones.

Supply—Spinners' Cops or Bobbins.

Efficiency—75 per cent.

**Production in lbs. per drum per 48-hour week**

Actual Winding Speed Yards per minute	Counts :					
	16's	20's	24's	30's	36's	50's
500	80	64	53	43	36	26
550	88	71	59	47	39	28
600	96	77	64	51	43	31
650	104	84	70	56	46	33
700	113	90	75	60	50	36
750	120	96	80	64	54	39
800	128	103	86	69	57	41
850	137	109	91	73	61	44

*High Speed Beaming.*

Supply—Magazine Cone Creel.

**Beam Production in lbs. per 47-hour week**

Warping Speed Yards per min.	No. of ends in Warp	16's	20's	24's	30's	36's	50's
300	400	20,142	16,116	13,428	10,743	8,953	6,446
	500	25,177	20,145	16,785	13,429	11,193	8,057
350	400	23,499	18,800	15,666	12,534	10,445	7,520
	500	29,374	23,500	19,583	15,667	13,056	9,400
400	400	26,856	21,688	17,904	14,325	11,937	8,595
	500	23,570	27,110	22,380	17,806	14,921	10,745
500	400	32,213	24,176	20,162	16,115	13,029	9,669
	500	40,276	30,220	25,202	20,145	16,286	12,086

*Multiple End Winding*—On a Reciprocating Traverse Machine.

Cone Supply.

Packages wound—Parallel cheeses for supply to twisting frame.

Counts—5/23's.

Efficiency—85 per cent.

Actual Winding Speed—300 yards per minute.

Production in lbs. per 96 drums per 48-hour week : 19,000.

**Institute Membership**

At the July meeting of Council the following were elected to membership:—

*Ordinary.*

- James Thomas Baines, 100, St. Stephen's Road, Preston (Manager, Preparation Dept., Jos. Hoyle & Sons Ltd., Portland Street, Accrington).  
 Wilfred Blakey, c/o John Priestman & Co. Ltd., Ashfield Mills, Thornton Road, Bradford (Departmental Director).  
 Clifford Duckworth, 28, Crestfield Avenue, Elland, Yorks. (Technical Dyer and Chemist, Ministry of Supply).  
 G. W. Gunter, Kewn, 207, Hinchley Road, Nuneaton, Warwickshire (Wool Felt Hat Manufacturer).  
 James Fitzpatrick, 161, Main Street, Elderslie, Renfrewshire (Hemp & Flax Mill Manager, Gourrock Ropework Co. Ltd., Port Glasgow).  
 Norbert Hooper, A.M.C.T., 18, Castleway, Castleton, Rochdale (Draughtsman, Tweedales & Smalley Ltd., Globe Works, Castleton).  
 James Isles, The Uplands, Upper Batley, Yorks. (Director, J. T. & J. Taylor Ltd., Batley).  
 Eric Harding Jones, A.Inst.P., 30, Moss Lane, Bramhall, Cheshire (Research Assistant, British Cotton Industry Research Association).  
 George Lucas, Eastney, Thornton Avenue, Heaton, Bolton (Works Manager, Jolly & Jackson Ltd., Vale Bleach Works, Horwich).  
 John L. F. McDowell, 84, Suffolk Avenue, off Row Farm Lane, Derby (Weaving Supervisor, British Celanese Ltd., Spondon).  
 William Meston, M.A., B.Sc., 91, Clifton Road, Aberdeen (Works Manager, Messrs. J. & J. Drombie Ltd., Grandholm Works, Woodside, Aberdeen).  
 Eric Moss, 4, Guildford Street, Hebden Bridge, Yorks. (Mill Manager, Hebden British Estate Co. Ltd., Foster Mill, Hebden Bridge).  
 Colin Nutter, A.M.C.T., 4, Saddleworth Road, West Vale, Nr. Halifax, Yorks. (Textile Inspector and Tester, H.M. Naval Victualling Depôt).  
 Henry Kirkman Price, 10, St. Barnabas Road, Cambridge (Jute Goods Merchant and Manufacturer).  
 John Stephenson, 34, Cromford House, Cromford Court, Manchester, 4 (Manufacturer and Merchant).  
 William Tong, Messrs. Kirklees Ltd., Bury (Chairman and Managing Director).  
 André Varga, 7, Lyndhurst Crescent, Ilkley, Yorks. (Director for British Isles, H. Duesberg, Verviers, Belgium).

*Junior.*

- Wm. Alfred Birtwistle, 20, Norfolk Road, Lytham, Lancs. (Student, c/o Messrs. Birtwistle & Oddie Ltd., Prospect Mills, Blackburn).  
 Harry Robinson, 12, Fern Street, Coppice, Oldham (Textile Student, Shirley Institute, Didsbury, Manchester).

**Employment Register**

The following announcement is taken from entries in our Register of Members whose services are on offer. Employers may obtain full particulars on application.

- No. 230.—A.T.I., 35 years of age, requires position as Assistant Manager in cotton spinning or rayon processing. City & Guilds Full Technological Certificate. Knowledge of bookkeeping and shorthand. Eight years experience as overlooker in Crêping Department.

**Obituary**

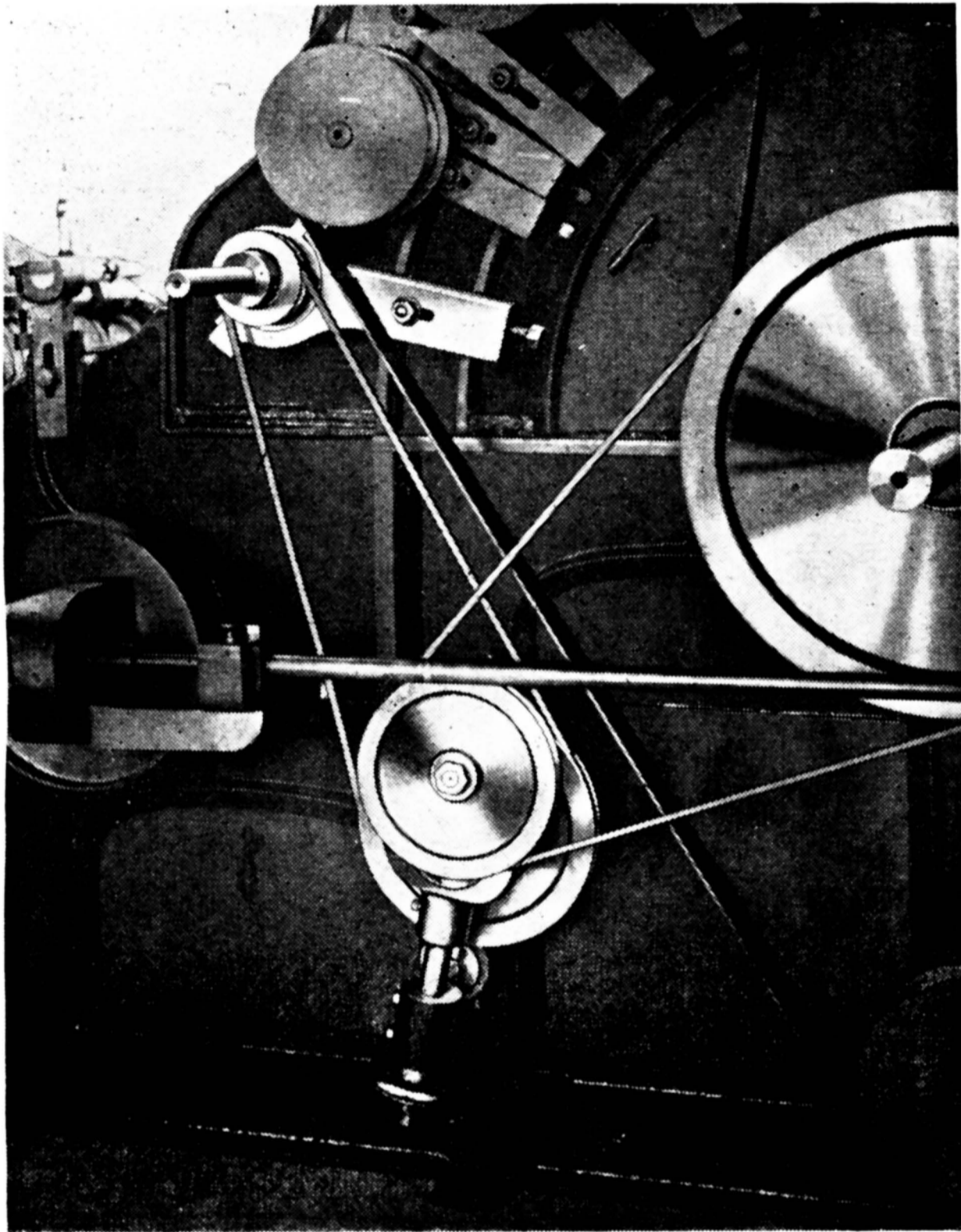
The Institute regrets to announce the death of the following members:—

- J. W. Nasmith, Hon. F.T.I., of Manchester, and W. Walker, A.T.I., of Shaw, Lancs.

**NOTICES: INSTITUTE MEETINGS**

Friday, 13th August. *Manchester*—1.0 p.m. Lunch-time meeting. Lecture:  
“ Developments in Textile Finishing,” by J. G.  
Evans, Esq., of Imperial Chemical Industries,  
Ltd., at the Institute’s premises.

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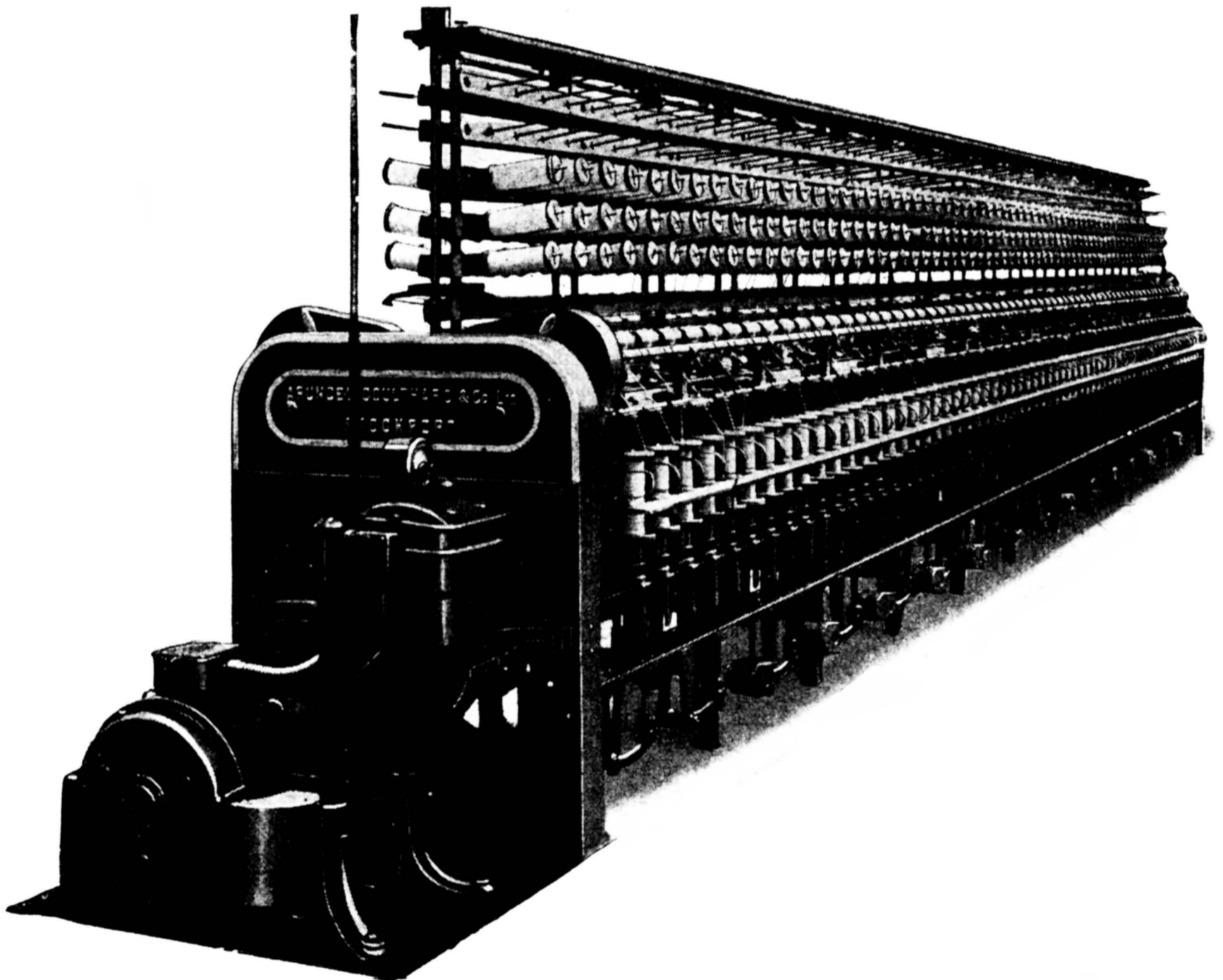
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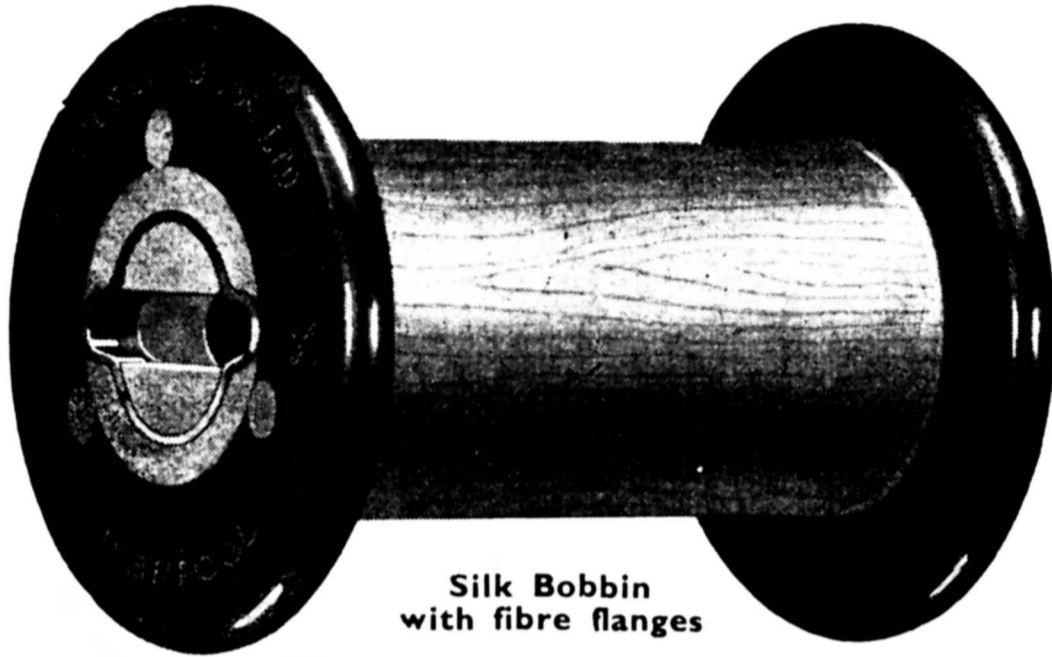
*Regd.*

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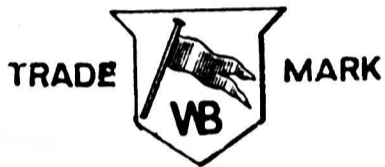
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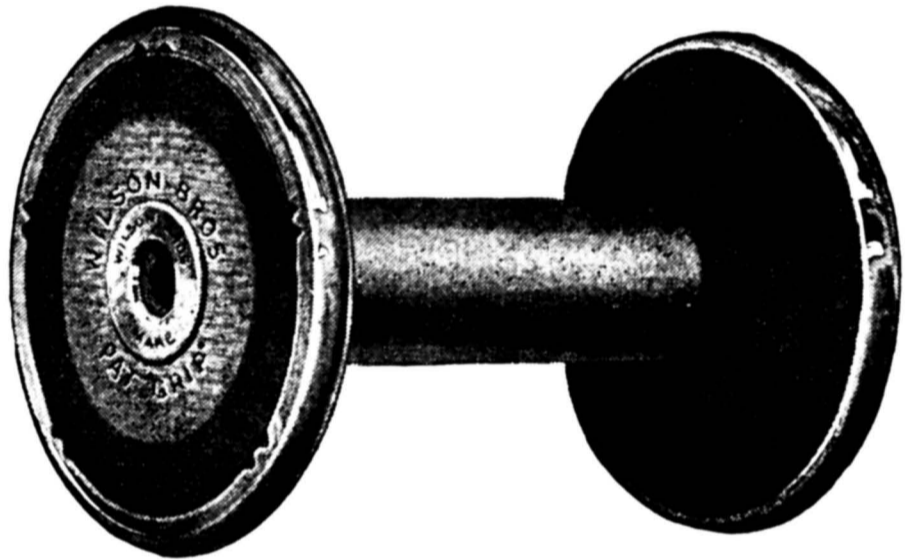
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# THE JOURNAL OF THE TEXTILE INSTITUTE

## TRANSACTIONS

### 4—THERMAL INSULATING PROPERTIES OF CLOTHING

By S. BAXTER and A. B. D. CASSIE  
(Wool Industries Research Association).

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#### INTRODUCTORY

The thermal insulation of clothing depends on a number of factors which are difficult to separate and measure individually. The two primary ones are the thermal conductivity of fabrics constituting the clothing and the surface emissivity of the fabric. The present paper separates these two factors on the assumption that Newton's law of cooling is adequate in dealing with the emissivity of a surface when temperature differences are no greater than those encountered in clothing problems. A more accurate study would, of course, require the surface emissivity to be separated into convection and radiation components, but the simpler assumption gives agreement with experimental data to within the limits of present experimental error. Its use is therefore justified until greater accuracy is attained in discussing clothing problems.

Thermal measurements on clothing have led to the use of an apparatus<sup>1, 2, 3</sup>, that simulates to some extent the conditions of use of fabrics: a surface is maintained at constant temperature and the heat required to maintain this temperature is measured when the surface is exposed to free air, and when the surface is covered with the fabric under investigation. The apparatus has led to the use of an empirical quantity, the thermal insulation value, or T.I.V., as a measure of the heat insulation of fabrics. The T.I.V. of a fabric is the per cent. saving in heat loss from the surface due to covering it with the fabric. If  $H_0$  is the heat lost per unit area per second from the uncovered surface, and  $H_c$  that from the covered surface, then T.I.V. is given by P in the equation

$$P = 100 \frac{H_0 - H_c}{H_0} \dots\dots\dots(1)$$

**THEORETICAL**

The meaning of T.I.V.'s is best appreciated by the analysis of heat flow from a heated surface through a layer of insulating material to free air. Fig. 1 shows the system together with the temperature gradients: BC is the insulating layer with one surface, B, maintained at a temperature  $T_1$ , and the other C, exposed to free air at temperature  $T_0$ . The heat flow,  $H_c$ , through unit area of the material is  $(T_1 - T)K/d$  where  $K$  is the thermal conductivity of the material,  $d$  is its thickness, and  $T$  is the temperature of

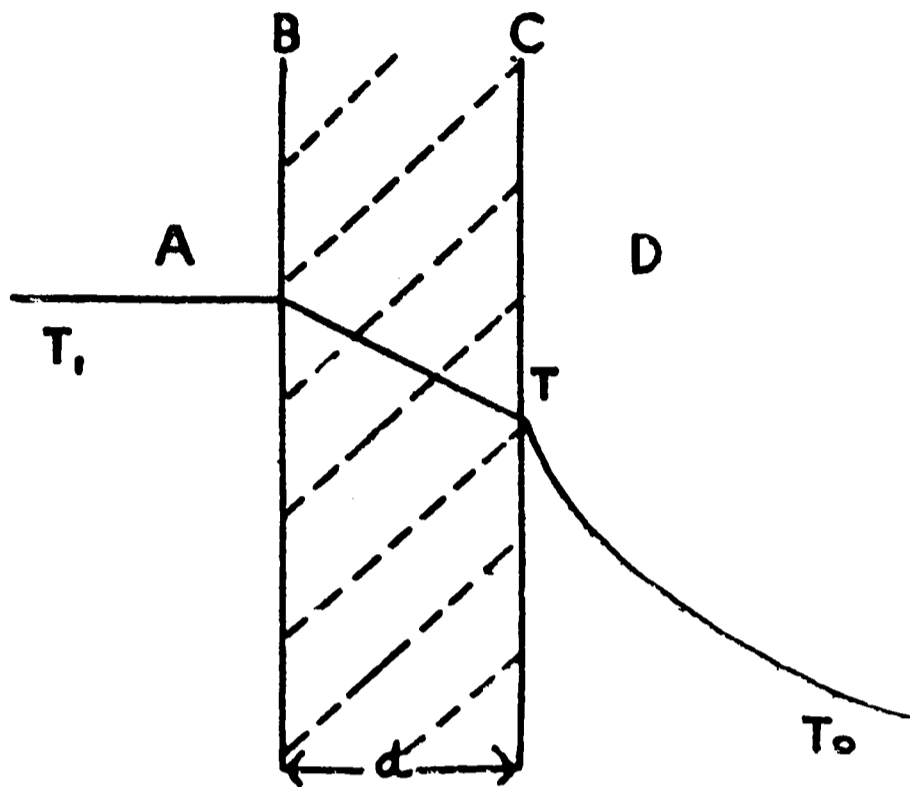


Fig. 1.

surface C. This must equal the flow of heat from unit area of the exposed surface, or

$$H_c = (T_1 - T)K/d = \sigma(T - T_0) \dots\dots\dots(2)$$

where  $\sigma$  is the emissivity of the outer surface, Equations (2) give:

$$H_c = K \frac{T_1 - T_0}{d + K/\sigma} \dots\dots\dots(3)$$

and

$$T = \frac{dT_0 + T_1K/\sigma}{d + K/\sigma} \dots\dots\dots(4)$$

The heat lost,  $H_0$ , from the uncovered surface at temperature  $T_1$  is

$$H_0 = \sigma^1(T_1 - T_0).$$

where  $\sigma^1$  is the emissivity of the heated surface, and by substitution in equation (1),

$$\frac{P}{100} = 1 - \frac{K/\sigma^1}{(d + K/\sigma)} \dots\dots\dots(5)$$

Equation (5) shows that T.I.V.'s can be discussed in terms of fabric thickness, thermal conductivity, and surface emissivities. There are, of course, difficulties in determining the thickness of a fabric for thermal insulation purposes, but many advantages are gained by discussing separately the factors that determine T.I.V.

Equation (3) shows that the effective thickness of a fabric for heat insulation is greater than the measured thickness by an amount,  $K/\sigma$ . The thermal conductivity of textile fabrics may be taken as roughly  $1 \times 10^{-4}$  c.g.s. units, and  $\sigma$  for still air is around  $2.5$  to  $3.3 \times 10^{-4}$  c.g.s. units<sup>5</sup>.

The effective thickness obtained from the still air layer at the exposed surface is thus around 0.4 to 0.3 cm. This is comparable with the thicknesses of many fabrics, and resistance to the transfer of heat from the exposed surface must give a large contribution to the T.I.V. When several layers of fabrics with air spaces between them are worn, heat transfer from one to another is by radiation and transport through free air, and the surface resistances of neighbouring fabrics will contribute as much to the insulation

provided by the clothing as do the thermal resistances of the fabrics, themselves.

Equation (5) shows that the T.I.V. depends on the emissivity  $\sigma^1$  of the uncovered surface; if this were infinite,  $P$  would always be 100 per cent. and values less than 100 per cent. are only obtained because  $\sigma^1$  is finite. Values of  $P$  therefore have no meaning unless the emissivity of the uncovered surface is given, and they can be used to discuss the heat insulation of other surfaces, such as the skin of the human body, only when the emissivities of these surfaces are known. Heat transfer through the skin is a very variable quantity depending in a complicated manner on environment, and the heat insulation given by clothing will depend on its effect on the skin as well as on its thermal properties. These are, however, problems for future physiological research, and the physicist can at present only note their existence.

A simplification does occur in equation (5) when applied to thick cloths in still air. If the uncovered surface is not an exceptional reflector,  $\sigma$  and  $\sigma^1$  will not be very different and the equation reduces to the simpler approximate form.

$$P = 100 \frac{d}{(d + K/\sigma)} \dots\dots\dots(6)$$

Experimentally, equation (5) is best used by plotting  $P$  against  $d$ , and from the resultant curve  $K/\sigma$  and  $K/\sigma^1$  may be obtained. If  $\sigma^1$  is known, both  $K$  and  $\sigma$  may be calculated. The greatest uncertainty in this procedure is determination of the thickness  $d$ : a cloth with surface cover may have an effective thickness considerably greater than its measured thickness even though this be made under light loading. In fact, many of the theoretical difficulties involved in thermal measurements on fabrics are included in the uncertainty as to the position of the surface separating the fabric from free air. Calculations of  $K$  and  $\sigma$  are possible only if the position of this surface is arbitrarily fixed, and in the present paper it is fixed by taking  $d$  as the thickness of the fabrics when measured under a load of 5 gm. per sq. cm. If the cloth has good surface cover, giving it effectively a greater thickness, this will appear as a low surface emissivity.

#### APPARATUS FOR T.I.V. DETERMINATIONS

##### (a) Description

The apparatus used was designed on the lines of the Pfeidner-Büttner Frigorigraph, a modification of which was used by Besserer<sup>4</sup>. The essentials of the apparatus are briefly as follows:—

A given surface is heated to a fixed temperature in an enclosure of constant temperature and R.H. by means of a constant electrical energy input. The surface is then covered with the fabric to be tested and the increase in temperature measured. T.I.V. is obtained from the increase in temperature.

Besserer used a cylindrical surface in his apparatus, but this had the disadvantage of introducing a seam into the material which is inadvisable. In the present apparatus contact uncertainties between the fabric and the surface were avoided by making the surface of semi-cylindrical form. The copper semicylinder, B, together with the "guard rings" A and C were mounted on a heat insulating base as shown in Fig. 2. The heating coils in A, B and C, Fig. 3, were arranged so that when all were connected in series each section came to the same temperature when uncovered. The surface covering D, which was identical to B, also had a heating coil which raised its temperature to the same value as surfaces A, B and C. The heating coils of the four surfaces A, B, C and D were connected in series through a barretter and rheostat to the mains. When adjusted correctly the barretter maintained the heating current at a constant value of .3 amps. The temperature of the surface was recorded by means of a low resistance

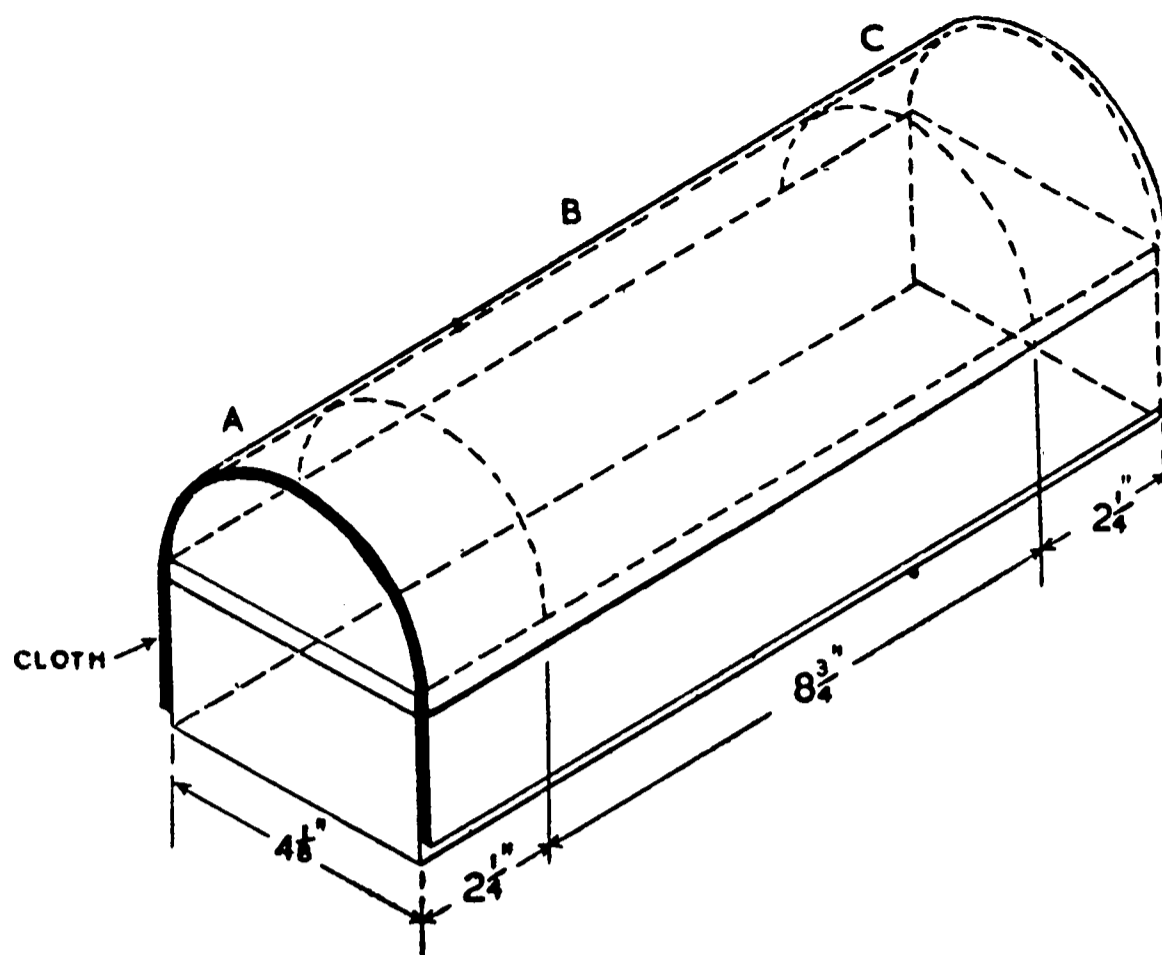


Fig. 2.

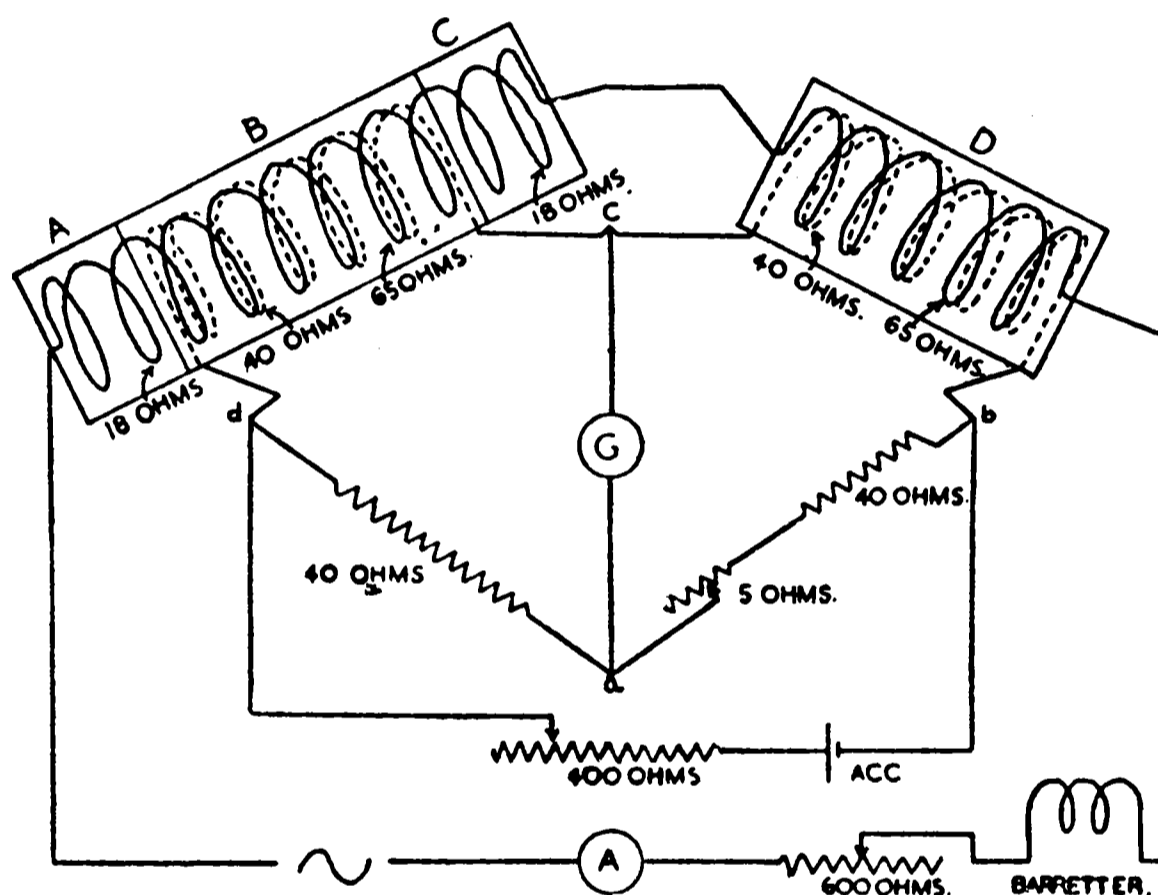


Fig. 3. Apparatus for measuring thermal insulation value of fabric.

Cambridge recording galvanometer which was fitted into a Wheatstone bridge circuit, Fig. 3, one arm of which consisted of a copper coil inside surface B and another arm consisted of a similar coil inside surface D. The arms dc and cb have, therefore large temperature coefficients whilst the arms ba and ad have practically zero temperature coefficients being made of manganin. The purpose of the surface D can now be seen; it is to prevent deflections on the galvanometer due to fluctuations in room temperature or heating current, as variations of either of these values will affect the arms dc and cb to the same extent and with a symmetrical bridge there will be no deflection of the recording galvanometer. The apparatus was run in a room maintained at a constant temperature of  $65^{\circ}$  F. and a R.H. of 65 per cent. The fabric to be tested was hung up in the room for at least 12 hours, to come to regain equilibrium and then hung over the surfaces A, B, C as shown in Fig 2. Before placing the fabric over the surfaces the temperature recorder records the constant temperature of the surface,  $33^{\circ}$  C., but when the fabric is placed over the surfaces A, B, C the temperature rises gradually to a new equilibrium value. A typical temperature—time curve is shown in Fig. 4. The main assets of the apparatus are (1) Easy recording, (2) Elimination of variations due to heating current and room tem-

perature fluctuations, and (3) Avoidance of contact uncertainties between the fabric and the heated surface.

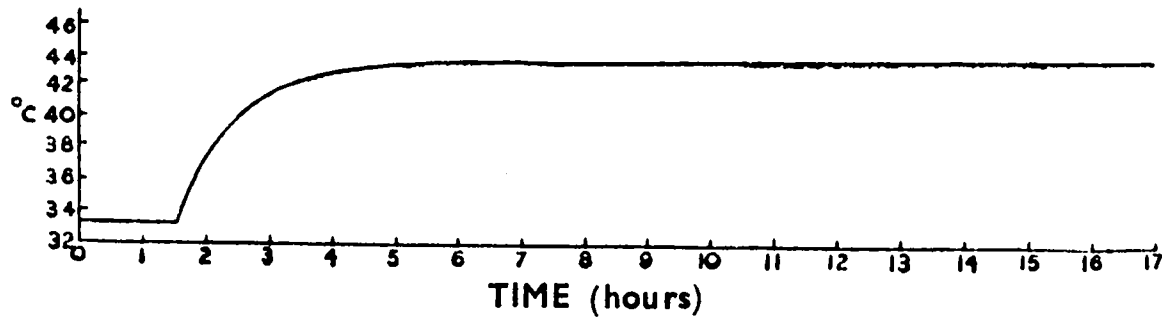


Fig. 4. Typical temperature-time curve.

**(b) Calibration**

The formula giving the thermal insulation value for this apparatus is readily derived.

Let  $T_0$  = the temperature of the room.

$T_3$  = the temperature inside the semi-cylinder B with infinite heat insulation over the curved surface.

$T_1$  = the temperature of the surface covered.

$T_2$  = the temperature of the surface uncovered.

If  $H$  is the heat input into semi-cylinder B and  $H_B$  the heat lost through the base when the temperature of the surface is  $T_1$ , then;

$$H_B = H \frac{T_1 - T_0}{T_3 - T_0}$$

and the heat lost through the covered surface is

$$H_c = H \frac{T_3 - T_1}{T_3 - T_0}$$

This assumes, of course, that the temperature throughout the inside of the surface is equal to that measured near the curved surface. The heat lost through the uncovered surface at  $T_2$  will likewise be

$$H_s = H \frac{T_3 - T_2}{T_3 - T_0}$$

and from Newton's law of cooling, the heat lost through the uncovered surface at  $T_1$  is

$$H_0 = \frac{(T_3 - T_2)(T_1 - T_0)}{(T_3 - T_0)(T_2 - T_0)}$$

The T.I.V. at temperature  $T_1$  is, therefore, from Equation (1) given as

$$\frac{P}{100} = 1 - \frac{(T_3 - T_1)(T_2 - T_0)}{(T_3 - T_2)(T_1 - T_0)} \dots\dots\dots(7)$$

Each fabric will have its T.I.V. measured at a different temperature,  $T_1$ , but as T.I.V. is not sensitive to the temperature at which it is measured on a dry surface, this will not introduce any appreciable error.

Equation (7) shows that the apparatus will be calibrated when  $T_3$  is known as  $T_0$  and  $T_2$  are measured constants for a given apparatus, and  $T_1$  is the measured variable.  $T_3$  is best obtained by noting that equations (5) and (7) have the same form, and that

$$\frac{(T_3 - T_1)(T_2 - T_0)}{(T_3 - T_2)(T_1 - T_0)} = \frac{K/\sigma^1}{d - K/\sigma} \dots\dots\dots(8)$$

If  $T_1$  is plotted against  $d$ , it should be possible to fit equation (8) to the curve and so obtain  $T_3$ ,  $K/\sigma^1$  and  $K/\sigma$ . The apparatus was calibrated by placing layers of greatcoat material over the surfaces A, B, and C, and allowing equilibrium to be established after each successive layer was added. When equilibrium was established the thickness of covering, the recorder deflection, and the temperature of the copper surface, which was determined by having a thermocouple in contact with it, were measured. The relationship between temperature and recorder readings and thickness of covering were determined, and Fig. 5 shows the relation of surface temperature,  $T_1$ , to thickness.

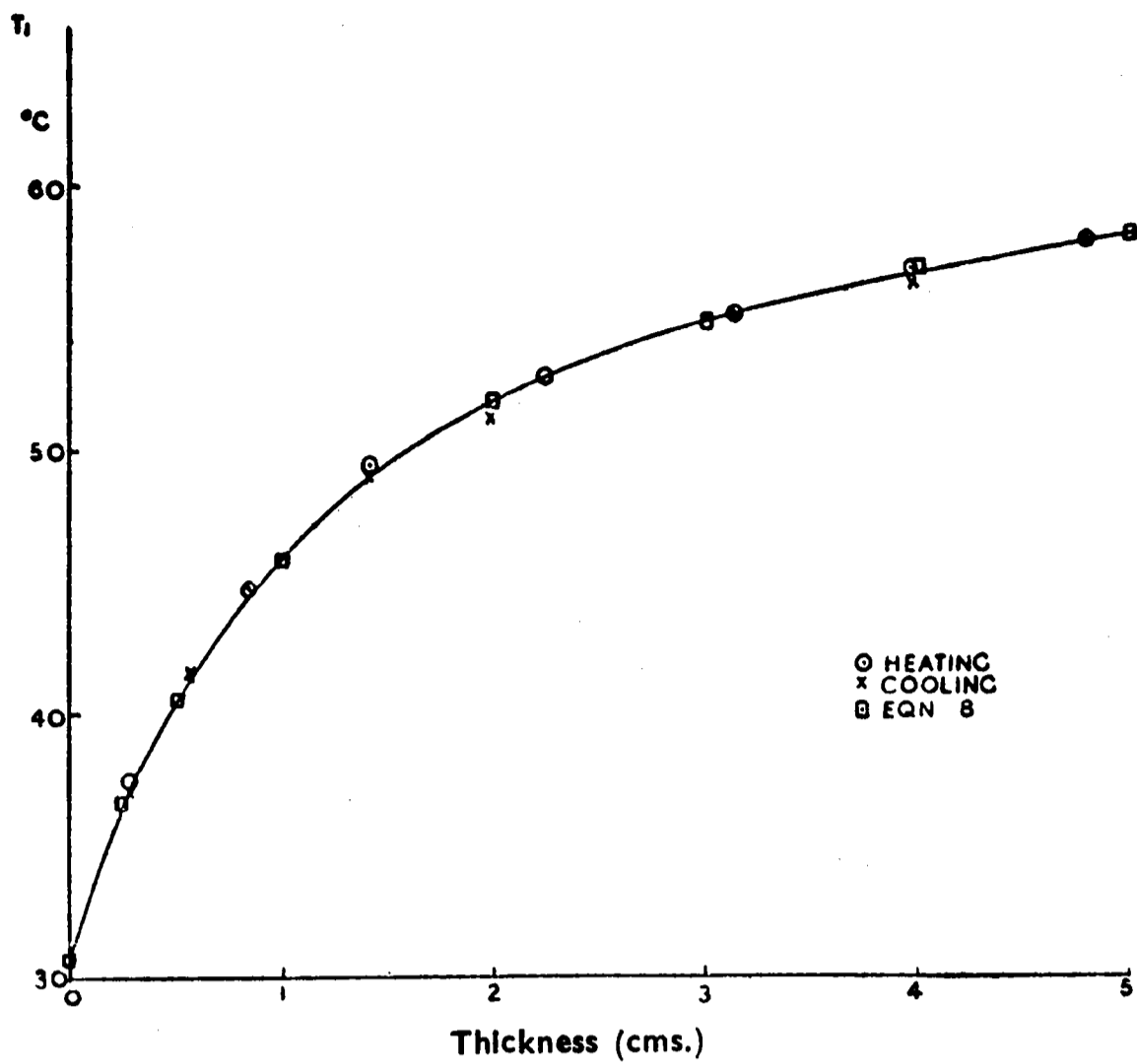


Fig. 5. Thickness of covering  $V$ . temp. of surface  $T_1$ .

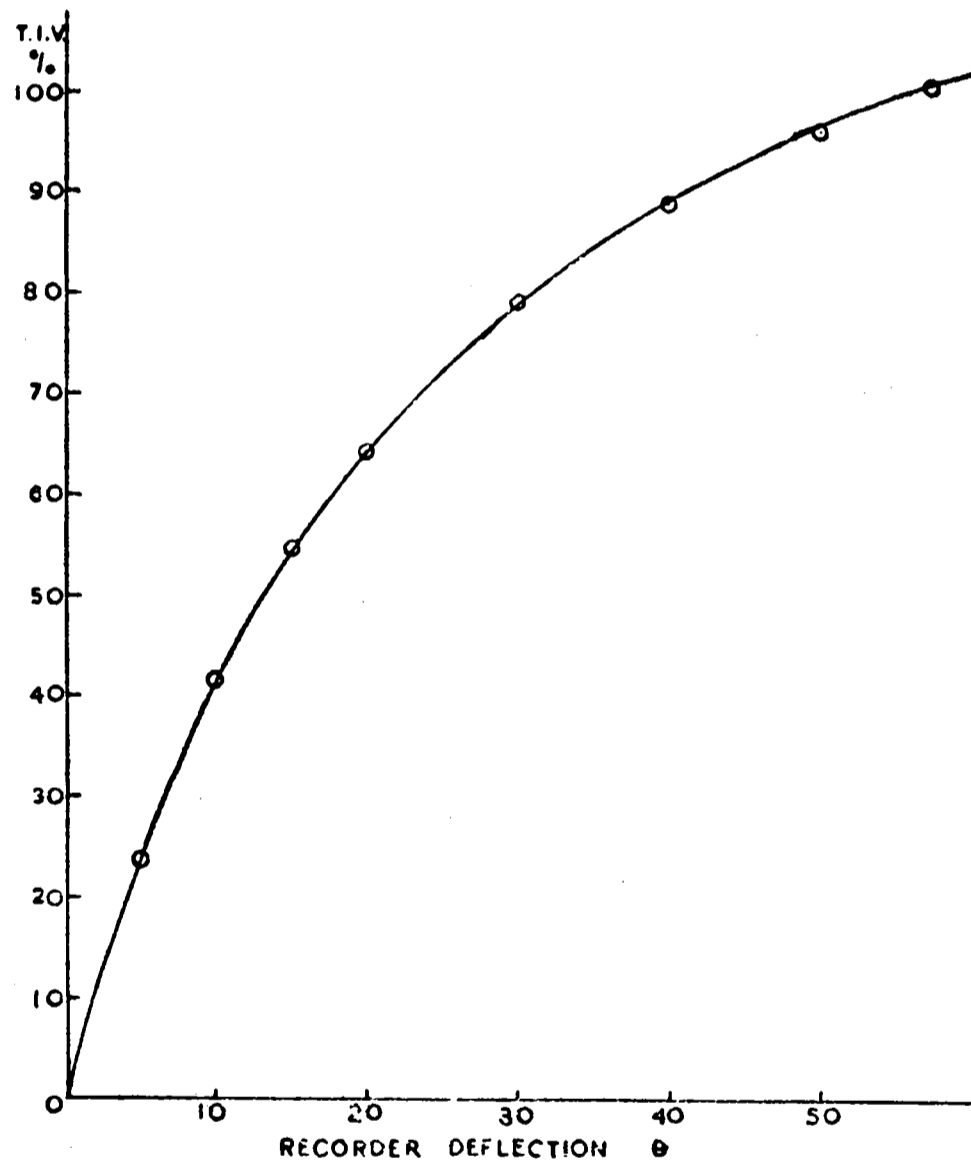


Fig. 6. Calibration curve of apparatus.

Equation (8) was fitted to the curve of  $T_1$  plotted against  $d$  by using the observed values of  $T_1$  for cloth thickness of 0.5, 1.0 and 4 cm. The resulting values of  $T_s$ ,  $K/\sigma^1$  and  $K/\sigma$  are  $66^\circ\text{C}$ ., 0.434, and 0.377 cm. respectively. The theoretical curve of  $T_1$  plotted against  $d$  using these values of the parameters is shown in Fig. 5, and it is seen that it fits the experimental curve to within the limits of experimental error. The theory developed in the present paper and the calibration of the apparatus both assume Newton's law of cooling, and it is satisfactory that good agreement holds between theory and experiment as it implies that Newton's law is adequate in dealing with the surface emissivities of clothing.

A curve giving T.I.V. in terms of  $T_1$  can now be obtained from equation (7) as  $T_0$ ,  $T_2$  and  $T_3$  are known. The values of these parameters in the present experiments were  $19^\circ$ ,  $33^\circ$  and  $66^\circ\text{C}$ . respectively, and their

insertion in equation (7) gives the calibration curve of Fig. 6. The recorder sensitivity was  $0.575^{\circ}\text{C.}$  per division.

**RESULTS**

**(a) Greatcoat Material**

The results obtained with the cloth used to obtain  $T_3$  are in themselves of interest. The T.I.V.-thickness curve for this cloth is shown in Fig. 7. The theoretical values shown on the graph were obtained from equation (5)

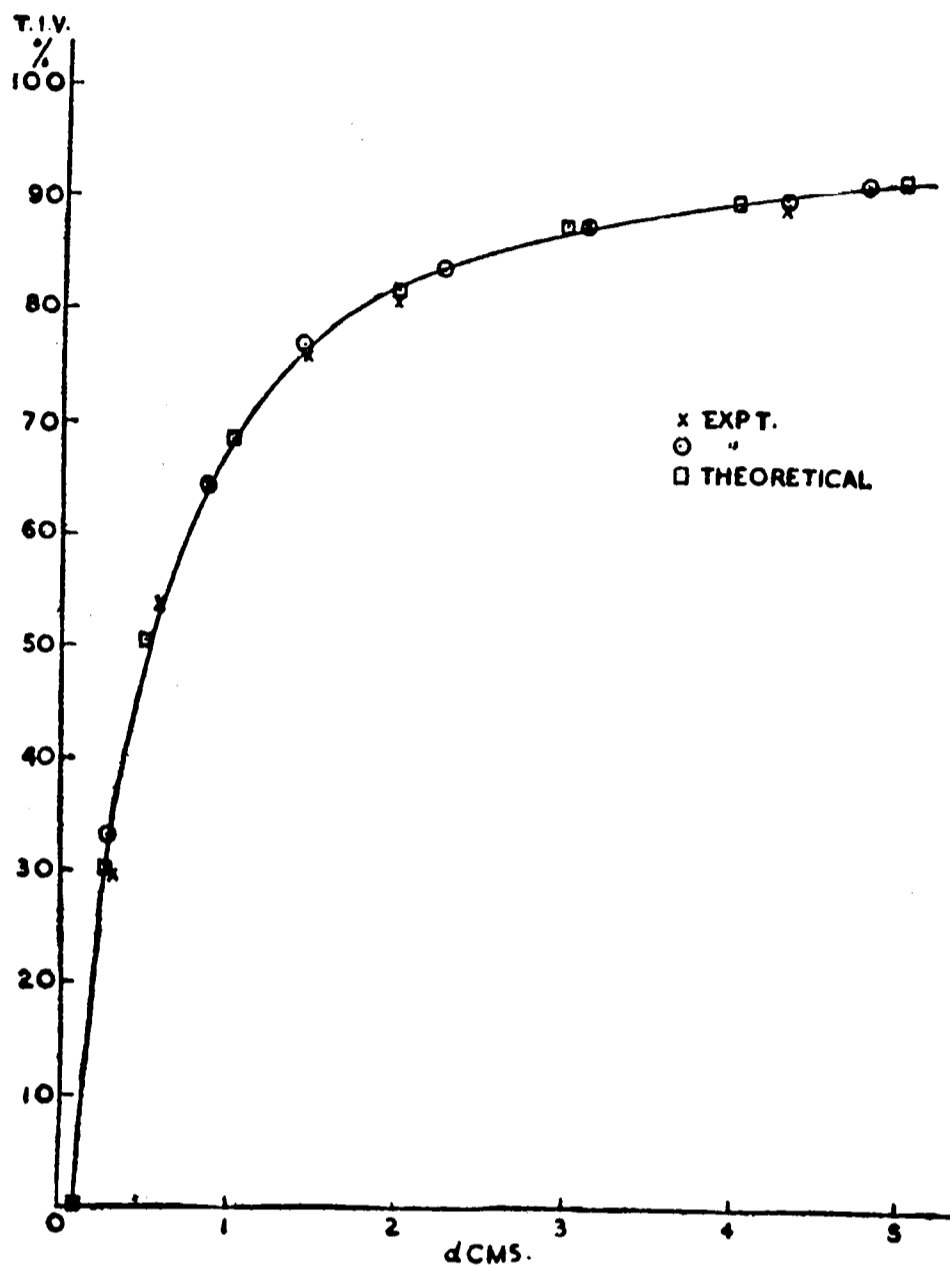


Fig. 7. T.I.T. V. Thickness greatcoat material.

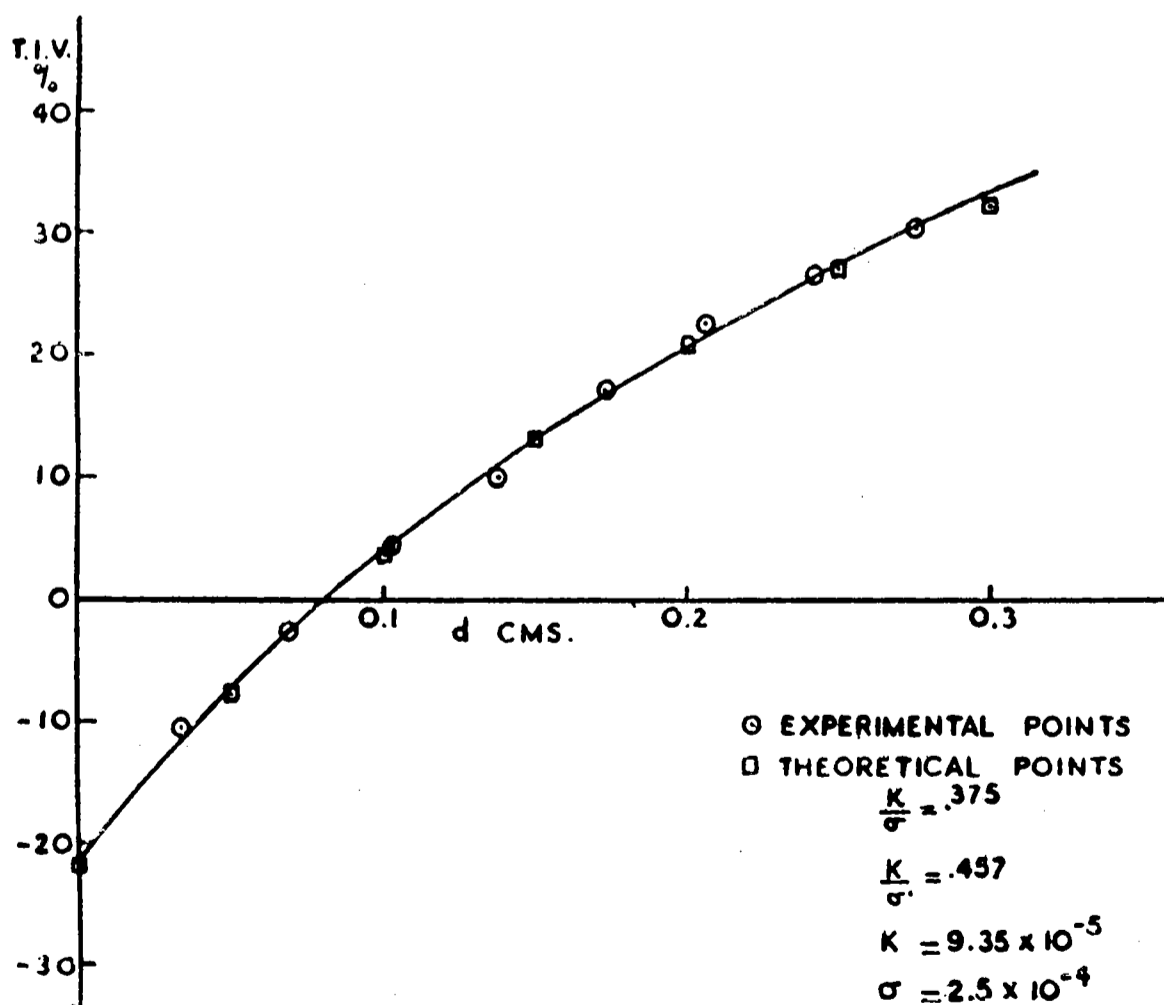


Fig. 8a. T.I.V. V. Thickness for cotton.

using the values of  $K/\sigma^1$  and  $K/\sigma$  obtained by fitting equation (8) to the empirical curve of Fig. 6. They do not represent an independent confirmation of the theory, but the graph is included to show the behaviour of greatcoat material in terms of the conventional T.I.V.

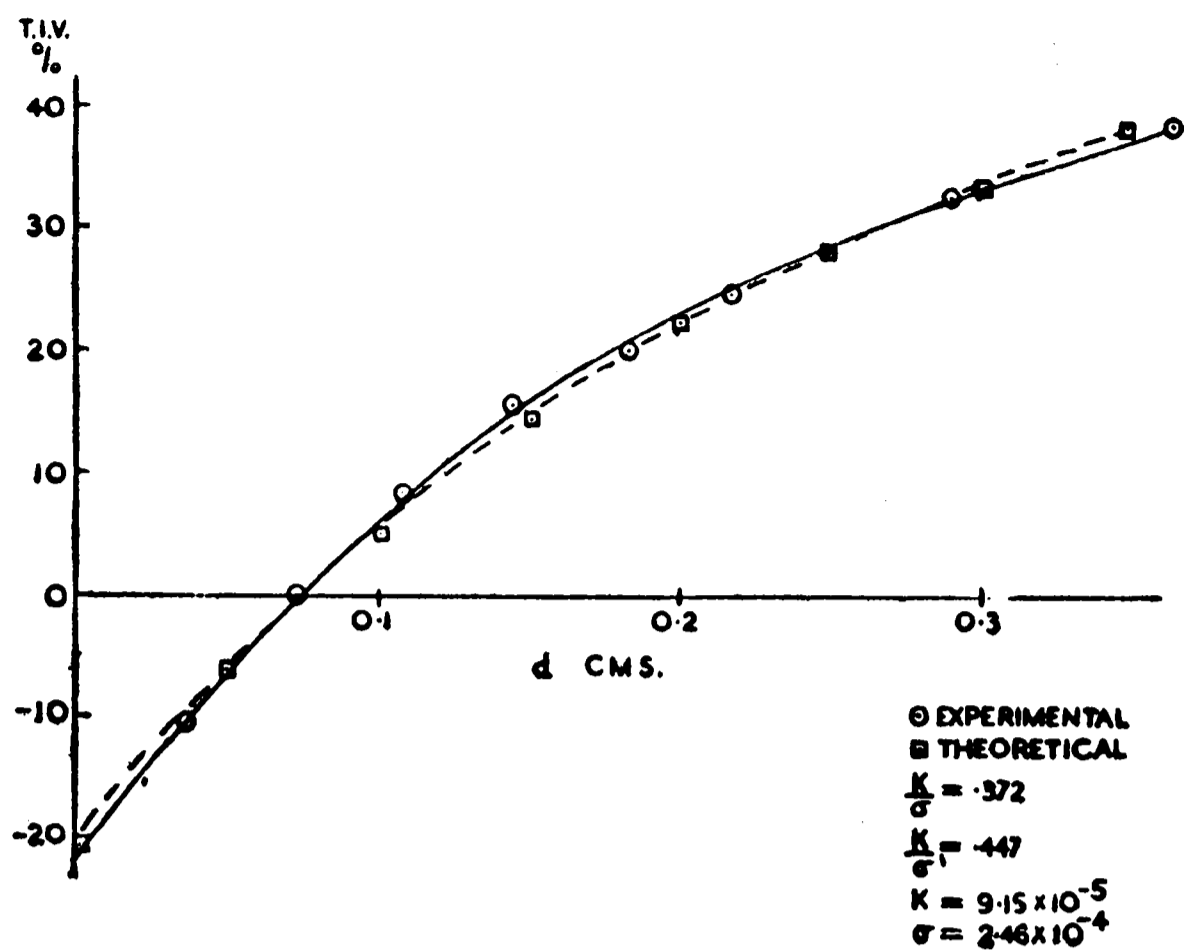


Fig. 8b. T.I.V. V. Thickness for worsted.

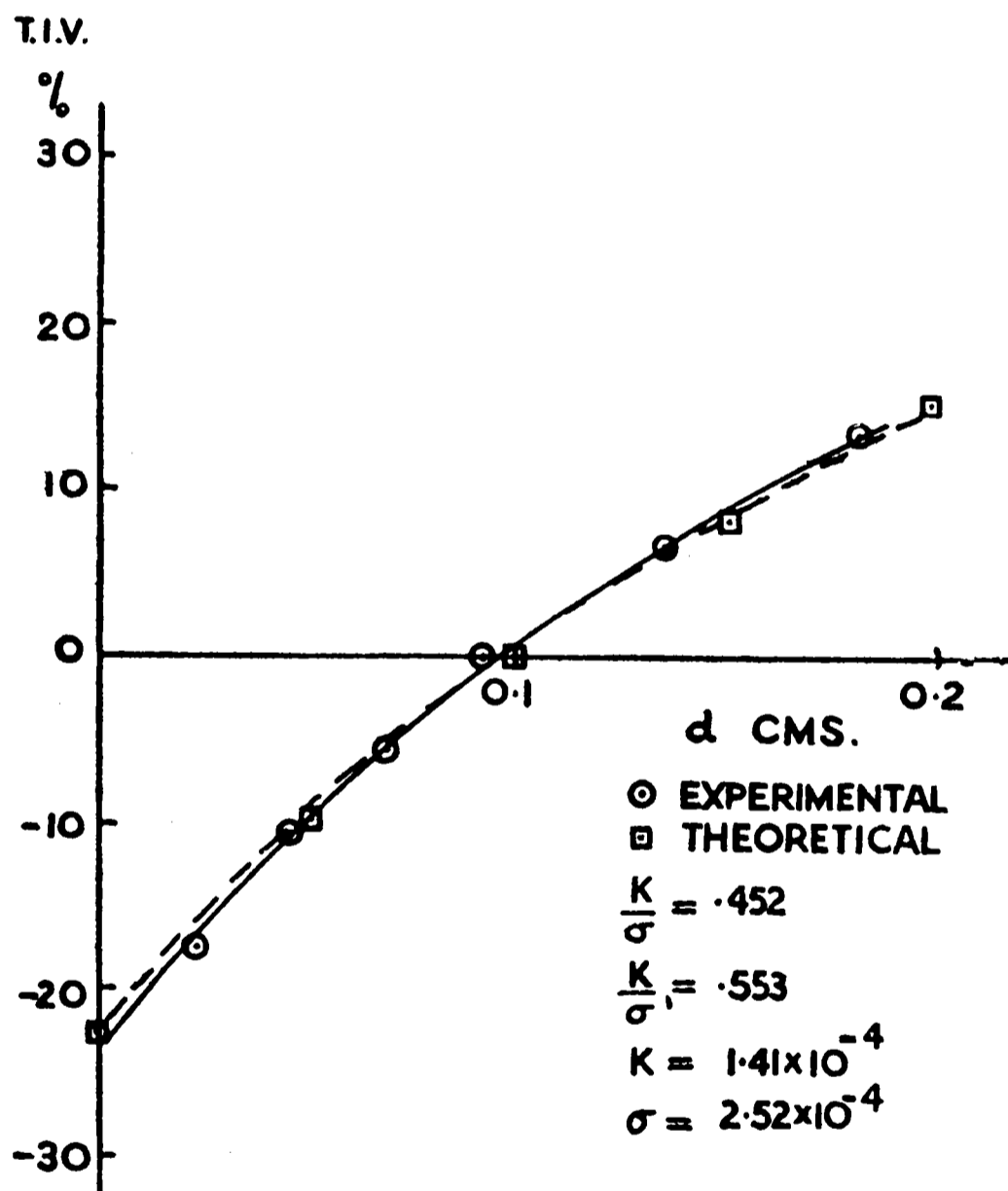


Fig. 8c. T.I.V. V. Thickness for staple fibre.

The values of  $K/\sigma^1$  and  $K/\sigma$  obtained for this cloth are 0.434 and 0.377 cm. respectively; as  $\sigma^1$  was  $2.06 \times 10^{-4}$  cal./cm.<sup>2</sup>/sec./° C.,  $K$  is  $8.9 \times 10^{-5}$  and  $\sigma$  is  $2.38 \times 10^{-4}$  in the same units.

**(b) Thin Fabrics**

The primary object of the investigations was to determine what differences there are between wool, cotton and rayon fabrics of the same structure. Thin fabrics were chosen as these are most readily reproduced in the different fibres. The cotton and worsted were made as closely similar in structure as possible, and a viscose staple fabric similar to the others was selected. Details of the cloths are given in Appendix 2.

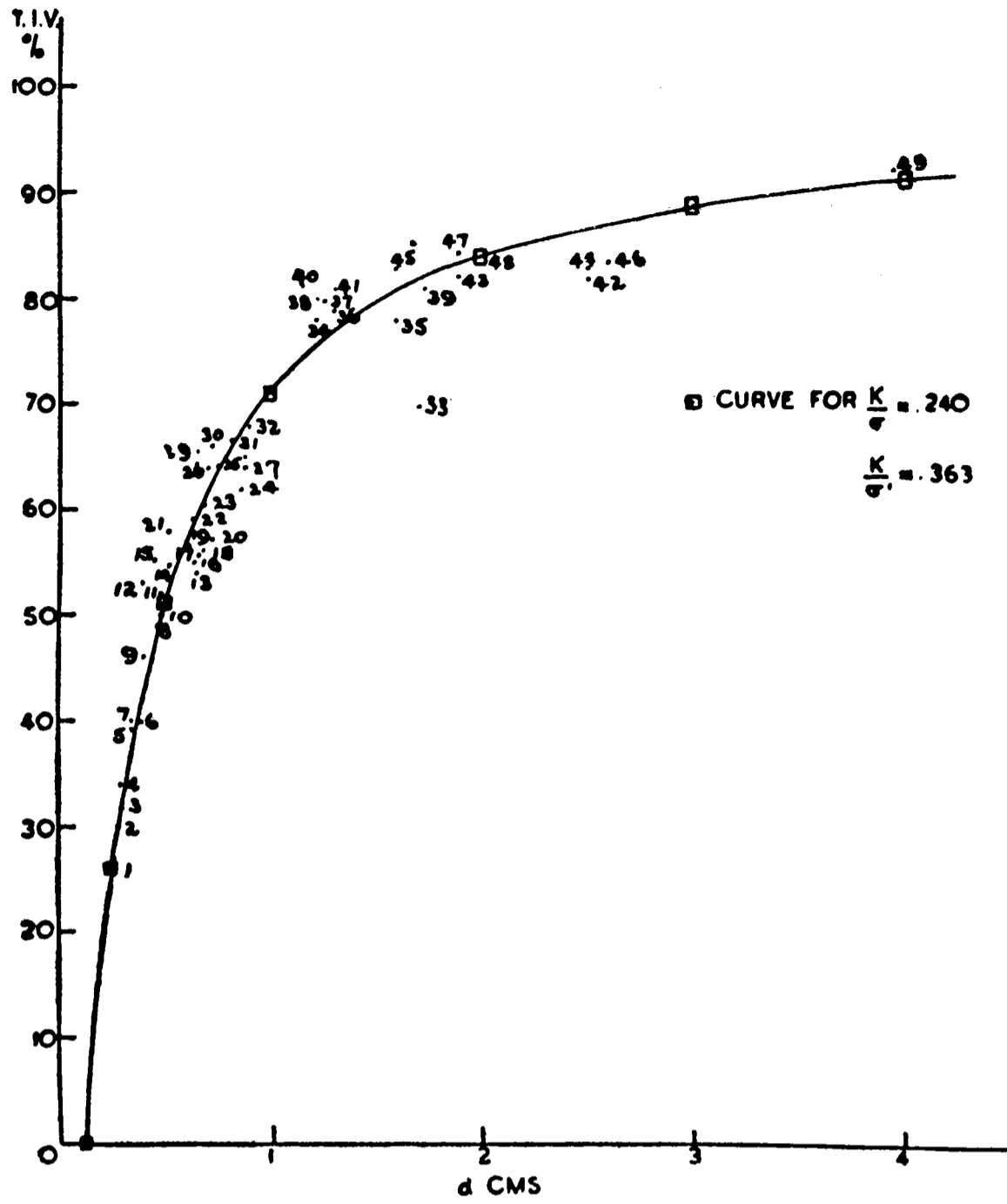


Fig. 9. T.I.V. of miscellaneous materials. (Appendix 2).

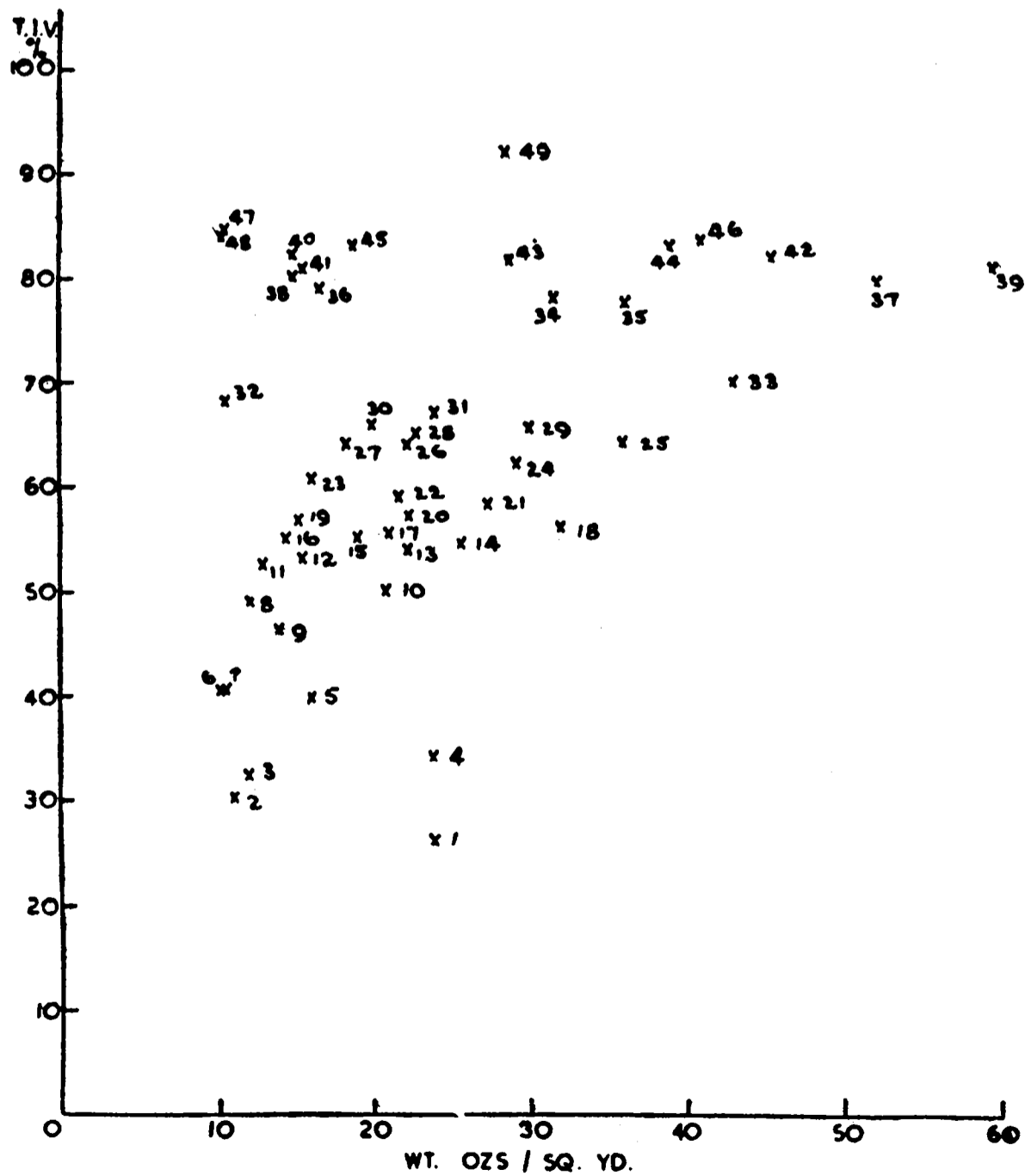


Fig. 10. T.I.V. of miscellaneous materials. (Appendix 2.)

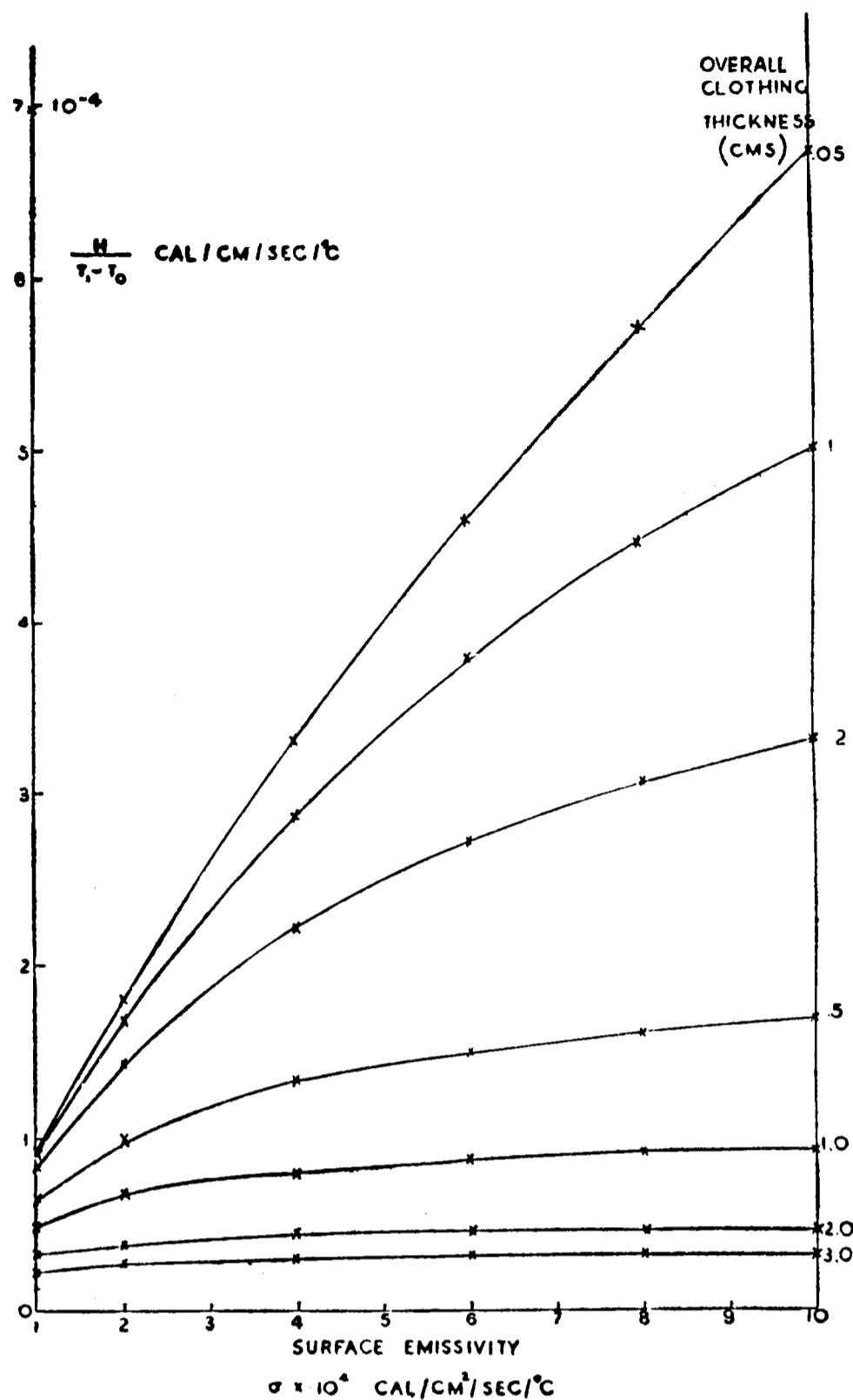


Fig. 11. Variation of heat loss with outer surface emissivity.

T.I.V. plotted against thickness is shown in Figs. 8a, 8b and 8c for the cotton, wool and viscose fabrics, respectively, and Table I gives the values of K and  $\sigma$  obtained by fitting equation (5) to the empirical curves; data for the greatcoat material are also included in Table I.

Table I

Fabric	K cal./cm./sec./°C × 10 <sup>5</sup>	Emissivity cal./cm. <sup>2</sup> /sec./°C × 10 <sup>4</sup>	
		T.I.V.	Drying*
Greatcoat ... ..	8.9	2.38	2.20
Worsted ... ..	9.15	2.46	2.35
Cotton ... ..	9.35	2.50	2.63
Staple fibre ... ..	11.4	2.52	2.65

\* cf. Appendix I.

The values of the thermal conductivities appear reasonable, whilst the emissivities agree surprisingly well with those obtained by the quite independent method described in Appendix 1. The milled greatcoat material has both a lower conductivity and a lower emissivity than the others. The low emissivity of the wool cloths is doubtless due to their surface cover which gives them effectively a greater thickness than the measured one. Their lower conductivities may be due to the breaking up of pores between the yarns by fibres that always appear on the surface of wool yarns.

**(c) Miscellaneous Fabrics and Waddings**

The experimental curve of Fig. 7 shows that for layers of the same cloth the points all lie closely on the curve owing to the fact that  $K/\sigma$  remains constant for each thickness. If, however, the T.I.V., determined for cloths of different structure and thickness, is plotted against thickness, some scatter of the points from the curve must be expected as  $K/\sigma$  will have a different value for the different cloths. In Fig. 9 cloth thickness is plotted against T.I.V. for a series of thick cloths each of a different structure. The curve drawn through the points is the curve of equation (5) taking  $K/\sigma$  as 0.240 cm. and  $K/\sigma^1$  as 0.363 cm. Since  $\sigma^1$  is  $2.06 \times 10^{-4}$  c.g.s., the corresponding value of  $K$  and  $\sigma$  are  $7.5 \times 10^{-5}$  and  $3.13 \times 10^{-4}$ . The cloths represented by points lying above the curve have a high thermal efficiency, whilst those fabrics represented by points lying below the curve have a poorer thermal efficiency judged apart from their different thicknesses. It will be observed that the points lying above the curve correspond in general to materials with the most uniform structure such as quilted waddings and felts; this type of structure is the most efficient for trapping air within the fabric in small pockets so as to cut down heat loss by convection to a minimum. The weight of a fabric has little direct influence on its T.I.V. as is shown in Fig. 10, where cloth weight in oz. per sq. yd. is plotted against T.I.V. A smooth curve would, in fact, only be obtained if all the fabrics tested had the same bulk density. The cloths of Figs. 10 and 11 can be identified by reference to Appendix 2. The effect on the T.I.V. of decreasing the bulk density (i.e. increasing the thickness) for a fabric of given weight may be judged from Table II, where two fabrics of nearly equal weights, but of different thicknesses are compared.

**Table II**

Sample	Wt. in oz. per sq. yd.	Thickness cms.	T.I.V. %	Bulk density gm. per c.c.
Blue Grey Melton ... ..	16.4	.176	24.5	.315
Quilted Wool Felt ... ..	14.7	1.14	81.5	.044

Figs. 9 and 10 and Table II show clearly that for a material of given weight, the maximum T.I.V. is obtained by making the bulk density as small as possible.

Before the minimum bulk density for any material can be determined, the uses to which it is to be put must be considered. The minimum bulk density that can be used will be determined to a large extent by the wearing qualities required of the material and the pressure, if any, that it is required to withstand.

Equation (5) shows that for thin fabric the T.I.V. is largely determined by the ratio of the emissivities of the textile fabrics to that of the covered surface. If the emissivity of the fabric is greater than the emissivity of the surface covered then, provided the fabric is sufficiently thin, the T.I.V. will have a negative value. This effect was discovered as long ago as 1784 by Leslie, who found that a metal canister filled with hot water cooled quicker when covered with a layer of flannel than when uncovered.

**SURFACE EMISSIVITY**

The present investigation has shown the importance of surface emissivity for the heat properties of fabrics of normal thickness. Clothing when made up of several layers of loosely fitting fabrics will have an overall conductivity that depends on the transfer of heat from one fabric to another, and fabrics with low surface emissivities will give clothing of low heat loss.

Surface emissivities contain two heat transfer factors, that due to radiation and a second due to convection. Heat transfer by radiation will

depend on the radiation properties of the fibres composing the fabric and on the colour of the fabric. Transfer by convection will depend on the roughness of the fabric surface. Table III gives the surface emissivities of two wool cloths, one a blue serge and the other a blue blanket. They were determined by the method of Appendix 1. It is seen that the rough surface of the blanket confers a low surface emissivity compared with that of the relatively smooth serge. The difference between the two is even more pronounced as the air speed increases from a value less than 1 m.p.h.

Smooth surfaced fabrics with their relatively large surface emissivities will give good heat transfer from fabric to fabric and presumably from skin to fabric; they will thus give clothing of large heat transfer even though the individual fabrics have the same thermal conductivity and thickness as fabrics with surface cover. Smooth surfaced fabrics are thus likely to be regarded as "cold" fabrics, whilst those with surface cover will be regarded as "warm."

**Table III**  
**Surface Emissivities**

Blue serge		Blue blanket	
Air speed M.P.H.	× 10 <sup>4</sup> c.g.s.	Air Speed M.P.H.	× 10 <sup>4</sup> c.g.s.
0.0	2.65	0.0	1.9
1.3	4.5	1.0	2.15
2.5	6.7	2.6	3.1
3.8	7.5	3.7	3.4

The surface emissivity of fabrics is important when the heat loss through single fabrics is considered, but its importance rapidly diminishes when only the outer surface of a number of layers of fabrics is considered, as for example, the outer surface of thick clothing. The heat loss through any thickness of clothing is given by equation (3), and the graphs of Fig. 11 show how the heat loss through clothing of different thicknesses depends on the emissivity of the outer surface. The conductivity of the clothing has been taken as  $1 \times 10^{-4}$  c.g.s. units, which is a fair average value for clothing fabrics. The heat loss increases appreciably with surface emissivities for clothing less than 1 cm. thick, but the loss through greater overall thicknesses of clothing is not greatly influenced by the emissivity of the outer surface.

It is of considerable interest to consider the radiation contribution to surface emissivity and its influence on loss of heat through clothing. If the surface is assumed to be a black body radiator, the emissivity at 20° C. is, from Stefan's constant,  $1.35 \times 10^{-4}$  cal./cm.<sup>2</sup>/sec./° C., and at 0° C. it is  $1.12 \times 10^{-4}$ . If the outer surface of clothing is metallised to give complete reflection of radiation,  $\sigma$  will not be less than  $1.0 \times 10^{-4}$  at 20° C. assuming its value when radiation is included to be  $2.35 \times 10^{-4}$  (cf. Table I) Equation (3) gives the ratio of the heat loss with, H, and without radiation, H<sub>R</sub>, for fixed values of T<sub>0</sub> and T<sub>1</sub> as

$$\frac{H}{H_R} = \frac{d + (K/\sigma_R)}{d + K/\sigma} \dots\dots\dots(9)$$

where  $\sigma_R$  is the emissivity with no radiation transfer. If the clothing has a conductivity of  $1.0 \times 10^{-4}$  and is 1 cm. thick, the saving in heat loss is 40 per cent. for an air temperature of 20° C. and 27 per cent. for an air temperature of 0° C. These calculations are based on the assumption of still outside air. If the air is moving slowly, say 3 m.p.h.,  $\sigma$  may be taken as roughly  $4 \times 10^{-4}$  c.g.c. units, (cf Table V) and the saving in heat by use of a reflecting surface cannot then be more than 10 per cent. at 20° C. and 7 per cent. at 0° C. The saving in heat loss obtained by using reflecting outer surfaces in cold climates must, according to these calculations, be too small to be of practical value except when the air is completely still.

## SUMMARY AND CONCLUSIONS

The theory of heat transfer through clothing is developed and it shows the importance of surface emissivity of fabrics for clothing insulation.

An apparatus is described which can be used to evaluate both thermal conductivity and surface emissivity of fabrics. It appears from the experimental data that Newton's law of cooling is adequate for the temperature differences that occur in clothing problems.

Data are given for a number of thick and thin fabrics and waddings and it is shown that the most efficient insulation for clothing of a given weight is obtained by using fabrics of the minimum bulk density compatible with required wearing qualities.

A simple method is given in Appendix I for determining the surface emissivity of fabrics, and the effects of wind speed and radiation heat transfer on the emissivity of the outer surface of clothing are discussed.

## ACKNOWLEDGMENTS

The authors' thanks are due to Mr. B. H. Wilsdon for his encouragement in this work, and to the Council of the Wool Industries Research Association for permission to publish the results.

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- <sup>4</sup> Besserer. *Arch. Hyg., Bakt.* **120**, 309, 1938.
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## APPENDIX I

## Direct determination of emissivity

The surface emissivity of a cloth that is wetted to a regain greater than the saturation regain can be obtained from measurements of the rate of drying of the cloth. If  $q$  gm. of water evaporate per second from a surface area  $2A$ , the heat used per second is  $Lq$ , where  $L$  is the latent heat of evaporation of water. When the cloth is drying in an atmosphere of controlled temperature and humidity, its rate of drying is constant, and it acquires the heat required for evaporation by taking up a temperature lower than that of the surrounding air; there is thus a balance between the heat gained from the air and that lost by evaporation, just as occurs for the wet bulb thermometer. The temperature of the cloth is therefore the wet bulb temperature for the controlled atmosphere, and the surface emissivity is given by:

$$\sigma = \frac{Lq}{2A(T_D - T_w)}$$

where  $T_D$  and  $T_w$  are the dry and wet bulb temperatures for the controlled atmosphere.

This method has been used to obtain the surface emissivity data given in the last column of Table I. The wet bulb temperatures were checked by using sleeves of the materials on a sling hygrometer, which was hung stationary alongside the fabric. It is seen that there is very fair agreement between the values obtained by two totally different methods. Close agreement could not be expected because the drying method employs wetted cloth whose radiation properties may differ from those of the dry cloth used for T.I.V. measurements.

**APPENDIX II**  
**Description of Cloths used**

No.	Description	Weight ozs./sq.yd.	Thickness 5 grams/cm. <sup>2</sup>	T.I.V. %
			cms.	
1	White Duffel A ... ..	23·5	·24	26
2	Uncut Double Plush ... ..	11·1	·28	30
3	" ... ..	12·2	·36	32
4	White Duffel B ... ..	23·5	·295	34
5	Wool Blanket ... ..	16·0	·335	39·5
6	Uncut Double Plush ... ..	10·3	·39	40
7	Blanket: 70% Wool; 30% Acetate...	10·5	·354	40
8	Uncut Double Plush ... ..	12·1	·47	49
9	Blanket: 60% Wool; 40% Acetate...	14·1	·40	46
10	Uncut Double Plush ... ..	20·8	·48	50
11	Blanket: 70% Wool; 30% Acetate...	13·0	·49	52
12	Laid Pile Fabric ... ..	15·5	·40	53
13	Synthetic Sheepskin B ... ..	22·3	·66	54
14	No. 5 Backed ... ..	25·7	·52	54·5
15	Uncut Double Plush ... ..	18·7	·45	55
16	" ... ..	14·4	·64	55
17	Synthetic Sheepskin A ... ..	21·1	·675	35·5
18	No. 5 Double ... ..	32·0	·683	56
19	Uncut Double Plush ... ..	15·2	·614	56·5
20	Synthetic Sheepskin C ... ..	22·4	·745	57
21	Duffel ... ..	27·4	·52	58
22	Uncut Double Plush ... ..	21·9	·64	59
23	" ... ..	16·1	·69	60·5
24	" ... ..	29·2	·86	62
25	Laid Pile Fabric ... ..	36·0	·75	64
26	Double Pile ... ..	22·2	·7	64
27	Uncut Double Plush ... ..	18·1	·76	64
28	" ... ..	19·5	·88	65
29	No. 5 Backed ... ..	30·0	·66	65·5
30	Uncut Double Plush ... ..	19·9	·73	66
31	" ... ..	24·0	·84	67
32	Hessian Backing Carded Wool. 1 lap ... ..	10·6	·90	68
33	Blanket Type Fabric ... ..	43	1·7	70
34	Uncut Double Plush ... ..	31·6	1·21	78
35	" ... ..	36·5	1·6	78
36	Hessian Backing Carded Wool. 2 laps ... ..	16·6	1·3	79
37	Uncut Double Plush ... ..	52·2	1·26	80
38	Quilted Kapok ... ..	14·7	1·22	80
39	Uncut Double Plush ... ..	59·4	1·74	81
40	Quilted Wool ... ..	14·7	1·14	81·5
41	Quilted Kapok. Fire Proofed ... ..	15·5	1·30	81
42	Uncut Double Plush ... ..	45·6	2·51	82
43	Hessian Backed Carded Wool. 4 laps ... ..	28·9	1·9	82
44	Double Pile ... ..	39·0	2·5	83
45	Cotton Quilt ... ..	22·0	1·6	83
46	Double Pile ... ..	41·0	2·6	83·5
47	Carded Type. Carbonised Waste ... ..	10·5	1·9	84·5
48	Carded Type. Noil ... ..	10·4	2·0	84·0
49	Hessian Backed 2 layers Ribbed Felt... ..	28·4	3·95	92·0
50	Cotton (Fig. 8a)... ..	4·3	·035	—
	Worsted (Fig. 8b) ... ..	4·3	·037	—
	Viscose (Fig. 8c) ... ..	3·1	·023	—

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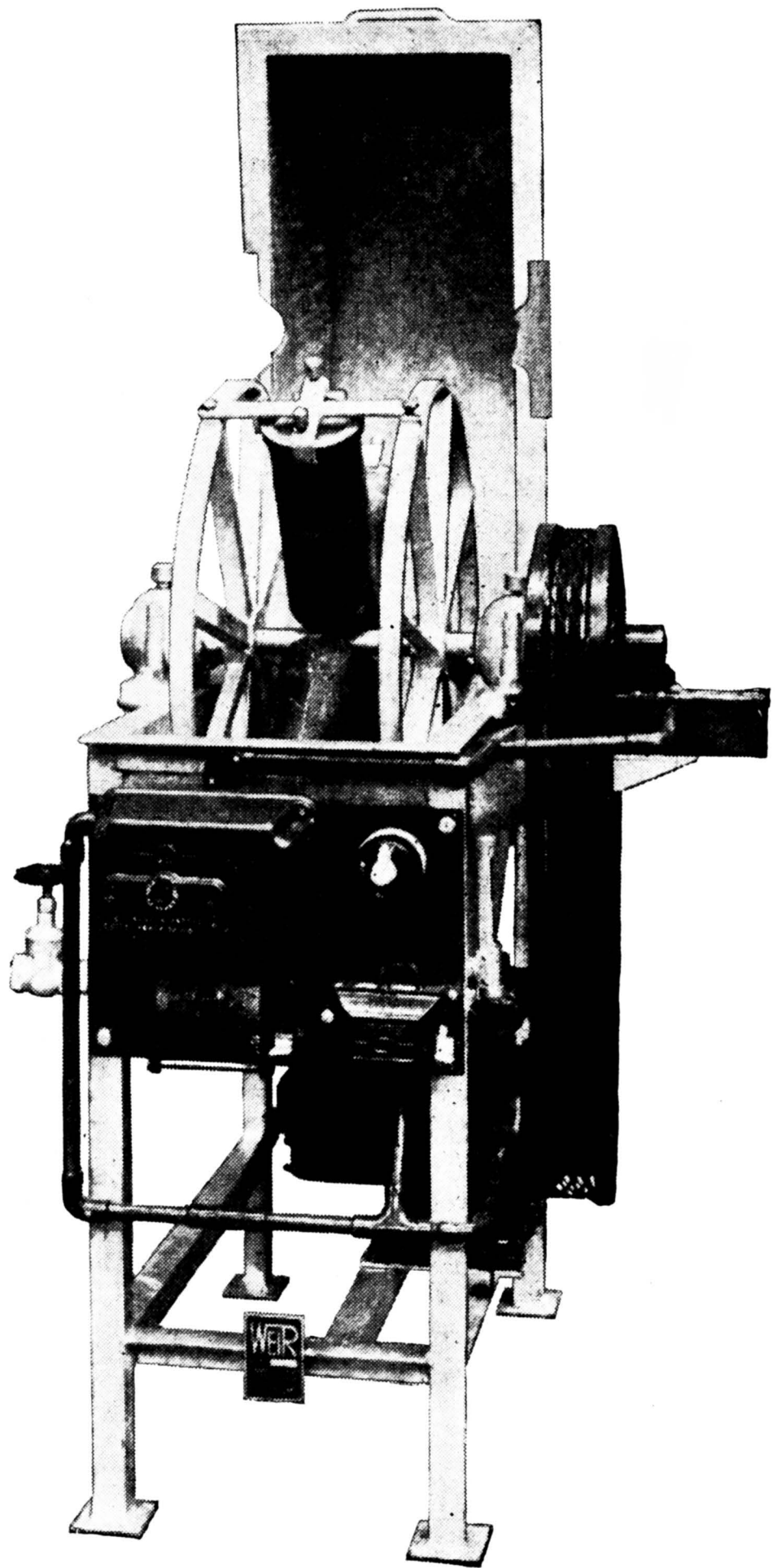
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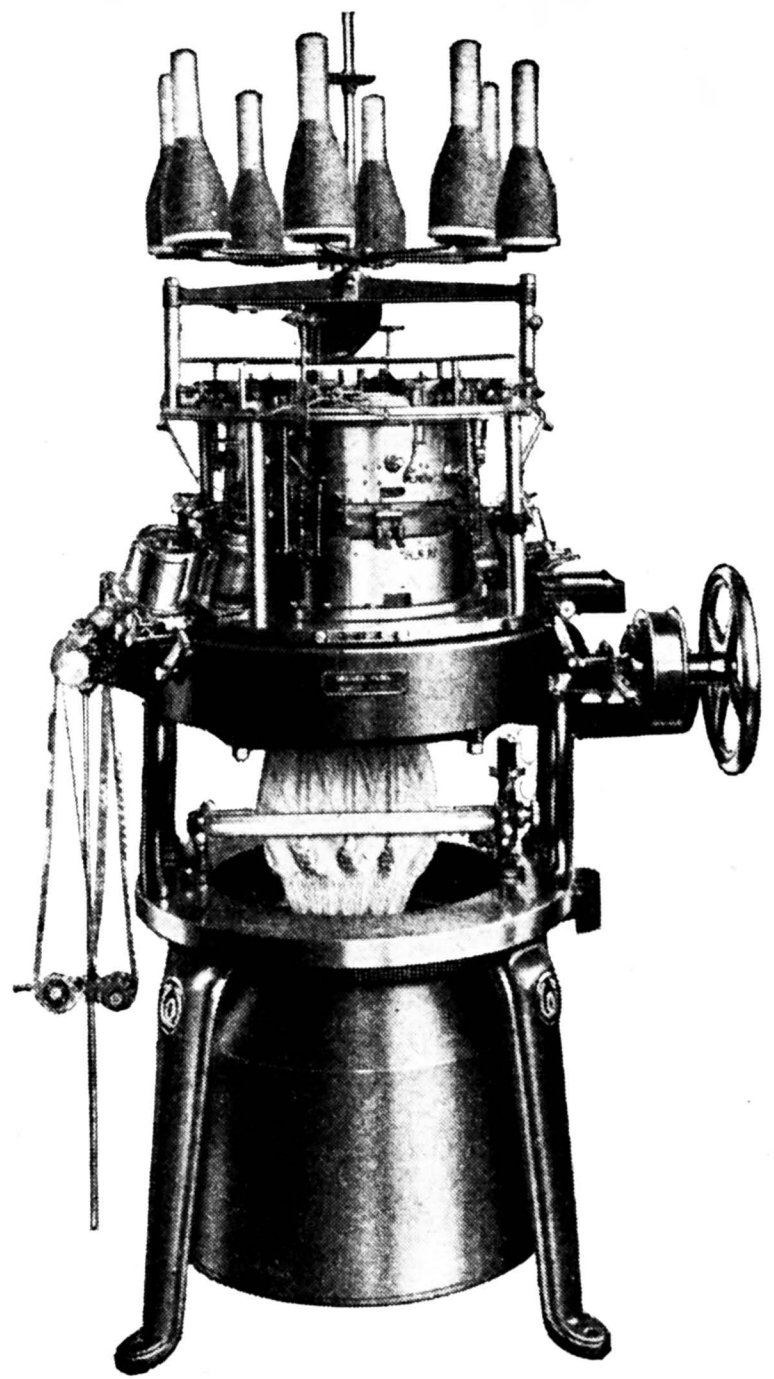
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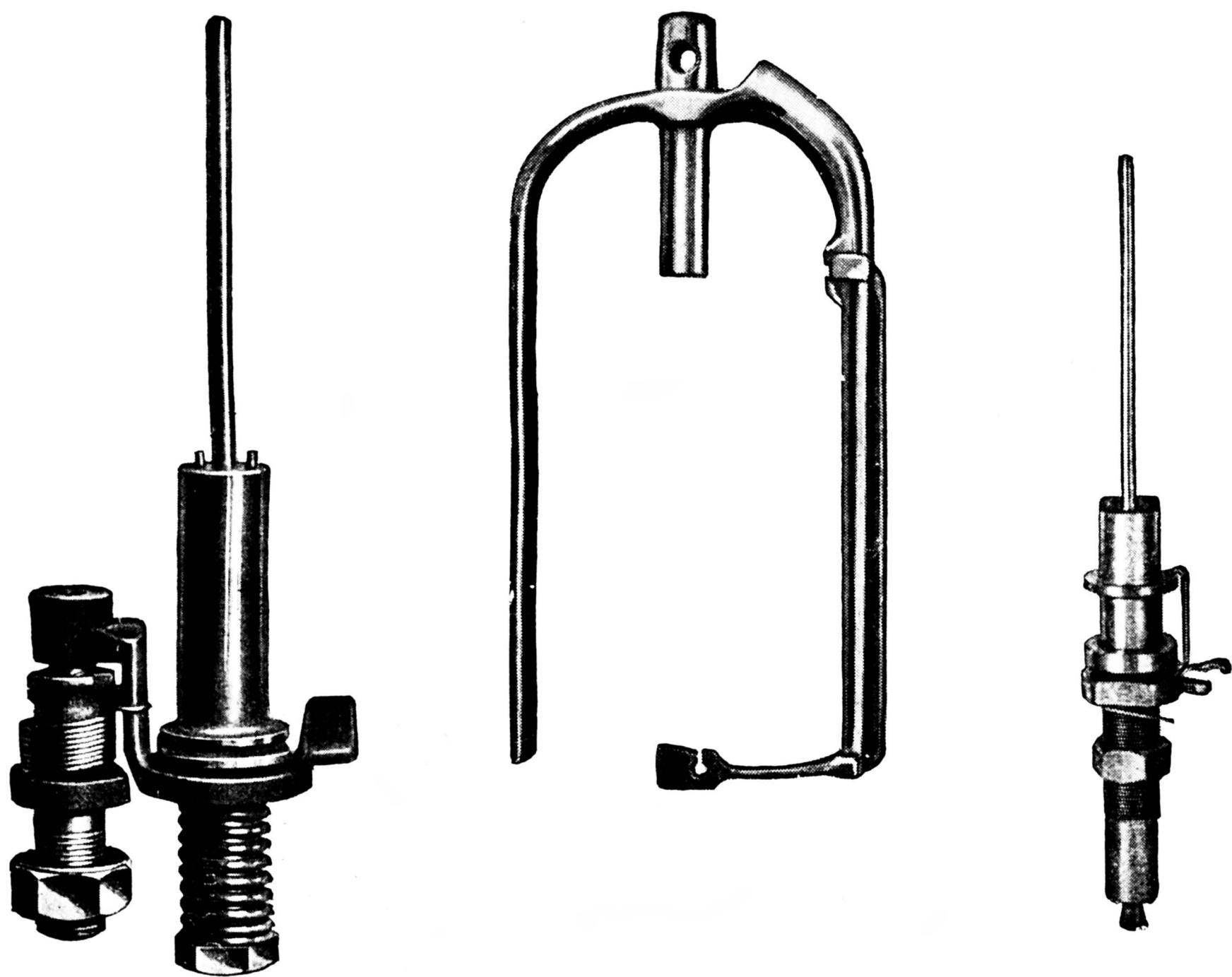
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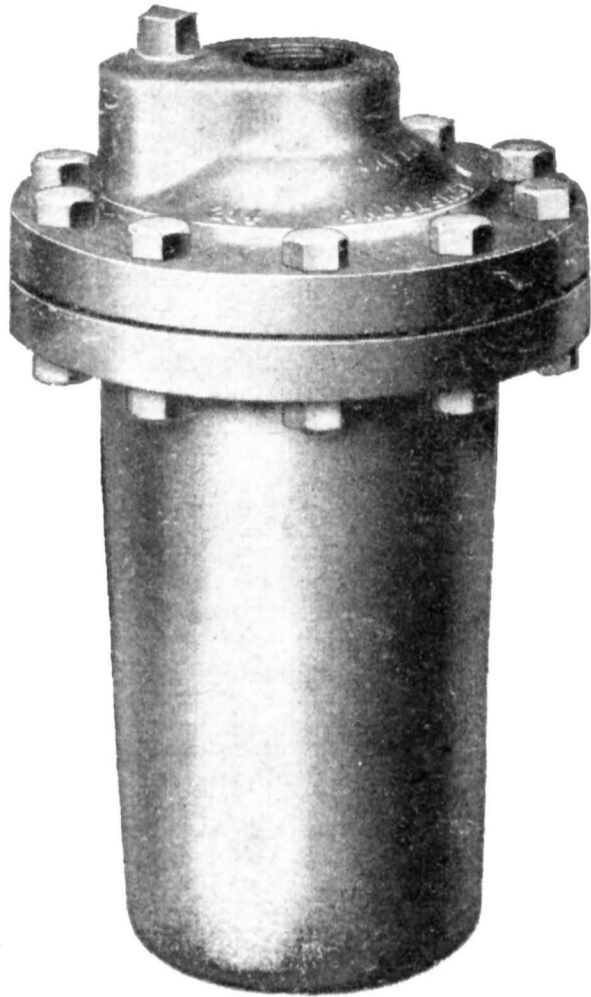
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## ABSTRACTS

### 1—FIBRES AND THEIR PRODUCTION

#### (A)—MINERAL

**Cotton: Cultivation in Madras.** *Indian Farming*, 1943, 3, 645. Cottons commercially known as "Westerns" and "Northerns," capable of spinning 24's and 32's, are grown on the black soils of the Anantapur, Bellary and Kurnool districts of the Madras Province. *Mungari*, a coarse short-staple variety, similar to Bengals, which is not capable of spinning more than 8's to 10's, is grown on the red and light black soils. The yield level and ginning percentage of *Mungari* are much higher than those of the Westerns and Northerns. The coexistence of these widely different varieties in the same tract favours undesirable mixing and hampers the spread of improved strains like H<sub>1</sub> and N<sub>14</sub> evolved in the Westerns and Northerns cottons, respectively. These two strains are unsuitable for growing on red soils. Co<sub>4</sub> is more suited to light black soils, whilst V<sub>434</sub> is more consistent in behaviour, especially on red soils. Attempts are being made to evolve strains of cotton suitable for red soils and combining the quality of the Westerns with the yield of *Mungari*. Plans have also been made for the testing of *arboreum* and *herbaceum* cottons with the object of isolating a type resistant to the small leaf disease, for the breeding of early thrip-resistant strains of American cottons, and for investigations of the use of cucumbers as a trap crop for the red hairy caterpillar. C.

**Sea Island Cotton: Production in Puerto Rico.** *Rayon Textile Monthly*, 1943, 24, 121. Attempts are being made to increase the production of "Sea Island, Special" cotton in Puerto Rico. This year's crop is expected to yield between 1,500 and 1,900 bales; the staple length is 1 $\frac{7}{8}$ -2 inches. C.

**Cotton Crops: Production and Staple Length.** *Cotton (M/cr.)*, 1943, 49, No. 2360, 6. A table is given showing cotton production and the staple length distribution of the crops in the United States, India, Russia, China, Egypt, Brazil, Peru, Mexico, Argentina, Sudan, Uganda, Chosen, Turkey, Belgian Congo and Iran, which together produce about 98 per cent. of the world's cotton. It is pointed out that even though 57 countries produce cotton commercially, the United States, India, Russia, China, Egypt and Brazil, together produce over 90 per cent. of the world's cotton. C.

**Perlock Rayon Tow Converting System.** J. L. Lohrke. *Rayon Textile Monthly*, 1943, 24, 129-130. In the Perlock system of converting continuous filaments in the form of tow to staple fibre while maintaining the substantial parallelism and the continuity of the sliver, the tow is passed through a drafting system having "breaker bars" between the front and back rollers, the breaker bars being rollers provided with a number of sharp edges. Machines now being used are each equipped with two complete sets of rollers and breaker bars and generally operate on a tow of 165,000 total denier. The machines produce slightly more than 30 lb. per hour and one girl operates two machines. Most of the processed tow is taken from the stapling machine to a gill box where a number of ends are fed together to form a thick sliver wound into a top ball for blends with wool. For purposes where the rayon is not to be used in a blend, the stapled rayon sliver may by-pass many of the usual drawing operations and proceed with few and possibly no doublings direct to the spinning frame. ("Perlock" is derived from the names of the patentees, Perry and Lohrke, U.S.P. 1,883,384.) C.

#### (B)—ANIMAL.

**Multivoltine Seed Cocoons: Refrigeration.** M. Rangaswami. *Indian Farming*, 1942, 3, 643-644. A brief report is given of investigations of the optimum

period for which indigenous multivoltine seed cocoons can be refrigerated and the anatomical stage of pupa at which the cocoons can be put in cold storage to delay the emergence of moths. The maximum periods for which cocoons of different ages can be stored are indicated, and hints are given on practical applications on a field scale. C.

**Improving Rambouillet Sheep for Western Ranges.** J. E. Nordby. *Natl. Wool Grower*, March, 1943, 33, No. 3, 12-17. Sectional type differences in fine-wool range sheep of Rambouillet origin are discussed. Fundamental attributes of the Rambouillet are a relatively long life and the ability to adapt itself to a wide range of environmental conditions. These characteristics are shown in the results obtained by the U.S. Bureau of Animal Industry in breeding Rambouillet sheep to improve size and body thickness and to obtain long staple wool of good quality (the term "quality" being used to express excellency of product). Wool blindness is an economic disadvantage, and wrinkles have little if any value. W.

**Pigmented Wool: Inheritance.** R. B. Kelley. *Australia: J. Council Sci. Ind. Res.*, 1943, 16, 10. Results obtained from further matings on white-woolled and pigmented sheep (see also this *J.*, 1942, A350) suggest that the white-woolled condition is due to the action of a dominant gene which inhibits pigmentation. W.

(C)—VEGETABLE

**Cotton: Production in Anglo-Egyptian Sudan.** *Cotton (M/cr.)*, 1943, 49, No. 2357, 6. Details are given of cotton production in the Anglo-Egyptian Sudan in 1941-42 and an estimate for 1942-43. Total production in 1941-42 amounted to 1,130,057 kantars (1 kantar=312 lb. seed cotton), of which 1,013,317 kantars were Sakel type and the remainder American type cotton. Output of lint amounted to 295,107 bales. The estimate for 1942-43 is 1,065,108 kantars, including 1,037,062 kantars of Sakel type. C.

**Sea Island Cotton: Production in the West Indies.** West Indian Sea Island Cotton Association. *Rept. 7th Ord. Gen. Meeting*, 1942, 8 pp. Details are given of the acreage, production, yield and price statistics for the Sea Island cotton seasons 1941-42, 1940-41 and 1939-40 in the various islands of the West Indies, and averages for various periods between 1921 and 1941. Total lint production in 1939-40, 1940-41 and 1941-42 amounted to 3,123,000, 3,372,000 and 2,600,000 lb., respectively. C.

**Cotton Root-rot Disease: Occurrence in the Punjab.** R. S. Vasudeva. *Indian Farming*, 1942, 3, 536-538. The symptoms and cause of cotton root-rot disease and its incidence in the Punjab are discussed. This disease causes heavy damage in the Punjab every year and affects both American and indigenous (*desi*) cottons. Cotton in the Punjab is normally sown in May and the disease first appears in June. The disease is markedly reduced in cotton sown in the first week of April and also in cotton sown about the end of June. The yields for late-sown crops can be further improved by close planting. Yields of American cotton when sown early in April may be adversely affected in certain seasons due to bad opening of the bolls, though root-rot mortality is greatly reduced. C.

**Punjab-American Cottons: Prevention of Tirak Disease.** R. H. Dastur and M. Singh. *Indian J. Agric. Sci.*, 1942, 12, 679-696. *Tirak* or bad opening of bolls in Punjab-American cottons on soils with saline subsoils is mainly caused by a disturbance in the water balance of the plant. Salinity in the subsoil renders the absorption of water difficult. Three types of ameliorative measures were tried for counteracting the toxic effect of salinity: (1) applications of gypsum, silt, farmyard manure and green manures, (2) washing down of the salts from the feeding zones of the roots by flooding, and (3) efforts for preventing the development of a water deficit by means of cutting down the vegetative growth (e.g. by late sowings) or by giving extra applications of water at the fruiting stage. The two measures of the third group proved successful in preventing *tirak* whilst the measures of the first two types failed to produce any effect. The opening of bolls (weight of seed cotton per boll) and the yields were significantly better in June-sown than in May-sown crops. Heavy watering from the fruiting stage lessened *tirak* appreciably and increased the yields in comparison to normal waterings. Heavy watering had no effect on the opening or yield of the June-sown crop. Late sowing was superior to heavy watering

in effect on *tirak*. June sowings produce fewer bolls per plant than May sowings on account of a reduction in the vegetative growth in the former. This disadvantage can be counteracted by increasing the number of plants per acre by adopting closer spacing of plants. Experiments with 15 American varieties and three *desi* varieties showed that the varieties differed in their adaptability to late sowing. The strains resistant to jassids were in general better suited to June sowing, whilst those susceptible to jassids had a well marked optimum towards intermediate sowings (end of May to second week of June). C.

**Cotton Gins: Maintenance.** C. A. Bennett and F. L. Gerdes. *U.S. Dept. Agric. Leaflet* 216, 1942, 8 pp. The repairing and modernising of cotton ginning machinery is discussed under the headings:—Checking pneumatic cotton-handling equipment, inspecting drying, cleaning and feeding equipment, putting gin stands in shape, modernising gin breasts, necessary attention to gin saws, testing lint-doffing systems, ginning bearings, belts and pulleys, providing pure-seed handling equipment, inspecting lint-handling systems, checking kicker, tramper and press, maintaining gin building, and taking care of the gin during the idle season. C.

**Cotton Ginnery: Control for Pure Seed Preservation.** C. A. Bennett and F. L. Gerdes. *U.S. Dept. Agric. Leaflet* 217, 1942, 8 pp. The importance of preventing mixing of seed cotton or mixing of ginned seed is pointed out and indications are given of places where mixing or contamination of seed is likely to occur. Practical methods of handling seed to keep it pure, such as (a) self-cleaning belts, (b) self-cleaning blowpipe systems, (c) gravity chutes in two-storey gins, and combinations of (a) and (b) are discussed. C.

**Cottonseed: Storage; Effects of Artificially Drying Seed Cotton.** R. A. Rusca and F. L. Gerdes. *U.S. Dept. Agric. Circ.* 651, 1942, 18 pp. Studies designed to duplicate the conditions of oil-mill and cotton-gin seed storages have shown that with green, damp or wet seed cottons, the process of artificially drying before ginning does not cause an increase in the rate of deterioration of the seed in storage but, in fact, retards the formation of free fatty acids. The higher the drying temperature used, the less was the free fatty acid content of the seed at the end of the 90-day storage period. Artificial drying of seed cotton at the gin caused temperature rises in the ginned seed, but in a few days natural cooling eliminated most of the differences. Drying wet cottons at the time of ginning with an air temperature of 220° F. caused a maximum moisture removal from the seed of 0.7 per cent. At the end of 90 days' storage the differences in moisture content between the undried and dried lots were reduced somewhat. Germination tests on the undried and dried seed indicated that drying improved the germination percentage of the seed, whether at the time of ginning or after 90 days' storage. Cottonseed which developed high free fatty acid content seemed to have a tendency toward low germination. The data indicate that a free fatty acid content of 2 per cent. becomes critical as far as cottonseed germination is concerned. The effects of conveying the seed from the gin stands to storage on a flat belt and by means of unheated and heated air were studied. The different methods produced only slight differences in seed temperature and moisture content and did not materially affect the free fatty acid content and germination. C.

**American Cotton: Carry-over, Production and Supply.** *Cotton (M/cr.)*, 1943, 49, No. 2357, 6. Statistics are given showing the carry-over, production and supply of Upland cotton for the seasons 1941-42 and 1942-43, classified according to grade and staple. The totals for 1941-42 and 1942-43, respectively, are carry-over 12,011,000 and 10,476,000, production 10,433,000 and 12,490,000, and supply 22,444,000 and 22,966,000 bales. C.

**American Cotton Stocks, 1942-43.** A. B. Cox. *Textile Weekly*, 1943, 31, 656 and 658. A cotton balance sheet for the United States for the seasons 1933-34 to 1942-43 is presented and the supply situation is discussed. It is pointed out that there will probably be a carry-over of about 9,700,000 bales in the United States on July 31, 1943. As the new crop will not be available for use in quantity for nearly two months after August 1, there is need, at the rate of present consumption in the United States and export, for a carry-over of 5 to 6 million bales of cotton of the qualities being consumed and exported. The available supply is analysed according to staple length and grade; there seems to be an ample supply of all qualities except  $\frac{15}{16}$  inch and  $\frac{31}{32}$  inch and a possible surplus of cotton

$\frac{7}{8}$  inch and under, and possibly some of the staples  $1\frac{1}{8}$  inch and over. The surplus grades are apparently low middling and below, and strict middling and above. The excess supply of cotton in the United States on July 31 will not exceed 4,000,000 bales, the bulk of which is low grade short staple cotton in the hands of the Government. After the last war there was a tremendous demand for low-grade cotton in Europe, and a similar accumulation of low-grade American cotton was readily disposed of. It is suggested that more concern should be shown over present shortages in important qualities of lint cotton and cottonseed products than over the surplus of low-grade cotton. C.

**Raw Cotton: Supply and Market Conditions.** J. A. Todd. *Textile Manufacturer*, 1943, 69, 155 and 157. The limited amount of cotton now reaching this country is coming mainly from the United States and Africa. Cotton purchased in other countries is still awaiting shipment. Quiet conditions have prevailed in the Manchester yarn and cloth markets during March. Narrow and indecisive price fluctuations have been a feature of the United States cotton markets. February consumption of all kinds of cotton by the U.S. mills at only 878,000 bales compared unfavourably with the 892,000 bales in February, 1942. This year farmers will be permitted to plant up to about 29,300,000 acres as against 24,005,000 acres actually planted last year but it appears doubtful if the area sown to cotton will be much above last season's figure. On the basis of the final ginning returns for the 1942 crop, the net "free" supply of American cotton in the U.S.A. this season would be around 15,800,000 bales, assuming that the 2,600,000 bales already delivered into the 1942 loan remain in the Government loan and no Government-owned cotton is released. Cotton prices in Bombay have continued to advance. Demand for better-stapled Indian cotton has continued in excess of supply, whilst supplies of short staples have remained in excess of mill needs. The 1942 Indian crop is estimated at 5,250,000 running bales, which, added to the carry-over of 2,900,000 bales gives a total supply of 8,150,000 bales. All-India mill consumption is estimated at 4,200,000 bales and exports at 400,000 bales, as against 4,000,000 bales and 900,000 bales, respectively, last season. The Egyptian Government is reported to be making arrangements for the purchase of the whole of the 1943 Egyptian cotton crop. The 1943 Argentine cotton crop is expected to be much inferior in both quantity and quality to that of 1942. Prospects for the South Brazil crop are reported to be mixed. São Paulo trade observers are predicting a harvest of around 1,700,000 running bales. The Peruvian crop is expected to reach 280,000 bales. C.

**(D)—ARTIFICIAL**

**Nylon: Production, Properties and Structure.** E. V. Garner. *Silk J. Rayon World*, 1943, 19, No. 226, 18-20. Of the polyamides included under the generic term, nylon, the two known as 66 nylon and 610 nylon have been developed commercially. In the system of nomenclature employed the first number is the number of carbon atoms of the diamine and the second the number of carbon atoms in the dibasic acid from which the polyamide is employed. Thus 66 nylon is the reaction product of hexamethylene diamine and adipic acid whilst 610 nylon is the reaction product of hexamethylene diamine and sebacic acid. Thick monofilaments are made from 610 nylon. Textile fibres obtained by extrusion of molten 66 nylon are characterised by high tensile strength, excellent elastic recovery, resistance to moisture, chemical stability and lustre. The relation of these properties to the chemical and physical structure is discussed with special reference to the use of X-ray methods for the study of crystal structure, size and orientation, and degree of crystallinity. C.

**Rayon Spinning Bath: Control of Acidity.** A. G. Arend. *Silk & Rayon*, 1943, 17, 176-178. A brief review is given of the automatic control of acidity in modern rayon production, with particular reference to portable pH recorders of the Leeds and Northrup Co., Philadelphia. C.

**Pulp: Mildewing.** See Section 8A.

PATENTS

**Dips for Sheep, etc.** Cooper, McDougall & Robertson Ltd., E. S. R. Willmore and F. A. Cooper. B.P.552,434 of 7/4/1943. Development of B.P.542,809 (this *J.*, 1942, A 258). An insecticidal dip for sheep and other animals consists of a powdered mixture of finely-divided sulphur and a cresylic acid derivative of a divalent metal, e.g. calcium, magnesium or barium cresylate. Derris or derris extract, nicotine or arsenical compounds may be added. W.

**Viscose: Production from Regenerated Cellulose.** British Cellophane Ltd., G. S. Heaven and E. Butler. B.P.552,681 of 15/10/1941:20/4/1943. A process for the production of viscose from regenerated cellulose comprises adjusting the content of water in the material to at least 30 per cent. reckoned on the weight of the dry cellulose, then treating with cold caustic soda solution in the proportion of at least 1.7 mols. of NaOH per  $C_6H_{10}O_5$  unit and in such a way that the whole of the aqueous solution is retained by the cellulose and that the whole of the cellulose is converted into alkali-cellulose, then treating with carbon bisulphide, and finally dissolving the sodium cellulose xanthate by the addition of water or dilute caustic alkali solution. The regenerated cellulose material may be scrap, rejects, off-cuts, trimmings or used material and is preferably in the form of small pieces able to pass through about 1-in. mesh. C.

**Cellulosic Material: Shredding.** British Cellophane Ltd., G. S. Heaven and E. Butler. B.P.552,682 of 15/10/1941:20/4/1943. A process for the shredding of water-sensitive non-fibrous cellulosic material comprises first saturating the material with water whereby its strength and toughness are considerably reduced, and tearing, grinding or cutting the treated material to form pieces of the desired dimensions. The material may be cooled during the tearing, grinding or cutting operation. The cellulosic material may be regenerated cellulose or lowly substituted cellulose esters in the form of sheets, films, tubes, filaments or yarn. The shredded regenerated cellulose materials may be used for the production of viscose. C.

**Alginic Acid Films: Production.** Cefoil Ltd. and R. C. Rose. B.P.552,770 of 21/10/1941:23/4/1943. In the production of alginic acid films by conversion from previously coagulated calcium or like insoluble alginate films, the insoluble alginate film is at least partially dried prior to conversion to alginic acid. The conversion to alginic acid in an acid bath takes place after drying without undue weakening of the strength of the film so that high speeds can be maintained without danger of breakage of the film in the machine. C.

**Copper: Recovery from Rayon Plant Waste Waters.** Soc. Anon. Bemberg. Ital. P.375,729 (through *Chem. Zentr.*, 1942, i, 2611 and *Water Pollution Res. Summary Curr. Lit.*, 1942, 15, 188-189). In order to recover copper from waste waters of the cuprammonium process, a sludge is first precipitated by the addition of lime. The sludge contains the copper as hydroxide as well as soluble and insoluble calcium compounds and many organic substances. The soluble calcium compounds are then converted into insoluble compounds (carbonate or oxalate) and the copper is dissolved by addition of ammonia. The copper can now be separated from the residue, which consists of calcium compounds, cellulose, and other material, by sedimentation or filtering. For example, by using ammonium carbonate and ammonia in appropriate amounts, the calcium can be converted into an insoluble form and the copper into a soluble form simultaneously. C.

**Viscose Waste Liquors: Recovery of Sulphur.** North American Rayon Corporation. U.S.P.2,270,174. Waste liquors containing sodium sulphides and cellulose decomposition products are mixed with sufficient sodium sulphate to raise the concentration to 35-40 gm. per l. and sufficient sulphuric acid to give 15-25 gm. per l., heated to about 80° C. and then left to cool. The precipitated sulphur settles readily. C.

**Rayon Thread Storage and Advancing Device.** American Enka Corporation. U.S.P.2,302,792. The device consists of "rotatable means defining an elongated thread contacting surface" (a roller that is narrower at one end than the other) and at least one arm that rotates about the above and tapers from its wide bearing end where it coincides with the narrow end of the above roller. The arm and roller may be rotated at different speeds. C.

**Rayon Yarn: Setting and Drying.** Industrial Rayon Corporation. U.S.P. 2,302,908. Rayon yarn is advanced in helical turns around a series of "thread-advancing thread-store" rollers, and is dried at one stage, then wetted with a nearly boiling aqueous liquid, and finally dried again. C.

**Rayon Yarn: Continuous Bleaching, Washing and Drying.** Industrial Rayon Corporation. U.S.P.2,302,936. Rayon yarn is advanced in helical turns around a series of "thread-advancing, thread-store" rollers, and is treated at one point with a neutral solution of an oxy-halogen salt of an alkali or alkaline earth, then

washed without an antichlor, and finally dried. The available chlorine content of the bleach liquor is arranged so that the times required for bleaching and washing are each less than one minute. C.

**Strong Viscose Rayon Yarn: Bobbin Spinning.** American Enka Corporation. U.S.P.2,302,971. Partially regenerated viscose yarn is withdrawn from the spinning bath at constant speed over a godet, propelled without gliding friction to a second bath for complete regeneration, passed over a faster godet where gliding contact is made, and then wound into a bobbin at a speed between those of the two godets and under such tension that it leaves the second godet tangentially in a straight line. C.

**Spool-spun Rayon Yarn: Wet Processing.** Industrial Rayon Corporation. U.S.P.2,303,052. Spool-spun rayon yarn is taken while moist from the spool and submitted to wet processing and drying operations as it advances in closely spaced helical turns, a change in length (stretch) being effected. C.

**Rayon Yarn: Continuous Processing.** Industrial Rayon Corporation. U.S.P.2,303,274. Incompletely processed rayon yarn is unwound under twist from its collecting package, submitted to wet processing and drying operations as it passes in helical turns around a series of thread-advancing thread-store devices, and collected at a constant linear speed in the form of a precision-wound cone. C.

**Cellulose Ester Rayon: Spinning.** Celanese Corporation of America. U.S.P.2,303,338. The cellulose ester is melted under pressure applied by a hot, aqueous liquid. C.

**Ventilated Rayon Spinning Machines.** Industrial Rayon Corporation. U.S.P.2,303,696/7. The claims are for means to enclose thread-advancing thread-store devices, arranged in two banks on opposite sides of the machine, so that a constant flow of air can be established through the machine. C.

**Rayon Bobbin Spinning Machine.** American Enka Corporation. U.S.P.2,304,097. The winding apparatus for a bobbin spinning machine comprises (1) at least two driven collecting devices arranged opposite each other, (2) a reciprocating member movable in a plane parallel to the axes of (1) and (3) a thread guide carried by (2) and movable in a direction transverse to the axes of (1) so as to guide yarn to either collecting device. C.

**Rayon Package Drying Device.** Proctor and Schwartz, Inc. U.S.P.2,304,685. The wet package is exposed to a drying medium while the yarn is being wound off and means are provided for withdrawing the package if the winding is interrupted. C.

**Cellulose Mixed Ester: Preparation.** Eastman Kodak Co. U.S.P.2,304,792. A mixed ester of cellulose, having a high viscosity, is obtained by soaking cellulose in an activating bath consisting of C<sub>2</sub>-C<sub>4</sub> fatty acids (at least 20 per cent. being acetic acid) and then esterifying it under the following conditions: (1) at least 60 per cent. of the total acyl content of the bath is fatty acid of 3-4 C atoms; (2) there are 5-7 parts of esterifying bath per part of cellulose; (3) except for the catalyst, the bath consists of unsubstituted lower fatty acid and anhydride; (4) the fatty acid constituent is  $\frac{3}{4}$ -3 parts per part of cellulose; (5) the amount of C<sub>3</sub>-C<sub>4</sub>-acid anhydride is slightly above the theoretical; (6) before mixing the reactants, the anhydride is cooled below 55° F. but not so much that the acetic acid solidifies; (7) the sulphuric acid added as catalyst amounts to 1-5 per cent. of the weight of cellulose; (8) the temperature of the mixture is allowed to rise to 70-90° F. and maintained near the maximum until the cellulose is substantially dissolved. C.

**Abrasive Disc Rayon Staplising Apparatus.** Celanese Corporation of America. U.S.P.2,305,692. Continuous filament yarn is caused in winding to rotate an abrasive disc against which it is guided so that some filaments are severed. C.

**Rayon Staple Wet Treatment Apparatus.** H. Tegetmeyer and W. Arnold (Germany; vested in the U.S. Alien Property Custodian). U.S.P.2,306,144. Apparatus for the wet treatment of rayon staple comprises a closed container, a bladed wheel mounted at the end to which the fibre and liquid are fed, the blades having resilient ends that form a close fit as they rotate in the container, a trough to receive the fibre and liquid forwarded by the blades, conduits for waste gases, and a lattice for conveying away the treated fibre. C.

**Grey Cellulose Ester or Ether Filaments: Production.** Celanese Corporation of America. U.S.P.2,306,283. Neutral grey filaments are spun from a solution of a cellulose ester or ether containing a dispersion of aniline black and Alizarin Cyanine Black. C.

**Ginnery Lint Reclaiming Machine.** J. E. Mitchell Co. U.S.P.2,307,287. A cotton extracting, cleaning and reclaiming machine comprises an extracting cylinder, a cleaning chamber, a hull board that directs cotton from the chamber to the cylinder tangentially to its lower, rising side, and provides with this an opening for the escape of hulls, trash and cotton locks not engaged by the cylinder teeth, a reclaiming saw below this opening for operating on escaping locks, and a doffer to remove reclaimed cotton from the saw and return it to the cleaning chamber. C.

**Viscose Rayon: Spinning.** E. I. Du Pont de Nemours & Co. U.S.P.2,307,863/4. (1) Viscose is extruded into a bath containing 7-15 per cent. of sulphuric acid at a temperature of at least 60° C. and the filaments are carried forward at a speed of at least 5,000 inches per minute into a second coagulating bath at a lower temperature. (2) Viscose is spun at a speed of at least 5,000 inches per minute into a bath containing 7-15 per cent. of sulphuric acid at a temperature of at least 60° C. C.

**Cellulose Acetate Spinning Bath.** E. I. Du Pont de Nemours & Co. U.S.P. 2,308,141. An acid solution of cellulose acetate is extruded into an aqueous solution of an amine with ionization constant greater than  $1 \times 10^{-6}$ . C.

**Pneumatic Cotton Picking Device.** A. P. Costa and W. C. Harris (Athens, Ga.). U.S.P.2,308,357. A drill-like cotton-picking spindle is carried by a shaft housed in the handle of the tool and driven by connection (pneumatic) with a driven shaft. C.

## 2—CONVERSION OF FIBRES INTO FINISHED YARNS

### (A)—PREPARATORY PROCESSES

**Comb-bladed Finisher Scutcher Beater.** *Cotton (U.S.)*, 1943, 107, No. 1, 106. The production of the finisher scutcher can be increased without increasing the beater speed by welding to the beater blade a comb-shaped blade formed from  $\frac{1}{8}$ -in. rolled steel. The design is shown in a sketch. C.

**Carding Problems: Discussion.** Alabama Textile Operating Executives. *Cotton (U.S.)*, 1943, 107, No. 1, 70-71. Mill experience is cited in answer to the following questions. (1) Do uniform settings on cards of the same type lead to uniform flat strips? (2) What flat speeds and weight of strips per flat are best for a mill spinning 13's average count? ;  $3\frac{1}{2}$  to 4 inches per minute and 15 to 18 grains per flat are recommended. (3) How many pounds of  $\frac{7}{8}$ -1 inch middling cotton should be run through a card before re-grinding, and should the doffer be run fast or slow for grinding? ; the recommendations range from 1800 to 3500 lb. on  $\frac{7}{8}$ -in cotton or 4000 lb. for 1-in. cotton, and only one mill out of four prefers the slow doffer. (4) What changes should be made in card settings when increasing cylinder speeds from 165 to 195 r.p.m.? ; no changes are required. (5) Which gives the better results, a light or a heavy lap, and should the speed of the licker-in be increased for a heavy lap? ; opinions are equally divided. (6) What is the best speed to run (a) a vertical opener and (b) a Centrif-Air machine? ; 650 r.p.m. for (a) and 450-600 r.p.m. for (b) are recommended. (7) What is a fair percentage of waste in the cardroom that can be worked again? ; figures range from 3 to  $6\frac{1}{4}$  per cent. C.

**Spun Rayon: Processing.** *Silk J. Rayon World*, 1943, 19, No. 226, 25-26, and *Textile World*, 1943, 93, No. 2, 109-110. The "tow-to-top" process consists of breaking or cutting the continuous filaments of rayon tow into staple fibre lengths and converting them into tops without destroying the original parallel alignment of the fibres. The resulting staple fibres may be of any desired length. This process has been carried out on a modified worsted roving frame. The tow enters the machine through rollers designed to spread and flatten it out and permit more uniform gripping by the breaking rollers. The first pair of breaking rollers grips the tow firmly while the second pair, revolving at a higher speed than the first, pulls the tow and causes the individual fibres to break. The second pair of rollers is fluted and a leather apron lies over the bottom member of the pair. Mounted between the two pairs of breaking rollers are two rollers with sharp flutings, which assist in the breaking and tend to produce fibres of

even length. The Campbell process uses a standard drawing apparatus, preferably an intersecting gill box, provided with patented attachments. The cutter feeds directly into the drawing or gill box. Its main feature is a "double helical shear." This, with the necessary feed rollers, forms the cutting machine which cuts diagonally and feeds the tow distributed in a band of fibres as wide and thick as the gill box will handle successfully. On the delivery end of the gill box, the attachments comprise a condenser or "dynamic funnel" and a "controller" which puts false twist into the condensed web. Other tow-to-top systems have also been developed. Tops produced by these methods are claimed to be suitable for the production of yarns of any denier and to have several advantages over those made by the traditional procedures. The elimination of carding and combing processes reduces the number of operations and the cost of equipment, and reduces waste of fibre. C.

#### (B)—SPINNING AND DOUBLING

**Spinning Problems: Discussion.** Alabama Textile Operating Executives. *Cotton (U.S.)*, 1943, 107, No. 1, 71-73. Mill experience is given in answer to the following questions. (1) How often should steel rollers be scrubbed, how often should leather aprons be inspected and cleaned, and what is the life of the top and bottom leather aprons? ; wide differences are apparent in the answers. (2) What results have been obtained with curved web rings? ; slight superiority over straight-web rings is reported, especially in the riding of the traveller. (3) Which is the best way to keep a frame clean? ; various practises are reported, and spraying cotton with oil is favoured in some replies. (4) To get maximum efficiency, what is the best method of doffing where several counts are involved and what is the best system of payment? ; mixed doffing jobs should be kept to a minimum and assigned to the best doffers; some replies favour payment according to the hank clock. (5) With what success are women being used to replace men on doffing jobs? ; training women spinners to doff is preferred to training inexperienced women. (6) What is the experience with "synthetic" roller cots? ; the common complaint of "eyebrowing" is overcome by using revolving top clearers; a very light buffing about once a year is sufficient. C.

**Twisters; Reduction of Waste at —.** W. F. Crowder. *Textile World*, 1943, 93, No. 2, 111. The cause of most waste in the twister room is oil or grease. Other causes include faulty builders on the frames, slack tapes, bad rings, lifter rods sticking, and tangled spools. Waste can be reduced by proper training of operatives and by keeping the machines in good mechanical condition. These measures will help to save oil as well as yarn. Cleaning arrangements should be carefully planned. It is possible that improvements in twisters could be effected by modifications in design, higher spindle speeds, and elimination of such features as water troughs, drag rods and ring grease. C.

#### (D)—YARNS AND CORDS

**Plastic-coated Yarn: Use for Screens.** *Modern Plastics*, 1943, 20, No. 7, 70 and 140. Plastic-coated yarn is proving a satisfactory substitute for steel and copper wire in the production of insect screen cloth. The product used for this purpose consists of multiple-ply cotton thread twisted tightly and impregnated with cellulose acetate-butyrate, over which multiple coatings of the same plastic are then extruded. The yarn is said to be flame-retardant and waterproof, and to have a semi-stiff finish which works satisfactorily on wire screen looms or textile box looms. Other types of plastic-coated yarn comprising cotton, rayon, linen and Fiberglas threads coated with various resins are also used for electrical insulation, industrial screens, decorative purposes, etc. The coating machine consists essentially of a frame of sheet iron containing the following elements: two containers in which are deposited the plastic to be used; a series of dies attached to the containers for the purpose of controlling the amount of plastic applied directly to the yarn in each application; and a heated chamber through which the coated yarn passes in its journey from die to die. The number of coatings applied may vary from 6 to 24. Pigmented or translucent finishes can be produced and the finished yarn may be either soft and flexible or fairly stiff as required. C.

#### PATENTS

**Combing Machine.** J. W. Nasmith. B.P.552,559 of 10/7/1941:14/4/1943. In a combing machine of the rectilinear type, the top comb is so mounted in a solid carrier member and controlled that in its reciprocatory movement it follows

two different arcuate paths, along one of which it moves to a point of its penetration into and ultimate withdrawal from the fibre tuft, whilst between that point and the detaching rollers, when engaged in the tuft, it moves upon the other path. This is best attained by mounting the top comb carrier upon a pivotal point, with means for transferring it from that pivotal point to another as a result of its own reciprocation. One of the two points of oscillation of the top comb may be mounted so that variation of the point of contact of the top comb teeth with the fibre tuft, with ensuing penetration of the teeth into the latter, will occur at a point of the arc determined by the adjustment of the point of oscillation. By connecting together the mechanical members which are regulatable to vary the point of oscillation, in all the heads of the combing machine, to a common setting shaft, simultaneous adjustment of all the points may be effected. In cases where it is desirable to cause the top comb to remain for a longer time in engagement with the fibre tuft, the setting shaft may be given a slight rocking motion so that the transfer of the comb to the point of oscillation which causes withdrawal of the top comb teeth from the fibre tuft is correspondingly delayed, reverse rocking of the shaft for the next stroke bringing the point of oscillation to that for the penetration of the comb. A device for varying the amplitude of throw of the top comb in its oscillation to and from the detaching rollers may be incorporated in the combing machine. C.

**Cotton Reel Blank Cutting Machine.** G. A. Storey and A. Taylor. B.P. 522,796 of 21/2/1942:23/4/1943. A machine for cutting round wood into lengths for cylindrical blanks for cotton reels and like bobbins comprises a frame, a number of saws mounted in the frame at spaced intervals, a chute to receive the rods of wood, a carrier adapted to receive a rod from the chute and means for traversing the carrier to bring the rod into engagement with the saws and means on the carrier for gripping the rod before and during sawing and for releasing the same after sawing. According to a preferred embodiment of the invention, each blank section of the rod is gripped during cutting. Also the carrier is reciprocated so that the parts of the severed rod are released in the same position as that in which the rod was gripped. C.

**Endless Belt Drafting Mechanism.** Casablancas High Draft Co. Ltd. and J. Noguera. B.P. 552,927 of 27/10/1941:30/4/1943. In drafting mechanism of the type using two endless belts, the belts are so arranged with respect to the front drawing rollers that the flattened strand of fibres passes from between the endless belts and is delivered to the front drawing rollers in a plane at right angles to the line of contact of the drawing rollers, whilst the surfaces of the belts which are gripped between the belt-driving rollers are in a plane at right angles to the plane in which the strand passes from between the belts. In this manner, the belts can be driven by positively driven rollers disposed lengthwise across the machine and capable of being coupled and driven as a single roller in the usual way, while at the same time, the flattened strand of fibres is delivered to the front drawing rollers in a plane at right angles to the line of contact of the drawing rollers, whereby the more loosely held fibres at the edges of the strand are squeezed towards the middle by the drawing rollers. C.

**Glass Fibre Yarn: Production.** Owens-Corning Fiberglas Corporation. U.S.P. 2,302,790. A mat of crossed glass fibres is pulled in a direction at an angle to the lay of the fibres, in a blast of air moving parallel therewith. C.

**Spinning Frame Tape Drive Tensioning Device.** Saco-Lowell Shops. U.S.P. 2,303,172. The tape passes around a take-up roller that is carried on a pivoted arm and balanced by a weight. C.

**Down-twister Spindle.** E. I. Du Pont de Nemours & Co. U.S.P. 2,303,912. The spindle is recessed throughout the area that normally engages the bobbin and a sleeve of wear-resistant material is fitted over the recessed area. C.

**Draw-frame Safety Device.** Whitin Machine Works. U.S.P. 2,304,169. A plunger secured to the shipper rod engages a recess in the edge of a disc fixed to the roller tension releasing device, so as to prevent the rod from sliding from the non-driving position when the plunger is out of alignment with the edge recess, and to hold the disc from angular tension-releasing movement when the plunger is in the recess. C.

**Ring Rail Lifting Mechanism.** Saco-Lowell Shops. U.S.P.2,304,228. The lifter rods for a ring rail are raised by lifter arms in combination with power arms pivoted to the same axis. Thrust screws adjust the lifter arms to their power arms and the lower ends of the latter are held by horizontal springs that tend to lift the rail. Each spring is so related to its power arm that as its tension changes with the rise and fall of the ring rail the effective leverage of the spring will change inversely and produce a roughly uniform lifting effort on the rail throughout its travel. C.

**Spindle Mounting.** Saco-Lowell Shops. U.S.P.2,304,370. The claim is for a mounting that permits lateral and vertical adjustment of a ring frame spindle and has resilient cushioning means between the rail and the spindle. C.

**Synthetic Rubber Roller Cot.** Dayton Rubber Manufacturing Co. U.S.P. 2,304,656. The roller cot contains as an essential constituent a synthetic rubber composed of a co-polymeride of acrylonitrile and butadiene. A vulcanising agent such as sulphur is added to the composition. C.

**Rayon Staple Drafting Device.** Eastman Kodak Co. U.S.P.2,304,885. A roller head for drafting rayon staple in a mixture of lengths consists of front and back pairs of rollers spaced apart more than the length of the longest fibre and between them a pair of conveyor belts. The belts and delivery rollers are driven at the same speed but faster than the feed rollers so that drafting occurs and the belts tend to compact the short fibre into the sliver. C.

**Slub Yarn Spinning Mechanism.** Celanese Corporation of America. U.S.P. 2,304,902. Magnetic clutches, actuated through cams and make-and-break switches, are used to rotate at alternating variable speeds roller pairs that co-operate with other, driven roller pairs for the production of slub yarn from rovings on a spinning frame. C.

**Opening Machine.** Davis and Furber Machine Co. U.S.P.2,305,639. A machine for opening fibrous stock comprises a closed casing, a cylinder journaled within the casing having its periphery studded with smooth radially projecting pins, a top portion of the casing conforming to an extensive segment of the cylinder and carrying baffles that approach the pins within a fraction of a fibre's length, feeding means, a discharge conduit connected with a suction fan, and means for rotating the cylinder so that the stock is repeatedly discharged from the pins and hurled against the baffles by centrifugal force. C.

**Twisting Frame.** Saco-Lowell Shops. U.S.P.2,306,342. Two horizontal rollers, one of which is driven, co-operate to draw yarn upwardly from a supply, and feed it through a vertical guide slot to a down-twisting device. One of the rollers (the upper one in the illustration) is supported (on a swinging arm) for movement into and out of contact with the other roller. C.

**Endless Band Drafting Head.** E. Toenniessen (Germany; vested in the U.S. Alien Property Custodian). U.S.P.2,306,848. The illustration shows a pair of flat rails between the pairs of feed and delivery rollers, with a pair of endless bands passing, respectively, around the top rail and top delivery roller and bottom rail and roller. One of the rails is freely shiftable relative to the other rail, but there are stops on the rails to limit the movement. C.

**Drafting Roller Head Top Roller Holder.** E. Toenniessen. (Germany; vested in the U.S. Alien Property Custodian). U.S.P.2,306,849. The top rollers are carried by a holder that is hinged to the support for the bottom rollers. The top holder is in two parts one of which is braked and presses against the other. (The illustration shows a drafting head with four lines of rollers and an endless belt passing around the bottom pair of intermediate rollers and a separate roller.) C.

**Doubling Frame "Singles" Preventing Device.** W. C. Gill (Johnston, R.I.). U.S.P.2,307,261. In apparatus for handling double-end yarn (as in ring doubling) it is arranged that if one end is severed it trips a hinged member, carried by a slotted guide below the normal path of the yarns, so that a cutting device is swung into the path of the other end. C.

**Sliver False Twisting Apparatus.** N. S. Campbell. U.S.P.2,307,821. A device for revolving a sliver about its longitudinal axis comprises a drum that can be revolved in both directions alternately and roller means mounted in the drum to feed the sliver at the same speed regardless of the opposite revolving of the drum. C.

## 3—CONVERSION OF YARNS INTO FABRICS

## (A)—PREPARATORY PROCESSES

**Jacquard Machines: Advantages and Disadvantages.** T. Crawshaw. *Silk J. Rayon World*, 1943, 19, No. 227, 17-18. A comparison of some of the advantages and disadvantages encountered when using single lift, single cylinder, and double lift, double cylinder jacquard machines. C.

**Finger Marks in Rayon Fabrics: Prevention.** H. E. Wenrich. *Rayon Textile Monthly*, 1943, 24, 83-84, 131-132. A discussion of the causes and prevention of finger marks, pressure marks, defects due to warp "stickers," bruise marks and similar defects in rayon fabrics. C.

## (C)—WEAVING

**Webbing and Firehose Loom.** Fletcher Works. *Textile World*, 1943, 93, No. 2, 115. In a narrow fabric loom for weaving heavy webbing and tubular fabric, such as firehose, vibration is reduced to a minimum by the balancing of the batten motion. The tension on the warps is derived by means of friction rollers. An even take-up of tubular fabrics is ensured by a new design of take-up rollers. One model of loom has been made with a batten which gives two beats to one turn of the crankshaft. Internal cut-path cams give the harness frames a smooth action and sufficient dwell to the shuttle, which contains a large cop, to clear the shed. C.

**Loom Stoppages: Recording and Control.** A. R. Kandler. *Textile World*, 1943, 93, No. 2, 106-107. A method for detecting too-frequent loom stoppages involves the determination of the "running number" of the loom, this being the number of revolutions or picks a loom makes from one start to the next stop. The average running number is obtained by dividing the number of picks by the number of standstills during the same period. Counting of standstills can be done by a counter operated mechanically or electrically by the starter handle of the loom. A sketch of an electrically operated counter, and a form for recording readings of the pick counter and the loom standstill counter are shown. Records obtained for seven looms are discussed. It is pointed out that the number of stops handled by the weaver gives a better idea of the work actually done than does the number of picks or the production. In addition, the tackler's efficiency can be checked by comparing the average running numbers or the number of stoppages occurring in the groups of several tacklers. The counting of standstills may also be of some help when trying out new styles or new materials. C.

**Protective Gloves: Weaving on Dobby Looms.** A. Johnson. *Textile Manufacturer*, 1943, 69, 181 and 183. It is suggested that protective gloves for use in industry could be woven in shaped form on doobby looms by a suitable arrangement of plain and double-plain weaves. A length of fabric incorporating hundreds of gloves could be finished in piece form and the gloves then cut and made ready for use by separating the fingers, the same shape serving for right- and left-hand gloves. By using the ordinary unstitched double plain weave as a basis and merging this into a plain weave single cloth structure in certain areas groups of pockets can be made conforming to a "futuristic" contour of the hand in which the palm and fingers are reproduced as squares or oblongs. Diagrams and photographs are given. The production of a glove with woollen warp threads, and cotton warp threads for the seam areas, and a weft of asbestos yarn is described in detail and the draft and pegging plan are shown. C.

**Rayon Weaving Defects: Causes and Remedies.** *Rayon Textile Monthly*, 1943, 24, 24-25, 85-86, 133-134. An account is given of the causes and prevention of the principal rayon weaving defects, such as broken warp ends, loose ends, finger marks, loose picks, weft loops, slugs and snarls, broken picks, split picks, uneven cloth or barré, doobby marks, reed marks, wrong bindings, selvages and drafts, dirty weft, dirty warp ends, tight picks, hang picks, floats, holes and creases, cracks, shuttle traps and fuzzy cloth. C.

## (D)—KNITTING

**Hosiery Needles: Types and Uses.** National Hosiery Manufacturers' Federation. *Textile Weekly*, 1943, 31, 660 and 663. Photographs of the various types of hosiery needles are given, together with a table giving their designations and the counts of cotton, wool and rayon yarns used for the production of hose,

half-hose and "sox," rib fabrics, plain fabrics, selvedge fabrics and interlock fabrics. The need for yarns free from faults, slubs, snarls, etc., is pointed out. C.

**"Komet" Knitting Machines: Operation.** K. O. Metz. *Cotton (U.S.)*, 1941, 105, No. 6, 136-142; No. 7, 120-124; No. 8, 116-122; No. 10, 192-194; No. 11, 134-138; No. 12, 139-141; 1942, 106, No. 1, 107-110; No. 3, 121-126; No. 4, 160-168; No. 5, 128-134; No. 6, 130-135; No. 7, 145-148; No. 8, 122-128; No. 9, 126-128; No. 11, 124-128; No. 12, 126-131; 1943, 107, No. 1, 126-130; No. 2, 156-161; No. 3, 124-129. Further instalments of a detailed description of the parts of the "Komet" and "Links and Links Komet" knitting machines. C.

**Full-fashioned Hosiery Mill: Management.** H. Britt. *Cotton (U.S.)*, 1941, 105, No. 4, 123-6; No. 5, 125-8, 148; No. 7, 117-9; No. 8, 111-114. Practical advice is given on the management of a full-fashioned hosiery mill, including notes on the building and its equipment, purchasing machinery and supplies, designing hosiery, and handling and inspecting the product at various stages. C.

**Hosiery Yarns: Controlling Supply to Knitters.** K. R. Barker. *Textile World*, 1943, 93, No. 2, 114. To prevent mixing of lots of hosiery yarn which is liable to cause difficulties in dyeing, one individual (yarn man) should be given the responsibility of checking the cases of yarn as they are received, delivering it to the machines, and keeping a constant check on the number of legs still to be footed from any given lot of yarn. The yarn man should keep a close watch on legger production and should make several trips a day through the aisles to guard against the possibility of a knitter obtaining a cone of yarn from the wrong lot, as might happen if he took one from another knitter's bin. All legs should be footed as soon as possible and not allowed to accumulate in large quantities ahead of the footers. The yarn man, knowing how many legs have been and are being knitted from a particular lot of yarn, should put aside a sufficient number of cones for the feet. It is good practice never to knit legs until sufficient yarn of one lot is on hand for both the legs and feet. C.

#### (G)—FABRICS

**American Service Textiles: Specification.** *Textile World*, 1943, 93, No. 2, 86-90. A digest is given of specifications for woven cotton fabrics, woven woollen and worsted fabrics, cotton, wool and rayon knit goods, and various miscellaneous textiles for Army, Navy and other Government departments. C.

**Wind-resistant Cotton Cloth: Specification.** *Textile World*, 1943, 93, No. 2, 83-85. Manufacturing and processing details are given for Type II 5-oz. water-repellent cotton poplin which is covered by Quartermaster Corps Tentative Specification P.Q.D. No. 1A, and is used in garments for arctic wear and in field jackets. C.

#### PATENTS

**Needle Loom.** Associated Weavers Ltd. (Bradford), H. R. Sewell and G. W. Harwood. B.P.552,429 of 3/10/1941:7/4/1943. In a rapier or needle loom for weaving fabric having a combination of textile fibre or yarn and metallic wire in both the warp and weft, the bobbin carrying one weft is mounted on the moving part of the needle mechanism in such manner that as the needle carries this weft through the shed, the bobbin follows the needle and thereby reduces the strain or pull on the weft. A pivotally mounted tooth or hook catch is mounted on the frame of the loom adjacent to the selvedge of the piece and the tooth or hook is adapted to catch the weft which passes around it prior to being passed through the shed by the needle. On the beat up the sley pushes the loop of weft over the catch and the catch is then free to engage the weft in the next pick or movement of the needle, and due to the pivotal mounting of the catch the latter falls or rises according to its relative position with the loom frame to engage the new weft or pick which it holds until this is forced off by the beating up of the sley. The bobbin carrying the wire weft may be mounted on the rapier arm of the loom on a suitably placed peg or mounting and if desired, the rotation of the bobbin may be controlled by a suitable spring or other tensioning device determined by the type, strength and thickness of the wire used. The textile fibre or yarn for the weft will be preferably fed to the needle in the usual manner whilst the yarn and wire for the warp may be on beams or creels. C.

**Straight-bar Knitting Machine Stop Mechanism.** W. Cotton Ltd., G. Wilders and W. G. Macdonald. B.P.552,574 of 11/10/1941:14/4/1943. A Cotton's Patent or other straight-bar knitting machine wherein the draw mechanism can be disconnected from its driving means and there is provided a friction brake for bringing the disconnected draw mechanism to rest and positive locking means for locking the draw mechanism in a predetermined position of rest, is characterised in that the positive locking means comprises a projection on a rotating part of the draw mechanism and a slidable member restrained against rotation with the rotating part, but slidably movable into the path of rotation of the projection. Conveniently, but not necessarily the rotating part is constituted by the cam and the projecting part projects from the side of such cam. Alternatively, the projecting part may project from the side of a disc co-axially with the cam. C.

**Selvages: Formation in Weaving Several Pieces on the Same Loom.** Sulzer Frères Soc. Anon. (Winterthur, Switzerland). B.P.552,618 of 14/10/1941:16/4/1943 (Conv. 20/12/1940). In a method of weaving simultaneously several pieces of fabric on the same loom wherein the selvedge edges of the pieces are formed by turning the cut ends of the weft threads back into the fabric, the weft threads are cut at a point midway between the adjacent fabric edges after the thread has been drawn through the shed and its end arrives beyond the outermost warp thread and before the reed as it begins its return motion leaves the weft thread just inserted after beating it up. C.

**Under-pick Loom Picking Motion.** R. H. Smith and G. W. Shackleton. B.P.552,691 of 5/11/1941:20/4/1943. In a picking motion for under-pick looms the operating cam engages a bowl or cam follower at the end of one arm of a bell-cranked lever or pair of levers mounted upon a pivotal shaft disposed in the end frame of the loom so as to be parallel with the low shaft carrying the operating arm, and the other arm is adapted to operate the arm or lever which propels the picking stick through the medium of the picking leather or other means. The arm or lever carrying the bowl or follower is preferably curved towards the cam so that the latter strikes or engages the bowl or cam follower approximately at right angles to the line joining the fulcrum of the lever with the axis of the follower with the result that the maximum force is applied to the bell-crank or pair of levers. The movement of the bell-crank lever or pair of levers is transmitted to the arm which propels the picking stick through a clutch which may comprise a pivotal ratchet tooth mounted upon the propelling arm and adapted to engage a frog or abutment on the free arm or lever of the bell crank or pair of levers. The pivotal ratchet tooth will be operated from a pivotal lever which brings the ratchets of each picking motion into engagement with its frog or abutment alternatively so that the picking is put into and out of action in the desired sequence. The ratchets may also be controlled by hand so that the operative may stop and start either picking motion. C.

**Winding Machine Spool Transfer Device.** K. J. Scharer (Maschinenfabrik Scharer, Erlenbach, Switzerland). B.P.552,702 of 16/12/1941:20/4/1943 (Conv. 14/11/1940). A spool or cop transfer device for yarn winding machines comprises a reciprocating slide carrying a clamping mechanism which automatically engages the spool or cop when the slide moves outwardly to discharge the spool or cop in a generally axial direction out of its position of mounting in the machine but which is inoperative to move the spool or cop during return movement of the slide. The fact that the clamping mechanism is thus inoperative during return movement of the slide makes it possible for a loaded spool or cop to be brought from winding position into position for discharge from the machine before commencement of such return movement of the slide during which movement the clamping mechanism is able to ride over the winding. The device is therefore applicable with particular advantage to winding machines having a number of spindles arranged in parallelism on a common rotatable carrier, but is not restricted in application to such machines. C.

**Knitting Machine Picker Mechanism.** B. Toone (Nottingham) Ltd. and B. T. Cole. B.P.552,746 of 20/10/1941:22/4/1943. Picking mechanism for a knitting machine comprises a slide part or feeler for travelling along a line of butts to drop in behind the last one thereof, a driving catch connected to the slide part to engage temporarily in front of one of the butts when the slide part

drops in so as to be driven by the butt in the direction of relative movement between the bed and the mechanism, and a picking member driven by the catch to make a picking movement. Preferably this picking member picks at least that butt which is engaged with the catch. The slide part, catch and picking member may be mounted on a pivoted arm or arms. Alternatively they may be mounted to move along a suitably shaped track or race. C.

**Camouflage Matting: Production.** Morton Sundour Fabrics Ltd., J. W. F. Morton, G. L. Allison and E. Bowker. B.P.552,754 of 27/11/1941:22/4/1943. A method of manufacturing camouflage matting comprises supplying a sheet of loosely matted fibres to a warp knitting machine which forms widely spaced warp threads into chains of stitches, and operating the machine so that its hooked needles pierce the sheet and loop the threads when forming them into stitches around successive transversely extending small quantities of the fibres, so that the fibres are bound together by the knitted chains. The sheet of loosely matted fibres may be supplied to a series of widely spaced pillar warps in a warp knitting machine, which warps are associated with a series of similarly spaced supporting or "stuffer" warps, and stitch-forming operations may be performed on the pillar warps, the knitting needles piercing the sheet and looping the pillar warps around successive transversely extending small quantities of the fibres and interlacing the pillar warps with the respective supporting warps. A warp knitting machine for this purpose comprises a series of widely spaced knitting needles, a similar series of pillar-warp guides for lapping the pillar warps round the needle hooks, a conveyer constituting a travelling platform on which a sheet of loosely matted fibres is carried to the needles, so that the sheet will be pierced by the needles and transversely extending quantities of the fibres will be bound by the warp chains knitted by the needles, and means for leading away the fabric produced by the knitting operations. Preferably, the machine also has means for leading supporting warps closely past the knitting needles and for shogging them from side-to-side thereof in conjunction with the hook-lapping action of the pillar-warp guides. Lateral strength may be obtained by incorporating in the fabric in conjunction with the pillar chains, with or without supporting warps, a supporting weft yarn which inclines from side to side of the fibre sheet and is looped with a quantity of fibres by one of the stitches at each point where the weft yarn crosses the chains. C.

**Welt-turning Mechanism.** G. Blackburn & Sons Ltd. and H. W. and E. Start. B.P.552,790 of 30/1/1942:23/4/1943. In a straight-bar knitting machine having automatic welt turning mechanism comprising welt hooks mounted in a bar which is operated to move the welt hooks up to the needles to receive the loops of the initial welt course drawn thereon, withdraw them from the needles during the knitting of at least a portion of the welt and to move them up to the needles for the return thereto of the loops of the initial course held by the welt hooks, mechanism is provided for automatically moving the welt hook bar longitudinally a short distance immediately after the loops have been received on the welt hooks or have been returned to the needles so as to move the welt hooks laterally from under the sinkers to prevent damage of the sinkers or welt hooks while permitting the knocking-over bits to work in their normal position. C.

**Jacquard Selector Bar.** D. Crabtree & Son, Ltd. (Bradford) and W. Felton. B.P.552,829 of 22/1/1942:27/4/1943. A selector bar for jacquards has one or more longitudinal stiffening ribs or flanges in combination with slidable selector pins which are accommodated in holes in the ribs or flanges and are guided crosswise of the selector bar by a guide piece or pieces formed separately from and fitted to the bar. C.

**Latch Needle.** A. R. Cole. B.P.552,890 of 24/9/1941:29/4/1943. A latch needle for the production of ladder-resistant fabric has, in addition to the main hook, a small subsidiary hook formed at the exterior front of the main hook at a location below the top of the main hook (so that the two hooks are adapted to draw loops of different lengths), which subsidiary hook is arranged to be closed or shielded by the latch in such manner as to permit a loop to be cast off without catching in it or in the main hook. C.

**Twisting and Winding Apparatus.** A. R. J. Ramsey (U.S. Textile Machine Co., Scranton, Pa., U.S.A.). B.P.552,901 of 24/10/1941:29/4/1943. Apparatus for twisting and winding yarn comprises a twister spindle rotated at constant

speed and on which a supply spool is mounted, a take-up roller on which the twisted yarn is wound, means to drive the roller at constant yarn-surface speed, a yarn guide interposed between the spindle and the take-up roller in line with the spindle axis, and automatic means to increase the axial spacing of the yarn guide from the spindle and spool in predetermined positive and direct relation to the increase in diameter of the yarn mass on the take-up roller. This arrangement off-sets the tendency of the balloon to decrease in area as the spool decreases in effective diameter. Cam mechanism may be provided by which the relative rates of movement of the yarn guide and a movable support for the take-up roller may be closely and accurately controlled. C.

**Camouflage Fabric: Knitting.** J. Stephenson & Co. (London) Ltd. and H. L. Leask. B.P.552,915 of 5/12/1941:29/4/1943. A fabric suitable for camouflage, insulation, decoration or sound absorption is made by knitting together strips or slivers of steel wool in a frame having a row of reciprocatory latch needles, a sliding member with cam groove adapted to co-operate with the rollers to actuate the needles, and means for guiding the material to be knitted into the path of the needles. The latch needles have an enlarged end in the form of a cobra head and a tapering latch. C.

**Thread Tensioning Device.** British Nylon Spinners Ltd., G. Loasby and L. Pownall. B.P.535,025 of 28/10/1941:5/5/1943. A thread tensioning device comprises a small bobbin, preferably flanged at each end, furnished with a number of projecting portions which are of such shape and at such distances apart as either to provide slots or to form pegs, the thread being passed through one or more of the slots or round one or more of the pegs in its passage over or round the bobbin. The bobbin and projections or pegs may be made of metal, porcelain, Bakelite or similar material, the surface being of such a degree of smoothness as to provide the desired coefficient of friction between the thread and the surface of the bobbin. The projecting portions or pegs may be an integral part of the whole tensioning device or may constitute or be mounted upon a collar or collars which are capable of being rotatable with respect to the barrel of the bobbin and of being fixed in any desired position thereon. The slots may be disposed radially or otherwise with respect to the barrel of the bobbin. The device may be used in winding threads of rayon, silk, nylon or any other type of continuous thread where it is desired to submit the thread to tension during winding. C.

**Winding Machine Electromagnetic Doffing Motion.** Universal Winding Co. U.S.P.2,302,715. On completion of winding, an electric circuit is closed, and an electromagnet actuates a drive shaft to operate the controller of doffing and donning mechanism. C.

**Knitting Machine Yarn Guide Tube: Production.** Hosiery Patents Inc. U.S.P.2,302,727. A blank of wear-resisting material is united to one end of a tubular member and bored to provide an apertured yarn guide tip. C.

**Full-fashioned Stocking Toe Gusset.** L. H. Mendelsohn. U.S.P.2,302,788. A full-fashioned stocking has a conventional diamond-point gusset or panel in the toe, but a row of openings is provided around the sides and tapered end of the panel. C.

**Rayon Yarn Rubbing and Conditioning Device.** American Enka Corporation. U.S.P.2,302,814, 2,303,353 and 2,303,354. (1) In winding from a source to a package, rayon yarn is passed between a number of corrugated surfaces the opposing points of contact being about 1 mm. apart. (2) A device for damping vibrations is applied to the yarn between the source and the above rubbing surfaces. (3) The above devices are used in winding rayon after passing it through a conditioning zone. C.

**Full-fashioned Stocking: Knitting on a Footer Machine.** J. L. Sutcliffe. U.S.P.2,302,815. A full-fashioned stocking is knitted on a "footer" with a 10-inch head by knitting the leg blank to a point (X) where the circumference is less than 10 inches, narrowing to conform with the shape of the leg, knitting the ankle and foot portions, sewing a V-shaped section from the welt down to the point (X) and completing the stocking. C.

**Automatic Loom Weft Feeler Mechanism.** Textile Equipment Inc. U.S.P. 2,302,862. A feeler slide, mounted at one end in a housing, has a pivoted tip the foot part of which engages the weft, whilst the heel is pivoted to a pull rod

that enters the housing. The end of the slide in the housing is bent through a right angle and this part, and the pull rod, are held in operative positions by means of coiled springs anchored to the housing. C.

**Rayon Bobbin Stripping Apparatus.** American Enka Corporation. U.S.P. 2,303,048. The claim is for a machine that automatically feeds rayon bobbins to a device that grips both ends and draws a cutter along them to sever the coils of yarn. C.

**Knitted Rayon Crêpe Fabric.** Cohn-Hall-Marx Co. U.S.P. 2,303,239. The claim is for a closely knit fabric having interlocked stitches of singles regenerated cellulose yarn with twists per inch about 40. C.

**Loom Take-up and Let-off Release Mechanism.** Draper Corporation. U.S.P. 2,303,297. The claim is for mechanism linking a single manually-operable lever with the take-up and let-off motions whereby these are simultaneously put out of action by depressing the lever. C.

**Weft Package Winding Apparatus.** Pepperell Manufacturing Co. U.S.P. 2,303,298. The core of the package has a head of pre-determined diameter ( $d$ ), rotated by a spindleless driver, a shank which is solid for most of its length and less than  $\frac{1}{2}d$  thick, and a tip supported by a cup at the end opposite to the head which forms a shoulder thicker than the shank to minimize the sloughing off of the yarn. C.

**Flat Knitting Machine Welt-turning and Take-up Attachment.** Alfred Hoffmann, Inc. U.S.P. 2,303,412. The claim is for means whereby the draw-off member is automatically moved in a direction opposite to that of the draw-off movement at the same time as the welt bar moves towards the needles. C.

**Sueded Asbestos Fabric.** United States Rubber Co. U.S.P. 2,303,534. At least one face of the fabric has a soft suede surface in which fibres are separated slightly from the warp and weft threads as floats with both ends rooted in their respective threads. C.

**Warp Knitting Machine.** Rudolph Bassist (New York). U.S.P. 2,303,903. The claim is for adjustable mechanism, independent of the needles, but operated in a variable timed relation to the operation of the needles, for continuously rotating the warp beam in the yarn-feeding direction. C.

**Loom Box Motion Yielding Drive.** Crompton & Knowles Loom Works. U.S.P. 2,304,162. The driving shaft for the shuttle box mechanism has a slotted collar between which and the bearing for the shaft is a loosely mounted, slotted gear. A key is used to connect the slot in the gear with that in the collar, and a spring is interposed between the gear and the key so that the key is yieldable in a radial direction away from the axis of the shaft when the collar turns relatively to the gear. C.

**Automatic Loom Electric Weft Detector.** Crompton & Knowles Loom Works. U.S.P. 2,304,181. A side-slipping weft detector pivoted to a carrier indicates weft exhaustion by its lateral motion, whereupon the carrier returns towards the surface under detection and means come into play to prevent the detector from further lateral movement. C.

**Loom Harness Cord.** Crompton & Knowles Loom Works. U.S.P. 2,304,194. The illustration shows a terminal with a constriction that grips the wire strands of the cable. Beyond this point, the hollow space opens out to rather more than the diameter of the cable towards the eye of the terminal, and the wire strands take up the larger room so provided. C.

**Electro-magnetic Warp Beam Holding Device.** Crompton & Knowles Loom Works. U.S.P. 2,304,218. In a let-off mechanism for a loom on which the warp beam tends to turn backwards during inactive periods, an electromagnet is used to hold the beam. It is energized on stoppage of the loom. C.

**Yarn Sizing and Winding Device.** E. I. Du Pont de Nemours & Co. U.S.P. 2,304,564. Yarn during winding is brought into contact with size (made up in a vapourizable medium) and while still wet is wound into a package. A traversing device is used to lay the yarn from end to end of the package, but at the ends of the traverse a random motion on the yarn is superimposed so that the ends of the package are randomly built. C.

**Circular Knitting Machine Plating Device.** Interwoven Stocking Co. U.S.P. 2,304,916. In a circular knitting machine fitted for knitting in either direction of rotation of the cylinder, two thread guides are used to feed yarn to the needles in plating relation, one guide remaining in the same position in both directions of rotation and the other being freely movable in both directions by the pull of the yarn so that the yarns are presented in proper relation for uniform plating in each direction of rotation. C.

**Jacquard Machine.** T. E. Holland and C. De Buck (Paterson, N.J.). U.S.P. 2,304,920. The vertical backing plate and the rectangular cylinder are so disposed that cards at the front of the cylinder and the backing plate, respectively, will assume co-planar arrangement, and the cards are pressed home by means of a pair of spring arms mounted on the frame. C.

**Bobbin.** Carbide and Carbon Chemicals Corporation. U.S.P. 2,304,922. The bobbin comprises (1) a cylindrical barrel, with internally tapered ends, (2) heads with flat surfaces that make line contact with the tapered ends of (1), (3) a hollow tie member within the barrel, forming a bearing and clamping the heads and the barrel together, and (4) discs at each end that frictionally fit in the barrel and act as centering pieces. C.

**Flat-knit Fabric Selvedge: Construction.** Berkshire Knitting Mills (Wyomissing, Pa.). U.S.P. 2,305,218. A flat-knit article has a reinforced section bounded by a single-yarn area that can be taken into a seam and includes a run-stop loop formation. C.

**Paper Pattern Indicated Loom Dobby.** Crompton & Knowles Loom Works. U.S.P. 2,305,328, 2,305,329, 2,305,330, 2,305,331, 2,305,333, 2,305,334. (1) A loom dobbie is fitted with a lifter knife reciprocating along a given path and having a heald lifter hook normally at one side of the path and a positioner that can be moved to set the hook in the path, a perforated sheet pattern located with the positioner between it and the hook, mechanism to feed the sheet pattern progressively, and means to transmit a force through the perforations to the positioner to cause this to move the hook into the operative path. (2) The claim is for a dobbie cylinder capable of taking sheet patterns of different widths. (3) Pattern reading means for the endless sheet pattern. (4) The reverse of (1); the force transmitted through the perforations moves the hook out of the path. (5) A lifter wire is used to move the heald lifting hook into the path of the lifter knife, the hook and wire exerting a given downward force, and a member is provided to raise the pattern paper against the wire so as to take out slackness. (6) A double index dobbie has two lifter knives working alternately, each requiring two successive picks for complete reciprocation, and the sheet pattern is moved at two-pick intervals to the pattern reading position. C.

**Hydraulic Warp Let-off Mechanism.** Crompton & Knowles Loom Works. U.S.P. 2,305,420, 2,305,421 and 2,305,422. Hydraulic means are used to brake the warp beam; when the tension in the warp reaches a certain level means operate to reduce the fluid pressure and allow the beam to rotate. C.

**Shuttle Dwell Device.** N. Lamarche (Lowell, Mass.). U.S.P. 2,305,534. The claim is for a "dwell" that consists of a long brake shoe to engage the shuttle, a side spring device for pressing the shoe inwards, and means for limiting the movement of the ends of the shoe. C.

**Loom Temple Roller Sleeve.** W. McCaskie (New Bedford, Mass.). U.S.P. 2,305,671. A sleeve for the cylindrical core of a temple is formed of cylindrically interlaced strands with raised spiral ribs. C.

**Widened Knitted Fabric: Production.** Phoenix Hosiery Co. U.S.P. 2,305,885. The claim is for knitted fabric that has widened courses with added end loops doubled with adjacent loops in these courses. C.

**Tubular Fabric Slitting and Rolling Machine.** W. H. Shields (Grand Rapids, Mich.). U.S.P. 2,305,997. The machine comprises a pair of driving rollers between which flattened tubular fabric passes, means ahead of these rollers for slitting the fabric down one edge, an inverted V-shaped flattening device with its apex next to the rollers and inside the tube opposite the slit edge, and means to vary the angle of inclination of the flattening device with respect to the axes of the rollers. C.

**Circular Knitting Machine Yarn Feeding Device.** W. B. Davis & Son, Inc. U.S.P.2,306,207. A finger mounted near the needles feeds yarn to selected needles from a supply spool under pre-determined, uniform tension. When the finger is not feeding the needles, a binder carried by the top plate comes into play and engages the yarn. C.

**Elastic Rib Topped Hosiery.** W. B. Davis & Son, Inc. U.S.P.2,306,246. The claim is for a garment in which an elastic thread is knitted into corresponding spaced wales in each of a number of equally spaced courses of plain fabric, and the normal length of the elastic thread floated between the spaced wales is less than that of the corresponding portion of fabric so that the fabric draws up into parallel, longitudinal, rib-like ridges. The illustration shows the top of a sock. C.

**Axminster Loom.** Crompton & Knowles Loom Works. U.S.P.2,306,279, 2,306,280, 2,306,303, and 2,306,304. (1) The claim is for the association of guide plates and reed dents to define guide aisles for the tuft yarns. (2) and (3) Electric stopping mechanism is operated by the tube frame. (4) Pile tuft cutting mechanism is claimed. C.

**Automatic Shuttle-changing Loom.** Crompton & Knowles Loom Works. U.S.P.2,306,286. A weft replenishing mechanism is designed to transfer a reserve bobbin into the shuttle in the upper box during the forward movement of the sley that occurs in its next reciprocation after the detector has indicated weft exhaustion during the preceding detecting interval, and means are provided in the path of the upper shuttle to engage it subsequent to the detecting interval and prior to the end of the box-shifting period and co-operate with the box-shifting mechanism to adjust the shuttle if it has been displaced too far outwardly for proper bobbin transfer at the end of the detecting interval. C.

**Loom Thread Cutting Mechanism.** Crompton & Knowles Loom Works. U.S.P.2,306,287. The device consists of a cutter mounted on a shuttle behind the weft and another, co-operating cutter mounted in front of the thread; one cutter consists of a series of spaced cutting edges. C.

**Synthetic Linear Polymer Yarn: Sizing, Twisting and Winding.** E. I. Du Pont de Nemours & Co. U.S.P.2,306,401. The claim is for a process whereby synthetic linear polymer yarn having less than 5 t.p.i. is continuously sized, dried at a temperature below 50° C. to a regain of not more than 12 per cent., and then given a twist of more than 15 turns per inch. C.

**Pile Fabrics: Construction.** Collins and Aikman Corporation. U.S.P. 2,306,390 and 2,306,405. (1) A cut pile fabric has a backing fabric composed of a set of tight warps, a set of oppositely woven slack warps, and a set of weft threads alternately passing over and under all the tight warps and all the slack warps so that they lie in two different planes, and pile tufts that pass successively under a weft in the lower plane, over a weft in the upper plane and over the next adjacent weft in the upper plane, whereby at least one of the legs of the tufts is inclined from the vertical. (2) The above tufts with inclined legs are interspersed among erect pile tufts to produce a pattern in pile fabric. C.

**Continuous-feed Cross-winding Frame.** W. Reiners (Germany; vested in U.S. Alien Property Custodian). U.S.P.2,306,871. A cyclically movable supply magazine carries bobbins through loading, reserve and running positions in turn. Means are provided for holding yarn ends side by side from neighbouring supports, and a knotter is placed in position to engage the free span of yarn ends of two adjacent supports. C.

**Warp Knitting Machine Patterning Mechanism.** P. Schönfeld and K. Barthel (Chemnitz; vested in the U.S. Alien Property Custodian). U.S.P.2,306,906. The claim is for means whereby pattern mechanism actuates a slide for moving the lapping plate of a warp knitting machine. C.

**Elastic Stocking Top: Construction.** Hemphill Co. U.S.P.2,306,914. A selvedge knitted stocking top has a first course of elastic thread, a second course of relatively inelastic thread, a third course of elastic thread knitted only at alternate wales and floating across the backs of the other wales, a fourth course of inelastic thread alternately knitted and tucked, a number of consecutive courses like the third, and then a course of inelastic thread knitted at all the wales. C.

**Knitting Machine Pattern Chain Button.** Wildman Manufacturing Co. U.S.P. 2,306,948. A button secured to the pattern chain includes cam and cap portions having grooves in their meeting faces to receive a notched cross link, and a projection that enters the notch to prevent sideways displacement of the button. C.

**Tubular Spool.** Aluminum Company of America. U.S.P. 2,307,354. The tubular body of a spool is formed with rib-like extensions that pass through the end flanges and are headed over to secure the flanges to the body. C.

**Two-way Elastic Hosiery Fabric.** Vanity Fair Silk Mills. U.S.P. 2,307,607/8. (1) Single courses of plain loops of inelastic yarn alternate with single courses of fine elastic yarn having loops at spaced wales laterally transferred and doubled with loops of other wales so that spreading occurs. (2) This type of two-way elastic fabric is incorporated as a strain-absorbing zone between the leg and the garter-attaching portions of a stocking. C.

**Thread Guide.** American Bemberg Corporation. U.S.P. 2,307,664. A body of material (a spherical ball) that bears against a winding core has a notch from the upper edge ending in a convex groove that continues around the lower half as a groove large enough to receive the thread completely. C.

**Automatic Wrap Stripe Knitting Machine.** Hemphill Co. U.S.P. 2,307,969. Means for knitting rib fabric and then automatically changing to plain are combined with eccentrically disposed wrapping mechanism that comes into play during the plain knitting, but is out of the way during the rib knitting and transfer from rib to plain. C.

**Elastic Knitted Body Fabric: Construction.** Hemphill Co. U.S.P. 2,308,121. A plain knitted body fabric has adjacent courses knitted from inelastic yarn formed into loops at every wale, and an elastic yarn at these courses formed into individual loops knitted through plain loops in some wales and tucked with plain loops in intervening wales. The elastic yarn lies in the fabric under slight tension and the knitted and tucked loops of elastic yarn are staggered in adjacent courses. C.

**Fashioned Stocking: Knitting.** L. H. Mendelsohn (Paterson, N.J.). U.S.P. 2,308,196. A unitary fashioned stocking blank is knitted with heel, sole and toe portions, the toe is closed, and the outer edges are seamed to the lower end of a leg portion. C.

**Flat Knitting Machine Welt Drawing-off Mechanism.** W. Heinitz (Chemnitz; vested in U.S. Alien Property Custodian). U.S.P. 2,308,226. An apparatus for use on flat frames with several divisions for drawing-off welts comprises welt bars, a shaft extending over the whole length of the frame carrying chain guide rollers at both ends of each division, a second parallel shaft carrying fabric-holding rollers driven through sprocket wheels by chains that pass around the above guide rollers, and take-up hooks at the chains, the arrangement being such that the welt bars are gripped by the take-up hooks, moved towards the fabric rollers and there transferred to the holding devices. C.

**Reinforced Warp-knit Stocking.** Richard Richter (Germany; vested in the U.S. Alien Property Custodian). U.S.P. 2,308,231. A stocking cut from warp fabric comprises a single piece of fabric that forms a complete foot portion and a separate reinforcing piece united without seams at each side of the instep and extending over the toe, half of the sole, a heel portion and a high heel portion of the stocking. C.

**Flat Knitting Machine Welt Drawing-off Mechanism.** Oscar Worm (Chemnitz; vested in the U.S. Alien Property Custodian). U.S.P. 2,308,237. A fabric shaft carries rollers connected with straps and hooks for drawing off welt bars, and independent endless chains carrying hooks connect all the welt bars and return the first-mentioned hooks into the position for receiving the welt bars. C.

**Leather Flesh-split Loom Picker.** H. J. Shivell (Kingsport, Tenn.). U.S.P. 2,308,393. The claims are for pickers made out of the flesh split of leather (after removing the grain), "pre-stretched to exhaust a substantial portion of its natural stretch." C.

## 4—CHEMICAL AND FINISHING PROCESSES

## (B)—BOILING, SCOURING, DEGUMMING AND WASHING

**Rayon Hosiery: Development.** *Rayon Textile Monthly*, 1943, **24**, 142-144. The author discusses the development of rayon hosiery and problems encountered in sizing and scouring operations, defects due to faulty scouring, the causes and prevention of the appearance of holes and "pops" during scouring and dyeing, and the use of corrective finishes and cationic dullers. C.

## (G)—BLEACHING

**Cellulose: Oxidation and Bleaching.** O. H. Weber and E. Husemann. *J. pr. Chem.*, 1942, [ii], **161**, 20-29 (through *Brit. Chem. Physiol. Abstr.*, 1943, A II, 58). The oxidation of cellulose has been investigated by finding the carboxyl content by the reversible methylene-blue method, and the viscosity in cuprammonium, and calculation of the degree of polymerisation by Staudinger's method. Under the action of atmospheric oxygen on soda-cellulose, a splitting of the cellulose chain takes place with formation of one carboxyl group for each broken linking. The effect of chlorine on cellulose in the bleaching process has been investigated for solutions of different pH. From comparison of degrees of polymerisation and monose numbers it is clear that in acid solutions (pH 0.9) there is considerable breakdown of the molecule. In addition to monocarboxylic acids, molecules containing no carboxyl groups are formed. At pH 5.5, the breakdown does not proceed so far and is oxidative. On the alkaline side autoxidation occurs. C.

## (I)—DYEING

**Chrome Azo Dyes: Constitution.** K. L. Dorman. *Amer. Dyes. Rept.*, 1943, **32**, 47-66. The nature, properties and uses of chrome azo dyes are discussed and tables are given showing chemical families capable of mordanting chrome azo dye types, chrome azo dye intermediates, the chemical constitution of chrome azo dyes classified according to colour, and the molecular weights and empirical formulae of chrome azo dyes. C.

**Indigoid Dyes: Structure.** N. Dokunichin and E. Levin. *Compt. rend. Acad. Sci., U.R.S.S.*, 1942, **35**, 110-113 (through *Brit. Chem. Physiol. Abstr.*, 1943, A I, 49). The absorption curves of the sulphuric esters of indigo and thioindigo leuco bases have been investigated. The curves for these substances are very similar, whereas those of the corresponding dyes differ considerably. This is probably due to the existence in the indigo molecule of a weakened internal H bond, which gives rise to the intense colour of the compound. C.

**Nylon: Dyeing.** C. M. Whittaker. *J. Soc. Dyers and Col.*, 1943, **59**, 69-74. The suitability of cellulose acetate rayon dyes for use on nylon is briefly discussed and an account is given of laboratory studies of the dyeing of nylon with direct cotton, azoic and vat dyes. Acetic acid was found to increase the affinity of many direct cotton dyes but in spite of this increase exhaustion remained poor in many cases. In attempts to increase the degree of exhaustion success was obtained by four different methods. (1) Pretreatment with, or addition to the dyebath of,  $\beta$ -naphthol or a number of other unrelated organic compounds. (2) Pretreatment with water or steam under pressure. (3) Pretreatment with, or addition to the dyebath of certain metallic salts. (4) Pretreatment with, or addition to the dyebath of monohydroxy alcohols or mono- or di-alkyl esters of dihydroxy alcohols. Details are given of the development of these methods and of the results obtained with them with various dyes. The use of (1) dry heat and (2) certain substances containing sulphonic groups for inhibiting the dyeing of nylon with direct cotton dyes is discussed and the possibility of obtaining varied effects on mixture fabrics containing nylon by the use of one dyebath is pointed out. Methods of applying azoic and vat dyes to nylon are described. C.

**Aminoacridines: Colour and Dyeing Properties.** A. Albert and C. L. Bird. *J. Soc. Dyers and Col.*, 1943, **59**, 74-76. 1-, 2-, 3- and 4-Aminoacridine are all yellow to red, whereas acridine has little visible colour. On forming the hydrochlorides they undergo marked bathochromy. Acridine is a very weak base and 3- and 4-aminoacridines are so little stronger than acridine that the assumption that they are normal amino-derivatives of acridine is justified. 1-Aminoacridine is weaker than acridine and, for this and other reasons, is considered to show a large *ortho* effect which is probably due to chelation of a

hydrogen atom by two nitrogen atoms. 2- and 5-Aminoacridines are far stronger bases than their isomerides, and this can best be explained on the grounds of extra-ionic resonance. The five monoaminoacridines, in the form of analytically pure bases, have been converted to the monohydrochlorides in solution and dyed in 1 per cent. shades, on mercerised cotton mordanted with 3 per cent. tannic acid and tartar emetic, and the dyeings have been tested for fastness to light, water, washing, alkali and acid. Supplementary information has also been obtained from dyeings on wool, silk, and viscose rayon mordanted as above, and cotton mordanted with Katanol ON. Results are tabulated and discussed. In general, the shades on viscose rayon were the same as those on mercerised cotton, only somewhat more intense, and the dyeings obtained with Katanol ON resembled those obtained with the tannic acid mordant. The dyeings on silk resembled more closely those on cotton than did the dyeings on wool. The colours obtained on wool suggest that no salt formation occurs between the dye and the acidic groups of the wool when the dissociation constant of the dye is  $10^{-10}$  or less, and that under these conditions the affinity is slight. In the case of 3- and 4-aminoacridines the colours are intermediate between those of the salt and the base, and in the case of the 2- and 5-isomerides the shade approaches that of the salt. The colours of the dyeings on vegetable fibres are, with the exception of 1-aminoacridine, consistent with the view that a salt is formed between the dye and the mordant. As regards fastness to light, 1-, 2-, 3- and 4-aminoacridines are as fugitive as commercial acridine dyes. 5-Aminoacridine is more fast to light. In fastness to wet treatments, the aminoacridines, with the exception of 5-aminoacridine, were distinctly inferior to Acridine Yellow GR, Coriphosphine O and Acridine Orange. Dyeings of 2-, 3- and 5-aminoacridines, but not dyeings of 1- and 4-aminoacridines, fluoresced in ultra-violet light. C.

**Dyes: Analysis for Alkaline Earth Metals.** See Section 9

**Wool: Mordanting with Salts of Aluminum.** L. W. Dale. *Iowa State Coll. J. Sci.*, 1942, 17, 49-50. Various salts of aluminum as wool mordants were compared under different conditions of temperature and pH to secure quantitative information on the composition, mechanical behaviour and resistance of the mordanted wool to degradation by acid and alkali. The results show that wool and aluminum do not combine as a compound. W.

**Alizarin: Dyeing on Wool.** R. Haller. *Kolloid Z.*, 1942, 100, 121-126 (through *Brit. Chem. Abs.*, 1943, B II, 116). The behaviour of wool dyed with Alizarin S before and after mordanting is discussed. Before mordanting the wool retains the characteristics of an acid dyeing, whereas after mordanting the colour is due to a fibre-lake adsorption complex. W.

(K)—FINISHING

**Rayon Yarns and Fabrics: Steaming.** *Silk and Rayon*, 1943, 17, 226-227, 260. A discussion of the purposes of and methods used in the steaming of crêpe yarns, the decatizing of rayon fabrics, and steaming operations in crêpe finishing and pre-crêpeing or embossing processes and in the finishing of pile fabrics. C.

**Plasticizers: Application.** J. M. De Bell. *Modern Plastics*, 1943, 20, No. 5, 93-94. The plasticizer supply in 1942 is briefly reviewed and a trend towards extension of good plasticizers with less effective ones and towards utilization of newer varieties based on vegetable oils is noted. New products and their uses are briefly discussed and lists are given of the plasticizers generally used for cellulose acetate, cellulose triacetate, cellulose acetate butyrate, cellulose nitrate, vinyl chloride, rubber, vinyl chloride acetate, vinyl butyral, vinyl acetate, ethyl cellulose, regenerated cellulose, protein materials, and chlorinated rubber. C.

(L)—PROOFING

**Rubber Substitutes: Sources and Properties.** N. G. Hiscox. *India-Rubber J.*, 1943, 104, 240-2, 265-6, 295-7, 313-5. A general review is given of "Rubber in relation to the War effort," with particular reference to the present emergency and the use of "reclaim," factice, and synthetic products. C.

**Service Fabrics: Mildew-proofing.** E. Croen. *Cotton (U.S.)*, 1943, 107, No. 2, 104-107, 118. Methods of mildew-proofing textile fabrics are reviewed with special reference to methods of meeting various American army specifications. Water- and mildew-proofing combinations are also discussed.

Methods of testing mildew-proofed fabrics are described and the testing of mildew-proofing agents for toxicity to men is briefly discussed. C.

**Textile Materials: Mildew-proofing.** *Silk J. Rayon World*, 1943, 19, No. 225, 16-20; No. 226, 28-31. The growth of micro-organisms on textile materials is discussed and a survey is made of recent investigations of the growth of mildew on wool and on cellulose fibres, tests of the efficiency of various mildew-proofing agents, and modern mildew-proofing processes, particularly processes for the treatment of sandbags, canvas, tent-cloths, and similar materials. C.

**Silverfish: Protection of Cotton and Rayon Goods.** C. L. Mantell and E. May. *Modern Plastics*, 1943, 20, No. 6, 51-53, 120. The habits of the silverfish and firebrat are briefly described and an account is given of observations of damage to cotton, rayon and mixture fabrics. Photographs of samples of fabrics exposed to the insects for various periods with and without other sources of food are shown and discussed. The results of the tests indicate that silverfish will not eat unfinished goods or goods from which the finish has been removed. They are particularly attracted to starch finishes and will feed where casein is present. Urea-formaldehyde resin finishes give protection against silverfish damage. Although it is commonly said that silverfish will eat protein, a cotton fabric treated with Cooper's gelatin was not attacked. C.

#### PATENTS

**Wool and Hair: Setting or Removing Permanent Stress from —.** N. H. Chamberlain. B.P.552,285/6 of 31/3/1943. Keratin is permanently set by treating with an acid reducing agent, e.g. acid bisulphite with or without alcohol (*see also* B.P.453,700; *this J.*, 1936, A 626), drying to remove free water films, deforming and setting with an alkaline solution at 40-50° C. and pH 10.5-11.5. In permanent waving, after treatment with the reducing agent and before drying, the hair is washed to reduce swelling. Increased and final setting may be obtained by treatment with an oxidising agent, e.g. hydrogen peroxide. The alkaline solution contains 10-40 per cent. mono-, di- or tri-ethanolamine. W.

**Aircraft Fabric Tautening Dope.** J. S. Gourlay, H. A. D. Perry and Imperial Chemical Industries Ltd. B.P.552,427 of 3/9/1941:7/4/1943. The tautening of aircraft fabric is effected by treatment with compositions containing nitrocellulose and ethylcellulose in a weight ratio lying between 2:1 and 1:2. Such compositions, compared with nitrocellulose dopes, have improved flexibility and elasticity, particularly at temperatures below 0° C., and a slower rate of burning, but their tautening properties are not substantially different from those of nitrocellulose dopes. C.

**Water- and Rot-proofing Composition: Preparation.** Geigy Colour Co. Ltd. (Manchester) and H. T. Ferguson. B.P.552,447 of 1/10/1941:8/4/1943. A water- and rot-proofing composition is prepared by dispersing an oily substance, such as a fat or wax, having water-repellent properties, in an aqueous solution of a soluble salt of an organic compound, preferably sodium naphthenate, then adding to the dispersion a copper or zinc salt, which will react to form an insoluble naphthenate or other salt having rot-proofing properties, and then subjecting the dispersion to emulsification. Preferably, there is finally added to the emulsion a soluble aluminium salt, e.g. aluminium acetate. Glue or gelatin may be added to the aqueous salt solution before dispersing the oily substance in it. C.

**Colour Striped Fabrics: Bleaching.** Mathieson Alkali Works (New York). B.P.552,567 of 18/9/1941:14/4/1943 (Conv. 27/9/1940). Materials containing pre-dyed threads (e.g. cotton shirtings) are impregnated with a hot aqueous alkaline solution containing a relatively small proportion of sodium silicate, steamed and then thoroughly washed, impregnated with a solution of a bleaching agent, preferably sodium chlorite, and steamed in a closed vessel for a relatively short time, e.g. 30 min. It is advantageous to include a small proportion of a detergent in the pre-treatment solution and the bleaching solution. By treatment in the manner described impurities can be removed without causing the dyes to run. C.

**Cellulose Derivative Cementing Composition.** Celluloid Corporation (Newark, New Jersey, U.S.A.). B.P.552,648 of 16/9/1941:19/4/1943 (Conv. 9/11/1940). A cement for joining thin films or foils having a basis of a cellulose ester or ether to fabrics, leather or other materials consists of 10 parts by weight of nitro-

cellulose and 6-10 parts of a substance which is a plasticiser for both nitrocellulose and the cellulose ester or ether of the sheet material dissolved in 60-100 parts by weight of a solvent mixture consisting of 25-50 per cent. low-boiling solvents and 75-50 per cent. of medium-boiling solvents. Suitable plasticisers include dimethyl phthalate, dibutyl tartrate, methyl phthalyl ethyl glycollate, ethyl phthalyl ethyl glycollate, and a mixture of ortho- and para-toluene ethyl sulphonamides. An excellent solvent mixture comprises acetone and the mono-methyl ether of ethylene glycol. C.

**Chlorite Bleach: Application.** Mathieson Alkali Works (New York). B.P. 552,711 of 17/9/1941:21/4/1943 (Conv. 18/9/1940). A process for the bleaching of cotton, regenerated cellulose or cellulose derivative materials, and mixtures of these, comprises impregnating the material with an aqueous solution of sodium chlorite and steaming the resultant wet mass. The sodium chlorite solution may be an acid or alkaline solution, according to the nature of the impurities to be removed. Generally, an acid solution is preferred, but in some cases it is advantageous to steam first in the presence of an alkaline sodium chlorite solution and then in the presence of an acid sodium chlorite solution. The use of a detergent in both alkali and acid steaming steps is desirable. It is claimed that this chlorite-steaming method results in good bleaching and good and uniform absorbency, and in comparison with other methods imparts an improved bottom for dyeing so that deeper shades are obtained with less dye. C.

**Sulphur Dyes: Application.** W. Watkins. B.P.552,735 of 16/8/1941:22/4/1943. Textile materials are dyed with sulphur dyes or the sulphuretted (or sulphide) vat dyes known as Hydron blues, by being first impregnated with a dye liquor of sufficient strength to give the desired shade without subsequent loss, and then, after impregnation, the goods are submitted to a fixing treatment to render the dyes insoluble, before they are subjected to any washing treatment. Preferably, the goods are dried after being impregnated with the dye liquor and before being submitted to the fixing treatment. The fixing treatment may comprise treatment in an acid bath or in a bath containing a metallic salt, e.g. magnesium sulphate, and, if necessary, an oxidising agent such as sodium bichromate. The method described is particularly suited to the continuous process of dyeing, and reduces loss of dye and effluent troubles. C.

**Wool and Spun Rayon Mixture Fabrics: Treatment to Improve Handle.** Courtaulds Ltd., J. H. McKeown and W. Penn. B.P.552,907 of 27/10/1941:29/4/1943. A process for improving the handle and appearance of fabrics containing animal fibres and fibres of regenerated cellulose comprises treating the fabrics at or near the boiling point with a dilute weakly alkaline solution of a sulphonated fatty alcohol or sulphonated fatty acid or an ester of either of these compounds in presence of an ammonium salt and continuing the treatment until the treating solution has become weakly acid. This treatment is particularly applicable to woven or knitted mixtures of wool and viscose staple fibre which are intended for use in the preparation of garments for underwear. The treatment imparts to such materials a more woolly appearance and a warmer handle. C.

**Weather-proof Fire-proofed Textiles: Production.** I. A. Jordan and L. A. O'Neill. B.P.552,909 of 27/10/1941:29/4/1943. A weather-resistant fire-proofing effect is produced by immersing fibres or fabrics in an aqueous solution of iron acetate and subsequently drying, whereby a basic iron acetate is precipitated, and thereafter treating the material with an anti-smouldering agent such as chlorinated rubber, chlorinated paraffin wax, chlorinated naphthalene, chlorinated diphenyl, or a vinyl chloride resin. Pigments or paints may be applied in association with the chlorinated compounds. C.

**Printing Compositions.** A. H. Stevens (Interchemical Corporation, New York). B.P.552,919 of 23/4/1941:30/4/1943. The printing composition comprises a water-immiscible solution of an organic film-forming agent in a volatile organic solvent, which solution will produce a stable emulsion when mixed with water, the solution having at least microscopically dispersed in it a water-insoluble diazoamino or diazoimino compound that remains unaffected in the organic continuous phase when a neutral or alkaline aqueous fluid is emulsified into the organic solution, and which reacts to produce a dispersible diazo salt when strongly acid aqueous fluid is emulsified into the organic solution. In the preferred form, the emulsion is formed with an aqueous solution

of a component capable of coupling with the regenerated diazo compound obtainable from the triazene on hydrolysis with acid, so that the final printing paste contains one dye component in solution in the aqueous inner phase of the emulsion, and the other dye component at least microscopically dispersed through the continuous phase of the emulsion. On printing, the coupling component in aqueous solution is absorbed into the fibres forming the yarns of the fabric, and the triazene is deposited on the outside of the fibres and yarns. When exposed to steam and acid fumes in an ager, the triazene is converted to the soluble diazo salt, which then couples with the coupling component. Sharp prints are obtained. In another form, the emulsion is treated before printing with an aqueous acid solution added directly or preferably in the form of another emulsion. This aqueous acid solution converts the triazene to the soluble diazo salt which transfers from the organic into the aqueous phase; the resultant printing paste is a standard emulsion paste, and may be printed on grounds prepared by impregnation with the coupling component. C.

**Block Printing Device.** B. Wykes and D. Evans & Co. Ltd. (Crayford). B.P.552,920 of 24/7/1941:30/4/1943. Details are given of a method of block printing in which the printing block, charged between impressions, makes successive impressions at different accurately located printing positions over the surface of the material by impact with the material, such impact being produced by the printing block falling each time through the same height by gravity on to the material while mechanically guided in its falling movements. In the preferred method, the printing block falls down a vertical slide guide, which is accurately located with respect to the surface of the material to be printed, the guide and the block (raised from the material) being moved between impressions to the next printing position and again accurately located for printing. The charging of the block between impressions may be effected by allowing the block to fall while mechanically guided on to a block-charging surface. C.

**Tentering Machine.** W. Whiteley & Sons, Ltd. (Huddersfield) and H. Charlesworth. B.P.553,059 of 1/9/1941:6/5/1943. A tentering machine of the type in which fabric is traversed through a series of superposed compartments which are heated by steam pipes and in which air drawn by a fan through one compartment is passed upwardly into the next compartment is characterised in that in each fan duct connecting a pair of compartments there is provided an auxiliary heater by means of which air drawn from one compartment can be raised in temperature as desired before passing into the next higher compartment. C.

**Mothproofing.** H. I. Jones. U.S.P.2,291,473 of 28/7/1942 (through *Chem. Abs.*, 1943, 37, 782). Use is made of a stable aqueous solution containing magnesium fluosilicate and magnesium benzenesulphonate. W.

**Isocyanates: Application in Water-repellent Finishes.** Heberlein Patent Corporation, New York. U.S.P.2,303,363/4. (1) Textiles are rendered water-repellent by treatment with aliphatic, mixed aliphatic-aromatic and naphthenic isocyanates, containing an aliphatic radical of at least 10 C atoms. (2) Textiles are treated with the reaction products of poly-isocyanates and alcohols or carboxylic acids that contain at least 8 C atoms in a hydrocarbon radical. C.

**Yarn Drying Machine.** Fibres Associates, Inc. U.S.P.2,303,476. The illustration shows a hot-air chamber occupied by six tiers of horizontal, endless belts moving in alternate directions and in staggered relation so that the yarn drops from one belt to the next and takes a zig-zag course to the bottom. This chamber forms one of a number of adjacent sections of the drying machine; the yarn is conveyed from the bottom belt of one section to the top belt of the next section. C.

**Alkyd Resin, Starch and Gum Finishing Paste.** Röhm & Haas Co. U.S.P. 2,303,773. A finishing paste consists of starch, a soluble gum and a small amount of a dispersion of a non-hardening alkyd resin modified with 30-55 per cent. of a non-drying higher fatty acid glyceride. C.

**Cellulose Acetate Hosiery: Production.** E. I. Du Pont de Nemours & Co. U.S.P.2,303,934. The yarn is wetted with an aqueous composition before knitting and the stockings are pre-boarded before dyeing by exposing them while stretched on rigid forms to saturated steam at 10 lb. excess pressure. C.

**Carbamyl Derivative Softening Agent.** Arnold, Hoffman & Co., Inc. U.S.P. 2,304,113. The claim is for the use of the following compound as a textile softening agent:  $\text{OC}[\text{N}(\text{CH}_2 \cdot \text{CH}_2 \cdot \text{OH}) \cdot \text{CH}_2 \cdot \text{CH}_2 \text{NH}(\text{HX}) \cdot \text{CO} \cdot \text{C}_{17}\text{H}_{35}]_2$ . C.

**Vesicant Gas Protective Glove.** Secretary of War of the United States of America. U.S.P. 2,304,137. The glove has a wear-resisting outer material and a protective lining made of a light cotton fabric coated first with rubber and then with viscose-rubber latex. C.

**Phosphonic Acid Finishing Agents: Application.** E. I. Du Pont de Nemours & Co. U.S.P. 2,304,157. The surface characteristics of textiles are modified by impregnating them with a free methylenephosphonic acid of the formula  $\text{RR}' \cdot \text{CH}_2 \cdot \text{PO}(\text{OH})_2$  or  $\text{CH}_2[\text{NR} \cdot \text{CH}_2 \cdot \text{PO}(\text{OH})_2]_2$ , and heating at 90-200° C. The radical R has a chain of at least 10 C atoms and is linked to N by a CO or CS group; R' is H or lower alkyl. Specification 2304156 covers the preparation of stearamidomethylphosphonic acid. C.

**Washable Finishes: Production.** Röhm & Haas Co. U.S.P. 2,304,252. The wash-fastness of textiles finished with soluble cellulose ethers, polyvinyl alcohol or starch pastes is improved by impregnation and heating with a quaternary ammonium salt of the formula  $\text{R} \cdot \text{O} \cdot \text{CH}_2 \cdot \text{NMe}_2 \text{R}' \text{X}$  where R is alkyl, R' is alkyl,  $\beta$ -methallyl, crotyl or benzyl, and X is a salt-forming anion. C.

**Stained Naphthol-dyed Fabrics: Clearing.** E. I. Du Pont de Nemours & Co. U.S.P. 2,304,435. Marked-off naphthol dye stains are cleared by the application of an aqueous solution of an organic per-acid. C.

**Fabric Heat Treatment Apparatus.** E. I. Du Pont de Nemours & Co. U.S.P. 2,304,474. Apparatus for subjecting fabrics to a heating fluid (e.g. steam) consists of a series of vertical tubes with pulleys for conveying the fabric down one tube and up its neighbouring tube. A heated fluid distributor forms part of one tube; it consists of an inlet conduit, a baffle and a perforated pipe through which the fluid encounters the fabric. C.

**Thermo-regulated Yarn Package Drying Apparatus.** Smith, Drum & Co. U.S.P. 2,304,897. Means responsive to the internal temperature of the package are employed to regulate the supply of heat to the hot air that circulates in the apparatus. C.

**Coagulated Protein Yarn Delustring Agent: Application.** R. S. Holt (Bernardsville, N.J.) and V. C. E. Le Gloahec. U.S.P. 2,305,006. Yarn is delusted by causing an amino-protein colloid to be adsorbed on it in the form of minute, coagulated particles. C.

**Alkylolamine Guanidine Phosphate: Application in Fireproofing.** Sylvania Industrial Corporation. U.S.P. 2,305,035. Alkylolamine guanidine phosphates are claimed as fireproofing agents. C.

**Cloth Raising Cylinder.** Parks and Woolson Machine Co. U.S.P. 2,305,526. A finishing cylinder combines abrasive-covered lags, brushing lags covered with a mixture of bristles and fibrous whalebone, and axial plates in contact with the outside bristles. C.

**Cellulose Derivative Plastic Coating Composition.** R. Endres (Dessau, Germany; vested in U.S. Alien Property Custodian). U.S.P. 2,305,920. Cellulose ethers and esters are plasticized by means of a tetrahydrofurfuryl ester of an ether of a lower fatty acid wherein the radical joined to the alkyl radical through the ethereal O atom has at least 6 C atoms. C.

**Spindle for Yarn Package Dyeing Apparatus.** Smith, Drum & Co. U.S.P. 2,306,719. The spindle passes through holes in two spaced plates, loosely through one hole and welded to a bushing nut that is threaded in the other hole. A groove in the spindle permits fluid flow through both plates. C.

**Vinyl Polymer Yarns: Dyeing.** American Viscose Corporation. U.S.P. 2,306,880. The dye bath contains a suspension dyestuff and benzhydrol, phenylbenzylcarbinol, or fluorenyl alcohol. C.

**Cellulose Ether Printing Paste.** Hercules Powder Co. U.S.P. 2,307,097. An insoluble pigment is dispersed in an aqueous emulsion the continuous phase of which is a solution of a cellulose ether in a solvent that is immiscible with water. The total solids content of the paste is not more than about 20 per cent. and that of the emulsion part not more than about 10 per cent. C.

**Sulphonic Acids: Application in Printing.** General Aniline and Film Corporation. U.S.P.2,307,118. Cellulosic textiles are printed with organic sulphonic acids, dried, steamed and rinsed. C.

**Chromyl Chloride: Application in Water-repellent Finishes.** E. I. Du Pont de Nemours & Co. U.S.P.2,307,045. Polysaccharides are rendered water-repellent by exposing them to contact with chromyl chloride, removing them from the treating zone, and heating. An "orientated layer of interaction products" is formed on the surface of the polysaccharide. C.

**Wood Pulp: Continuous Bleaching.** A. M. Kennedy and S. J. Lloyd. U.S.P. 2,307,137. The claim is for a method of bleaching wood pulp in which the pulp rises through and against a stream of Na chloride+hypochlorite and is withdrawn at the surface, and the chemic is regenerated and maintained at a predetermined concentration of hypochlorite ion. C.

**Thermoplastic Stiffening Fabric.** Celanese Corporation of America. U.S.P. 2,307,179. The fabric has alternate warp ends of thermoplastic yarn (e.g. cellulose acetate rayon) and non-thermoplastic yarn (e.g. cotton), with a horsehair weft. C.

**Stenter Clips.** M. G. Hinnekins (Paterson, N.J.). U.S.P.2,307,221. The clips on a stentering chain have a fork-forming terminal and a lug-forming terminal, the lug of one clip being received by the fork of its neighbour. The clips are pivoted about vertical axes. C.

**Plastic-coated Soft Fabric: Finishing.** E. I. Du Pont de Nemours & Co. U.S.P.2,307,225. Textile fabric is given a thin coating of a thermoplastic composition containing a cellulose ether and a thin surface coat of a thermo-setting composition containing a urea-formaldehyde resin. A design coat comprising a pigment, plasticizer and ethylcellulose may be applied between the above two coats. The fabrics have the same suppleness as the uncoated material. C.

**Liquefied Starch: Production.** Buffalo Electro-Chemical Co., Inc. U.S.P. 2,307,684. Starch is liquefied by treating at a temperature above the gelling point with a peroxide in the presence of sufficient copper to catalyze the oxidation but not to effect rapid decomposition of the peroxide. C.

**Cloth Winding Apparatus.** Celanese Corporation of America. U.S.P. 2,307,880. One at least of the driven guide rollers that lead cloth to a take-up roller is fitted with means to cause one end to rotate eccentrically with respect to the other end. C.

**Animalized Cellulosic Rayon Dyeings.** General Aniline and Film Corporation. U.S.P.2,307,973. An animalizing agent and a mordant for basic dyes are added to the spinning solution of the cellulosic material and the coagulated filaments are dyed with acid dyes. The fastness of the dyeings to wet treatment is improved. C.

**Iceproof Glue.** Arabol Manufacturing Co. U.S.P.2,308,185. Equal portions of protein and starch are combined with a thiocyanate in the proportion of about 60 per cent. of the dry weight of the protein. When immersed in water the thiocyanate dissolves and the protein then forms a gel. C.

**Graphitic Rubberised Laminated Fabric.** Acheson Colloids Corporation. U.S.P.2,308,305. One surface of the fabric is coated with fine graphite in a harmless liquid, the other surface is then brought into contact with a body of mouldable rubber composition, and the structure is moulded in a press. C.

**Textile Lubricant.** Baker Castor Oil Co. U.S.P.2,308,355. The claim is for a synthetic oleic glyceride substantially free from hydroxyl groups and having substantially all double bonds connected to the 12th C atoms in the oleic radicals. C.

**Suede-like Flock-finished Fabric: Improving Resistance to Soiling.** Atlas Powder Co. U.S.P.2,308,429. Flock-finished fabric is given a coating of an enamel containing ethylcellulose, cellulose acetate or vinyl acetate-chloride co-polymeride, a solvent, and a filler consisting of a pigment and a slip agent. The proportion of filler in the enamel is at least 2.8 times that of the plastic and the amount of enamel deposited in the cloth is about  $\frac{1}{2}$ -3 oz. of solids per sq. yd., that is enough to saturate the flock partially without forming a con-

tinuous coating. The treated cloth is dried and raised (abraded), giving a soft, suede fabric that is resistant to wear and soiling. C.

**Constant-viscosity Resin Emulsion.** Resinous Products and Chemical Co. U.S.P. 2,308,474. A constant-viscosity emulsion of the oil-in-water type, suitable as a vehicle for pigments, comprises casein peptized in ammoniacal solution, an alkyd resin modified by a drying oil, and a soluble cellulose ether which is added at any stage during a process for reducing the viscosity to a constant value, namely, by heating the emulsion at below 100° C. C.

## 5—ANALYSIS, TESTING, GRADING AND DEFECTS

### (A)—FIBRES

**Cotton Standardization and Related Services: Development.** United States Department of Agriculture. *U.S. Dept. Agric., Agric. Marketing Administration Service and Regulatory Announcements*, No. 163, 1942, 26 pp. A report of developments in cotton standardization and related services which includes reports of International Universal Cotton Standards Conferences, standards for American, Sea Island and American-Egyptian cottons, standards for length of staple, preparation of standards for long-staple cotton, symbols for grade designations for American upland cotton, reasons for variations in the classification of cotton, public cotton classing services, changes in contracts for future delivery, classing and market news services for organized cotton-improvement groups, and cotton-fibre testing services. C.

**High Capacity Balance Damping Device.** H. L. Andrews, F. W. Oberst and E. G. Williams. *Rev. Sci. Instruments*, 1943, 14, 22-23. Details are given of an electromagnetic damping device for use on high capacity balances (100-kg. capacity, sensitive to 200 mg.), such as are used for measuring insensible weight loss in man. A brass damping cylinder is suspended from the end of the balance arm to which is attached a circular segment so that the motion of the cylinder is accurately vertical. When the balance is in equilibrium one-half of the damping cylinder is in the air gap of an electromagnet system. A writing stylus is attached to the string suspending the damping cylinder for recording on a kymograph. In recording the weight loss of a man at rest on the bed suspended from one arm of the balance sufficient weights are added for an approximate balance. As the man loses weight continuously the writing stylus will approach a base line. The moment this cuts the line, a given weight, usually 10 g., is placed on the bed. The pen rises without oscillation and then gradually returns to the base line. The damping device does not affect the sensitivity of the balance. A diagram of the electromagnet and damping cylinder, and records obtained with and without the damping device are shown. The power required for damping amounts to only 0.5 amp. at 12 volts, d.c. C.

**Textile Mill Laboratory.** R. W. Philip. *Cotton (U.S.)*, 1943, 107, No. 2, 79-83. An account is given of the construction, equipment and work of the laboratory at Tallassee Mills, Alabama. The mills manufacture ducks, drills and twills, and industrial fabrics for the rubber, bakelite and other industries. The laboratory division consists of the main physical testing laboratory room, the chemical laboratory, the office, and the display room. An air-conditioning system is provided and the physical testing laboratory is maintained at 70° F. and 65 per cent. R.H. A list of machines and instruments in use is given. The laboratory personnel consists only of employees with practical mill experience, who at any time can conduct tests in the mills and have done so before learning laboratory work. The laboratory is under the supervision of the assistant superintendent of the mill, who virtually has the position of technical superintendent. Tests are made on the finished products, and regular tests are made for weight, counts, ends and picks, twist, crimp, gauge, strength, elongation and other physical characteristics. In addition the laboratory staff carries out (1) control testing, e.g. testing of laps, sliver and roving by daily weighings, (2) check testing, including weekly regain tests, and end-breakage, loom stoppage, desizing, viscosity and other tests, and (3) practical research testing, such as tests of blends of cotton to determine spinning qualities, tests of drafts, settings and speeds, and tests of new products, materials and ingredients. On the results of the control tests, the laboratory has the authority over any department to order necessary changes. The results of check tests and practical research tests are reported to the main office and to the departments involved. C.

**Cotton Fibre Bundles: Strength.** R. W. Webb. *Textile Research*, 1943, 13, No. 4, 18-21. Tests by the Chandler round wrapped bundle method and the Pressley flat unwrapped bundle method have given an average strength value of 80,000 lb. per sq. in. for American Upland cottons, some results being as high as 106,000 lb. per sq. in. Average values of 85,000 to 90,000 lb. per sq. in. have been obtained for American-Egyptian cotton, and of 95,000 to 110,000 lb. per sq. in. for Sea Island cotton. Sea Island fibre bundles containing 1, 2, 3 and 4 turns per bundle, corresponding to 1.60, 3.20, 5.33 and 8.00 twists per in., gave average fibre bundle strengths of 93,500, 80,200, 65,900 and 48,100 lb. per sq. in., compared with 98,900 without twist. C.

**Cupri-ethylenediamine Cellulose Solutions: Viscosity; Rapid Determination.** R. S. Hatch. *Pulp and Paper Ind.*, 1942, 16, 13-17 (through *Brit. Chem. Physiol. Abstr.*, 1943, B II, 79). Viscosity is measured by the falling-ball method, using aluminium balls, on 1 per cent. solutions in 0.5M.-cupri-ethylenediamine. The oven-dry pulp is swollen in 0.167M.-solvent and dissolved by adding the appropriate amount of 1.0M.-solvent. Air is displaced by nitrogen, but rigid exclusion of oxygen is unnecessary if the measurements are completed within an hour. The preparation of the solvent, the calibration of the tubes, and the method of temperature correction are described. The method gives results in agreement with standard methods. C.

**Fibres: Structure.** E. R. Schwarz. *Textile Research*, 1943, 13, No. 4, 4-11. The influence of fibre structure on properties is considered and the importance of secondary valence bonds is discussed. The usefulness of polarized light, ultra-violet light, infra-red radiation, X-ray diffraction, micro-manipulation, and electron microscope techniques in investigations of the inter-relationship of atom, molecule, crystallite, fibril and cell in fibres is indicated. C.

**Swollen and Stretched Cellulose Nitrate Fibres: Double Refraction.** H. R. Kruyt, D. Vermaas and P. H. Hermans. *Kolloid Z.*, 1942, 100, 111-121 (through *Brit. Chem. Physiol. Abstr.*, 1943, A I, 61). Measurements of the double refraction ( $\delta$ ) of cellulose nitrate fibres stretched to varying extents after immersion in ethyl alcohol, ethyl alcohol-acetone mixtures, and other organic liquids are recorded. Relations between the rod- $\delta$  and adsorption- $\delta$  and extension are discussed. The observations lead to the conclusion that during extension of the swollen fibre breaking down of crystalline material, recrystallisation of amorphous material, and orientation of micelles occur. In ethyl alcohol-acetone mixtures these processes occur simultaneously, in 100 per cent. ethyl alcohol consecutively. C.

**Bubblfil: Properties and Uses.** J. B. Quig. *Silk J. Rayon World*, 1943, 19, No. 225, 27-29; No. 226, 22-25. The characteristic properties of kapok are described and the development of Bubblfil with a view to its use as a substitute for Java kapok is discussed. The properties of Bubblfil are compared with those of other buoyant materials. Although medium Bubblfil when packed loosely has a buoyancy per given weight which closely approximates that of kapok, it requires 1.7 times as much medium Bubblfil to equal the buoyancy of kapok in terms of the volume (lb./cu. ft.) of buoyant material used. It has, however, been possible with types of Bubblfil having sausage-shaped bubbles to equal the volume buoyancy of Java kapok when an equal weight of material is used. The bulk of a life jacket or vest made of long sausage-shape Bubblfil would be greater than one made of kapok but less than one made of cork. Bubblfil retains its buoyancy considerably better than kapok during immersion and can be used to replace kapok in life jackets, life rafts, tow targets, etc. The resilient property of Bubblfil also makes it useful for cushioning against vibration and cushioning against shock, e.g. in the delivering of supplies by parachute. Bubblfil also has excellent heat insulating properties which, together with its resistance to compression, make it suitable for use as a padding material, e.g. in sleeping bags and aviators' jackets. C.

**Silk Fibroin: Structure.** E. Abderhalden. *Z. physiol. Chem.*, 1940, 265, 23-30 (through *Brit. Chem. Physiol. Abstr.*, 1943, A II, 75). In addition to polypeptide chains, silk fibroin contains large amounts of 2:5-diketopiperazines or ring structures closely related thereto. A secondary formation of the isolated 2:5-diketopiperazines from poly- or di-peptides is excluded. Glycylalanine, glycytyrosine, and alanylserine anhydride have been isolated. C.

**Wool Fibre Bundles: Determination of Number of Fibres.** J. I. Hardy and H. W. Wolf. *U.S. Dept. Agric. Circ.* 654, 1942, 10 pp. Details are given of a rapid method of determining the fibre density or number of fibres per unit area of fleece samples which consists in measuring the cross-section area of wool-fibre bundles under controlled conditions of temperature, humidity and pressure. In the instrument designed for this purpose, the bundles of fibres are held in a slot 0.045 in. wide and 0.625 in. deep. The depth of the fibres in the slot is measured with a thickness gauge in thousandths of an inch under a dead-weight load of 5 kg. Formulae for calculating the number of fibres in a bundle and the bundle size from the gauge reading are given. Results are compared with results obtained by two gravimetric methods and by actual counting of the fibres in a cross-section of a bundle. Reliability of the proposed cross-section-area method is indicated by the fact that the correlation and regression coefficients on the actual fibre counts approach unity. About 50 samples can be measured in a working day of 8 hours. C.

**Fibre Swelling-Staining Reagent.** W. M. Harlow. *Paper Trade J.*, 1943, 116, *TAPPI*, 170. A swelling-staining reagent for use in the study of fibre structure consists of a solution of ruthenium red in trimethylbenzylammonium hydroxide. A photo-micrograph of delignified fibres of shortleaf pine stained with this reagent is shown. C.

**Textile Fibres: Properties.** W. von Bergen. *Mechanical Engineering*, 1943, 65, 183-190. The microscopical structures and physical and chemical properties of wool, silk, cotton, rayon, protein, nylon and Vinyon fibres are briefly described, and photo-micrographs of the various fibres, stress-strain curves, and tables showing elastic constants for various fibres and metals, relative wet breaking strengths of various yarns, and moisture regains, specific gravities and chemical properties of various fibres are given. The influence of fibre properties on manufacturing processes and on finished products is discussed. C.

**Is Crimp a Reliable Guide to Fibre Fineness in Merino Wools?** W. R. Lang. *Pastoral Rev.*, 1943, 53, 94-95. Two merino stud wools are illustrated, one having 14 crimps per inch and a mean fineness of 22.5 microns, and the other 6 crimps per inch and a mean fineness of 21.6 microns. Reference is made to Duerden's correlation between crimp and fineness in S. African merino wool and to Bosman's application of this classification to a wide variety of types which make up the Union's slip; Duerden found a fair measure of agreement, whereas Bosman concluded that crimps are an unreliable guide for estimating fineness on unselected material. Bosman's examination of 123 S. African merino stud rams also showed lack of correlation between quality and crimps. An examination of 100 good Australian merino stud wools (basing the quality number obtained from the crimp on Duerden's scale and the quality number obtained from the fibre fineness on the international fineness scale) showed only a 27 per cent. agreement between crimp and fineness. A simple scale, similar to that used by Duerden and Bosman, to show the number of crimps per inch, is illustrated. W.

**Donkey Hair: Morphological and Histological Investigations.** E. Babic. *Z. f. Tierzüchtung*, 1941, 48, 284-294 (through *Biol. Abs.*, 1942, B 16, No. 22461). Hairs from the face and sides of donkeys were characterised by localization of pigment along one side of the hair, and were elliptical in cross-section. Those from females were more nearly round in cross-section than those from males. Cross-sections showed a medullary region, either star-shaped, cross-shaped, or irregular and broken. W.

**Coloured Wools.** W. R. Lang. *Pastoral Rev.*, 1943, 53, 194-195. A brief survey of the probable causes of colour banding, golden colouration and canary stain, and colours produced bacterially (green and red colouration and pink rot). W.

#### (B)—YARNS

**Yarn Strength: Calculation.** *Cotton (U.S.)*, 1943, 107, No. 2, 134. A method of calculating the single-yarn strength that can be expected from 30's to 60's combed yarn made of  $1\frac{3}{16}$ -inch Middling cotton is explained. Tables are given showing actual lea strengths and calculated lea and single-yarn strengths of various counts of yarn made of  $1\frac{3}{16}$ -inch Middling cotton with 12 per cent. comber waste and a twist factor of 3.5. C.

**American High Tenacity Rayon Yarns: Deniers and Filament Numbers.** H. R. Mauersberger. *Rayon Textile Monthly*, 1943, 24, 135. A table is given showing the deniers, filament numbers, producers, and process and trade names of American high-tenacity rayon yarns with breaking loads of 3-6 g. per denier and "semi-high-tenacity" yarns of 2.25-3 g. per denier. They are being used for tyre cords and bomb parachute materials. Eight companies are producing such yarns by the viscose process and one company produces a high-tenacity acetate yarn. Thirty-seven different semi-strong and high-tenacity yarns are now being produced, compared with only two or three last year. C.

**American Rayon Hosiery Yarns: Deniers and Filament Numbers.** H. R. Mauersberger. *Rayon Textile Monthly*, 1943, 24, 141. A revised table of rayon hosiery yarns is given, showing deniers, filament numbers, qualities and producers. The relatively few changes that have been made since October, 1942, are indicated. C.

**American Rayon Yarns: Deniers and Filament Numbers.** H. R. Mauersberger. *Rayon Textile Monthly*, 1943, 24, 122-123. A revised table of deniers and filament numbers of American rayon yarns is given and changes since September, 1942, are discussed. Nine yarns have been removed and 12 new yarns added. Notable additions include 1100-denier and 1150-denier, 490-filament, high-tenacity viscose yarns or "Rayflex" tyre cord yarns, and a 30-denier, 40-filament "Fortisan" yarn. C.

(C)—FABRICS

**Mass-produced Goods: Sampling Inspection.** H. Rissik. *Engineer*, 1943, 175, 334-335, 346-347. It is pointed out that focusing attention on the pattern of the observed results of inspection rather than upon the number of defective items produced, makes it possible to judge quality in a mass of product submitted for inspection by examining relatively small samples instead of all items in the mass. The principles of sampling inspection on a statistical basis are explained and illustrated by a study of examples. Details are given of the "control chart" sampling inspection plan and the A.O.Q.L. ("average outgoing quality limit") double sampling inspection plan and examples illustrating typical applications are discussed. C.

**Spun Rayon Fabrics: Costing.** Rayon Weaving Association. *Silk & Rayon*, 1943, 17, 150-156. Directions are given for costing all types of spun rayon fabrics except those woven on Jacquard looms. The necessary tables of data are: (1) Basic taped warp length for 100 yards of cloth in the loom state. (2) Warp and weft "thread yarn factors" (T.Y.F.) to provide allowances for the excessive bending that warp or weft may have to suffer in particular weaves. (3) Yardage to be added to the basic taped warp length in all cloths where the weft T.Y.F. does not exceed the warp T.Y.F. by more than 10 (for excesses of 11-25, the additions are half those in the table, and for excesses over 25 no additions are made). (4) Yardage to be added to allow for the weft counts. (5) Yardage to be added where the ends per inch in the reed are more than 60 and the ends exceed the picks by 1-10, 11-20 and so on up to 111-120. (6) Yardage to be added where the ends per inch in the reed and the picks per inch on the table added together are 160-169, 170-179 and so on up to 240 and over. These tables are for cloths comprised in "Section I," which excludes 100 per cent continuous filament warps and certain satin and twill weaves. Section II includes 2 x 1 twills where the ends per inch in the reed exceed the picks per inch on the table. The required tabulated data are: (7) which is the counterpart of (1). (8) Yardage to be added where the ends exceed the picks by more than 10 (if the picks exceed the ends by 0-10, half the tabulated additions are made; if they are more than 10 in excess, no additions). (9) Yardage to be added for high reedage, 61-140 ends per inch in warp counts up to 16's, 71-170 for 17's-30's, and 81-230 for 31's or finer. (10) The counterpart of (4). Section III includes cloths woven with continuous filament warps; the lengths are calculated according to Tables 7-10, with a deduction of 2 yards for satin weaves and an addition of 1 yard for all other weaves. Examples are given in the three sections. C.

**Textile Test Data: Application of Rank Correlation.** E. R. Schwarz and K. R. Fox. *A.S.T.M. Bull.*, 1942, No. 119, 21-24. The Kendall rank correlation coefficient technique is outlined and an example of its application to the stiffness ratings of ten different fabrics tested on two different machines is discussed. The Kendall coefficient of concordance is explained and its application to data

intended to demonstrate the possible means of selection of a test method or apparatus and to the study of the relationship between service tests and laboratory tests is discussed and illustrated by applications to cotton fineness data and to results obtained in six techniques for determining the handle of fabrics by means of four different instruments. C.

**Textile Products: Analysis.** *Rayon Textile Monthly*, 1943, 24, 127-128, 148. An excerpt is given from the American Commercial Standard CS 65-43 relating to methods of analysis and of reporting the fibre composition of textile products. Textile terms are defined and details are given of methods of analysis, including (1) mechanical analysis, (2) analysis for total sizing, finishing and other non-fibrous materials, and (3) the analysis of mixtures of cotton and wool, rayon and wool, and silk and wool and mixtures of cotton, rayon, silk and wool. Methods of reporting the results and certifying tested goods are also laid down. C.

**Clothing: Self-antiseptic Properties.** L. H. James and A. C. Lundell. *Soap*, 1943, 19, No. 3, 93, 95-97, 115, 117. Tests are described for the assessment of self-antiseptic and self-sterilizing effects in treated fabrics. The fabrics are prepared for antagonism to microbial growth and are not intended for therapeutic use on wounds and tissues. Apart from treated fabrics being effective in accomplishing the purpose intended, they must be non-toxic; the treatment should be permanent and the strength and other properties of the fabric unimpaired. W.

(D)—OTHER MATERIALS

**Cellulose Insulation: Stability.** F. M. Clark. *Electrochem. Soc. Preprint*, 1943, 83, No. 6, 81-96. The chemical changes occurring in cellulose insulation in use, which are generally attributed to a combination of oxidation and pyrolysis, are discussed and a report is given of a study of the effects of heat and moisture on manila insulating paper. Oil-treated manila paper insulation was found to deteriorate less rapidly than the unimpregnated insulation, but the nature of the chemical reactions causing the deterioration appeared to be unaffected by the mineral oil. Observations of the change in copper number on heating showed that in a closed space the maximum stability is obtained when the insulation is substantially dry and the possibility of oxidation is eliminated. The presence of oxygen accelerates but does not much alter the nature of the change. Moisture has a greater accelerating effect and the combined effects of oxidation and moisture produce the greatest instability. A linear relation was found between the increasing copper number and decreasing tensile strength of manila paper heated at 120° C. Losses in tensile strength were also related to decreases in pH value. Oxygen, oxides of carbon and unsaturated hydrocarbon gases were found in the gases evolved when the insulating paper was heated at temperatures from 120° to 300° C. in the absence of air or oxygen. The evolution of oxygen and oxides of carbon suggests the possibility of oxycellulose formation and its later destruction under more severe thermal exposure. In view of the loss in tensile strength observed with dry insulation heated in an inert atmosphere and the marked effect of moisture, it is suggested that the fundamental change responsible for the degradation of cellulosic insulation in electrical apparatus involves the formation of hydrocellulose. The presence of moisture appears to accelerate the formation of oxycellulose. C.

**Cellulose Acetate: Mechanical Tests.** W. N. Findley. *Modern Plastics*, 1943, 20, No. 7, 99-105, 138. A report is given of tests on specimens of cellulose acetate plastic cut from a sheet 0.3 in. thick and tested in a room maintained at 77° F. and 50 per cent. R.H. It was found that about 1½ months were required for the compressive yield point and the weight to approach equilibrium in an atmosphere of constant temperature and relative humidity. The yield point and fracture stress increased with increasing rate of strain for tests in tension, compression and torsion. The modulus of elasticity in tension and torsion was independent of the rate of strain for the values tested, but the modulus in compression increased with increasing rate of strain for loading in compression. Ageing of the material at constant temperature and relative humidity increased the tensile strength about 4 to 12 per cent. and the modulus of elasticity in tension about 15 per cent. during a time of about one year. A transverse hole in a static tension specimen reduced the ultimate elongation in 2 in. to about 8 per cent. of the elongation in a solid specimen. The ultimate strength (based on the net area) was about 10 per cent. less for a specimen with

a hole than for the solid specimen. Fatigue tests showed that the endurance limit, obtained by computing stress from the flexure formula, varied with the shape of the specimen. Ageing increased the endurance limit about 25 per cent. in a period of 15 months. The endurance limit of the material was decreased by the rise in temperature of the specimen resulting from internal friction. The endurance limit decreased with increasing testing frequency up to 750 cycles per minute and from there on to 2900 cycles per minute remained constant. A change in the range of stress caused a decrease in the endurance limit (defined in terms of the alternating component of the stress cycle) as the mean stress of the cycle became larger, for values of mean stress in tension. C.

**Paper: Measurement of Curling Tendency.** F. T. Carson and V. Worthington. *J. Res. Natl. Bur. Stnds.*, 1943, 30, 113-121. In a method frequently used to determine the tendency of paper to curl, a measurement is made of the amount of curl of a small piece of the paper floating on water. The measurement is customarily made in terms of an arbitrarily chosen angle. The maximum curvature, however, is a more logical measure of curliness. An effort has been made to determine the maximum curvature of freely curling paper from measurements made of the curling of paper in contact with water. Optical apparatus devised for this purpose is described. The use of the curl sizing tester for determining curvature is also discussed. Measurements of the relative curliness of a number of lithographic papers are recorded. The correlation of curl with other related properties such as expansivity, shrinkage, density and air permeability, is discussed. It is pointed out that the results of the measurement of curl agree reasonably well with what is known about the behaviour in use of the papers studied. C.

**Phenolic Plastics: Effects of Continuous Heat on Strength.** T. S. Carswell, D. Telfair and R. V. Haslanger. *Modern Plastics*, 1943, 20, No. 6, 79-82, 126. An account is given of investigations of the change of impact and flexural strengths of a number of moulded phenol-formaldehyde plastics with prolonged heating up to 500 hours, at temperatures of from 110° to 225° C. Tests were made by standard methods on three compositions containing about 50 per cent. of organic fillers (wood flour, macerated fabric and cotton cord), compositions containing 50 per cent. asbestos fibre and 50 per cent. resin and 60 per cent. mica and 40 per cent. resin, respectively, and an unfilled pure phenolic resin. Results are given in tables. They show that at 110° C. even after 500 hours, there is no appreciable loss in either impact or flexural strength, except for the pure resin which exhibits a loss of about 20 per cent. in flexural strength, and only a slight tendency to blister or distort. At 140° C. a loss in impact strength is apparent in the fabric-filled material after 54 hours and in the cord-filled material after 162 hours. The flexural strength of the cord-filled specimens falls off gradually after 6 hours at 140° C., but after 162 hours has decreased by only 16 per cent. from its original value. The strengths of the pure resin, and the materials containing wood flour, mica and asbestos fillers, are unaffected even after 162 hours at 140° C. The wood flour-filled and pure resin specimens begin to show a gradual loss in impact strength after 6 to 18 hours at 170° C., whilst the flexural strength of the pure resin and of the fabric-filled specimens shows a drop after 6 hours. The mica-filled product begins to show a slight loss in both impact and flexural strength at 225° C., but the asbestos-filled material stands up well even after 500 hours. There is a tendency for these materials to blister at this temperature. The limiting temperatures (temperatures at which a 10 per cent. reduction in strength occurs after 162 hours of heating) are given for the six materials tested and discussed in relation to the uses of the materials. It is pointed out that the filler plays a major part in determining limits of serviceability and that the organic fillers show a definite deterioration, as exhibited by lowering of the strength characteristics and by visual disintegration of the moulded specimen, at much lower temperatures than do the inorganic- or mineral-filled materials. C.

**Plastic Materials: Ignition Points.** J. Delmonte and M. A. Azam. *Modern Plastics*, 1943, 20, No. 6, 88, 122 and 124. Strips of plastic materials were brought into contact with molten sodium hydroxide and observations were made of the minimum temperatures at which the materials would spontaneously burst into flames and of the temperatures at which instantaneous ignition (ignition in less than one second of contact) occurred. Results are given for polystyrene, polyvinyl chloride-acetate, polymethyl methacrylate, cellulose

nitrate, cellulose acetate, cellulose acetate-butyrate and various phenolic materials. The authors suggest that ignition temperature is best reported as the lowest temperature at which a plastic material will burst into flames. In general, thermosetting materials have higher ignition points than thermoplastic materials. C.

**Dyes: Estimation of Light Fastness.** *Assoc. Ital. d. Chim.*, 1940, 3, No. 2, 41 (through *J. Amer. Leather Chem. Assoc.*, 1942, 37, 210). A short history of the various attempts to obtain a classification or measure of the resistance of various dyes to light is given. Long and exhaustive experiments have been made on the influence of atmospheric humidity, temperature, nature of the fibres, etc. The experiments were carried out in 20 different localities situated between 65° latitude north and 38° latitude south, from sea level to an altitude of 3,694 meters, using a great variety of fibres and 72 dyes. The results show that wool behaves much more regularly than any other fibre, especially cotton. For this reason the new scale will consist of 8 typical dyes on wool. This scale is reproducible, independent of climatic factors and can be used as standard for comparison purposes. The scale will carry 3 colour intensities differing from each other in the ratios 1/3:1:2. The classification of the light fastness will consist of the descriptions:—1=bad, 3=moderate, 5=good, 6=very good, 7=excellent and 8=extraordinary. W.

#### PATENTS

**Laboratory De-linting Machine.** Murray Co. U.S.P.2,304,565. The claim is for a laboratory model of a saw de-linting machine for use in the determination of the percentage of mechanically removable lint on ginned cottonseed. C.

**Electronic Yarn Defect Indicator.** Brown Instrument Co. U.S.P.2,304,645. A multiple control apparatus for indicating defects in yarns comprises an electronic valve, a number of detectors each connected to the grid to vary its potential with respect to the cathode, control means connected with the anode and cathode and continuously operative in each of a number of positions, and switching means that connect the detectors individually to the grid in succession and adjust the control means to each of its operating positions in succession in accordance with the detector connection. C.

**Baled Wool: Density Determination.** Forte Dupee Sawyer Co. (Boston). U.S.P.2,304,731. The bale is weighed ( $W$ ) and placed in one of two hermetically sealed chambers of known volume ( $V_1$  and  $V_2$ ) that are connected and are at the same temperature and atmospheric pressure ( $P_1$ ). The empty chamber (volume  $V_2$ ) is partially evacuated (pressure  $P_2$ ) and the connection is opened so that both chambers reach a new pressure ( $P_3$ ). The volume of the chamber not occupied by wool is then calculated from  $V_2$ ,  $P_1$ ,  $P_2$  and  $P_3$  by Boyle's law and deducted from  $V_1$  to give the volume of wool of mass  $W$ , thus giving the average density of the baled wool. C.

## 8—BUILDING AND ENGINEERING

### (A)—CONSTRUCTION AND MAINTENANCE OF BUILDINGS AND PLANT

**Metals: Corrosion; Thermodynamic Considerations.** J. C. Warner. *Electrochem. Soc. Preprint*, 1943, 83, No. 5, 67-80. The contributions which thermodynamics can make to the elucidation of corrosion reactions are discussed under two headings: (1) The use of the principles of thermodynamics and thermodynamic data to calculate the spontaneity or non-spontaneity (free energy change) of corrosion reactions when specified metals are placed in specified environments. If the corrosion process occurs by an electrochemical mechanism, the maximum (reversible) potential of the corrosion couple may be calculated and this potential may be considered the driving force of the corrosion process. The results of such calculations are summarised for the common metals in several ordinary environments. (2) If the corrosion process is spontaneous, the conditions for the limiting corrosion rate in the steady state may be expressed by setting the free energy decrease in the process equal to the sum of the energies dissipated in the various parts of the electrochemical system. For convenience in discussing the conditions for the steady state, the energy liberated and the various energies dissipated in the process are converted into potentials. This leads to the steady state condition that  $E$  (reversible) =  $\sum_i E'_i$  (irreversible, back, or dissipative e.m.f.'s). C.

**Moulded Plastic-bonded Veneers and Wood: Applications.** R. J. Nebesar. *Mechanical Engineering*, 1943, 65, 197-201. Advantages of wood constructions are discussed and tension and compression data are given for various woods, steels and aluminium. Details are given of hot-press and cold-press synthetic resin bonding agents for plywoods and of the moulding process used in the manufacture of flat plywood for general use and shaped plastic-bonded veneer structures of composite curvatures for specific uses. Problems involved in providing aircraft structures of veneers and wood which will be durable under all weather conditions and the problem of weight control are discussed. A semi-monocoque moulded-plywood fuselage, and wing outer panels and wing tips constructed of plywood are briefly described. C.

**Timber: Moisture Content and Glueing.** *Practical Engineering*, 1943, 7, 483-484. A curve showing the variation of the moisture content of timber with the relative humidity of the air is given and suitable values of the moisture content for various purposes are indicated. The relation between swelling and moisture content is briefly discussed and expressions are given for the increase in length in tangential, radial and longitudinal directions for a 1 per cent. increase in moisture content. Breakdown of joints due to glueing together boards of different moisture contents and boards cut in different planes, and increases in moisture content due to glueing are discussed. Glue spreads for use with veneers are specified, and specific gravities of various dry woods are listed. The advantages of synthetic adhesives are pointed out. C.

**Sifbronzing.** *Mech. World*, 1943, 113, 653. It has always been undecided whether sifbronzing is welding or brazing and the matter is discussed by the originators of the process, The Suffolk Iron Foundry (1920) Limited. It appears that the process is akin to oxy-acetylene welding, but a tabular statement compares sifbronzing and brazing from the points of view of composition, technique, strength of joint, etc. La.

**Industrial Wire Ropes.** *Mech. World*, 1943, 113, 665-667. The construction, selection and use of wire ropes in industry are considered in a specially contributed article. La.

**Engineering Fundamentals (12).** *Power & Works Engineer*, 1943, 38, 135. No. 12 in the educational series deals briefly with gas engines. La.

**Fluid-Flow Metering.** A. Linford. *Power & Works Engineer*, 1943, 38, 109-110. An introductory article which is to be followed by others on the various types of fluid-flow meters. A number of general points on location, purpose and accuracy of meters are briefly considered. La.

**Fluid-Flow Meters.** A. Linford. *Power & Works Engineer*, 1943, 38, 131-134. Mechanical fluid-flow meters of the positive, semi-positive (positive rotary) and inferential types are illustrated and described. La.

**Boiler Feed Regulation.** F. J. Matthews, *Laundry Record*, 1943, 65, 168-9. The disadvantages of intermittent manual control for boiler feed water are discussed in some detail and automatic regulators are briefly described. Apart from the improvement in efficiency obtained by continuous operation the dangers of high and low water level can be avoided. La.

**Extending the Life of Equipment.** *Dyer*, 1943, 89, 293. While mainly intended for dyehouses, the article has some useful points on the war-time repair plant and use of scrap, including welding, building up, etc. La.

**Fuel Economy in Dairy Plants.** C. S. Darling. *Power & Works Engineer*, 1943, 38, 125-127. Points useful to many users of small boilers are emphasised by considering in some detail economies that could be introduced into a dairy plant. The figures are based on a report in the U.S. Bureau of Agriculture Bulletin. La.

**Earth-leakage Protection.** G. W. Stubbings. *Power & Works Engineer*, 1943, 38, 139-140. The principles employed in simple forms of earth-leakage protective devices are briefly discussed and circuit diagrams are given. La.

#### (C)—STEAM RAISING AND POWER SUPPLY

**Coal: Storage.** R. A. A. Taylor. *Textile Manufacturer*, 1943, 69, 170-171. The influence of such factors as the size, age, state and type of coal, the size and site of the stack, and ventilation on the storage of coal for industrial purposes is discussed. Coal in the form of nuts, cobbles or round coal free from fines and

slack is most suitable for storing. Stacks should preferably be of less than 200 tons and in open situations on clean, firm ground. Ample ventilation should be provided, e.g. by means of pipes projecting vertically and horizontally into the stack. Alternatively, ventilation may be effectively suppressed. Stack temperatures should be measured at intervals by means of thermometers lowered into pipes which are closed at the lower ends and extend into the stack. If a fire breaks out, the seat of the fire must be dug out by holing, trenching and cutting valleys, and the hot coal scattered and cooled. Spraying a fire seems to be useless unless an inordinately large volume of water can be used. Coal undergoes some deterioration on storage but except for the loss of coking power the deterioration that occurs when the temperature has followed the normal course of rising a few degrees and then falling during two or three months will scarcely be noticeable. C.

**Boiler Water Treatment.** *Mech. World*, 1943, 113, 650. A new booklet issued by The Permutit Co. Ltd., discusses the subject from the point of view of fuel economy and the saving in boiler repairs and renewals. La.

**Mechanical Stokers.** C. S. Darling. *Mech. World*, 1943, 113, 659-662. At the present time it is essential to keep mechanical stokers in the maximum state of efficiency and repair and the difficulties are increased by war-time fuels. A recent American paper on this subject is reviewed in the light of conditions in the British Isles, and stokers are considered under the headings, chain grate, travelling grate, multiple retort stoker, single retort stoker, and spreader stoker. La.

#### (D)—POWER TRANSMISSION

**Stroboscopic Patterns: Application in Determination of Speeds of Rotation.** D. A. MacInnes. *Rev. Sci. Instruments*, 1943, 14, 14-16. The use of stroboscopic patterns for fixing and measuring rotational speeds is discussed. Patterns having as many as nine bands may be utilised. The patterns occur in a definite recurring sequence, according to a simple numerical relation. Most of the speeds intermediate between those at which patterns are stationary may be obtained by correcting for the precession or recession of the patterns. C.

**Lubricants: "Oiliness." Surfaces: Estimation of Roughness.** J. J. Bikerman. *J. Soc. Chem. Ind.*, 1943, 62, 41-42. Heidebroek has found an empirical relation between the time required to separate two plates immersed in a lubricant and the force used for the separation. He concluded that his experiments could not be explained by purely hydrodynamical considerations and that they gave information on "oiliness" of the lubricant. In the present paper the author shows that the empirical relation can be deduced from hydrodynamical considerations and utilised for estimating the roughness of the contact surfaces of the plates. C.

**Thin Metallic Films: Lubricating Action.** F. P. Bowden and D. Tabor. *J. Appl. Physics*, 1943, 14, 141-151. An investigation has been made of the rôle of thin metallic films in reducing the friction and wear between metal surfaces. It is shown that with metallic films possessing suitable mechanical and surface properties the coefficient of friction is very low and may be similar to that observed on ice. In many cases the behaviour of these thin metallic films resembles that of ordinary lubricants except that Amonton's law is not obeyed. The friction and wear properties of some copper-lead alloys have been studied and the results indicate that the lead in the alloy is extruded during sliding and forms a thin lubricating film on the hard copper matrix. It is suggested that these metallic films play an important part in the action of many bearing alloys. C.

**Oil Retaining Bearings.** *Power & Works Engineer*, 1943, 38, 127. A short note on "Compo-H" porous oil retaining bronze bearings. La.

**Centrifugal Machines.** *Mech. World*, 1943, 113, 635-637. The importance of centrifugal machines in industry and the somewhat unusual conditions under which they are used, are emphasised, and it is shown that the subject of electric drives for such plant is important and complex. Different types of motor rigid couplings and friction clutches are considered, together with the switching devices which are necessarily involved. La.

## (F)—LIGHTING

**Illumination: Calculation.** P. Moon. *J. Optical Soc. America*, 1943, **33**, 115-122. A survey is made of the present status of illumination calculations under the headings, basic methods, illumination from uniform sources, illumination from non-uniform sources, illumination from arrays of sources, the light field, and interreflections, particular attention being given to advances made during the past five years. C.

## (G)—HEATING, VENTILATION AND HUMIDIFICATION

**Overheating Buildings.** *Power & Works Engineer*, 1943, **38**, 141. As the overheating of buildings represents direct wastage of fuel, Sarco Thermostats Ltd., Cheltenham, have constructed a chart showing the fuel wasted under different conditions of overheating. Enlarged copies are available on request for those active in fuel economy schemes. La.

## (H)—WATER PURIFICATION

**Water Treatment.** R. P. Donnelly. *Power & Works Engineer*, 1943, **38**, 85-6, 111-112, 136-7. The chemical background of the demineralisation process for purifying water is first discussed, together with the nature of the "Organolite" resins. A typical plant for the production of "distilled" water is illustrated and described. The effect of regeneration on the capacity is considered and it has been shown that increases in capacity are to be obtained by using greater volumes of salt solution and not by increasing the strength, the maximum strength is about 4 per cent. Various properties of the resins and their practical applications are discussed. Finally, some special applications are described and it is concluded that a lime-base exchange treatment will become the standard practice in the future. La.

## (I)—WASTE DISPOSAL

**Rayon Factory Waste Water: Purification.** K. H. Tänzler. *Gesundheitsing.*, 1942, **65**, 204 (through *Water Pollution Res. Summary Curr. Lit.*, 1942, **15**, 188). The main processes used for the manufacture of rayon are outlined. The volume of waste waters produced for every 1000 kg. of rayon is about 50-100 cubic metres and a large factory handles several thousand cu. m. per day. These waste waters contain dissolved, colloidal and suspended matter, including sulphides, sulphates, acids, hypochlorites, soaps, glucose, cellulose, viscose and fibre. Waste waters from the spinning machines are particularly harmful as they contain 200-700 mg. of sulphuric acid per litre. Waste washing waters containing acid decompose sodium sulphide from other wastes and produce hydrogen sulphide. The waste waters are sometimes acid and sometimes alkaline. Copper can be recovered from waste waters from the cuprammonium process of manufacture. There is no entirely satisfactory method for treating large volumes of waste waters from rayon factories. It is possible to remove the fibre on fine screens, and to treat the liquid by biological oxidation processes. According to Pritzkow the waste waters can be treated by neutralisation and settling. Hydrogen sulphide can be removed by aerating the liquid in a tower packed with coke. C.

## PATENT

**Plastic Fire-proof Compositions: Production.** H. Rose and Celotex Ltd. B.P.552,425 of 5/8/1941:7/4/1943. A process for the manufacture of a plastic fire-proof composition from a waste fibre sludge, slurry or suspension derived from the paper-board, fibre-board and paper-making industries and containing up to 90 per cent. of water, comprises incorporating with the sludge, slurry or suspension a proportion of a solid incombustible agent such as burnt and powdered fire-clay, fuller's earth, diatomaceous earth or kieselguhr, followed by an alkali silicate. In order to increase the initial set when applying the composition there may be added a small proportion of lime or calcium chloride. Preservatives, colouring matter and fillers may also be added. The composition may be applied as a plaster to porous surfaces, e.g. brickwork or fibre board, or may be formed into slabs, blocks, tiles, etc., by pouring into moulds and allowing to set. C.

## 9—PURE SCIENCE

**Asiatic Cotton Flowers: Genetics of Petal Colour.** B. Nath. *Indian J. Genet. Pl. Breed.*, 1942, **2**, 43-49 (through *Plant Breed. Abstr.*, 1943, **13**, 111). It is shown that two factors, *Ya* and *Yb*, are necessary for the production of yellow petal in Asiatic cottons; *Yb* assort independently of the gene  $R_2$ . C.

**Autotetraploid Asiatic Cotton: Breeding.** S. G. Stephens. *J. Genetics*, 1942, 44, 272-295 (through *Plant Breed. Abstr.*, 1943, 13, 111). Meiotic studies of a colchicine-produced tetraploid *Gossypium arboreum* var. *neglectum* ( $4n=52$ ) gave further support to the hypothesis that diploid *Gossypium* species are secondary polyploids. The female gametes of the tetraploid were 40-50 per cent. fertile and this was in agreement with the fertility expected from examination of meiosis in pollen mother cells. Male fertility however was lower owing to the slow pollen tube growth of many apparently viable grains. The tetraploid when crossed with several New World diploid species gave hybrids with less than 1 trivalent per pollen cell thus indicating that homologies between Asiatic and wild diploid species are very low. The use of induced polyploidy in cotton breeding is shown to be restricted, owing to the secondary polyploidy which exists in all species of *Gossypium*. C.

**Cotton Hybrids: Cytology.** N. K. Iyengar. *Indian J. Agric. Sci.*, 1942, 12, 785-787. Chromatin bridges were noticed at anaphase I, metaphase II and anaphase II of meiosis in  $F_1$  triploid hybrids between Asiatic and American cottons. The number of bridges at metaphase II varied from one to four per nucleus, indicating that structural changes had taken place in more than one bivalent. No abnormal configurations at metaphase I, such as unequal bivalents, etc., could be clearly observed. The bridges at metaphase II were long and thin and their persistence at this stage showed that the bridges formed at anaphase I were not broken. The formation of a bridge at anaphase II in one of the sister cells indicated that a loop chromatid must have been formed at anaphase I, as a result of an inversion pairing and two cross-overs having taken place, one in the inversion region and one in the region proximal to it, in which only one chromatid was involved in both the cross-overs. A monocentric loop and a fragment would be formed at anaphase I. The loop chromatid formed a bridge at anaphase II, the centromere having divided. These results indicate that both numerical and structural changes take place in the triploids. Both of these factors may contribute to the sterility of the hybrids. The structural changes lead to the formation of new chromosomes which may prove to be of evolutionary significance. C.

**Pulp: Mildewing.** A. Niethammer. *Holz Roh-u.-Werkstoff*, 1942, 8, 269-273 (through *Rev. Appl. Mycol.*, 1943, 22, 121). An account is given of studies of the growth of moulds on sulphite cellulose, mechanical wood pulp, and sulphite spent lye. The organisms developing on sulphite cellulose and/or wood pulp fall into four groups, viz., (1) characterized by profuse superficial growth without perceptible penetration into the fibres, e.g., *Mucor silvaticus*, *Thielavia* [*Thielaviopsis*] *basicola*, *Penicillium glaber*, *P. notatum*, *P. expansum*, *P. luteum*, *P. purpurogenum*, and *Stysanus stemonites* from pulp and cellulose; (2) species making little superficial growth but adhering firmly to the substratum, which is clearly permeated though not visibly disorganised, e.g. *Trichoderma koningi* (widespread on all the materials examined), *Fusarium* spp., and *Cladosporium herbarum*; (3) species making copious aerial growth besides infiltrating into the substratum without, however, causing perceptible softening, i.e. *Aspergillus niger* and *A. glaucus*, both of rare occurrence in the material under observation, being isolated once from pulp and developing only at 30 to 32° C.; (4) species of slow but vigorous growth, at first primarily aerial but later invading and definitely softening the substratum, e.g. *Dematium* [*Pullularia*] *pullulans*, which gradually converts portions of both cellulose and pulp strips into a black, soft, slimy mass; *Synsporium biguttatum*, isolated from cellulose and rapidly transforming the strips into a soft mass; and *D. (Endomycopsis) albicans*, from the same sample of cellulose as the foregoing. Mixed cultures of various species of moulds generally caused more extensive deterioration of cellulose and pulp than one alone, particularly fruitful in this respect being the co-operation between *Penicillium luteum* and *T. koningi* or *Pullularia pullulans*, *T. koningi* and a species of *Fusarium*, and *F. orthoceras* and *P. pullulans*. In contrast to the luxuriant growth made by the moulds on cellulose and pulp, development on the spent lyes of sulphite cellulose, diluted with two-thirds of tap water, was poor, a noteworthy feature being the accumulation of oil and fat indicative of degeneration. C.

**Amylase: Activity Determination.** A. D. Dickson. *Cereal Chemistry*, 1943, 20, 31-35. A report is given of a collaborative study of methods for the deter-

mination of amylase activity. Six samples of malt, selected for their range in diastatic power, were submitted to 18 laboratories for determination of diastatic power by either the Fehling titration or ferricyanide modifications. Other methods studied by some of the collaborators were: (1) Kneen and Sandstedt (1941) measure of saccharification, (2) Sandstedt, Kneen and Blish (1939) method for  $\alpha$ -amylase by a dextrinization procedure, and (3) Blom and Bak's (1938) and (4) Józsa and Johnston's (1935) viscometric methods for  $\alpha$ -amylase. The results are tabulated and discussed. Means of duplicate determinations, standard deviations, and coefficients of variability between duplicates and between laboratories are given. Further study of the various methods for  $\alpha$ - and  $\beta$ -amylases is recommended for the purpose of determining the cause of variability in results and of modifying the procedures to give better agreement between laboratories. C.

**Malt Extract Amylase: Inactivation.** W. J. Olson, B. A. Burkhart and A. D. Dickson. *Cereal Chemistry*, 1943, 20, 126-138. The rate and extent of inactivation of the amylase components of malt extracts were measured at 60°, 65°, and 70° and at pH 3.3 and 0° C. Measurements were made of saccharification of soluble starch, liquefaction of raw starch paste, and dextrinization of both soluble starch and amylopectin on the original and partially inactivated extracts. Complete inactivation of  $\beta$ -amylase was not attained at 60° for the maximum time studied, i.e. 90 min. At 70° the  $\beta$ -amylase was completely removed after 15 min. treatment, whilst at 65° approximately 20 min. were required for complete inactivation. At pH 3.3 and 0° the loss of dextrinizing or  $\alpha$ -amylase activity was extremely rapid. The maximum effect was obtained usually in 5 min. This treatment results in relatively little reduction of saccharifying power, most of this reduction apparently being due to loss of  $\alpha$ -amylase. A highly significant correlation between starch liquefying power and dextrinizing power was found, indicating that these two effects are probably produced by the same component of the diastatic system. C.

**Starch; Action of Enzymes on —.** K. Myrbäck. *Tekn. Samfund. Handl.*, 1941, 79-129 (through *Brit. Chem. Physiol. Abstr.*, 1943, A II, 57). The action of dextrinogen amylase on starch gives about 21 per cent. of "limit" dextrin having 6, 4 and especially 3 glucose residues per molecule. Taka-amylase gives about 20 per cent. of "limit" dextrin (6 residues per molecule), and small quantities of tetra- and tri-saccharides. Pancreatic or salivary amylases, however, produce chiefly tetrasaccharides and about 25 and 27 per cent. of "limit" dextrans, respectively, since the enzymes which decompose "limit" dextrans specifically are absent. If dextrinogen amylase contains no  $\text{PO}_4$  the whole of the  $\text{P}_2\text{O}_5$  of starch is to be found in "limit" dextrin, especially in those of high molecular weight;  $\text{PO}_4$  has no influence on the rate of decrease of "limit" dextrin formation. The presence of reducing groups (e.g. —CHO) in the substrate is (contrary to K. Meyer's theory) without important influence on the saccharo-amylase activity. C.

**Cereal Products: Analysis for Iron.** B. Sullivan. *Cereal Chemistry*, 1943, 20, 36-38. A report is given of a collaborative study of the determination of iron in cereal products by the method outlined by Andrews and Felt. Tests were made on samples of plain and enriched flour, bread and whole wheat. The results are tabulated and discussed. The agreement between results of collaborators is unsatisfactory. It is suggested that most of the discrepancies arise in the preparation of the samples for analysis and possible sources of variation are indicated. C.

**Cellulose: Oxidation.** *Silk J. Rayon World*, 1943, 19, Jan., 30-35; Feb., 20-24. A useful review of recent work by Jackson and Hudson, by Davidson, and by Kenyon and his associates on oxidation by periodic acid, chromic acid, and nitrogen dioxide. C.

**Nigerian Cassava Starch: Quality and Production.** (1) J. R. Furlong. (2) K. T. Hartley. *Bull. Imperial Inst.*, 1942, 40, 257-271. (1) In 1939 the total value of cassava starch or tapioca flour entering into commerce was in the neighbourhood of £900,000, of which about 95 per cent. came from the Netherlands East Indies. In Nigeria *Manihot utilissima*, the roots of which yield cassava starch, is widely grown as a local foodstuff and a crude starch has also been prepared in some parts for local consumption. Tests have been made on six starch samples representing different varieties of cassava grown by the Agricultural

Department and prepared under Departmental supervision and on a batch of 15 samples of starch representing ten varieties prepared under the close supervision of the Agricultural Chemist at the Government Farm, Agege, by a further developed process. Reports of chemical analyses, commercial valuations and dextrinisation trials are given and the basis of quality is discussed. It is pointed out that Nigeria can supply a cassava starch of high purity which, however, lacks the fineness of division required in first-grade starch. It has not yet been possible to provide the requisite pulverising equipment in Nigeria. The difficulty can, however, be overcome by grinding in this country. (2) Details are given of a method for the production of cassava starch as a Nigerian village industry. C.

**Sericin: Denaturation.** Z. Hirose. *J. Agric. Chem. Soc. Japan*, 1941, 17, 389-393 (through *Brit. Chem. Physiol. Abstr.*, 1941, A III, 771). Sericin- $\alpha_{4.8}$  contains more diamino-acid N than does  $\alpha_{3.8}$ -sericin. In composition,  $\alpha_{4.4}$ - and  $\alpha_{4.2}$ -sericins are more similar to  $\alpha_1$ -sericin than to  $\alpha_{3.8}$ -sericin. The  $\alpha_{4.2}$ - and  $\alpha_1$ -sericins contain more carbohydrate and amino-sugars than does  $\alpha_{3.8}$ -sericin. The tryptophan content increases in the order (a)  $3.8 < 4.2 < 4.4$  and 1. C.

**Proteins: Properties; Nomographic Representation.** J. Wyman, Jr., and Elizabeth N. Ingalls. *J. Biol. Chem.*, 1943, 147, 297-318. The molecular weight, sedimentation constant, diffusion constant, frictional ratio, hydration, shape, relaxation time and viscosity increment of proteins are considered. The various equations involving the different properties are examined, and the construction of nomograms for (1) sedimentation constant, diffusion constant, partial specific volume, molecular weight, frictional ratio, viscosity increment, axial ratio and hydration, and (2) relaxation times, axial ratio, molecular weight and hydration, is explained. Examples illustrating the convenience and value of the nomograms are discussed. C.

**Rubber: Peroxidation.** E. H. Farmer and A. Sundralinghan. *J. Chem. Soc.*, 1943, 125-133. The course of reaction in the autoxidation of rubber has been studied, principally under photochemical conditions. In ultra-violet light high yields of peroxide are formed in the very early stages of oxygen absorption, but soon decay reactions set in so that the ratio of the peroxide oxygen content to the oxygen intake decreases rapidly. The secondary products are hydroxylated compounds. Examination of the changes in unsaturation, in hydroxylic oxygen content, and in peroxidic oxygen content, as oxidation proceeds, leads to the conclusion that the oxygen enters mainly or wholly at  $\alpha$ -methylene carbon atoms to produce hydroperoxide groups and not by addition at double bonds. Chain scission accompanies oxidation, even from the outset of reaction, causing striking reductions in the molecular weight. The consumption of oxygen in relation to the degree of degradation produced is discussed. C.

**Alginates: Application in Clarifying Turbid Solutions.** R. C. Rose. *J. Soc. Chem. Ind.*, 1943, 62, 44. To 100 ml. of the turbid solution are added 20 ml. of 2 per cent. sodium alginate (Manucol I). After mixing thoroughly this is poured with stirring into 20 ml. of 5 per cent. calcium chloride solution. The alginates form a weak gel which contracts rapidly and separates into a gel phase and a liquid phase. The gel phase contains all of the insoluble impurities originally present in the turbid solution, leaving a clear liquid phase which can be strained and pressed off by means of a square of fabric. This method may be regarded as a rapid method of dialysis, the gel acting as a permeable membrane. It could also be used as a method of collecting and recovering a dispersed material. As sodium alginate is precipitated by bi- and ter-valent metals (other than magnesium) the method is not applicable if salts of these metals are present in the turbid solution. Interfering cations, however, can usually be precipitated, or alternatively they can be sequestered with sodium hexametaphosphate (Calgon). C.

**Collodion Membranes: Thickness and Electromotive Behaviour.** K. Sollner and C. W. Carr. *J. Gen. Physiol.*, 1943, 26, 309-323. A number of dried collodion membranes of thickness 3-160 $\mu$ , were prepared from materials of different electrochemical activity. The characteristic concentration potentials across them were measured and the means of these values determined for each thickness, the results show that the characteristic concentration potentials across dried collodion membranes increase with increasing thickness until a constant value is reached which is characteristic of the particular preparation used. With electrochemically active collodion, characteristic concentration potentials approaching

the thermodynamically possible maximum are obtained with membranes of only  $10\mu$  thickness, thinner membranes giving appreciably lower values. With two rather inactive commercial collodion preparations the characteristic concentration potential increased from about 30 mv. for membranes  $3\mu$  thick to about 42 mv. for  $20\mu$  membranes. With a highly purified collodion preparation the constant maximum value was about 32 mv.,  $4\mu$  thick membranes giving only about 22 mv. It is shown that these results do not support the homogeneous phase theory as applied to the dried collodion membrane, but are compatible with a micellar structure. Possible special cases of the micelle theory are discussed. C.

**Gelatin: Ultra-violet Absorption Spectrum.** M. Abribat. *C. r. Acad. Sci.*, 1942, 214, 417-419 (through *Brit. Chem. Physiol. Abstr.*, 1943, A I, 49). All specimens of gelatin examined show very weak bands at 2600, 2660 and 2700 A., with slight inflexions at about 2535 and 2790 A. These are independent of pH and temperature. The same bands appear in the spectrum of ovalbumin, and are attributed to a sterol group. C.

**Photo-electric Tricolorimeter.** G. F. G. Knipe and J. B. Reid. *Proc. Phys. Soc.*, 1943, 55, 81-91. A detailed description is given of a colorimeter designed to measure the colour of nearly-white paper with sufficient accuracy to specify those differences that are visible, but the nature of which cannot be determined by visual colorimeters. The instrument makes use of a double monochromator system and three diaphragms which select the correct proportion of light of each wave length to enable the result to be given in C.I.E. units directly. The calibration and performance of the instrument are discussed, and a table of measurements on typical white and cream photographic papers is given. C.

**Colour: Specification and Description.** Dorothy Nickerson. *A.S.T.M. Bull.*, 1942, No. 119, 19-20. American War Standard Z44 of the American Standards Association for the Specification and Description of Colour is given and discussed. For the most general case, the use of the system of colour designations established in the Inter-science Colour Council and National Bureau of Standards system of colour designations is recommended. For visual comparison and a popular designation that can vary in precision according to the tolerance required, the use of the Munsell notation is recommended. For colour specifications computed from basic specifications standard I.C.I. specifications ( $Y, x, y$ ) are to be used, or  $Y$ , dominant wave length, and purity, which may be computed from I.C.I. specifications. For basic work the spectrophotometer is recognised as the fundamental instrument in the standardisation of colour. C.

**Optical Systems: Flux Calculations.** A. C. Hardy. *J. Optical Soc. America*, 1943, 33, 71-74. Irradiance due to a circular source is studied and flux calculations in optical systems are explained. Visual and non-visual instruments are considered. Examples illustrating the usefulness of flux calculations for predictions of the performance of optical systems are discussed. C.

**Standard Response Curves: Analytical Representation.** P. Moon and Domina E. Spencer. *J. Optical Soc. America*, 1943, 33, 89-103. Various analytical representations of radiometric weighting functions are considered. A simple equation is found to approximate the standard lamprosity (visibility) data for the human eye. It is suggested that the presented tabulated values of  $v(\lambda)$  and  $\bar{y}(\lambda)$  be replaced by the proposed standard equation  $v(\lambda) = (A/\lambda^p)e^{-q/\lambda}$ . Such a procedure would increase precision, eliminate the need for standardisation of a method of interpolation and extrapolation, and simplify integrations in which the spectroradiometric curve can be expressed analytically. Pending standardisation, the equation for  $v(\lambda)$  can be used as a convenient approximation to the C.I.E. data. With continuous spectra, the analytic integrations generally agree with numerical integrations (using the C.I.E. data) to within a small fraction of 1 per cent. Analytic differentiation is also possible, and both integration and differentiation will be of value in theoretical investigations of light and colour. C.

**Rubber: Rheology.** *Nature*, 1943, 151, 563-564. A report is given of papers on the behaviour of rubber in elongation, compression and shear, the position of the rubber-like state on the plastic-elastic scale, and rheological problems in the rubber industry, presented at a recent joint conference of the Manchester section of the Institution of the Rubber Industry and the British Rheologists' Club. C.

**Dyes: Analysis for Alkaline Earth Metals.** K. A. Freeman. *J. Assoc. Off. Agric. Chemists*, 1943, 26, 171-172. Details are given of a method for the determination of organically combined Ca, Ba and Sr in coal-tar colour pigments in which the pigment is decomposed by ammonium carbonate solution, the metal precipitating as carbonate and the dye forming a soluble ammonium salt. Ammonium carbonate was chosen because it does not decompose barium sulphate, which is present as substrate in many lakes. The method gives doubtful results for the D & C Red food pigments Nos. 15, 16 and 31. For other pigments containing certified coal-tar colours it appears to give results corresponding to at least 98 per cent. of the theoretical, based on the pure dye content of the pigment as determined by titration with titanium trichloride. Since most lakes of Ca, Ba and Sr are made by boiling the sodium salt of the dye with the appropriate metallic chloride the method has been found to be practical for checking the completeness of the conversion. C.

**Flour: pH Determination.** F. A. Collatz. *J. Assoc. Off. Agric. Chemists*, 1943, 26, 107-112. A report is given of collaborative studies of the determination of the pH of flour and similar products by the electrometric method. The data show that the method is reliable and gives excellent results at the hands of different workers. The following procedure is recommended as a tentative standard method: Weigh 10.0 g. of the sample into a clean, dry Erlenmeyer flask and add 100 ml. of recently boiled, distilled water at 25° C. Shake the contents of the flask until the particles are evenly suspended and the mixture is free from lumps. Digest for 30 min. and shake the suspension at frequent intervals. Leave for 10 min., decant the supernatant liquid into the hydrogen-ion vessel, and immediately determine the pH by means of an electrode and potentiometer that have been previously standardised by means of a standard buffer solution. C.

**Furfuraldehyde: Determination.** I. J. Duncan. *Ind. Eng. Chem., Anal. Edn.*, 1943, 15, 162-164. In a study of methods of determining furfuraldehyde it was found that the steam-distillation of pentoses and plant material with hydrochloric acid resulted in higher yields of furfuraldehyde than steam-distillation with phosphoric acid. With 12 per cent. hydrochloric acid at least twice as long was required for the removal of all the furfuraldehyde as with 18.5 or 24 per cent. hydrochloric acid. The yield of furfuraldehyde from xylose was approximately the same when the three concentrations were used. In the application of the aniline acetate colorimetric method, the addition of small amounts of oxalic acid and disodium phosphate to the colour reagents resulted in increased colour intensity and shortened slightly the time required for maximum colour to develop. The colorimetric method was not affected by methylfurfuraldehyde or hydroxymethylfurfuraldehyde. The distillates from alfalfa or sweet clover produced coloured solutions very similar to that produced with pure furfuraldehyde, as shown by spectrophotometric curves. The titration method of Hughes and Acree gave consistently higher results than the colorimetric method when applied to the distillates from pure sugar, alfalfa, or sweet clover. This may be due to the presence of reducing substances other than furfuraldehyde in the distillates. For these reasons it is thought that the colorimetric method may be more accurate. C.

**Rubber Materials: Analysis for Sulphur.** L. V. E. Cheyney. *Ind. Eng. Chem., Anal. Edn.*, 1943, 15, 164-165. In a modification of the method recommended by the American Society for Testing Materials for the determination of total sulphur in rubber and rubberlike materials the nitric acid-bromine oxidation is carried out in the usual way and the resulting solution is then evaporated slowly until no more nitrogen oxide or bromine fumes are visible, diluted with 10 to 15 ml. of concentrated nitric acid, and heated to boiling. To the vigorously boiling solution are added successively several 0.5 g. portions of potassium chlorate. Explosions do not occur when the additions are made to the vigorously boiling solution in this way. Details of the complete procedure are given. The method is especially valuable for the analysis of vulcanized synthetic rubberlike materials and is also applicable to a wide variety of sulphur-containing organic compounds. C.

**Starch: Rapid Determination.** J. P. Nielsen. *Ind. Eng. Chem., Anal. Edn.*, 1943, 15, 176-179. A rapid and reasonably accurate method for the determination of starch in certain vegetables comprises grinding the fresh sample in a Waring Blendor-type disintegrator, extracting the starch with 4.0 to 4.8

molal perchloric acid, and estimating the starch colorimetrically with iodine by means of a photo-electric colorimeter. Alcohol extraction of the products is unnecessary. The use of a red filter in the colorimeter considerably reduces the error produced by dextrans. C.

**Sulphur: Semimicro-determination in Organic Substances.** J. H. Jones. *J. Assoc. Off. Agric. Chemists*, 1943, **26**, 182-186. In a simple, rapid method for the determination of semi-micro quantities of combined sulphur in non-volatile organic compounds, the sample is oxidised to inorganic sulphate by a mixture of nitric, hydrochloric and perchloric acids and titrated with barium chloride, using tetrahydroxyquinone as indicator. Experimental details and typical results are given. C.

**Cellulose Acetate *p*-Toluenesulphonate: De-acylation.** T. S. Gardner and C. B. Purves. *J. Amer. Chem. Soc.*, 1943, **65**, 444-449. A mixed acetate-*p*-toluenesulphonate of cellulose averaged 0.196 *p*-toluenesulphonyl group in the primary alcoholic and 0.054 group in the secondary alcoholic positions of the glucose residues. When this mixed ester was de-acylated with excess sodium methylate in methanol, the analysis of the product suggested the presence of 0.06 methoxyl, 0.007 *p*-toluenesulphonyl and 0.183 anhydro groups. Re-acetylation gave an anhydrocellulose acetate whose composition also supported this conclusion. A drastic methanolysis reduced this acetate to substances among which was 0.025 mole of the liquid equilibrium mixture of methyl  $\alpha$ - and  $\beta$ -3:6-anhydroglucofuranoside and 0.022 mole of an anhydro-dihexose. The latter was isolated as a fully methylated derivative, whose stability during methanolysis and hydrolysis suggested that an ether, rather than a glycosidic bond, united the two hexose units. If this conclusion is correct, the anhydrocellulose contained some glucose residues that were condensed through their alcoholic groups to form a cross-linked structure. The reactions occurring during the de-acylation of the original cellulose mixed ester can be explained by the mechanism usually assumed for Walden inversions. The anhydrocellulose was partly degraded by hot dilute mineral acid, decomposed in cold, concentrated acid and swelled but did not dissolve in various solvents for cellulose. These observations, together with the similar behaviour of the anhydrocellulose acetate toward many organic liquids, are all consistent with the cross-linked structure proposed for the substance. C.

**Proteins: Partial Hydrolysis and Structure.** R. L. M. Synge. *Chemical Reviews*, 1943, **32**, 135-172. The significance and authenticity of partial hydrolysis products from proteins are discussed, and the results of investigations of silk fibroin, protamines and histones, partial hydrolysis products containing basic amino acids derived from other proteins, and non-basic partial hydrolysis products of keratins, gelatin, elastin, plant proteins, casein and phosphoproteins are reviewed. No general picture of protein structure emerges from the studies reviewed. Except in the protamines, tussore silk, and vitellinic acid, few cases of direct linkage of two amino acid residues of the same species have been established; direct association of different amino acids has been proved in a number of cases, of which the following seem to be the outstanding examples: (1) glycine-alanine and glycine-tyrosine in silk fibroin; (2) glycine-leucine and alanine-leucine in elastin; (3) proline-phenylalanine and leucine-glutamic acid in gliadin; (4) lysine-proline-glycine in gelatin; and (5) valine-leucine, isoleucine-glutamic acid-serine (phosphoric ester) in casein. The isolation of such groupings in significant yield suggests some regularity of structure rather than statistically random occurrence of amino acid residues along a peptide chain. The methods used in the study of protein structure are critically reviewed and the need for improvements in technique is emphasized. C.

**Pigment Suspensions: Thixotropy.** H. Green and Ruth N. Weltmann. *Ind. Eng. Chem., Anal. Edn.*, 1943, **15**, 201-206. The criterion of thixotropy is discussed and it is pointed out that a complete transformation from a gel to a sol on shaking or stirring is not a pre-requisite for thixotropy, but that a partial transformation is all that is necessary. Controversial points such as the non-linearity of the lower end of the consistency curve, the three different yield values, the apparent viscosity, and plastic flow without liquefaction are discussed. The hysteresis loop obtained by plotting the change in torque with increasing and then decreasing r.p.m. in a rotational viscometer is analysed and the time element and velocity gradient element in thixotropic breakdown

are studied. An equation for the upcurve, an expression for the area of the loop, and other important relationships are deduced. Experimental results for various pigment suspensions are examined and theoretical and empirical equations are compared. Pigment suspensions which do not give hysteresis loops are mentioned and it is suggested that these materials are plastic without being thixotropic. C.

**Rubber Photogels: Formation and Properties.** H. P. Stevens. *Trans. Inst. Rubber Ind.*, 1943, 18, 218-224. A report is given of further work on rubber photogels, including studies of the anomalous behaviour of benzoquinone which has a retarding instead of a sensitising action on photogel formation, the insolation of dry rubber, and the rate of gelling of milled and unmilled rubber. Samples of raw rubber became partially insoluble on exposure to light, which observation necessitates a revision of the views expressed in a previous paper. It seems clear that separation of a photogel from a rubber sol is the direct result of the formation of an insoluble type or modification of the rubber independent of the solvent and cannot be ascribed to a reaction involving cross linking or any type of combination between the rubber and the solvent. On the other hand, a reaction may subsequently ensue promoted by a solvent or sensitiser, or the latter as a negative catalyst may prevent the separation of a photogel or eventually disperse one already formed. Photogels formed in inactive solvents, such as ligroin, benzene, toluene and cyclohexane, are generally rather tenuous, readily revert to sol form on exposure to light and air, and show a small loss of 2 or 3 per cent. in weight after drying as a result of conversion to gel. In such cases it would seem that there is nothing more than separation of rubber rendered insoluble by insolation. With an active solvent, such as carbon tetrachloride, or one containing a sensitiser such as a benzene-acetone mixture, a reaction proceeds independently of and simultaneously with the formation of insoluble rubber, and a new rubber derivative is formed in which molecules of the solvent react, probably additively with the unsaturated hydrocarbon. In neither case can the majority of gels be regarded as vulcanisation products. The possibilities of oxygen-bridging, of cyclisation, and of addition of solvent hydrocarbon as a whole to the unsaturated rubber molecules as a result of the action of light are briefly discussed. C.

**Aromatic Hydrocarbons: Ultra-violet Absorption Spectra.** R. N. Jones. *Chemical Reviews*, 1943, 32, 1-46. The influence of various structural factors on the absorption spectra of aromatic hydrocarbons is discussed, particularly with respect to changes produced in the spectra by the introduction of alkyl substituents, alicyclic groups, and alkene and cycloalkene groups. References to the absorption spectra of about 370 hydrocarbons are collected in tables. References to published work number 262. C.

**Stroboscopic Equipment.** G. Windred. *Engineering*, 1943, 155, 401-402. The basic principles of stroboscopes are explained and the Strobotac and Strobolux are briefly described. The Strobotac is a self-contained portable instrument having a vacuum tube relaxation oscillator for controlling the flashing speed of a neon lamp mounted in a parabolic reflector in one side of the case. The frequency and hence the rate of flashing can be adjusted between the limits of 600 r.p.m. and 14,400 r.p.m. The Strobolux is virtually a source of high-intensity light for use in conjunction with the Strobotac when this instrument is unable to supply sufficient light for the illumination of large areas or for photographic purposes. The use of these instruments in the taking of single-flash photographs, e.g. of mechanical impact phenomena, is discussed and typical photographs are reproduced. C.

**Polymeric Materials: Mechanical Properties.** A. Tobolsky and H. Eyring. *J. Chem. Phys.*, 1943, 11, 125-134. A molecular model is presented in terms of which the elastic viscous properties of rubber-like substances can be interpreted. Experiments on stress relaxation at constant extension, creep under constant load, extrusion, vibration, and breaking are discussed in terms of a mathematical formulation of this molecular model. C.

**Rubber: X-Ray Studies.** G. A. Jeffrey. *Trans. Inst. Rubber Ind.*, 1942, 18, 166-172. A brief account is given of the application of X-ray diffraction methods to the study of rubber and similar long-chain compounds. A report of a discussion of this subject is also given. C.

**Animal Skin Proteins: Acid-base Binding Capacity of Limed Skin.** E. R. Theis and T. F. Jacoby. *J. Amer. Leather Chem. Assoc.*, 1942, 37, 611-620. Acid-base binding curves are given for animal skin limed for varying periods. Long contact with alkali changes the structure of the collagen which apparently fixes more acid and more base and has a lower  $pH$  than unlimed collagen. For hair treated with alkali, a greater amount of acid and base are fixed and the isoelectric point of the keratin proteins is shifted to a slightly higher  $pH$ . W.

#### PATENT

**Solution or Suspension Drying Apparatus.** Research Association of British Flour Millers and J. Thomlinson. B.P.552,475 of 2/12/1941:9/4/1943. In apparatus for drying solutions or suspensions of pulverulent matter in a liquid in which the solution or suspension is sprayed in a chamber, while a current of dry air is directed against the spray to absorb moisture therefrom, mechanical conveyor means are provided for reintroducing through the top of the chamber, in the form of a curtain or screen around the sprayed solution or suspension, fine material which has already been separated from the air in the apparatus, so as to intercept, and absorb moisture from any material which, by spreading action, has been thrown out to an excessive extent. The curtain may be just outside the chief zone of the spray and the material may be spread by a chain passing round the wall or on top of the first chamber, just above the chief zone of spraying, in a trunking to which material from the second and/or subsequent chambers is fed, the chain being fitted with flights or fingers for conveying the material, and slots, adjustable in size, being formed in the side or bottom of the trunking and movement of fine material so fed may be assisted by a current of air blown or induced through the trunking. C.

### 10—ECONOMICS

**Textile Wholesale Prices, April, 1943.** *Bd. Trade J.*, 1943, 149, 185. Monthly index numbers are given for the period April, 1942, to April, 1943. The numbers for April, 1943, are Cotton 136.2, Wool 174.4, Other Textiles 133.6, All Articles 162.8 (1930 = 100). C.

**Mill Restaurant: Economics.** *Textile Weekly*, 1943, 31, 731-732. Details are given of the expenditure and income of a Lancashire cotton mill restaurant between June 1, 1942, and March 27, 1943. The restaurant serves about 250 midday dinners daily and provides a trolley tea service inside the mill. Tickets are sold for the various courses for the following day, and a ticket issuing machine counts the number of tickets issued. The tickets issued during the period were: Soup (2d.), 6,156; Meat and two vegetables (8d.), 39,837; Sweets (2d.), 42,440; Tea (1d.), 13,524; Tea and biscuits (1d.) served in the mill totalled 87,505. Analysis shows that the recorded profit of £62 really arose from the sale of tea and biscuits and not from the dinner service. The dinners are of a better standard than those of the local British Restaurants but only 250 of the 650 workers use the service. C.

**Textile Commodities: Average Wholesale Prices.** *Textile Weekly*, 1943, 31, 752. Average wholesale prices are tabulated for American, Egyptian and East Indian cottons, American and Egyptian cotton yarns, various cotton cloths, wool tops, noils and yarns, acetate and viscose rayons, hemp, jute, and linen yarn for August, 1939, the months November, 1942,—April, 1943, and the week ending May 22nd, 1943. C.

**Textile Wholesale Trade Index Numbers.** *Bd. Trade J.*, 1943, 149, 201. Index numbers of trading by wholesale textile houses in April are given with comparative figures for earlier periods. The April index numbers for (1) sales for home trade and (2) the value of stocks at the end of the month are 101 and 102, respectively, based on average monthly sales or stocks in 1937 = 100. The index of home trade sales is 12 per cent. lower than in March, which is smaller than the decrease last year (18 per cent.), but greater than the normal peace-time movement. April sales were 1 per cent. below the average of the preceding 12 months, against 5 per cent. above the average last April, and 9 per cent. above the average for the year in peace-time. The value of stocks at the end of April was a little below the March figure, but 16 per cent. higher than a year ago. C.



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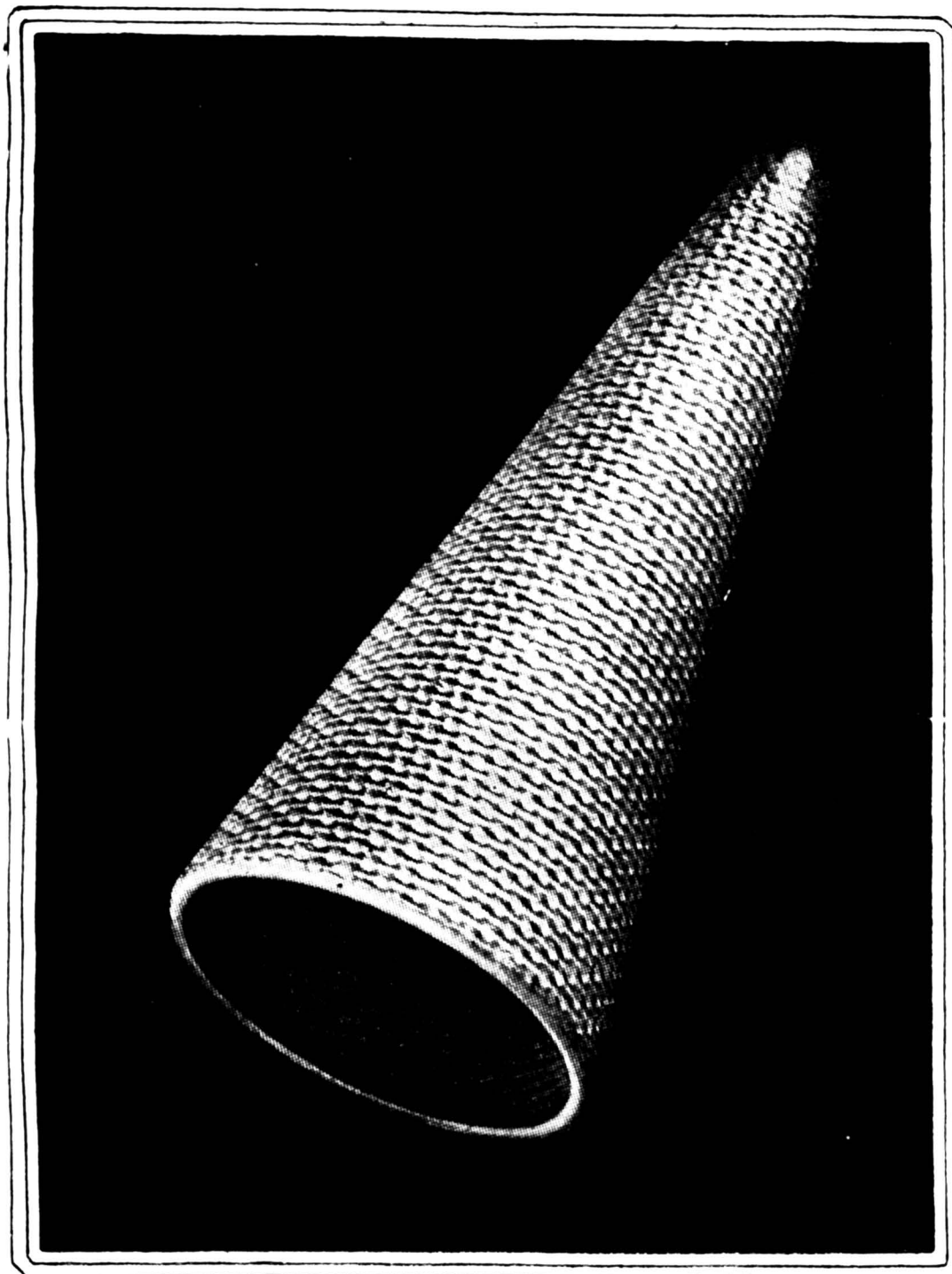
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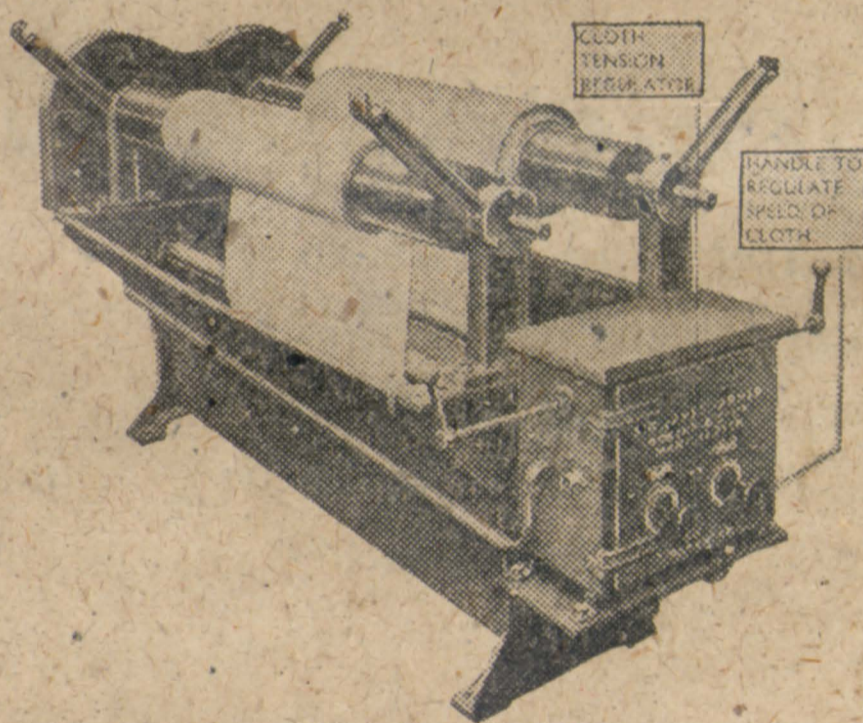
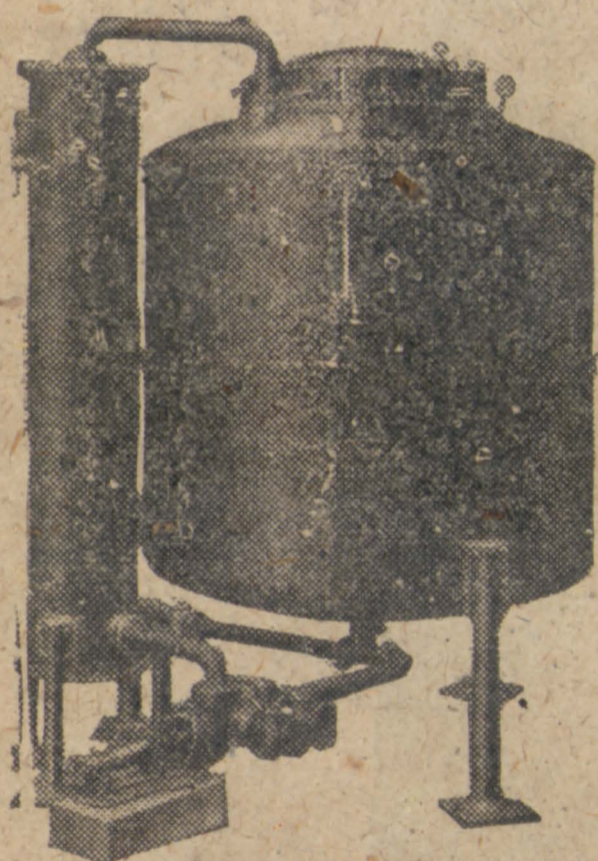
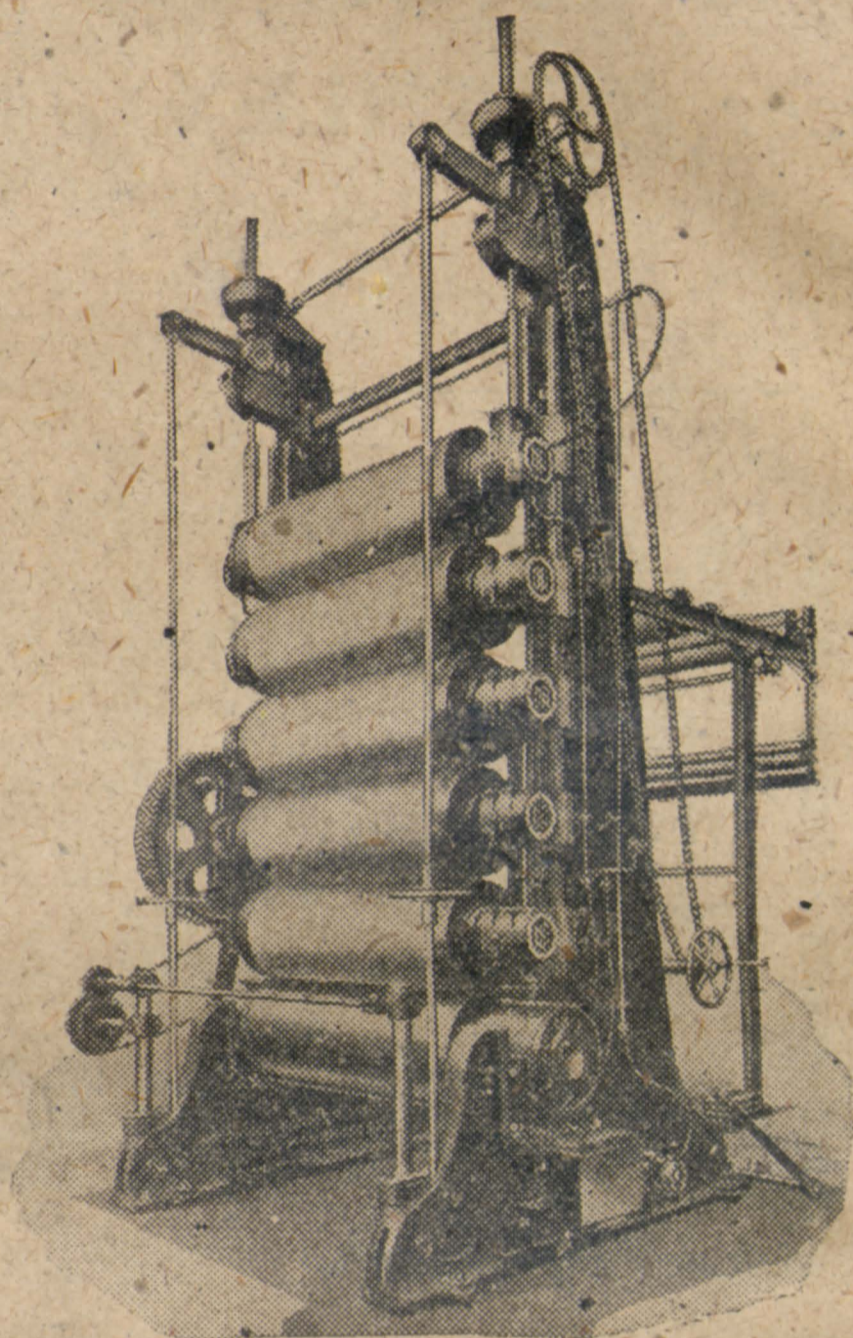
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