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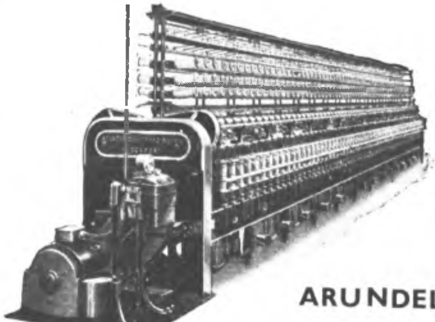

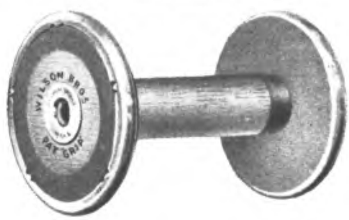

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PROCEEDINGS

Yorkshire Section

SCAFFOLDING THREADS IN YARN AND CLOTH STRUCTURE

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(Paper delivered to the Yorkshire Section, 4th December, 1944)

The strength of a yarn spun from material consisting of short fibres depends to a large extent, on the degree to which it is twisted. This has an important bearing upon the behaviour of warp threads during weaving and any attempt to increase the strength of a yarn is usually welcomed by the weaver. In general the easiest way to increase the strength is by increasing twist and there is always a tendency to use tightly twisted yarns which, unfortunately, impart a rough handle to the fabric.

Recently, however, many cloth constructors have seen the possibilities of twistless yarns and attempts have been made to produce fabrics from yarns with little or no twist. In some of these the fibres were simply glued together or, in the case of wool, slightly felted to make a cohesive yarn with little twist. The size used for glueing the fibres was washed out in the process of cloth finishing, but the milled state of the yarns was carried into and became a feature of the cloth. Another method was to twist a very thin thread with a much thicker single yarn, so that the bulk of the latter would hide the supporting thread. The thick single yarn would then appear as a virtually twistless yarn.

In the early part of the present century this supporting thread principle was used to make fabrics from twistless mohair in the warp. A thin cotton was wrapped around the mohair, supporting it during weaving. The finished cloth was carbonised and the cotton was beaten out leaving a fabric with remarkable crease resisting properties. A more recent development has been the use of an acetate rayon supporting thread. This could be removed by acetone in a readily controlled process.

In studying these four methods of weaving yarns with very low twist it is noted that the adhesive methods and the fine permanent supporting thread have not been widely applied. In the method where the cotton is carbonised, the application is very limited and the effect of the process on the animal fibres is not good. The method which takes advantage of the solubility of the supporting thread in acetone is comparatively new.

For the ideal soluble thread to have the widest application it must necessarily be cheap. It must possess ample strength even in fine counts and the effects should be obtainable with the minimum loss of yarn. Furthermore, the removal process should be easy, inexpensive, and non-injurious to the residual fibres and, finally, the ideal thread should be capable of being used in combination with all types of fibres.

The latest development in connection with the use of soluble thread has come from an unexpected source. It has been found that seaweed, hitherto of limited use and application yields substance which can be spun into filaments similar in appearance to the familiar viscose rayon. For many years, however, it was thought that seaweed rayon would be precluded from commercial exploitation because of its ready solubility in weak alkaline solutions. This assumption was correct in so far as the normal use of rayon yarns and fabrics is concerned, but the very weakness of this original type of seaweed rayon for normal purposes has become its greatest recommendation where a readily removable thread is required.

Calcium alginate, the form in which this yarn is most easily manufactured, has a strength of approximately 2 grams per denier, and can easily be spun as fine as 50 denier. Its dissolution is rapid and in most cases the normal soap and soda scour given to wool goods is sufficient to remove the rayon yarn from a cloth when combined with other fibres. This, in the case of fabrics consisting in the finished state wholly of wool, means that no extra process is needed for removal. Calcium alginate rayon fulfils the other qualifications of an ideal soluble thread. It can be used in productions which hitherto have been made by the aid of either cotton or acetate. The more readily soluble alginate threads have enabled the principles of the method to be developed much farther than with removable threads of cotton or acetate. Methods in which a soluble thread is used in the construction of fabrics, from which it is later removed by treatment in weak alkaline solutions, are now to be developed and described.

The soluble thread is used for the purpose of binding, supporting, carrying, embossing, spacing, ornamenting and bonding. Experiments using the soluble yarn with the foregoing objects will now be described.

Owing to the pioneer nature of the work, it is inevitable that certain sections have been developed far more than others. It would be a presumption, therefore, to claim that the structures of the examples given have universal application as each firm caters for its own special customers whose peculiar needs are known and, therefore, details when stated are offered merely as proof of a workable idea to be modified as necessary or desired.

Alginate Rayon Used as a Binding Agent

Yarns spun from long fibred material are often extremely hairy in character and their manipulation is very difficult, especially when used as warp owing to the projecting fibres clinging to each other whilst the threads are crossing during the changing of the shed in the loom. Certain remedies may be applied in order to bind the fibres of the yarn, e.g. increasing twist or applying size, but these measures are not always successful and designs with tight interlacings such as plain weave, might have to be omitted from the range of fabrics made from very hairy yarns. If such yarns are bound with alginate rayon, weaving is facilitated and then, when the rayon is removed during scouring, the long fibres are released and give character to the cloth. This application might bring into the textile field a range of fibres hitherto precluded because of the difficulty in controlling them. In one sense the soluble rayon, by binding extraneous fibres to the yarn, acts as a size, but is rather more certain and regular in its binding power. Yarns so bound would certainly be useful in the knitting process where fibrous material is reluctant to submit to needle control.

Fancy Yarn

The typical fancy yarn is composed of core, effect and binder threads, the first mentioned being the foundation around which the effect thread is wrapped, the binder being used primarily to prevent the effect thread from slipping along the core during weaving and thereby disturbing the pattern. Once the fancy yarn is in the cloth the binder is no longer required; in fact its presence may be of doubtful value, especially where lightness of cloth, fullness of handle, and maximum covering power of the fancy yarns is desirable. Because the binder usually remains in the cloth some effort is usually made to ornament it. From the preceding discussion it is evident that calcium alginate rayon should find useful application as a temporary binder easily removed from the cloth. In Fig. 1 two cloths are shown. The upper one illustrates a stripe made from a fancy yarn of rayon with the alginate binder retained, whilst the lower cloth shows the effect given by the same yarn with the binder removed and gives evidence of the extra fullness of the stripe. When the fabrics illustrated are rubbed between finger and thumb the threads with binder retained are much harder in handle, a quality which has an important influence on the handle of the fabric as a whole. Other less obvious uses of alginate rayon may be cited. Suppose, for example, thick crossing threads in gauze are tied down at certain points by soluble rayon and later removed in scouring. The freed loops then rise to form a pile fabric. Another application utilises the solubilty of the rayon in the production of mult-layered fabrics. During weaving, the layers can be held together by the alginate threads and the compound structure of the cloth arranged in such a way that, on the dissolution of the alginate rayon, tubular or very wide cloths are left, the width being greater than that of the loom.

Alginate Rayon as a Supporting Agent

The main use of alginate rayon as a supporting thread is in connection with the twistless yarns which have interested many inventors for several years. Taking a single yarn with known turns per inch it is possible to twist it with fine continuous filament alginate rayon in a direction opposite to that of the singles twist and with a sufficient number of turns in the two-folding to leave a twistless yarn when the soluble thread is removed.

The field can be extended to include all types of natural and synthetic fibres. It is not necessary for the residual yarn to be twistless. For very fine counts such as 1/100's worsted it is advisable to leave some twist in the yarn to give reasonable stability to the cloth. In this case the alginate rayon once more acts as a substitute for a size but with far greater effect. This application enables manufacturers to produce worsted fabrics of a fineness hitherto unknown and so to keep ahead of foreign competition in old markets and enter new ones.

The structure of these gossamer fabrics is to be on a plain weave basis and, therefore, the possibility of ornamentation by printing, instead of weaving should not be overlooked. By this means, light weight wool fabrics might have application for clothing purposes quite outside the limited scope of the wool fabrics made on orthodox lines. The handle of the fabrics made from twistless yarns is, as would be expected, much softer than that of cloths made from yarns in their twisted state, although this quality in the fabric may be obtained at the expense of other desirable features such as springiness in handle and strength. Where cheap fibres are blended in a yarn with more expensive fibres the elimination of twist would obviously be an important contributory factor in softening the handle of the fabric. Blankets made on these lines with wool and jute blends give remarkable evidence of this method of improving handle.

One feature of the twistless cloth is that the interstices between the yarns are very much smaller than when twisted yarns are used. Fabrics made from twistless yarns are therefore successful foundations for impregnation with resins or as filter cloths. One rather more interesting feature arising from the use of twistless yarns is that, provided the set of the cloth is maximum and the weave one with tight interlacings, such as plain weave, then the cloth need not be weaker than its twisted counterpart and may even be stronger.

The lustre of twistless yarn is greater than that of twisted yarn, a feature which has general application when cotton yarns are used with sateen weaves and especially when used for stripes. In this connection instead of 2/120's cotton striping it is now possible to use 1/60's bound with alginate, the latter not necessarily in its twisted form but even twistless, the soluble rayon being removed in cloth scouring.

In Fig. 2, on a worsted ground ordinary 2/60's cotton stripngs have been used alternatively with 1/30's of the same shade supported by a fine thread of alginate. The more prominent stripe is formed by the singles thread which is also more regular in appearance owing to the elimination of twist. In this way cloths such as panamas may be ornamented by twistless cotton, or even very fine singles wool thereby tending to soften the handle of the cloth. If the same intensity of striping is required as would be given by two-fold yarn, the amount of the striping in its singles twistless state can be reduced.

It must not be imagined that the utility of twistless yarn is confined to the woven fabrics. In certain knitted structures it will be possible to use the fibre length of the twistless yarn with benefit to the fabric. In knitted structures normally made more compact by milling, the weight could be reduced and the milled surface retained. Similar effects may be produced with lightly set but tightly bound gauze interlacings and even in the field of lace there should be room for the use of yarns supported by the soluble rayon. In the latter case the length of fibre and the size of the mesh would necessarily bear a close relationship in order to preserve the cohesiveness of a fine lace made, for example, from twistless wool. It is, however, when used as an accessory to a foundation fabric that the utility of twistless yarn is most obvious. Short fibred material in twistless form can be supported by soluble alginate rayon during weaving and used to soften the back of the fabric or as wadding, thereby producing maximum fullness or making a surface more amenable to raising. Such yarns would be of use to designers in all branches of the trade to use for such special effects as fringes or where unwanted lengths are cut from the fabric, since, after the removal of the supporting thread, there remains no evidence of the manner in which the fabric has been woven. A self explanatory example of such a use is given in Fig. 3.

The last application in this section arises from the common method of obtaining a preliminary idea of the appearance of stripings. This is done by weaving stripes weft way, and then giving the cloth one quarter turn. A disadvantage of this method is that usually the warp is two-fold and may not give the correct relationship of the warp and weft in the readjusted pattern. If, however, single yarn is supported by soluble alginate rayon and used as warp, and the ground weft is made of two-fold yarn, then, after the alginate is removed and the pattern given a quarter turn, the usual effect of two-fold warp and single weft is obtained.

Alginate Rayon Used as a Carrying Agent

In this section, the function of the soluble alginate rayon is extended beyond that of a mere supporter. It actually carries into the fabric additional lengths of yarn. The simplest example yet developed produced in the weft an effect which has, up to the present required the use of two beams in weaving. When two beams are employed the yarn from one beam is fed into the fabric more rapidly than from the other. The well known crimp effect is the result. So far this effect has been obtained mainly warp way, but by wrapping a wool thread around a soluble alginate core, weaving this pick and pick or 2 and 2 etc., with the wool yarn in its straight form and removing the rayon in the finishing process, a crimp effect similar to that shown in Fig. 4 can be produced in the weft direction. In the commoner method, tension of the yarn on the beam must be carefully regulated and checked from time to time during weaving in order to give a regular crimp, but when produced weft way it will not vary to the same extent as the effect is more precisely regulated in the two-folding process. The method also enables the warp and the weft styles to be embodied in one cloth. Furthermore, the method of twisting the effect thread can vary through wide limits and any degree of crimp can be obtained by choosing a suitable two-folding process. Slight crimp can be obtained by the normal twisting procedure with one set of rollers. In this case, the convolutions which similar threads make around each other in evenly twisted yarn cause the folded product to be rather shorter in length than the constituent single yarn. Thus, for example, if a two-fold yarn consisting partly of alginate rayon is woven alongside an ordinary single thread, the dissolution of alginate rayon will leave its companion thread with a slight length advantage over its neighbour and form a crimp. The difference is accentuated if, during the twisting of the soluble and insoluble threads, the turns in the latter are decreased, thereby increasing the size of its coil around the alginate. If, at the same time the twist is being inserted into the soluble component, it may contract and further accentuate the crimp.

Still further length advantage is obtained if the insoluble thread is thicker than its companion and this condition is ideal for the manufacturer of alginate/other-fibre two-fold yarns, as, owing to the soluble component being in continuous filament form and strong enough to carry a much thicker thread, a marked length advantage is given to the permanent thread, especially when combined with the advantage in length given by untwisting. Finally, by using two pairs of rollers revolving at different rates, greater degrees of crimp are easily obtained. It is obvious that if the length advantage increases to such an extent that there is danger of the yarn slipping it is necessary to add a binder thread. This binder need not be soluble as, in many cases the crimp fabric can be made by one shuttle, providing the binder is retained and the core removed. Further elaborations on these lines are obvious; for example, if a fancy yarn frame is available alternating lengths of one yarn may be straight and crimped, i.e. alginate core wrapped round the permanent thread for a short distance and then reversed for the next section. When this is woven in the cloth (weft mixed) a crimp fabric from one weft is produced.

Abnormal Loops. The extent to which crêpe effect is developed when a soluble alginate carrier thread is employed is determined by the length advantage enjoyed by the permanent thread over the rayon core. In the manufacture of yarns for crimp fabrics the maximum length advantage of the long yarn is reached when its coils commence to form loops. It must not be assumed that beyond this limit such yarns have no application but they come into a different class. The point at which looping takes place during twisting was noted and exploited in the formation of pile fabrics. When pile fabrics are being reviewed one very important type is at once called to mind, i.e. the Astrakhan or woven imitation of the lambskin. The curled lock of the true skin is imitated in fabrics by superimposing lengths of mohair on a foundation fabric and the effect threads are most natural with little twist. The facility with which such yarns can be woven by the assistance of soluble alginate rayon encouraged the attempt to make an Astrakhan fabric on a simple dobby loom instead of the more complex pile wire loom. In brief, mohair threads with a great length advantage over the soluble core were bound with a soluble binder and floated weft ways for a good length between tightly bound sections on a plain warp. After each effect pick stabilising picks of plain weft were woven in a plain weave to give a grey cloth similar to the small cutting in Fig. 5. Thus, on removing the alginate, the resilient mohair came to the surface giving the Astrakhan effect shown in Figs. 5 and 6. It is well known that the curly effect of the woven Astrakhan is greatly enhanced by a special treatment given to the pile yarn before weaving. Briefly, the process consists of doubling a number of the pile yarns into a highly twisted rope and subjecting it to a setting process. The rope is untwisted and the yarn woven as warp on the pile wire loom. In the present case, however, it is possible to set the mohair yarn whilst it is in its twisted form with the alginate rayon woven in the cloth so that the expense of the setting process is avoided.

Furthermore, the degree of crimp can be precisely determined according to the amount of twist in the two-fold and the efficiency of the setting method chosen. Even in the method of making pile fabrics by wires, the soluble carrier thread may be used. If the alginate/mohair pile yarn is woven alongside a similar yarn in its straight form and made to mount over wires in weaving, there will be differences in height of pile after the removal of the soluble thread. In weft piles also, new effects may be obtained by the use of alginate/other fibre combinations. When these are woven with long floats bound down at intervals and the float cut by knives acting parallel to the warp, a crimped cut pile is formed and this principle can also be applied to the warp wire looms for cut pile. For the purpose of discussion the use of wool has been implied as a convenient basic fibre owing to its plasticity in water and the ease with which it can be deformed and set in the new position. It should be emphasized, however, that the possibility of other fibres being treated in this way must not be overlooked as the many resins at present on the market may enable cotton, silk, or the synthetic fibres to be set in the same manner.

It is not a great step from the production of loops on one side of the fabric by the alginate rayon method, to a development of loops on both sides of the cloth for use as rugs, terry towellings or furnishings. This, without doubt, is a much simpler method than the cumbersome manipulation of a pile wire or terry loom. In all the cases cited, the basic pile fabric may be twistless or highly twisted according to the effect required. Furthermore, it has been assumed that both core and binder threads have been removed, but this may not apply in all cases. For the production of certain effects ranging from crimps to pile it may be an advantage to retain either the core or the binder thread. The production of pile effects both plain and figured can obviously be developed on a knitted ground; for example, one of the three coloured wefts often used on a popular type of jacquard knitting machine can be replaced by an alginate/other fibre pile thread. This would give a raised effect on a knitted fabric, although it is likely that an insoluble binder or core might be an advantage in the loose knitted structure.

Other applications due to the ability of the alginate rayon to carry the extra length of warp or weft into a fabric may be briefly mentioned. It would be worth while experimenting to get the right conditions for using such a yarn in an attempt to eliminate cracked stripes so prevalent in certain types of suitings. In another application the tensioning of weft could be regulated to a degree much greater than that possible by the existing method which relies upon frictional contact of the weft on the brush in the shuttle. Finally, the soluble thread could carry into the cloth, weft ways, sufficient additional length of yarn to produce many abnormal styles in such novelties as distorted weft effects.

Alginate Staple Fibre

Mixtures of alginate staple fibre with other natural or synthetic fibres might be used for the production of both plain and fancy effects. Fibres which are difficult to process alone might, in this way, be carried through the spinning by an alginate rayon, and after weaving, the removal of the alginic fibre from the cloth would leave a fabric made from a fibre difficult or impossible to control. It is, of course, fully realised that a great amount of experimental work will have to be done before the value of these suggestions is known.

All Calcium Alginate Fabric

One section of the embroidery trade uses a woven fabric merely as a basis upon which the stitches of an interlocked embroidery pattern are superimposed. The woven fabric is then removed to leave a net-like effect which is similar to lace. Obviously here is a use for calcium alginate rayon fabric which would carry the embroidered section with ease during processing and be removed by a weak solution of alkali. Fig. 7 shows a small motif isolated from an alginate fabric on these lines. All alginate fabric made from heavy denier yarn might also be used to solve a problem which is always present when wool fibres are transported in jute packs. By using the alkali-soluble fabric as a backing to the existing jute pack or even as the sole covering of the bale, the possibility of stray fibres going forward into the dyed cloth and appearing as a defect, would be reduced considerably. Such a project obviously must depend upon the cost of the alginate rayon yarn, its strength and the amount of money saved in burling, as compared with the existing cost of jute fabric.

Calcium Alginate Rayon Used as an Embossing Agent

An interesting major development has arisen out of what was originally a minor process in the production of woven imitations of the Astrakhan lambskin. This relates to the setting of the effect thread in the position it takes up when folded with alginate rayon so that, on the removal of the latter, the basic thread is coiled. It was considered worth while to develop this as a special effect on fabrics other than Astrakhan to produce an entirely new ripple finish. In addition to the expensive pre-treatment of the yarn already described in relation to Astrakhan fabrics it is possible to produce crimp effects by weaving, embossing, or by using Wensleydale or Lincoln wools or specially processed corrugated synthetic fibres. In the new method single or two-fold wool yarns, with or without twist, supported by calcium alginate rayon can be set after weaving by steam or other means so that, when the supporting thread is removed, the yarn remains corrugated to give a rippled surface. It must be borne in mind that this method controls precisely the number of corrugations the fibres have in the finished cloth. For example, a range of four yarns could be made by twisting a thread of calcium alginate with a single thread of wool so that each has a different number of turns per inch and yet leave the wool components twistless. If woven as stripes in one cloth and the alginate removed, stripes would be formed from yarns with different numbers of ripples per inch. Other fibres, natural or synthetic may be treated in this way by the assistance of resins as already mentioned. By this means a designer is given a new tool in the production of both standard cloths and novelties and one which will be applied to other types of fibres in both continuous and staple forms. How far this method can be applied in other ways, e.g. for increasing the warmth of cotton blankets by giving cotton a crimp remains to be seen as, in all the examples described, the price factor is undoubtedly important in determining the utility of the effect obtained.

The Curling of Yarns

Certain yarns are woven in such a manner that they form loops which are set by heat or boiling, and are then withdrawn from the woven backing to be used later as crimped pile thread. It is suggested, that an improved method would be to make a warp of thick yarn intended for use as pile and cross this plain weave with alginate rayon weft. This fabric could then be treated to a setting process and afterwards the alginate could be removed and the yarn re-wound. Furthermore, if the prospective pile thread were merely twisted with alginate rayon and set, it could be woven in this state or, if required, the alginate component could be removed by a simple scour and the treated yarn woven alone.

Alginate Rayon Used as a Spacing Agent

Missed Thread Effects. There is a limited number of fabrics made in which the warp threads are not equally spaced, that is, some reeds may contain a normal complement of threads, whilst others may be empty. In this way stripes are formed down the cloth and the effect is suggestive of hand-made open-work fabric. Warp stripes are arranged very easily and cause little trouble in the loom, but similar effects produced weft ways are difficult to obtain. It will be found, however, that these effects are possible if picks of soluble alginate rayon are woven where the gap is to appear. This entails no disturbance of the mechanical action of the loom and the openwork effect is just as pronounced in the weft as by missing threads from the reed. To obtain the full benefit of this idea alginate rayon threads should be woven warp ways to preserve the open-work stripe effect also. The finished effect of the fabric made on the foregoing lines is shown on Fig. 8. Because of the special properties of the alginate rayon it is possible to weave such stripes in wool fabrics, and, by milling with a neutral milling agent or in acid solutions, felt the wool before washing away the calcium alginate. By this means it is possible to make open-work effects in milled fabrics. Interesting possibilities are opened out by this idea when fabrics are made from materials which do not mill, or which have not the clinging power of wool. It is possible that open-work effects in such materials as cotton and synthetic fibres in both continuous and staple form could be preserved by the addition of the correct-non-slip resin.

Intermittent Lengths of Yarn. Many fabrics are ornamented during weaving by the insertion of tufts of material which appear much more prominent than the ground. Usually, the tufts are automatically twisted between two carrier threads, enabling them to be woven without difficulty. The carrier threads, however, remain a permanent feature of the cloth and their position can usually be traced between the spots. If, however, the carrier threads are made from alginate rayon, they will disappear in the ordinary soap soda scour, thereby leaving no trace of the manner in which the tufts have been inserted. This removal of the carrier threads is very beneficial to the handle of the cloth as the highly twisted sections of the yarn between the tufts are eliminated. One example produced on these lines is shown in Fig. 9. The idea is obviously open to unlimited development and patterns have been produced where not only intermittent slub effects are used for stripings, but even intermittent loop pile effects.

Structural Modifications. Further important methods of utilising a soluble alginate rayon as a spacing agent can now be considered. Thick extra threads of alginate rayon may be inserted as warp or weft on a ground of a dissimilar type of yarn so that certain of the basis threads are caused to loop abnormally and retain this position in the fabric. The removal of the alginate rayon leaves projecting loops to form pile threads on the body of the cloth. In the next suggested structure groups of threads or a complete fabric composed of soluble alginate yarn may be superimposed over a foundation fabric. Threads of the latter can be made to stitch into the alginate threads during weaving so that when the alginate is removed projecting loops are left on the body of the cloth to form pile. Furthermore, calcium alginate rayon threads may form the central fabric of a treble cloth and stitches from the outer permanent fabrics may be looped into the soluble centre cloth in much the same manner as when stitching three cloths together. By removing the alginate rayon, the outer fabrics would be separated to form two distinct uncut pile fabrics. Finally, in the type of manufacture known as double plush it may, where the loom permits, be advantageous to allow the stitching threads from the one cloth to mount over or under the alginate rayon threads suitably placed in the other cloth. Again the dissolution of the alginate allows uncut loops of yarn to be formed on either cloth.

Alginate/Other Fibre Mixtures

Soluble rayon may be mixed as staple fibre with other fibres. It is well-known that a highly milled dense woollen fabric has poor warmth-retaining qualities in comparison with an open structure of the same weight. If, however, a highly milled surface is desired it may be possible to produce milled fabrics honeycombed with channels left when the alginate fibres are removed after acid milling.

Alginate Rayon Used as an Ornamenting Agent

In the preceding examples the whole of the alkali soluble rayon was removed from the fabric in order to produce the desired effect. In the present development intermittent lengths of alginate rayon are removed giving still greater novelty. The success of the method depends entirely on the efficiency of the medium which converts the alkali soluble yarn into a form insoluble in alkaline solutions. So far, the most suitable of the converting solutions is chromium-acetate, and in the first experiment a hank of calcium alginate tightly wrapped about its middle was half immersed in the solution until the conversion of this section into an alkali insoluble type had been completed. One disadvantage of this method, is that the insoluble sections take on the familiar blue colouring of chromium, but it may be possible to use other agents which are colourless, although the principle of the method will remain the same. This yarn could then be removed in the scouring process. Patterns have been pro-yarn could then be woven as an effect thread and intermittent sections of soluble filament yarn removed in the scouring process. Patterns have been produced which are similar to extra weft effects by printing the yarn after it has been woven into the fabric. Briefly, cotton or wool fabric may be woven on fast running tappet looms with extra picks or ends of soluble alginate rayon. By printing areas of this fabric with chromium acetate suitably mixed with fullers earth to form a paste a pattern may be formed of what is now alkali insoluble rayon. On scouring, the soluble sections are removed to leave a pattern formed of extra weft. The fabric in its grey form is illustrated in Fig. 10 and the effect after printing and the removal of the soluble alginate sections is shown in Fig. 11.

Alternative methods of procedure suggest themselves. It may be possible to form a protective layer on the areas which are required to be removed. Thus, after immersing the fabric in a converting bath followed by a treatment to remove both protective layer and alkali soluble rayon it is possible to leave a pattern of extra weft. This method of ornamenting fabrics might enable large scale production of figured goods of a type different from existing styles. At present, the ornamentation of a basic woven fabric can be done by normal printing methods, but the structure of such a fabric remains unaltered and is not comparable with the extra weft figure produced by the jacquard. Fabrics made by the method described are comparable with jacquard products, but with unlimited scope with regard to pattern. It is realised, of course, that the details of the design could not be as intimate as that given by the jacquard loom. On the other hand the possibilities of using various converting media such as beryllium acetate, chromium acetate, ferric acetate, with the attendant opportunities for cross-dyeing should not be overlooked. Once the precise method of printing is learnt it could, of course, be applied to any fabric which includes soluble alginate rayon in its structure. Fabrics made from simple yarns, crimp fabrics, pile fabrics, etc., could be printed so that the immunised sections would remain insoluble during the alkaline scouring, thereby increasing the attractiveness of the finished fabrics.

Printing All-Alginate Fabrics

Once the immunising process is successful with calcium alginate yarn in a mixed yarn fabric, it seems probable that the same method might be applied to the production of open-work effects on the basic fabric of all alginate rayon. Thus, the stencilled areas which resisted the action of alkali would form the ground of the design and the soluble areas would disappear to make an open-work pattern. The cloth would then have an appearance similar to that produced at present by boring holes in a fabric by sharp drills. In the latter method, however, it is necessary to bind the edges of the pattern by a special operation, whereas in the suggested method, it is assumed that the fusing of the threads at the borderline of soluble and insoluble areas would obviate that process.

In concluding this section it should be stated that, by an appropriate arrangement of soluble and insoluble threads and printing in certain areas the weave could be changed, for example, from 2 and 2 twill to 2 and 2 hopsack or a gauze could be changed to a leno weave.

Alginate Rayon Used as a Bonding Agent

Up to this point alkali soluble alginate rayon has been utilised—

(*a*) as an essential assistant in the production of a fabric from which it is completely removed to give the final effect,

(*b*) to produce a soluble fabric or section of a fabric, parts of which are rendered alkali resistant so that the pattern effect is obtained when the soluble portions are removed.

In neither of these were the plastic properties of the rayon considered. For example, before the solubility in alkaline solutions is completed the alginate is in the form of a jelly which can be moulded and then converted into an alkali resistant alginate. Such a property is capable of being turned to advantage in the manufacture of textile materials in the following ways.

Pile Effects. In many pile fabrics it is necessary to add a backing of an adhesive solution in order to make the loops more secure. In these cases the adhesive is used lavishly in order to ensure that each pile thread is reached. It is suggested that the alginate thread if interwoven with the addition of the normal binding threads so that it rests in the trough of the pile thread might, after gelatinisation and pressing, secure the loop far more intimately and without as great a disturbance to the cloth as is usual with the present method. The process would be completed by converting gelatinized alginate into a form insoluble in alkalis.

Stiffened Fabrics. Occasionally manufacturers introduce into their fabrics stiffening agents which produce rigid, or not easily creasable fabrics. In view of the preceding use of the soluble rayon its success as a stiffening agent appears a foregone conclusion. When the yarn is woven between two or more layers of cloth it can be gelatinized, pressed into the interstices of the fabric and converted to an alkali insoluble type. By this means a rigid cloth is produced. The soluble threads can also be used wherever intimate bonding is required, for example, in tightly twisted tyre cords.

To sum up, therefore, it is clear that in the field of textile design and cloth construction there is unlimited scope for the employment of a suitable soluble thread, whatever its type. Such a thread may be used to simplify mechanical operations, make entirely new effects and fabric structures or simplify the production of styles made by older methods. Furthermore, the use of soluble threads as binding, supporting, carrying, embossing, spacing, ornamenting and bonding agents has been demonstrated. It can also be used in spinning, weaving, knitting, lace and other manufactures, e.g. braiding.

One of the most suitable soluble threads has been found to be calcium alginate rayon, a Cinderella filament, which has been precluded from commercial exploitation on orthodox lines for years owing to its easy solubility in weak alkaline solutions. Because of the advantages that calcium alginate possesses over other threads used on account of its solubility the investigation of its possible applications has been pressed forward with far greater confidence than was possible with the older soluble fibres and, in effect, has evolved a new textile technique which will eventually take its place as a new tool in the hands of the textile designer.

Acknowledgment. The author is indebted to Mr. J. Manby of Leeds University for the photographs illustrating this paper.

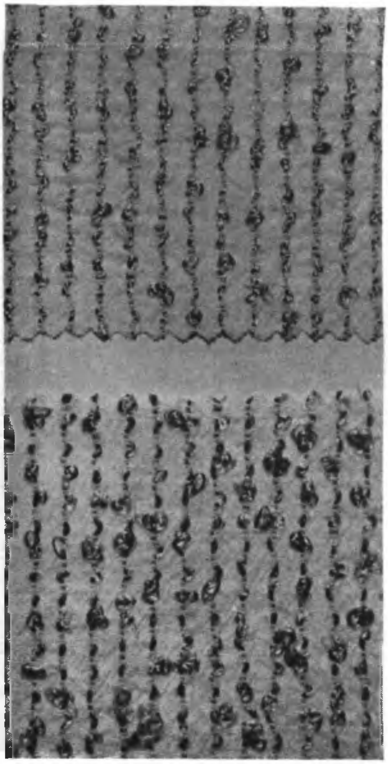

Fig. 1

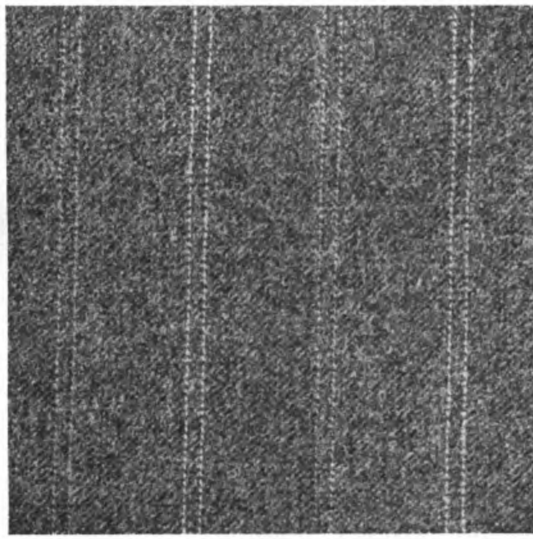

Fig. 2

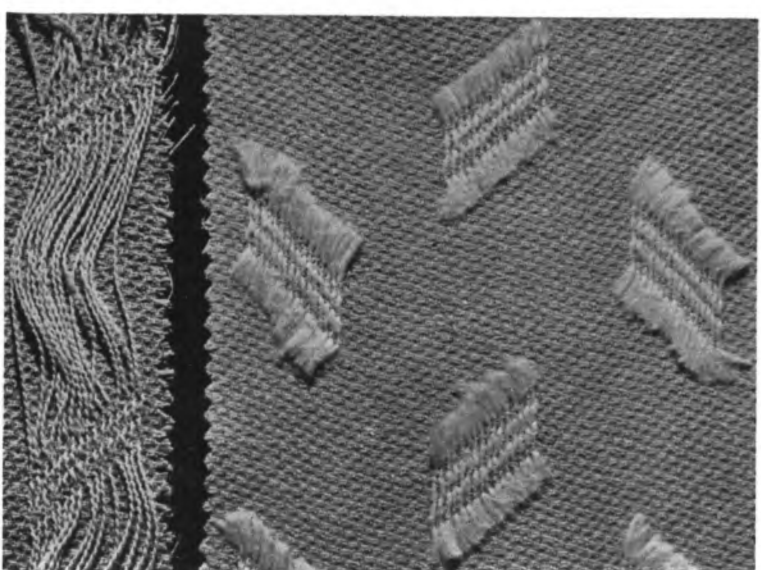

Fig. 3

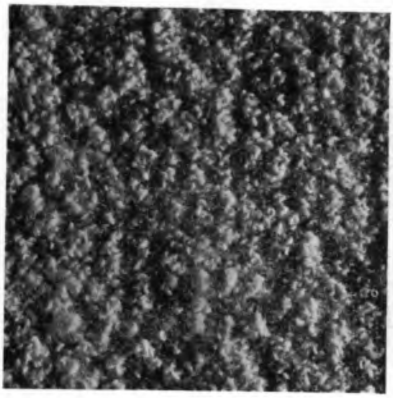

Fig. 4

Fig. 6

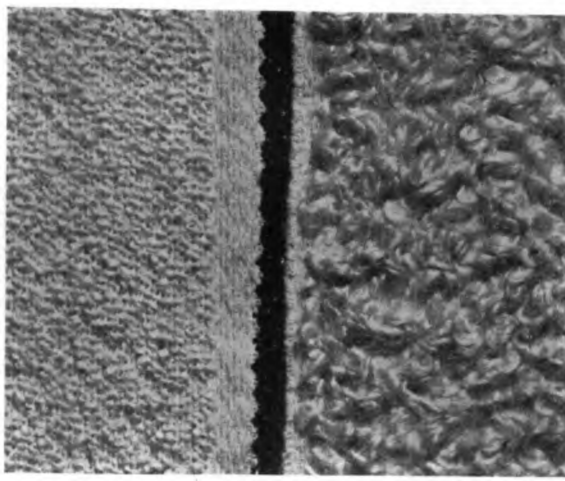

Fig. 5

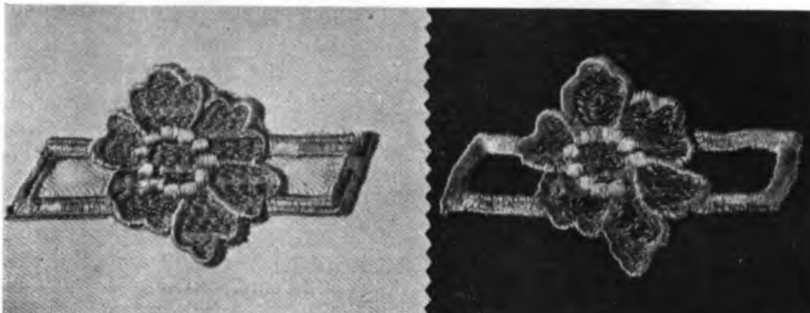

Fig. 7

Fig. 8

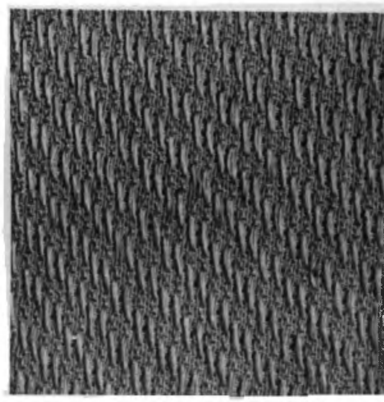

Fig. 10

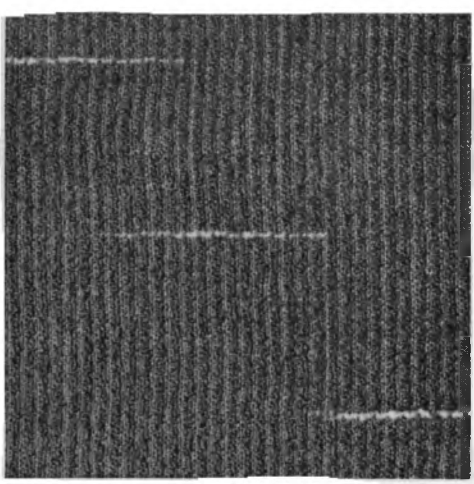

Fig. 9

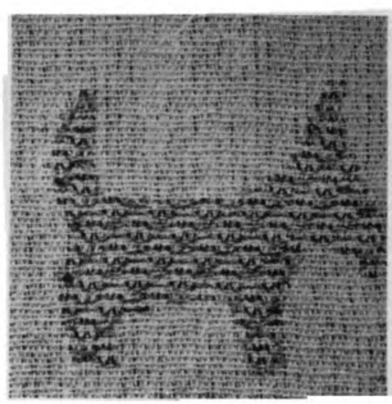

Fig. 11

DISCUSSION

Mr. Frank Hopkinson observed that Mr. Johnson had shown how a soluble alginate thread can be used in conjunction with animal, vegetable or synthetic fibre in the derivation of various effects and having served its constructional purpose, can be readily removed. At first glance removal by solution seems to be a wasteful procedure. But it is done in order to create valuable novelties and the cost is thereby justified. Light-weight fabrics in wool can thus be made which are obtainable in no other way. It is possible that pile, loop and similar cloths may be made more cheaply by this method, than by the ordinary established practice. Alginate rayon has been under consideration for a good number of years but Mr. Johnson's applications of this rayon to the production of novelty fabrics certainly break new gound.

Mr. Johnson agreed that novelty fabrics could bear the cost of removable alginate rayon, just as many products are used in the finishing of ordinary cloths but do not appear in the finished fabrics.

Mr. E. J. Poole noted that the new cloths had great possibilities and that Mr. Johnson was to be commended on the amount of thought he has given to the work. He asked in case of the pile structures, loop and cut pile, what degree of firmness could be obtained. He considered the use of insoluble alginate to give firmness to taffeta a useful application. He asked how fine alginate can be spun, noting that it would be very useful if a firm taffeta fabric of 1 to 1½ oz. could be produced with the aid of alginate.

Mr. Johnson stated that it was possible to use alginate as a substitute for size and thus weave finer counts than is possible at the moment by the use of size. He had no mechanical method for measuring firmness of pile apart from a qualitative pull. Alginate could be spun commercially to 40 denier with 21 filaments.

Mr. Poole observed that the removal of 40 denier alginate, equivalent to 200's worsted, would involve a certain degree of openness. He asked if this would influence the firmness of the fabric, or introduce slip.

Dr. Chamberlain referred to Mr. Poole's point. Owing to the difference in density between wool and alginate, the degree of openness introduced would be less than would appear at first sight.

Mr. J. Dumville referred to one of the samples, noting with surprise that the mere scouring of the fabric and dissolution of the alginate effected so great a change between the loom state and finished state of the cloth.

Mr. Johnson in a reply to a question by Mr. Kendall said that observed shrinkages were from 2 per cent. to 5 per cent.

Mr. H. D. Halliday enquired about gelatinisation of the alginate in order to give additional firmness to cloth and prevent slipping.

Mr. Johnson replied that the alginate is gelatinised by means of soap and alkali and immersed in a bath of chromium acetate which converts it to an insoluble form.

Mr. Poole asked what were the special features of 100 per cent. insoluble alginate fabric.

Mr. Johnson replied that such fabric is fire-resistant. There is a difficulty in dyeing because of the blue cast given to the fabric by the chromium. On first crushing the fabric its crease-resistance is quite good but under continued pressure it seems to crease fairly heavily. It has good draping qualities.

Lancashire Section

FABRICS FOR INDUSTRIAL USES

Textiles and Driving Belts. Historical Review

By D. G. Hinchcliffe.

(*Paper delivered to the Lancashire Section, 13th July,* 1945).

Textile fibres have for over 70 years been used in mechanical belting fabrics and driving belts. A survey of the subject of belts for power transmission with a bias towards textiles should therefore fit into the Institute's plan to have a series of papers on industrial textiles.

It is possible that the first use of textiles in power transmission other than driving ropes (a separate and older subject in themselves) was in the form of some sort of thread to sew together the butts of leather of which the earliest belts were made. Rubberised fabrics appeared early, and it will surprise many to know that cotton and india-rubber driving belts were made over 100 years ago. The sailing ships of the 18th and early 19th centuries required strong sailcloth and this fabric obviously recommended itself as the foundation material for belts for power drives.

The Official Handbook of The Rubber Exhibition at the Science Museum in 1934-5 stated: " . . . .When two great discoveries were made in the early part of the 19th century, the rubber industry as we know it, can fairly be said to have begun. The first of these in 1820, was the process of mastication due to Thomas Hancock and the second in 1823 by Charles Macintosh. Rubber goods gained steadily in popularity, and although vulcanization was still unknown, by 1825 there was a considerable use of rubber in strip form, for tubes, air-proof and water-proof fabric articles of many kinds for various industrial purposes, for rubber rollers, driving belts and surgical goods. Hose was being made on a considerable scale by 1826, and the beer engines in taverns around London were equipped with rubber tubing before 1830."

The earliest belts must have been poor compared with the rubber friction belting of today, and though separation of the plies may still be experienced in severe cases, it must have been much more common until rubber and the industrial processing of it (including vulcanization) were much better understood. Even in the last 15 years big improvements have been made.

The defects of the early rubber/fabric belts and their high manufacturing costs, undoubtedly led in 1873 a retired sea Captain, Maurice Gandy, to produce a driving belt of ply formation similar to the rubber one mentioned, but without rubber, the plies being held together by rows of longitudinal sewing. This type is commercially known as sewn cotton duck today, but its use is now rather restricted. Presumably Captain Gandy with his seafaring knowledge tried the tar and pitch which he had known, as a means of proofing his belt and this may have led to modern methods of impregnation with the bituminous componds generally used today.

The pioneer makers of belts made from textiles were soon forced to realise that sheer tensile strength and coefficient of friction were not the only factors which decided whether a belt was a good one or not. Wear at the edges due to the action of guide forks remains a problem. So also does the internal abrasion which arises when belts conform to the shapes of pulleys; the outer surface being stretched more than the inner one.

The next outstanding development was the camel hair belting due to Reddaway. Spinning mules were greatly increased in length with little or no change in the headstock or drive. Belts made from cotton, flax and ramie all possessed objectionable characteristics. Those made from wool and hair were very satisfactory. The most suitable fibre is that provided by the Bactrian two-humped camel. It is strong, elastic and has a high resistance to fatigue. The camels were originally kept as transport camels but some are now farmed for their hair.

Solid woven hair belting, as it is called, is of multi-ply cloth construction, the number of cloths varying from 3 to 6. These constituent cloths are bound tightly together to make a compact whole by binder warp threads. Other forms of this solid weave were subsequently developed, chiefly with belts made from cotton yarns only, and with the cloths interlocking about the weft. Generally speaking, each type has its limitations, despite compensating advantages. The comparatively recently developed method of impregnating belts of this construction with rubber has effected great improvements.

The Germans have used silk waste in the production of solid woven belting to a considerable extent and in the future there may be a development with nylon.

In the early days of motoring with its slow speeds and low engine revolutions, solid woven cotton belting was found to be a most satisfactory lining for brake drums. As speeds increased and the duties of brakes and clutches became more onerous, other types of impregnants were developed which had appreciably higher melting points than the bituminous types used for general belting drives. Gradually even these were found to be insufficiently heat-resisting, for the fibre base frequently charred and in severe cases even ignited and burned out owing to the heat developed.

Solid woven cotton belting suitably impregnated is still extensively used as a brake lining where the heat development factor is within reasonable limits. These include a number of big colliery winding engines. The motor lawn mower probably has a cone clutch lined with it, and the most familiar examples of it are the fabric inserts in the aluminium channelled stairtreads on omnibuses and in a large number of offices and stores.

For high speeds, heat-resisting fibre was necessary and asbestos came into its own. The belting was made in exactly the same way as the multi-ply woven solid belting, though with coarser yarns. The original asbestos yarns were spun with fine gauge brass wire to give them strength, for it was not then possible to spin asbestos yarns strong enough, without some such reinforcing, to withstand the high tensions and heavy beat-up of the loom which does this solid weaving.

A later development arose by accident. In the late 1920's motor car brakes would not act after the car had been washed, until the water in the drums had been evaporated. The water film present between the fabric and the metal drum acted as lubricant between the drum and the fabric. Thus the same fabric may be used dry as a friction material and wet for anti-friction purposes.

Later developments have led to subsequent modifications in the processing of the two fabrics to enhance the anti-friction properties of the bearing material, but basically the fabrics are still the same.

The next outstanding development was the work of the Dick brothers. Their balata belt was invented and patented in 1885. Balata is a vegetable gum of a nature somewhat similar to gutta-percha. It exudes as sap from trees of the genus Mimusops found in the virgin forests of Venezuela and the Guianas. The qualities which distinguish it from other gums and make it specially valuable in the manufacture of balata belting are its great toughness and comparative lack of stretch. Almost equally important are the waterproof qualities.

During the later war years when rubber was so scarce and much in demand, some firms who manufacture both rubber friction and balata beltings have stated quite openly that there is in reality little to choose between these two types under normal operating conditions so long as the temperature does not exceed say 70° F. The subject of rubber friction and balata belts would be incomplete without mention of india-rubber and canvas conveyor and elevator beltings which have played such a tremendous part in the mechanisation of many industries, notably coal. They are of the same ply construction as the fabrics above described, but have rubber coverings both on the carrying face and the back, varying in thickness according to the requirements and nature of the work involved. Incidentally, solid woven cotton beltings have also made their contribution in this field notably as elevator belts for use in the flour milling industry.

The five main types of belting (including leather) have in the course of time found their own spheres of application. Reverting to the subject of internal abrasion as belts bend round pulleys, belt lengths and pulley diameters have been reduced and speeds are higher in modern practice than formerly. A belt 40 feet long travelling at 2,000 r.p.m., may go completely round the drive 50 times a minute. Each portion of the belt bends over each pulley during each cycle, so that every bit of the belt bends and straightens out 100 times a minute—6,000 times an hour—48,000 times per 8-hour day—240,000 times per 5-day week—and 12,000,000 times per 50-week year. Shorten the centres and reduce the belt lengths to 20 feet and these figures are doubled. Increase the belt speed to 4,000 r.p.m. and the flexings are doubled again. The belt speeds and lengths quoted are well within sound and normal recommended modern practice. This almost astronomical number of bends is but one aspect of the picture. The sharpness of the bends is another. On a test drive with a belt running on its normal recommended minimum pulley diameter of 10 inches, a 10-year life was reduced to one of 8 months by simply forcing the same belt to do exactly the same work on pulley diameters of 5 inches. So the belt which lasts longest is the one capable of making the maximum number of bends, under any given set of conditions.

But the belt has other functions. It must withstand tension, hold its fastener and it must not stretch unduly even when atmospheric conditions change. The stresses at the joint are higher and the fastener makes an irritating noise when the belt runs at high speeds over small pulleys. The answer to this is an endless belt. Endless belts were originally made in leather and then in balata and rubber friction material. In each of these types overlapping is essential to achieve the endless effect. Splices and joints may still be regions of weakness.

The endless belt can be made with the warp wound in a ring of pre-determined length in accordance with the length of the endless belt required. Actually the warp is wound very slightly obliquely, or as a very flat helix, beginning on one edge of the belt and ending on the other, so it is not absolutely at right angles to the weft as in normal weaving. These belts are generally woven 2 and 2 and are extremely flexible. Being of single cloth construction, the warp yarn easily pivots about the single shot weft. The internal abrasion is reduced to a minimum, and the whole belt lends itself to high speeds and a high frequency of drive-cycles. Its main weakness is the exposed weft on the edges which is very vulnerable. The weft wears very quickly in contact with guide forks, pulley flanges or other obstructions and once the edge has frayed, the whole belt quickly disintegrates. This is unfortunte because it reduces the belt's sphere of application to drives where fast and loose pulleys do not operate. This type of belt is most efficient when rubber-proofed, but, even in this open-weave and somewhat loose construction, impregnation of these belts with rubber is a difficult problem. Fabrics of this type are extremely efficient filters and the more closely or tightly or " solid " they are woven (and of course the thicker they are) the more completely they act as filters and militate against efficient impregnation. Furthermore, rubber and cotton particles carry similar electric charges and are therefore mutually repellent. If the interstices in the fabric could be filled with rubber, the yarns would be insulated and internal abrasion much reduced. A successful effort to achieve this has been the weaving of "Filastic" yarn into a solid woven belt. It is rather expensive, and the ideal still remains to weave grey and impregnate thoroughly.

The importance to Lancashire of belts with textile foundations is emphasized by the Board of Trade returns in the Export Trade Accounts recently published. In the years 1938-9 the average weights and value of finished belting exported were:—

Woven Hair	550 tons ...	£153,000
Rubber and Canvas	1,588 tons ...	£304,000

These totals would represent roughly 1,500 tons of cotton yarns and ducks combined, yarns for the solid woven type and ducks for the remainder. There are no published figures of similar details for sales in Great Britain so far as the cotton duck base types are concerned, but in solid woven hair and solid woven cotton alone recent figures have shown aggregate sales to amount to well over 700 tons per year (£350,000) of which 400 tons can be assumed to be cotton yarns. These home trade figures must be materially increased by the weights of cotton duck used in the manufacture of ply beltings, including of course conveyor and elevator belts.

Review

The Chemistry of Cellulose. By Emil Heuser. Published by John Wiley & Sons, Inc. Chapman & Hall Ltd. London, $7·50. pp. 660.

This book is described on its paper jacket as " A compendium and critical digest, with due consideration of the microscopic and sub-microscopic structure of the cellulose fiber." But the ideal text-book on cellulose chemistry has not yet been written. It should of course consist of a collection of short monographs each written by an expert, edited by a board of experts to thread the story together.

The book before us is an attempt by a well known cellulose chemist to supplement his earlier elementary text-book of 1924. His authoritative touch is seen in several chapters on which he has expert knowledge, such as for example on xanthates. The whole subject has been treated critically, but occasionally the criticism is merely reported. For example on p. 420 the criticism of Schorigin and Rymaschewskaja on one possible structure for monomethylene cellulose isolated by the reviewer is reproduced without comment. Reference to an actual Haworth model of cellulose would have revealed that a methylene group just sits nicely between the C atoms in the 2 and 3 position of a glucose residue to give a 5 atom ring, and therefore this possibility cannot be excluded. Incidentally this subject is poorly dealt with, without any chronology and the work of Saegusa (1941) is not mentioned.

A few misprints such as " sloutions " (p. 143) and " Gyot " (p. 420) occur. The full production of formulæ on p. 477 seems unnecessary and contributes to the excessive and uncomfortable weight of the volume (2½ lb.).

The author is to be congratulated on getting specially excellent indexes together.

In drawing attention to a few minor blemishes in the work, it must be stated that the great excellence of the book will commend it to students and research workers, until such time as the Research Associations in this country see fit to issue both elementary and advanced accounts of each sub-section of the cellulose industries. This publishing activity should be considered as a part of research since accurate education is the beginning of fruitful research.

F. C. Wood.

Publications received

46th Report of the Joint Research Committee of the Gas Research Board and the University of Leeds. First Report on Radiant Heating.

Whilst this very interesting report on heating by radiation deals mainly with the use of radiant heat for paint drying, it also indicates many other applications, including the drying and finishing of textiles. Its appreciation calls for more than an elementary knowledge of physics, but its readers will agree that the statement of the principles applied makes the report complete in itself. The physicist alone will appreciate the difficulties to be overcome in the making of the measurements recorded. The reference to the fact that claims regarding the special suitability of the short wave radiation from the tungsten filament lamp for radiant heating were frequently based on doubtful evidence is very timely. The presentation of the work is excellent.

Ulster To-day. H.M. Stationery Office for Northern Ireland.

A very well illustrated 32 page guide dealing with Northern Ireland, its part in the United Kingdom and its industrial and other activities.

Education in Textiles in the District in and around Manchester. A Student's Guide, published by the Regional Advisory Council for Technical and other forms of further education for Manchester and district. Session 1945-46.

An outline of courses at the various educational institutions.

Yorkshire Council for further Education. Seventeenth Annual Report, November, 1945.

The British Council, Science Department. Outline of Activities.

This is an informative pamphlet setting out the organisation and work of the Science Department, controlled by the Committee, of which Sir Henry Dale, O.M., G.B.E., F.R.S., is chairman. The Science Department was formed four years ago under the chairmanship of the late Sir William Bragg. The making known of British achievement in the world of science appears to be in the most capable hands, and the least one can do is to wish the organisation the great success its efforts deserve.

Cotton: A Working Policy. By a Fabian Research Group. (Published by Fabian Publications Ltd., in conjunction with Victor Gollancz Ltd. Price 6d.).

It should be interesting to compare the contents of this 21 pp. booklet with the report of the " Working Party " expected in the near future.

The Journal of the Bradford Textile Society: Session 1944-45. (Price to non-members 10/6.)

This record of the Proceedings for 1944-45 gives brief accounts of ten lectures, delivered during the session, together with the Chairman's report to the Annual Meeting and the Accounts.

From Bretton Woods to Full Employment. By Dag Hammarskjold. Supplement A to Svenska Handelsbanken's Index.

Two lectures delivered at the University of Stockholm, October 23rd and 25th, 1945.

Obituary: Dr. Harold Hibbert

The death in Philadelphia, Pennsylvania, U.S.A., on May 13, 1945, of Dr. Harold Hibbert, removed from the field of cellulose chemistry one of its leading authorities. Born in Manchester, England (August 27, 1877), he graduated with First Class Honours in chemistry from Victoria University in 1897, and continued under W. H. Perkin, Jr., receiving his Master's Degree in 1900. A Ph.D. (*summa cum laude*) was awarded him by the University of Leipzig in 1906, and in 1911 he received the degree of D.Sc. from Victoria University; and in 1936 was awarded the degree of LL.D. (*honoris causa*) from the University of British Columbia. In January of 1943 he was accorded the distinction of honorary membership in the Society of Chemical Industry, and only a few days before his death, was made a member of the United States National Academy of Science.

His academic work, in addition to the foregoing, was done at the University of Wales (1900-1904), Tufts College (U.S.A.), The Imperial College of Science, and The Mellon Institute in Pittsburgh, Pennsylvania, U.S.A. In 1919 Dr. Hibbert was appointed to the faculty of Yale University, and from 1926 until September of 1943, he held the E. B. Eddy professorship of industrial and cellulose chemistry at McGill University in Canada.

His work from 1910 until 1914 at the Wilmington, Delaware laboratories of the du Pont Company on the isolation of the two solid isomeric forms of nitroglycerine was one of the most important achievements in the field of explosives chemistry. His passing is mourned by colleagues and students and by the industries which have benefited so greatly from his work.

Dr. Hibbert was a member of the Institute for more than twenty years.

E. R. Schwarz, F.T.I.

Massachusetts Institute of Technology,
Cambridge, Massachusetts, U.S.A.

Scottish Section

The section held meetings in Edinburgh and Dundee on November 20th and 21st, respectively, when Mr. C. M. Whittaker read a paper on " Tools for the Intelligent." At the Dundee meeting he repeated the lecture and dealt also with the dyeing of " Fibro." The talks inspired many questions, the majority of those present taking part in the discussion.

Yorkshire Section

On Monday, November 12th, at the joint meeting of the Bradford, Batley, Dewsbury and Morley Textile Societies, Messrs. T. O. Butler (Batley), H. Schofield (Dewsbury), G. Edmundson (Morley), H. Halliday (Textile Institute) and H. F. Hartley (Bradford), discussed the question, " Are Worsteds and Woollens Competitive or Complementary." There was a large attendance and the thrusts and parries of argument were keenly enjoyed. As frequently happens in good debates the cases put up for woollens and worsteds being competitive and those for their being complementary were equally convincing. It was clear that the factors deciding the opinion of any individual must be such as his experience or his financial interest. It was generally agreed that most people included both types of fabrics in their wardrobes and that occasion usually dictated whether worsted or woollens should be worn.

Institute Diplomas

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

FELLOWSHIP

AHMED SELIM, M.Sc., Ph.D., A.T.I., Manager, Jute Weaving and Spinning Mills, Egypt.

SIDNEY BEETHAM HAINSWORTH, A.T.I., Director and General Manager, J. H. Fenner & Co. Ltd., Hull.

FRED MARSH, A.T.I., Assistant Inspector, Aeronautical Inspection Directorate, Air Ministry.

ASSOCIATESHIP

ROBERT REID MILL, Manager, Messrs. Valentine & Sons Ltd., Dundee.

COLIN NUTTER, Chief Textile Inspector, H.M. Naval Victualling Dept., Halifax.

Institute Membership

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

Ordinary

Percy Addy, Holmeleigh, Shepley, Huddersfield (Assistant, Textile Department, Technical College, Huddersfield).

Adrian Matthew Allison, B.Com., 20, Sunningdale Park N., Belfast, N. Ireland (Cost Accountant, Old Bleach Linen Co. Ltd., Randalstown, Co. Antrim).

William Rowland Bamber, 20, Edward Street, Langley Mill, Nottingham (Warp Knitter, British Celanese Ltd., Spondon, Derby).

Frank Barrett, " The Laurels," 4, Hospital Road, Riddlesden, Keighley, Yorks. (Assistant Manager, Hattersley Sons & Co. Ltd., Haworth, Nr. Keighley).

Louis Bohm, M.Sc.(Tech.), 8, Egerton Road, Fallowfield, Manchester, 14 (Research Chemist).

Fred Boyer, 2, Thornlea Avenue, Wentworth Road, Swinton, Lancs. (Mule Spinning Overlooker, Acme Spinning Co. Ltd., Swinton Hall Road, Pendlebury).

John Hut Burns, Lea Mills, Matlock (Assistant Manager, Lea Mills, Matlock).

Albert Edward Butlin, 19, Barlow Road, Chapel en le Frith, via Stockport (Research Departmental Manager, Ferodo Ltd., Chapel en le Frith).

Chun Chen, B.Sc., 1, Ash Grove, Victoria Road, Leeds, 6 (Student, Leeds University).

Leonard Cooper, B.Sc., " Calrows," Charlesworth, Nr. Manchester (Buyer, United Africa Co. Ltd., Bridgwater House, Whitworth Street, Manchester).

Harry Dearden, 3, Debdale Gate, Mansfield Woodhouse, Mansfield, Notts. (Winding, Warping, Beaming, Overlooker, Harwood Cash & Co., Lawn Mills, Mansfield, Notts.).

James Dearden, 49, Alexander Road, Tonge, Bolton, Lancs. (Sales Executive, Knowles Ltd., Peel Mills, Bolton).

Alan Murray Gordon Debenham, 6, St. James's Square, Manchester, 2 (Managing Director, Fine Cotton Spinners' and Doublers' Association Ltd.).

George Derbyshire, 313, Hadfield Road, Hadfield, Nr. Manchester (Bleachworks Foreman, River Etheraw Bleaching Co. Ltd., Hollingworth, Manchester).

George Duffy, "Ivy Dene," 571, Chorley Old Road, Bolton, Lancs. (Cardroom Sub-Manager, Knowles Ltd., Turton Street, Bolton).

Edwin Finney, Box 139, G.P.O., Geelong, Victoria, Australia (Instructor in Charge, Cotton Manufacture, Textile College, Gordon Institute of Technology, Geelong).

James Firth, 31, Myrtle Road, Middleton, Lancs. (Chemist, Bleachers' Association Ltd., Blackfriars House, Parsonage, Manchester).

Donat H. Fregeolle, 187, Hughes Avenue, Pawtucket, R.I., U.S.A. (Textile Technician, Hemphill Co., 131, Clay Street, Pawtucket, R.I., U.S.A.).

Aldham Leonard Garratt, 6, St. James's Square, Manchester, 2 (Executive Director, Fine Cotton Spinners' and Doublers' Association Ltd.).

John William Green, Phoenix Telephone & Electrical Works Ltd., The Hyde, Hendon, London, N.W.9 (Chief Inspecting Engineer).

James Newsome Hargreaves, 2, Heaton Row, Ferncliffe, Bingley, Yorks (Designer, Parkland Manufacturing Co. Ltd., Clyde Street Mills, Bingley).

Thomas Hinchliffe, c/o Spring Mills, Dadar, Bombay, India (General Manager, Bombay Dyeing and Printing Co. Ltd.).

Paul Horn, P.O.B. 5016, Tel-Aviv, Palestine (General Manager, Etun Ltd., Weaving Factory, 6/41 Merkas Volovelski, Tel-Aviv, Palestine).

Joseph Jackson, 36, Regent Crescent, Skipton, Yorks. (Textile Designer, Mark Nutter Ltd., Firth and Ellerbank Mills, Skipton).

William Elliot Kyle, "Dunaird," Weensland Road, Hawick, Scotland (Assistant Manager, Lyle & Scott Ltd., "Y Front" Factory, Hawick).

George Lever, 107, Clarence Street, Bolton (Under Carder, Tootal Broadhurst Lee Co. Ltd., Sunnyside Mills, Daubhill, Bolton).

Roy Crago Mather, Mather & Platt Ltd., Park Works, Manchester (Engineer).

William Phillips McCarter, c/o W. P. McCarter & Co. Ltd., Church Street, Buncrana, Co. Donegal (Underwear Manufacturer, Church Street, Buncrana, Co. Donegal).

George Knight O'Malley, I.C.I. Ltd., 3, South Frederick Street, Dublin (Dyestuffs Sales Manager).

Reginald Webb Redston, 48, Parkland Crescent, Leeds, 6 (Student, Leeds University).

Jack Rest, 2nd Calibration Troop, R.A., C.M.F. (Assistant Manager, Hosiery Factory, J. Toun & Sons, Premier Works, Earl Shilton, Leic.).

Alan Righetti, 9, Evans Court, Toorak, S.E.2, Victoria, Australia (Student, Melbourne University).

Jacob J. Schwarz, 38, Dudley Court, Upper Berkeley Street, London, W.1. (Managing Director, Kozequilt Co. (London) Ltd., 185, The Vale, Acton, London, W.3).

Ernest Sewell, Dominion Textile Co. Ltd., Magog Print Works, Magog, Prov. Quebec, Canada (Manager).

Philip A. Smith, c/o Messrs. Wm. Smith (Poplar) Ltd., East Ham By-Pass, London E.6 (Tarpaulin & Tent Manufacturer).

Wilfrid Smith, "Farfield," Cross Hills, Nr. Keighley (Worsted Spinning Manager), J. C. Horsfall & Sons Ltd., Hayfield Mills, Glusburn, Nr. Keighley).

Edward Crayston Stevens, M.A., B.Sc.(Tech), Maryland, Gannock Park, Deganwy, Caernarvonshire (H.M. Forces).

Alan Cawley Swindells, 6, St. James's Square, Manchester, 2 (Executive Director, Fine Cotton Spinners' and Doublers' Association, Ltd., Manchester, 2).

Venkatramier Viswanathan, Thirumagal Mills Ltd., Katpadi Road, Gudiyattam, Madras Presidency, S. India (Manager).

Giles Whittle, York House, Markland Hill Lane, Bolton (Consulting Engineer, Crosses & Heatons Ltd., Lever Street, Bolton).

Mildred Elizabeth Whitton, " Kerry," 24, Snakes Lane, Woodford Green, Essex (Company Director, Wm. Smith (Poplar) Ltd., East Ham By-Pass, London, E.6).

Andrew M. Woodman, 2A, Eastcheap, London, E.C.3 (Managing Director, Benjamin Edquiston, 29, Queen Elizabeth Street, Towerbridge, London, S.E.1).

Norman Wonnacott, 10, Lenox Place, Scarsdale, New York, U.S.A. (Sales Manager and Technical Assistant to President, c/o Willcox & Gibbs Sewing Machine Co., 214, W. 39th Street, New York City, N.Y., U.S.A.).

Junior

Grace Merle Anderson, 6, Pine Tree Avenue, Humberstone, Leicester (in charge of Dyeing Laboratory, Messrs. Wolsey Ltd., Abbey Meadow Mills, Leicester).

Cecil William Earls, " Glenroyd," Beggars Lane, Leek Staffs. (Student).

George Roy Pollard, Green Ways, Huthwaite Road, Sutton-in-Ashfield, Notts. (H.M. Forces).

Natan Profesorski, 45, Dryden Street, Nottingham (Student).

Harold Robinson, 3, Stubbins Vale Terrace, Ramsbottom, Nr. Manchester (Assistant Manager, Joseph Porritt & Sons Ltd., Sunnybank Mills, Helmshore, Manchester).

Malcolm Law Stead, 12, Crow Tree Lane, Bradford, Yorks. (Textile Designer, Denholme Silk Weavers Ltd., Forside Mill, Denholme Clough, Nr. Bradford).

William Arthur Straw, B.Sc., " Seilloh," 31, Oakfield Avenue, Birstall, Leicester (Chemist, W. E. Saxby (Leicester) Ltd., Abbey Gate, Leicester).

Cedric Whiteley, Hullen Edge Hall, Elland, Yorks. (Trainee, James Sutcliffe & Sons Ltd., Greetland, Yorks.).

Obituary:

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

J. BARR, A.T.I., Bradford.

R. B. BROWN, Elstead, Surrey.

INSTITUTE MEETINGS

IRISH SECTION

Wednesday, 16th January, 1946—*Belfast*. 7.30 p.m. Lecture: "The Influence of Science on Civilisation," by D. Lindsey Keir, M.A. (Vice-Chancellor, Queen's University, Belfast), at the Royal Academical Institution, Belfast. By invitation of the Royal Institute of Chemistry.

Monday, 21st January, 1946—*Dublin*.

Tuesday, 22nd January, 1946—*Belfast*. 7.45 p.m. College of Technology, Belfast. The film, "Cotton Blossoms," will be shown at both these centres, and will be preceded by a talk on "Training and Welfare," by one of the staff of the Cotton Board.

LANCASHIRE SECTION

Tuesday, 8th January, 1946—*Bolton*. 7.30 p.m. Lecture: "Textile Yarn Processing," by H. Marsden, M.C., M.Sc., A.T.I. (Universal Winding Co. Ltd.), at the Municipal Technical College.

Friday, 11th January, 1946—*Manchester*. 1.0 p.m. Lunch-time meeting at the Institute's premises. "A Maker-up Looks at the Textile Industry," by L. J. Firth (Hirst & Thackeray Ltd.).

Tuesday, 22nd January, 1946—*Oldham*. 7.30 p.m. Lecture: "Rayon Staple," by H. Ashton, F.T.I. (Courtaulds Ltd.), at the Municipal Technical College.

Friday, 25th January, 1946—*Manchester*. Section Dinner at the Midland Hotel.

MIDLANDS SECTION

Wednesday, 23rd January, 1946—*Nottingham*. 6.45 p.m. Lecture: "The Lace Industry," by W. I. Taylor (Messrs. Lace Productions Ltd., Long Eaton), at the College of Arts and Crafts. After the lecture the lace machinery in the College can be inspected.

YORKSHIRE SECTION

Monday, 14th January, 1946—*Bradford*. 6.30 p.m. Lecture: "The Marketing of English Wools," by O. Mombert (Bradford), in the Midland Hotel.

Wednesday, 23rd January, 1946—*Doncaster*. Visit to Messrs. British Bemberg Ltd. (Joint visit with Bradford Textile Society and arranged by Bradford Textile Society.)

ALPHABETICAL INDEX TO ADVERTISEMENTS

THE JOURNAL OF THE
TEXTILE INSTITUTE
TRANSACTIONS

24—SOME CALCULATIONS RELATING TO THE ARRANGEMENT OF FIBRES IN SLIVERS AND ROVINGS

By G. A. R. Foster, J. Gregory and J. R. Womersley

I. INTRODUCTION

In the course of researches on cotton spinning it became necessary to make a number of calculations concerning the arrangement of the fibres in slivers and rovings, and the effect of the arrangement on the thickness of the roving and on the composition and weight of tufts drawn or cut from it. These calculations are collected together in this paper with a few practical examples of their application.

In the mathematical treatment it is necessary to make certain simplifying assumptions, such as that the fibres are straight and parallel to the axis of the sliver and that they are perfectly controlled by the machinery. Since these conditions are not satisfied in practice, it is not surprising that there are considerable quantitative differences between calculated and observed results. In spite of this the theory gives a useful picture of the arrangement of the fibres, and has led to the discovery of new knowledge. In most cases there is little to be gained at present by extending the mathematics to rovings in which the fibres are not parallel. In the last section, however, two methods of measuring the degree of parallelisation are suggested, and these may form the basis of a more complete theory should this prove necessary in the future.

II. UNIFORM SLIVERS OR ROVINGS

It will be convenient to consider first of all the composition of tufts drawn or cut in various ways from an ideal uniform sliver (or roving) in which the fibres are supposed to be straight and parallel to the axis of the sliver. In all cases the sliver is to be pictured as being held between the left and right hands.

Let n be the number of right-hand ends of fibres per unit length of sliver, n
and f the fraction of these which are of length l; n may be called the fibre f, l
density for right hand ends. A uniform sliver will now be defined as one in which both n and f are the same at all parts. Then f is obviously the fractional frequency of occurrence of fibres of length l in a large random sample of the cotton, and therefore the mean staple length, L, is given by the equation L

$$L=\frac{\Sigma fl}{\Sigma f}=\Sigma fl. \qquad (2.0)$$

since $\Sigma f=1$, by definition.

(In the remainder of this paper the limits of the summations will be omitted when they are either zero or the maximum fibre length, so that Σ, for example, indicates summation over all fibre lengths, and Σ_b summation over all lengths greater than b.) Σ Σ_b

Mass per Unit Length of Sliver

N_l The number N_l of fibres of length l that cross a section of the sliver taken perpendicular to its axis is the number whose right-hand ends lie within the length l of sliver to the right of the section, and is therefore given by

$$N_l = nfl \qquad (2\cdot1)$$

N The number, N, of fibres of all lengths that cross the section is therefore

$$N = \Sigma N_l = n\Sigma fl = nL \qquad (2\cdot2)$$

N may be called the fibre number.

M From these equations the mass per unit length of the sliver, M, is given by

$$M = n\Sigma\, \mu fl,$$

μ where μ is the fibre weight per unit length. If μ is independent of l,

$$M = n\mu L = \mu N \qquad (2\cdot3)$$

Tufts drawn from the Sliver

It will be noticed that if a tuft is selected from the sliver by clamping it under a very narrow bar and combing out all the loose fibres, its composition is given by equation (2·1) and the mean length of the cotton so selected by

L_1
$$L_1 = \frac{\Sigma N_l l}{\Sigma N_l} = \frac{n\Sigma fl^2}{N}$$

σ Now $\Sigma fl^2 = L^2 + \sigma^2$, where σ is the standard deviation of fibre length, and by (2·2) $N = nL$ so that

$$L_1 = L + \sigma^2/L \qquad (2\cdot4)$$

This is greater than L because the method of selection favours the longer fibres, the chance of a fibre crossing the bar being in fact proportional to its length. The question of such a biased sample has been previously discussed by Townend[5] in connection with Wilkinson's[6] method of sampling wool fibres.

b If now the sliver is clamped under a bar of width b instead of a narrow bar, the fibres of length l held under the bar are those whose right-hand ends lie within a length $l+b$ of sliver, and is therefore

$$N_l = nf(l+b);$$

the mean length of the fibres so selected is given by

$$L_1 = \frac{n\Sigma fl^2 + nb\Sigma fl}{n\Sigma fl + nb\Sigma f} = \frac{L^2+\sigma^2+bL}{L+b}$$

$$= L + \frac{\sigma^2}{b+L} \qquad (2\cdot5)$$

M_1 It is easily seen from the above equations that the mass, M_1, of a tuft selected by clamping the sliver under a very narrow bar ($b=0$) is given by

$$M_1 = n\mu\Sigma fl^2 \qquad (2\cdot6)$$

Dividing by the mass per unit length of the sliver,

$$\frac{M_1}{M} = \frac{n\mu\Sigma fl^2}{\mu N} = L_1 = L + \frac{\sigma^2}{L} \qquad (2\cdot7)$$

by (2·3) and (2·4).

Number of Fibres crossing both of two near Sections of the Sliver

Köhler[3] has calculated the number of fibres that snap when a yarn is broken, on the assumption that each fibre has to reach more than a certain distance ($g/2$) beyond either side of the place of break if it is to be held with such a force that instead of slipping it breaks. This part of his paper is thus essentially a calculation of the number of fibres that cross both of two sections of the yarn, and it is interesting to repeat it, using the methods and notation of the present paper.

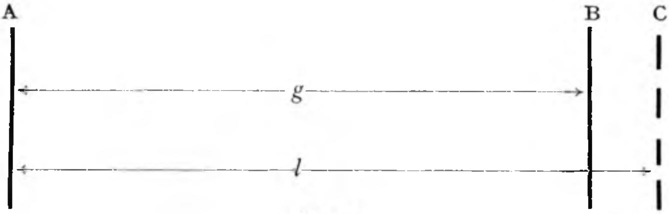

Fig. 1.

Let A and B (Fig. 1) be two sections of the yarn a distance g apart. Then the fibres that cross both A and B must be longer than g, their right-hand ends must lie to the right of B and their left-hand ends to the left of A. Therefore the right-hand ends of those which are of length l lie between B and C, i.e. within a length $(l-g)$ of sliver. The number of these is therefore $(l-g)nf$, and the number of all lengths

$$=n(\Sigma_g lf - g\Sigma_g f)$$

$$=n(\Sigma_g f)\left(\frac{\Sigma_g fl}{\Sigma_g f} - g\right)$$

$$=nF_g(L_g - g) \qquad \text{.............................(2.8)}$$

where F_g is the fractional frequency and L_g the mean length of fibres longer than g.

By (2·2) this $= \frac{NF_g}{L}(L_g - g)$ and $\frac{F_g}{L}(L_g - g)$ is therefore the number of fibres that cross the two sections g apart expressed as a fraction of the total number that cross one section. If the notation is suitably changed this fraction will be found to be identical with Köhler's equation (4). According to Spencer-Smith and Todd[4] this fraction also measures the correlation coefficient between the thickness of sections of sliver g apart due to the overlapping of the fibres. It should also be noted that (2·8) gives the number of fibres crossing a section of a combed tuft (2·6) at a distance g from the line of grip.[2]

Comparison with Observation

The extent to which the foregoing equations are obeyed for actual slivers can best be judged by comparing the weights of tufts obtained by clamping a sliver under a narrow bar with equation (2·7).

Tufts were prepared by clamping a sliver under a bar half an inch wide, combing and brushing out all the loose fibres on either side of the bar and cutting along the edges of the bar. Two tufts were thus obtained, each half that which would have been obtained with a very narrow bar, and the portion of sliver under the bar gave the weight per unit length of the sliver. Table I gives the results obtained on a number of third-head draw-frame slivers. The observed values of M_1/M are the means of ten tests on each sliver. The fibre lengths were obtained on a modified form of Balls's Sledge Sorter on which the fibres were counted instead of being weighed.

Table I

Cotton	L ins.	σ ins.	$L+\frac{\sigma^2}{L}$	M_1/M observed	P_1
Egyptian	0·895	0·26	0·97	0·765	0·79
Sakel	1·035	0·37	1·165	0·89	0·77
Mississippi	0·975	0·34	1·095	0·93	0·85
American	*0·765*	*0·25*	0·845	0·75	0·89
Queensland	0·78	0·24	0·855	0·73	0·86

All the observed values are less than those calculated from equation (2·7). This may possibly be due to the fibre weight per unit length not being independent of the length, to breaking of the fibres during the combing of the tufts, or to the fibres not being straight and parallel in the sliver. However, the mean fibre lengths of these cottons obtained on the sledge sorter by weighing and assuming the fibre weight per unit length to be independent of the length, are identical with those obtained by counting the fibres. Breaking of fibres is difficult to detect, but the weights of the tufts were independent of the amount of combing provided this was not obviously insufficient. The conclusion is therefore drawn that the smallness of the observed weights of tufts is due to the lack of complete parallelisation of the fibres in the sliver and therefore the ratio P_1 (given in the last column of the Table) of the observed to the calculated weight can be taken as a measure of the degree of parallelisation. Its precise meaning as such is discussed in Section 4.

The following values of P_1 for a set of Queensland cotton slivers illustrate the parallelisation of the fibres by the draw-frames:—

Sliver :—	Card	1st Head	2nd Head	3rd Head
P_1	0·69	0·84	0·86	0·86

III. NON-UNIFORM ROVINGS

The Thickness of Non-Uniform Rovings ; Latent Periodic Fibre Arrangements

Some of the above calculations will now be extended to non-uniform rovings. The most important and interesting are those in which the variations in thickness are periodic. A periodic variation in thickness must be the result of a periodic arrangement of the fibres, but the overlap of fibre on fibre tends to smooth out the effect of the periodic fibre arrangement, and therefore the amplitude of the thickness variations is always less than that of the fibre arrangement. The smoothing is inappreciable when the period is long compared with the staple length of the cotton, but for short periods the smoothing is considerable, and the variations in thickness are either zero or so small that they can barely be detected. This is shown by the following calculation of the amplitude of the thickness variations in terms of the amplitude of the periodic fibre arrangement.

The result obtained is slightly different according to whether it is the ends or some other points, for example the mid-points, of the fibres that are arranged periodically. However, it will be seen later that rovings are sometimes produced in which the ends pointing in one direction tend to be so arranged, and therefore only this case will be considered in detail, whilst the results for the mid-point arrangement will merely be quoted.

x If x is the distance measured along the roving, then the number of right-hand ends of fibres within a short length dx of roving at x may be represented by:—

n_0

$$n\,dx = n_0\left(1 + r\cos\frac{2\pi}{\lambda}x\right)dx, \qquad (3\cdot1)$$

λ, r where λ is the wave length, it will be seen that r represents the fractional amplitude of the periodic arrangement. Assuming again that the cotton is perfectly mixed, i.e. that the fibre length frequency distribution is the same at all parts of the roving, the number of fibres of length l in (3·1) is $f\,n\,dx$, and the number, N_l, of these that cross a section of the roving at x is the number whose right-hand ends lie between x and $(x+l)$.

$$\therefore\; N_l = f\int_x^{x+l} n\,dx$$

Substituting for n from (3·1) and integrating, we obtain after reduction

$$N_l = n_0 f\left\{ l + \frac{r\lambda}{2\pi}\sin\frac{2\pi l}{\lambda}\cdot\cos\frac{2\pi x}{\lambda} + \frac{r\lambda}{2\pi}\left(\cos\frac{2\pi l}{\lambda} - 1\right)\sin\frac{2\pi x}{\lambda}\right\} \qquad (3\cdot2)$$

To get the total number, N, of fibres crossing the section, this must be summed over all lengths of fibre.

$$\left.\begin{aligned} \therefore \quad & N = n_0\left\{L + rA\cos\frac{2\pi x}{\lambda} + rB\sin\frac{2\pi x}{\lambda}\right\} \\ & \text{where } A = \frac{\lambda}{2\pi}\Sigma f\sin\frac{2\pi l}{\lambda} \\ & \text{and} \quad B = \frac{\lambda}{2\pi}\Sigma f\left(\cos\frac{2\pi l}{\lambda} - 1\right). \end{aligned}\right\} \qquad \ldots\ldots\ldots\ldots(3.3)$$ A

B

This is easily reduced to

R

$$\left.\begin{aligned} & N = n_0 L\left\{1 + R\cos\frac{2\pi}{\lambda}(x - a)\right\} \\ & \text{where } R = \frac{\sqrt{rA^2 + B^2}}{L} \\ & \cos\frac{2\pi a}{\lambda} = \frac{rA}{RL}, \text{ and } \sin\frac{2\pi a}{\lambda} = \frac{rB}{RL} \end{aligned}\right\} \qquad \ldots\ldots\ldots\ldots(4.4)$$ a

The extent of the smoothing is given by the ratio R/r and it will be noticed that when the fibres are all of the same length, L,

$$R/r = \frac{\lambda}{\pi L} \cdot \sin\frac{\pi L}{\lambda}.$$

When L is a multiple of λ this is zero, that is the roving is uniform in thickness.

When the fibres are of different lengths we can obtain an estimate of R/r which is sufficiently accurate for most purposes by assuming that the frequency distribution of fibre lengths follows the normal law:—

$$f(v)\,dv = \frac{1}{\sigma\sqrt{2\pi}}e^{-v^2/2\sigma^2}\,dv$$

where $v = l - L$, the deviation of fibre length from the mean length L, σ = the standard deviation of fibre length, and $f(v)\,dv$ is the frequency of fibres having deviations between v and $v + dv$. When it is necessary to integrate over a continuous frequency distribution, $f(v)\,dv$ must be substituted for f. v

The summations in (3.3) can then be made, and the ratio R/r expressed in terms of L, the mean staple length, and σ the standard deviation of fibre length. The following formula is obtained:

$$R/r = \frac{\lambda}{L}\cdot\frac{1}{2\pi}\left\{1 + e^{-4\pi^2(\sigma/\lambda)^2} - 2e^{-2\pi^2(\sigma/\lambda)^2}\cos\frac{2\pi L}{\lambda}\right\}^{\frac{1}{2}} \qquad \ldots\ldots\ldots\ldots(3.5)$$

(In order not to interrupt the main argument, the details of this calculation have been placed at the end of this section.)

In Fig. 2 the relation (3·5) has been plotted for three values of σ which cover the range of standard deviations of fibre-length likely to be met with in practice. It will be seen from the curves that if the staple length is equal to or greater than the length of the period only a small part of the amplitude is realised as a thickness variation. At no point within this range does the value of R/r rise above 15 per cent. on either curve, and the shape of the curve is also little affected by comparatively large differences in the value of σ; thus there is very little thickness variation in spite of the presence of a latent periodic fibre arrangement.

An example of such a latent periodic fibre arrangement is shown in Fig. 3a which is a reproduction of a photograph showing thickness variations in 1.6-hank Texas intermediate roving as ordinarily measured by the roving photographic regularity tester. The roving does in fact contain a periodic fibre arrangement, but the length of the period is of the order of 0·4 inch, which is considerably less than the average length of the cotton, so that the periodicity is not evidenced as a thickness variation. The arrangement of the fibre ends may be examined by mounting the roving in a Balls Sledge Sorter feed box, taking a nip of 1/20th of an inch of the trimmed end of the roving, and withdrawing the nipped fibres. The feed box allows this to be done with the minimum of disturbance of the fibres, and the weights of successive nips give an approximate idea of the arrangement of the fibre ends. These weights are plotted in Fig. 3b. The graph is necessarily rather irregular, but the period is fairly clear and its presence is confirmed by examination in the Grating Periodograph.[1]

Derivation of Equation (3.5).

The equation (3.5) is obtained by substituting $l=L+v$ in (3.3). We thus obtain after expansion :*

$$\left.\begin{aligned} A&=\frac{\lambda}{2\pi}\sin\frac{2\pi L}{\lambda}\int_{-\infty}^{\infty} f\cos\frac{2\pi v}{\lambda}dv+\frac{\lambda}{2\pi}\cos\frac{2\pi L}{\lambda}\int_{-\infty}^{\infty} f\sin\frac{2\pi v}{\lambda}dv \\ B&=\frac{\lambda}{2\pi}\cos\frac{2\pi L}{\lambda}\int_{-\infty}^{\infty} f\cos\frac{2\pi v}{\lambda}dv-\frac{\lambda}{2\pi}\sin\frac{2\pi L}{\lambda}\int_{-\infty}^{\infty} f\sin\frac{2\pi v}{\lambda}dv-\frac{\lambda}{2\pi}\end{aligned}\right\} \quad \ldots\ldots(3.6)$$

In these, write $C=\int_{-\infty}^{\infty} f\cos\frac{2\pi v}{\lambda}dv$

$$S=\int_{-\infty}^{\infty} f\sin\frac{2\pi v}{\lambda}dv$$

Squaring and adding, we have

$$A^2+B^2=\frac{\lambda^2}{4\pi^2}\left(1+C^2+S^2-2C\cos\frac{2\pi L}{\lambda}+2S\sin\frac{2\pi L}{\lambda}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots(3.7)$$

In order to calculate the values of C and S, combine the two expressions for C and S into one complex formula and substitute the value of f.

Then :

$$C+iS=\frac{1}{\sigma\sqrt{2\pi}}\int_{-\infty}^{\infty} e^{-v^2/2\sigma^2+i2\pi v/\lambda}dv \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(3.8)$$

Now let us choose a such that

$$-v^2/2\sigma^2+i2\pi v/\lambda+a^2=-(v/\sigma\sqrt{2}-ia)^2$$

Then $$a=\frac{\pi}{\lambda}\sigma\sqrt{2}$$

Equation 3.8 may thus be written :

$$C+iS=\frac{1}{\sigma\sqrt{2\pi}}e^{-2\pi^2\sigma^2/\lambda^2}\int_{-\infty}^{\infty} e^{-(v/\sigma\sqrt{2}-i\pi\sigma\sqrt{2}/\lambda)^2}dv$$

$$=e^{-2\pi^2\sigma^2/\lambda^2}\frac{1}{\sqrt{\pi}}\int_{-\infty}^{\infty} e^{-z^2}dz$$

$$\therefore\ C+iS=e^{-2\pi^2\sigma^2/\lambda^2}$$

Thus $$S=0 \text{ and } C=e^{-2\pi^2\sigma^2/\lambda^2}$$

We then have $$\frac{R^2}{r^2}=\frac{A^2+B^2}{L^2}$$

$$=\left(\frac{\lambda}{L}\cdot\frac{1}{2\pi}\right)^2\left\{1+e^{-4\pi^2(\sigma/\lambda)^2}-2e^{-2\pi^2(\sigma/\lambda)^2}\cos\frac{2\pi L}{\lambda}\right\} \quad \ldots\ldots\ldots(3.5)$$

which is the required expression.

* In these integrals the true limits of integration, $v=-L$ and $v=l-L_m$ have been replaced by infinite limits. This is permissible, since only a very small proportion of the area of a normal curve having the same standard deviation as the actual frequency distribution of the cotton will be outside these limits.

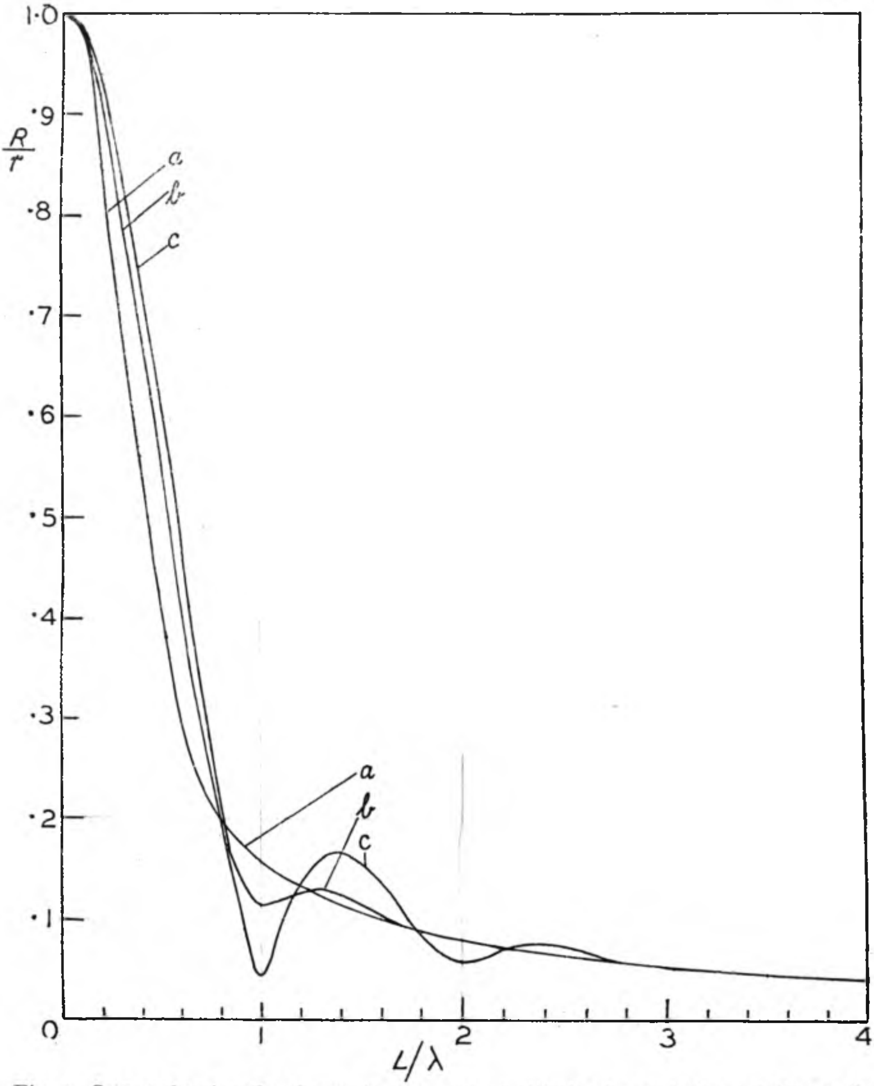

Fig. 2. Curves showing the change in apparent amplitude of a periodic variation as the wave length decreases. Standard deviation of fibre length (*a*) 50 per cent. (*b*) 25 per cent. (*c*) 12·5 per cent. Calculated from equation (3·5).

Fig. 3. Periodic arrangement of Fibres in Texas Intermediate Roving.
(*a*) Trace obtained by the roving photographic regularity tester.
(*b*) Graph of weights of successive nips taken from the roving mounted in the feed box of the Balls Sledge Sorter.
(*c*) Graph of weights of successive half-inch lengths after passing through the roving frame.

When the mid-points of the fibres are arranged periodically, (3·3) becomes:

$$N=n_0\left(L+\frac{r\lambda}{\pi}\Sigma f\sin\frac{\pi l}{\lambda}\cdot\cos\frac{2\pi x}{\lambda}\right) \quad \text{.....................(3·9)}$$

The Effect of Drafting upon a Latent Periodic Fibre Arrangment

Since the wave length of a short periodic variation is increased when the roving is drafted the amplitude of the thickness variations may also be increased and a variation that was not apparent in the undrafted roving may be revealed or developed.

The increase in amplitude will be calculated on the assumption that the leading fibre ends which were a distance x apart before drafting, are a
D distance Dx apart after the application of a draft D. This implies perfect control of the leading fibre ends by the rollers. If, for example, the fibres move with the speed v_1 of the back rollers until their leading ends reach the nip of the front rollers moving at speed v_2, then during the time, x/v_1, between the arrival of the leading ends of two fibres x apart, the foremost fibre moves $v_2x/v_1=Dx$. This is merely intended as an example of one way in which the leading ends might be spaced out by the drafting; for the purposes of this calculation it is not necessary to assume the exact mechanism, but only that the original distances between the leading ends are multiplied by the draft.

If the distance x is measured along the roving from the leading end of some arbitrary fibre as origin, then, on the assumption made, the leading end of a fibre at x in the drafted roving was at x/D in the undrafted roving, and the fibre ends in a short length, dx, of drafted roving were all within a length dx/D before drafting.

We shall suppose that the roving moves through the drafting rollers from left to right, i.e. with the right-hand ends leading. Then with the right-hand ends in the undrafted roving arranged according to equation (3.1), the number of right-hand ends in a length dx of the drafted roving at x is obtained by substituting x/D for x and dx/D for dx. This gives

$$ndx=\frac{n_0}{D}\left\{1+r\cos\frac{2\pi x}{D\lambda}\right\}dx \quad \text{..........................(3.10)}$$

which is merely a periodic variation whose wave length is D times that of the undrafted roving. The amplitude of the thickness variations can be computed from equations (3·3).

Suppose now that the roving is presented for drafting with the left-hand ends leading instead of the right, so that now the rear ends are distributed periodically. The number of left-hand ends of fibres of length l within a length dx at x is the number of right-hand ends at $(x+l)$, and is therefore

$$n_0 f\left\{1+r\cos\frac{2\pi}{\lambda}(x+l)\right\}dx \quad \text{..........................(3.11)}$$

To obtain the total number of left-hand ends within dx we should sum (3.11) over all lengths of fibre, and this amounts to adding a number of simple harmonic terms differing both in phase and in amplitude. If the wave length is comparable with the fibre lengths, the phase differences are large and on summing the amplitude is considerably reduced.

Drafting with the left-hand ends leading will not therefore develop a short period to the same extent as drafting in the opposite direction. When x/D is substituted for x and dx/D for dx (3·11) becomes after drafting

$$n_0 f\left\{1+r\cos\frac{2\pi}{\lambda}\left(\frac{x}{D}+l\right)\right\}\frac{dx}{D}$$

$$=\frac{n_0 f}{D}\left\{1+r\cos\frac{2\pi}{D\lambda}\left(x+Dl\right)\right\}dx \quad \text{................(3.12)}$$

Since the number of fibres of length l crossing a section of the roving at x is the number of left-hand ends between $(x-l)$ and x, to get the thickness of the roving (3.12) must be integrated from $(x-l)$ to x and then summed over all lengths of fibre. This gives the thickness,

$$\left.\begin{aligned} N' &= \frac{n_0}{D}\left\{L + A' \cos\frac{2\pi x}{D\lambda} + B' \sin\frac{2\pi x}{D\lambda}\right\} \\ \text{where } A' &= \frac{rD\lambda}{\pi}\Sigma f \cos\frac{\pi}{D\lambda}\left(2D-1\right)l \,.\, \sin\frac{\pi l}{D\lambda} \\ \text{and } B' &= \frac{-rD\lambda}{\pi}\Sigma f \sin .\frac{\pi}{D\lambda}\left(2D-1\right) l \,.\, \sin\frac{\pi l}{D\lambda} \end{aligned}\right\} \quad \text{..............(3.13)}$$

As before, the amplitude can be computed from these equations when the wave length and the fibre frequency distribution are known.

The development by drafting of a periodic fibre arrangement latent in the Texas Intermediate roving mentioned previously is shown in Fig. 3c, in which the weights of successive half-inch lengths of the drafted roving are plotted. With the draft of 5 used in spinning this roving the length of the period becomes approximately 2 inches, which is considerably greater than the staple-length of the cotton ; consequently a periodic thickness variation of comparatively large amplitude results. The longitudinal scale in Fig. 3c is contracted relative to that of Fig. 3b by the amount of the draft, so that the lengths of the period are directly comparable as plotted. It will be seen that there is a close correspondence between the length of the period measured directly in the Intermediate roving as an ends-arrangement, and in the drafted roving as a weight variation.

The different effects produced by drafting a roving containing a latent periodic fibre-arrangement in the two ways, "normal" and "reverse," are illustrated in Fig. 4, in which the weights of successive half-inch lengths of the drafted rovings are plotted (draft=$6\frac{3}{4}$). In "normal" drafting the Intermediate roving is wound off the bobbin and presented to the drafting rollers in the ordinary way ; but in "reverse" drafting the Intermediate roving is first wound on to another bobbin prior to drafting, so that it is presented in the opposite direction to normal. The three upper curves in Fig. 4, representing "normal" drafting of a 1·6-hank Intermediate Texas roving, show a well-defined periodicity, which, however, is of considerably smaller amplitude than is shown by the "reverse" draftings in the three lower curves. The approximate figures for the fractional amplitudes are 0·26 for the "normal"; and 0·41 for the "reverse." The ratio of the amplitude of the "reverse" spinning to that of "normal" is thus 1·6, which is much less than the ratio of 9·8 obtained by substituting the values for the length-frequency distribution of the cotton, the wave-length, and the draft in equations (3·13) and (3·3). Similarly, for drafting a 2·4-hank Intermediate combed Sakel roving containing a short-wave period, a ratio of 19·8 was calculated between the amplitudes of "reverse" and "normal" spinnings, whereas the actual ratio observed was only 4·4. The discrepancy between the theoretical and observed ratios is too great to be accounted for by the lack of parallelisation alone and must be mainly ascribed to the known lack of perfect control during drafting, and perhaps also to the fact that it may not be the ends of the fibres which are arranged periodically but some points between the ends and the mid-points ; if it were the mid-points, there would be no difference between the reverse and normal drafting. Nevertheless the differences between the two directions of drafting are so great that the above calculation is justified as a general picture of the arrangement and motion of the fibres.

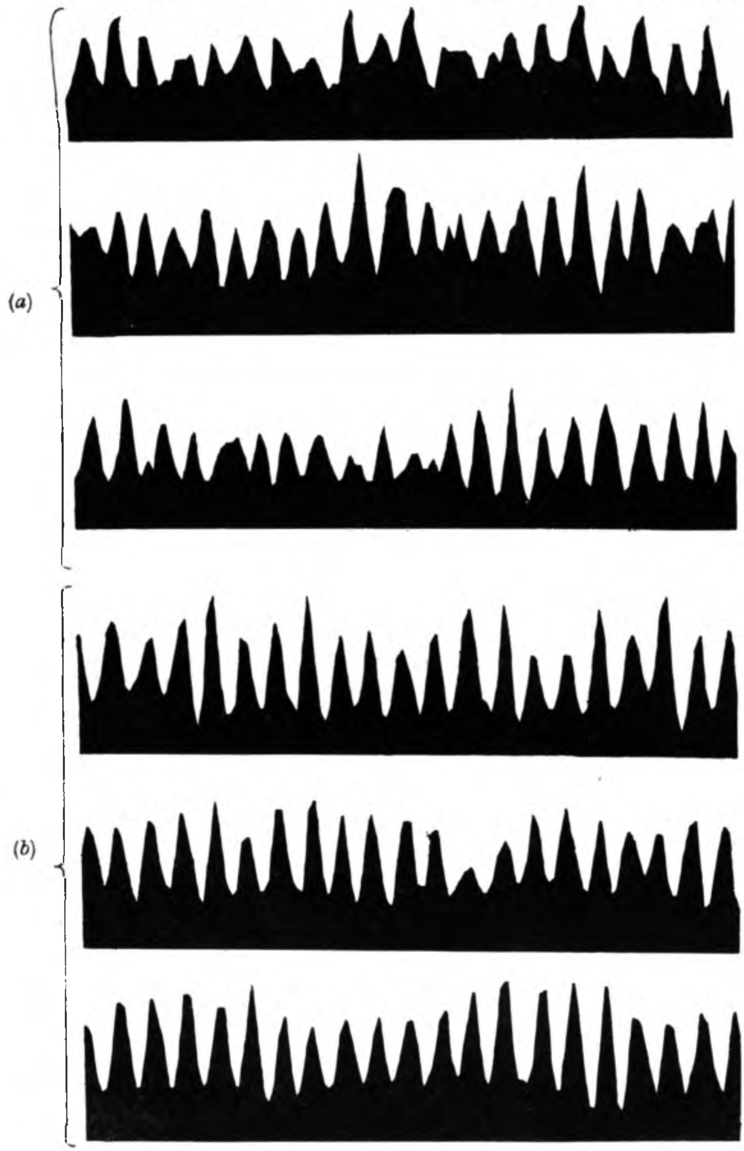

Fig. 4. Graphs of weights of successive half-inch lengths of drafted rovings. (1·6-hank Texas Intermediate with draft of $6\frac{3}{4}$). (*a*) " Normal " drafting. (*b*) " Reverse " drafting.

The Composition of Tufts drawn from a Non-Uniform Roving

During the course of work on the drafting wave it was required to test whether there is any difference in staple length between the cotton in the thick and thin places of an irregular roving such as might be expected to occur from the irregular motions of "floating" fibres between the drafting rollers, the thick places containing an excess of shorter fibres. In order to do this a number of tufts of cotton were selected from the thick and thin places respectively by clamping the roving under a metal bar half an inch wide and combing out all the loose fibres on either side of the bar. We have already seen in section (2) that this method of selection favours the longer fibres, and it is easy to see that the excess of long fibres is greater in the tufts drawn from the thin places, for the fibres held under the bar extend into regions on either side of the thin place where the roving is thicker, i.e. where the number of fibre ends per unit length is greater. If, therefore, the length of the drafting wave is comparable with the staple length, some of the longer fibres from these thicker places are included in the selected tuft and increase the mean staple length of the cotton from the thin places. In a similar way the staple length of the tufts taken from the thick places is less than it would be if the roving were uniform.

The extent of this difference, which is due entirely to the method of sampling, will now be estimated by extending the calculation in the first part of this section (p.200) and shown to be negligibly small.

It is sufficiently accurate for this purpose to assume the drafting wave to be a simple harmonic variation in which the fibre ends are arranged according to equation (3·1). Since the number, N_l, of fibres of length l held under the bar of width b is obtained by integrating $fndx$ from x to $(x+b+l)$ it is given by equation (3·2) if $(b+l)$ is substituted for l.

But the mean length L' of these fibres is $\Sigma l N_l / \Sigma N_l$. We require the values of this when N, the thickness of the roving is a maximum and a minimum. We see at once from (3·4) that N is a maximum when $x=a$ i.e. when $\cos 2\pi x/\lambda = rA/RL$ and $\sin 2\pi x/\lambda = rB/RL$ whilst N is a minimum when $x=a+\lambda/2$, i.e. when $\cos 2\pi x/\lambda = -rA/RL$, and $\sin 2\pi x/\lambda = -rB/RL$. L'

Putting these values of x into equation (3·2) we find

$$L'_{max} = \frac{\Sigma fl(l+b) + \frac{r^2\lambda}{2\pi R}\left\{A\Sigma fl \sin 2\pi\frac{l+b}{\lambda} + B\Sigma fl\left(\cos 2\pi\frac{l+b}{\lambda} - 1\right)\right\}}{\Sigma f(l+b) + \frac{r^2\lambda}{2\pi R}\left\{A\Sigma f \sin 2\pi\frac{l+b}{\lambda} + B\Sigma f\left(\cos 2\pi\frac{l+b}{\lambda} - 1\right)\right\}} \quad \text{......(3.14)}$$

The value of L' for the thin places is obtained by changing the sign after the first term in both the numerator and the denominator. It will be noticed that when $r=0$ this reduces (as it should) to equation (2·5). L' can be calculated when the length frequency distribution of the cotton and the wave length, λ, and the amplitude, R, of the drafting wave in the roving are known.

Equation (3·4) is used to obtain r from R.

The above calculation assumes the ends of the fibres to be arranged periodically. The precise arrangement of the fibres in the drafting wave is, however, not known, and it is therefore necessary as an alternative to estimate the values of L'_{max} and L'_{min} when the mid-points of the fibres are arranged periodically. The result obtained is:—

$$L'_{max} = \frac{\Sigma fl\,(l+b) + \frac{r\lambda}{\pi}\Sigma fl \sin\frac{\pi}{\lambda}(l+b)}{\Sigma f\,(l+b) + \frac{r\lambda}{\pi}\,\Sigma f\,\sin\frac{\pi}{\lambda}(l+b)} \quad \text{.............. (3.15)}$$

From equation (3·9) the fractional amplitude of the drafting wave is

$$\frac{r\lambda}{\pi L}\Sigma f \sin\frac{\pi l}{\lambda},$$

which enables the value of r to be calculated.

The approximate magnitude of the effect indicated in equations (3·14) and (3·15) is shown by the following table, which was worked out for a cotton having a mean staple length of 22mm. and a standard deviation of fibre-length of 4·9 mm. The length of the drafting wave was 76 mm., the fractional amplitude 30 per cent., and the width of the bar 13 mm.

		Mid-points periodic	Ends periodic
Mean calculated length of fibres from	Thick places ...	22·62 mm. ...	22·37 mm.
	Uniform sliver	22·68 mm. ...	22·68 mm.
	Thin places ...	22·79 mm. ...	22·77 mm.

IV. FIBRE PARALLELISATION

All the above calculations are based on the assumption that the fibres are straight and parallel to the axis of the sliver. It is to be expected that the lack of parallelisation in actual slivers will cause the observed values to differ from the calculated. These differences might therefore be used to measure the degree of parallelisation. In this section two such methods are suggested.

Method I

The first method depends on the fact, mentioned at the end of section II, that the observed weight of a tuft drawn from a sliver by clamping it under a bar and combing out all the loose fibres is less than that calculated on the assumption of complete parallelisation. The degree of parallelisation might therefore be measured by the ratio of the observed to the calculated weight of the tuft.

In order to see the meaning of this method it is necessary to calculate the weight of the tuft when the fibres are not parallel.

Suppose that the projected length of a fibre of length l upon the axis
l'' of the sliver is l''. Let the fraction of all the fibres of length l that have
f'' this length be f''. Then since the number of fibres of length l whose right-hand ends lie within unit length of sliver is nf the number of length l and also of projected length l'' is nff''. The number of fibres in this class that cross a section of the sliver is the number whose ends lie within a length l'' of sliver, and is therefore $nff''l''$, and the total number of fibres of length l that cross the section $nf\Sigma f''l''$. But this summation is merely the mean pro-
l' jected length of the fibres of length l. Denoting this by l', the number of fibres of length l that cross the section is nfl'. If the fibre-weight per unit length is independent of l the weight of these fibres is $\mu nlfl'$, and the weight of the whole is $\mu n\Sigma lfl'$.

By measuring the weight per unit length of the sliver μn can be eliminated from this expression. For consider a length h of sliver so long compared with the lengths of the fibres that the effect of the ends can be ignored. Then the number of fibres of length l in this length is nfh and their weight is $\mu nhfl$. The weight of the sliver is $\mu nh\Sigma fl$ and the weight per unit length $\mu n\Sigma fl = \mu nL$ .... (5·1).

It will be noticed that this is identical with (2·3).

p The ratio p of the weight of the tuft to the weight of unit length of sliver is given by

$$p = \frac{\Sigma lfl'}{\Sigma lf}$$

This is the weighted mean value of l' over all lengths of fibre weighted according to the lengths of the fibres. Its value when the fibres are straight and parallel is

$$\frac{\Sigma fl^2}{\Sigma lf} = L + \frac{\sigma^2}{L} \text{ by equation (2.4)}$$

P_1 Dividing p by this we get a measure of the degree of parallelisation, P_1, which is weighted according to the lengths of the fibres, i.e. it is affected more by the parallelism of the longer fibres. We have if M is the weight per unit length of the sliver and M_1 the weight of the tuft

$$P_1 = \frac{\Sigma fl\cdot l'}{\Sigma fl\cdot l} = \frac{M_1}{M}\cdot\frac{1}{L+\sigma^2/L} \quad \text{.................... (5.2)}$$

Method II

The true mean projected length may, however, be found by the second suggested method. For the ratio of number of fibres crossing a section of the sliver to the weight per unit length of the sliver is

$$\frac{N}{M} = \frac{n\Sigma fl'}{\mu n\Sigma fl} = \frac{1}{\mu}\cdot\frac{\Sigma fl'}{L} \quad \text{.........................(5.3)}$$

which when multiplied by the fibre weight μ, is the ratio P_2 of the mean projected length to the mean length of the fibres.

The number of fibres crossing a section might be counted, but it can be found more conveniently and the necessity for measuring the fibre weight avoided by clamping the sliver under a bar, combing out the loose fibres on one side, stretching the tuft out straight and cutting a narrow strip about say an eighth of an inch wide from its base and weighing this. If there were no fibre ends within the strip its weight would be proportional to the number of fibres crossing the edge of the bar ; it is assumed that the fibres are not so curled up that an appreciable number cross the bar more than once. To find the small correction for the effect of the ends it is sufficiently accurate to assume that the fibre ends in the strip of width b of the straightened tuft were in a strip of width P_2b in the sliver, and to ignore the small number of very short fibres shorter than b. The number of ends in the strip is then nP_2b, and if we imagine these fibres extended to the outside edge of the strip its weight would be exactly proportional to the number of fibres crossing the edge of the bar. Since the ends are evenly distributed across the strip, the average length of fibre to be added to do this is $\frac{1}{2}b$ and the weight to be added is $\frac{1}{2}\mu b.nP_2b=\frac{1}{2}\mu nP_2b^2$. Hence, if M_2 is the actual weight of the strip and N the number of fibres crossing the edge of the bar

$$\mu Nb = M_2+\tfrac{1}{2}\mu nP_2b^2$$

and we have:

$$P_2 = \frac{\mu N}{M} = \frac{1}{Mb}(M_2+\tfrac{1}{2}\mu nP_2b^2)$$

$$= \frac{M_2}{bM} + \frac{P_2b}{2L} \text{ since } M=\mu nL \text{ by (5.1)}$$

$$= \frac{M_2}{bM}\left(\frac{1}{1-b/2L}\right)$$

$$P_2 \doteq \frac{M_2}{bM}\left(1+\frac{b}{2L}\right) \qquad \text{.................................(5.4)}$$

If b is about an eighth of the staple length the correction makes a difference of about 6 per cent. to P_2, which is sufficiently small to justify the approximations made in deriving it.

It will be noticed that the preparation and straightening of the tuft is nothing more than a device for straightening the fibres in a short length of the sliver, and the weighing of the strip determines the weight per unit length of the straightened sliver. The ratio of this to the weight of the original sliver measures the degree of parallelisation of the fibres. The straightness of the fibres in the tuft is therefore the standard with which that of the fibres in the sliver is compared, and hence the success of the method in practice depends on whether the tuft can be straightened sufficiently to form a reasonable standard. The standard of straightness in the first method (Equation 5·2) is obviously that existing in the method of measuring the fibre lengths in the determination of $L+\sigma^2/L$.

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NOTE ON SECTION CUTTING BY A MODIFIED PLATE METHOD

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The ordinary "plate method" is eminently suitable for cutting sections of smooth transparent fibres, but cotton and wool fibres scatter light transversely because of surface irregularities in the axial direction—convolutions and scales. Some of the incident light is transmitted through the fibres by internal reflections, but enough escapes to destroy the contrast between the sections and the background. To obviate this a modification of the plate method has been used for such fibres. In this the fibres are surrounded with a "black medium" to absorb the scattered light (1, 2). This effectively absorbs the scattered light, but is open to two objections. One is that a smear of the medium is sometimes left by the razor on the cut ends of the fibres. The other objection is that it unnecessarily reduces the light transmission, since the light must traverse a length of fibre equal to the thickness of the plate. With a rayon delustred by means of titanium dioxide the amount of light which can pass through this length of fibre is too small. However, if the black medium surrounds the fibres at their upper extremities only then the light can travel up between the fibres and illuminate them transversely almost to the top surface, thus considerably increasing the amount of light emerging from the cut ends. Satisfactory sections of delustred rayons are then obtained. The new method is also better than the old for cotton and wool.

The improved routine is as follows:—The cotton fibres, for example, are drawn into the hole in the metal cross section plate in the usual way with a loop of fine cotton or wire. The tuft of fibres should be firmly held, but it should not be tightly jammed in the hole. A simple test of this is that it should be held only just sufficiently firmly that when the tuft is waggled on one side the movement is not conveyed to the tuft at the other side of the plate. The fibres are then damped with water in the case of hard fibres like cotton, and each side is cut off with a single smooth slicing cut, using a sharp safety razor blade. To do this most conveniently the slide should be raised above the bench. This can be done simply by placing it upon an upturned cotton reel for each cut. (The hole in the reel accepts the lower tuft and permits the slide to lie flat.)

When the tufts of fibres have been cut off flush with the surface of the plate on each side, the cut ends should be dried for a few moments in a current of warm air. Then a small amount of the black medium (2) is smeared on to the cut ends of the fibres on the side last cut with a piece of cotton fabric. Excess of the black medium should be wiped off with a piece of clean, damp cloth.

The wiping operation should be repeated till no black mark appears on the cloth. A cover glass is stuck, with a drop of glycerine, on the side treated with black medium, and the metal slide is placed on a glass slide on which has been put another drop of glycerine. The sections are now ready for examination.

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ABSTRACTS

1—FIBRES AND THEIR PRODUCTION

(B)—Animal

Silk: Cultivation in Italy and France. Eric Hardy. *Silk J. Rayon World*, 1945, **21**, September, 30-31. The writer reviews the present position of the raw silk industry in Italy and France and its post-war opportunities. The Italian and French mulberry plantations have suffered very little during the war, but the stocks of silkworm and eggs have been more seriously affected. Sericulture could first be encouraged in these countries as a village and domestic industry. C.

Silk Cocoons: Properties. M. O. Korchagin, A. D. Platova and A. A. Tikhonova. *Shelk*, 1940, **10**, 13-14 (through *Chem. Zentr.*, 1941, II, 1696-7 and *Chem. Abstr.*, 1945, **39**, 3936[8]). It is established that on degumming cocoon fibres in an autoclave at 114° C. the greater part of the sericin A changes into sericin B. Fractionation of sericin and determination of the A and B fractions is therefore not a reliable test for the ability of the fibres to withstand reeling. Nitrogen analysis by the Kjeldahl method gives satisfactory agreement with the results of reeling. C.

New Zealand Sheep Industry. J. E. Duncan. *New Zealand J. Agric.*, 1945, **71**, 47-53. A review of the development of the industry, of the numbers, types and distribution of sheep (shown in a series of tables), and of systems of sheep farming. W.

Wool and Lamb Production by Different Types of Ewes and Breeds of Rams. P. E. Neale. *New Mexico Coll. Agric., Agric. Exp. Sta., Bull*, 305, 1943, 26 pp. Wool and lamb production data are given from sheep crossing experiments on New Mexico ranges. It is hoped that the results may be useful in indicating quick methods of improving sheep in general. The breeds used were two types of Rambouillet rams and ewes ("smooth," with long staples and open fleeces, and "tight," with short staples and tight fleeces), Corriedale rams, Romney rams and Hampshire rams. Smooth Rambouillet rams × tight Rambouillet ewes produced the highest value fleeces; Romney rams × Rambouillet ewes of both types produced the cleanest wool, but of comparatively low value owing to the coarseness of the fibres. Fibre length and diameter in the offspring appeared to be midway between those of the parents. Clean wool yield was increased to a greater extent by increasing fibre length beyond the average than by increasing fibre density beyond the average. A good breeding guide is to select for extreme length without allowing the fibre to become too coarse. Lamb production data are given on percentages of lambs marked and weaned, weaned weights, and weight of lamb produced per ewe. W.

Wool Clip Oddments: Preparation. "Jason." *Pastoral Rev.*, 1945, **55**, 512-513. Pre-war methods of picking the pieces, and of preparing back and belly wool, locks and stained pieces, are described for the benefit of classers with little or no pre-war experience. W.

Genetics and the Merino. J. L. le Roux. *Merino Breeders' J.*, 1945, **7**, No. 3, 8-10, 33. Comparisons of density (number of fibres per unit skin area, in conjunction with fibre diameter) can be misleading unless the animals are of the same age and in the same condition, and unless the measurements are made at corresponding locations on the body; they are therefore inapplicable to large numbers of flock sheep. Bosman's finding that development is not associated with density (these *Abs.*, 1943, A706) is criticised for this reason, and also because he disregards the influence of recessive characteristics. The ultra-plain Camden Park merino flock, Australia, has been pure-bred over a long period, and its wool production is low (6-7 lb. per head). Progeny testing for high production of both wool and mutton is desirable. Plainness is dominant to development, and corrective and systematic cross-breeding of these two types is necessary to maintain a middle type, the aim being high and economical production. W.

Fellmongering Investigations. I. Review of Australian Fellmongering Industry. F. G. Lennox. *Australia: Council Sci. Ind. Res., Bull.* No. 184, 1945, 9-44. Figures for skeepskin consumption and pelt production and for exports of skins and pelts from 1905 show that, up to 1939, the industry, though substantial, treated only about 40 per cent. of the sheepskins produced in the Commonwealth. The abnormal war-time growth of the industry, due to the loss of overseas markets, especially France, has shown the need for research into fellmongering methods. Factors governing the choice of method are breed of sheep, prevailing market prices for wool and pelts, condition of the skin on arrival at the fellmongery, price and availability of sodium sulphide, effect of regulations governing noxious trade, ease of wool scouring, and space available for fellmongering. The operations involved (soaking, burring, depilating, pulling, washing, liming, fleshing and scudding, deliming and bating, pickling, and pieing) are described, with particular reference to the scientific principles involved. A flow sheet summarises the operations (excluding wool scouring and basis production). The lay-out of the fellmongery is discussed, and also the effect of climate on the method used for sweating, meteorological data being given for Australian capital cities. The sweating operation, which, if carefully conducted, is unsurpassed for treating merino skins, perhaps most urgently needs improvement, but there is also opportunity for research on the painting process, mechanical dewooling, treatment of the pelt, and labour-saving methods of pieing without damaging the wool. The structure and biochemistry of the sheepskin are described. A glossary of fellmongering terms is given. W.

II. Method of Following the Loosening of Wool on Sheepskins. F. G. Lennox. *ibid.*, No. 184, 1945, 45-55. A semi-quantitative physical method for ascertaining the loosening of wool on sheepskins is described. It involves measuring the force required to pull a staple of wool from the skin, cutting, scouring, drying and weighing a 2·5 cm. length from the middle of the staple, and calculating the pull in grams weight required to detach a staple of which 2·5 cm. weights 1 mg. This value is the "depilation load," and varies with different samples from the same skin, with the operator making the test, and inversely with the skin temperature. By measuring the depilation load at intervals during sweating or after painting, the gradual release of the fibres can be followed. Close agreement between the depilation load and bacterial count methods supports the belief that the loosening of wool by sweating is primarily due to bacterial action. Measurements made at two fellmongeries suggest that the depilation load must almost reach zero before wool loosening can be regarded as complete. W.

III. The Bacterial Flora of Sheepskins. M. E. Maxwell. *ibid.*, No. 184, 1945, 57-87. Samples of fresh, dry and sweated sheepskins (mainly merino), pie pieces and soak water from 15 Australian fellmongeries were examined bacteriologically; 47 ærobes and 28 anærobes were isolated in pure culture and their biochemical reactions determined, the majority being separate species. Types and numbers of bacteria do not vary appreciably in skins from different fellmongeries. Dry and green skins show a numerically low bacterial population on the wool roots, the dominant types being ærobes of the *Bacillus subtilis* and feebly proteolytic groups. During sweating, bacteria increase rapidly on the wool roots, a typical strain of *Proteus vulgaris* becoming dominant. The bacteriology of "pie" is described and the rôle of bacteria in skin digestion is discussed. Most of the samples of soak water with high counts of proteolytic bacteria, particularly anærobes, were obtained from fellmongeries with a high incidence of damaged pelts. W.

IV. Bacteria Responsible for the Loosening of Wool on Sheepskins. M. E. Maxwell. *ibid.*, No. 184, 1945, 89-116. Bacteria recovered from sheepskins in the sweating process were studied by examining the flora recovered from the wool roots during incubation of unsterilized sheepskins, and by noting which bacteria could completely loosen wool on sterile foetal lambskin and on bisulphite-sterilized sheepskin. Bisulphite sterilization was used only after unsuccessful attempts to use X-ray irradiation, drying followed by heating, and various antiseptic chemicals. Of the 47 ærobic bacteria isolated, an atypical strain of *Proteus vulgaris,* an unidentified species of *Achromobacter, Flavobacterium estero-aromaticum,* and an unidentified species of *Flavobacterium* were the only ones capable of loosening the wool. The superiority of *Proteus vulgaris* is confirmed, but not explained, although its pronounced motility may be partly responsible. Wool loosening is not entirely due to bacterial action; on sterile foetal lambskin it occurs during incubation, and on adult sheepskin during incubation after bisulphite sterilization. W.

V. Removal of Dissolved Oxygen from Soak Water by Sheepskins. W. J. Ellis. *ibid.,* No. 184, 1945, 117-123. Using 43 grams of sheepskin per litre of water, unsoaked sheepskin with the wool attached may reduce the oxygen content of tap water to zero during 2 hr. soaking; soaked and burred skin may require 4-5 hr., and, in an advanced state of decomposition, 3 hr. The main consumption of oxygen is due to the skin rather than the wool. Samples of fellmongery soak water contain little or no dissolved oxygen. The oxygen content of soak water can be maintained at its initial concentration by vigorous æration, but this treatment is without measurable effect on the subsequent rate of wool loosening on fresh sheepskin during sweating. W.

VI. The Soaking Operation. F. G. Lennox, W. J. Ellis and M. E. Maxwell. *ibid.,* No. 184, 1945, 125-141. Soaking increases the moisture content of freshly flayed sheepskins, an immediate effect being to increase the depilation load. The need to sweat dry skins steadily diminishes with increase in the time of soaking. Continuous soaking of fresh skins produces slower bacterial multiplication on the wool roots, and therefore slower loosening of the wool, than in the usual procedure of soaking followed by incubation in air. The volume of clean soak water used has no measurable effect on sweating; increasing the temperature of the soak water lowers the depilation load in the early stages, but does not shorten the total sweating period. Soaking in solutions of hydrochloric acid and sodium hydroxide has no measurable effect on sweating, but continuous soaking increases the rate of bacterial wool loosening with decrease in acidity, and of non-bacterial wool loosening with increase in alkalinity. Acetic acid at 0·05M. or higher concentrations also accelerates non-bacterial loosening, but produces swelling and damages the skin tissues; lower concentrations slightly delay bacterial loosening. Details are given of the effect on wool loosening of soaking in nicotinic acid, urea, oxidising and reducing agents, depilatories, bacterial nutrients and enzymes; thioglycollic acid, ferrous sulphate and ferric sulphate damage the wool, and sodium sulphide reduces it to a slime. W.

VII. Effect of Temperature on the Rate of Sweating. F. G. Lennox and M. E. Maxwell. *ibid.,* No. 184, 1945, 143-153. The temperature coefficient of sweating, measured by the time for the depilation load to fall to 4 or for the bacterial count to rise to the minimum count producing zero depilation load, diminishes rapidly with increase in temperature over the range 10°-22° C., but less rapidly over the range 22°-40° C. With some skins a two-stage fall in depilation load occurs during incubation at or below 18° C.; the first stage is non-bacterial, but the second stage requires the multiplication of wool loosening bacteria on the wool roots. Incubation at 25° C., after holding for various periods at 5° C., shows that the rate of sweating increases with the period of storage at the lower temperature. Cooling the skin to 15° C. after sweating for 17 hr. at various temperatures between 15° and 32° C., retards sweating, but the effect is more pronounced when measured by the depilation load method than by the bacterial count method because the depilation load itself is increased by decrease in temperature. W.

VIII. Ammonia in Relation to the Sweating of Sheepskins. F. G. Lennox, M. E. Maxwell and W. J. Ellis. *ibid.,* No. 184, 1945, 155-165. Under ærobic conditions the *p*H of the skin surface increases from 7 to 8, and more ammonia is evolved than under anærobic conditions, when there is no significant change in *p*H; an ammonia concentration of 0·1M. is retained by the skin tissues under both ærobic and anærobic conditions; wool loosening is slightly favoured by ærobic sweating. Ammonia prevents the multiplication of the most important wool loosening bacteria, and its accumulation in the skin tissues cannot therefore be responsible for the predominance of wool loosening species towards the end of sweating. Added ammonia retards sweating when its concentration in the tissues approximates 0·07M; it produces non-bacterial loosening of the wool in 6 hr. when used for soaking at 0·05M. or higher concentration, but the depilation load does not fall to zero even after 48 hr.; the value attained on loosening with ammonia is slightly too high for easy pulling by hand. It is unlikely that the ammonia produced during sweating is the principal cause of wool loosening. W.

IX. The Wool Loosening Activity of Ammonia and Some Related Compounds. F. G. Lennox. *ibid.*, No. 184, 1945, 167-193. Ammonia, used as a gas or in aqueous solution, loosens the wool on freshly-flayed, soaked or unsoaked sheepskin within 3-5 hr., but the depilation load does not reach zero. The gas does not loosen the wool on dry skin, but partially loosens the wool on moist skin if allowed to penetrate from the wool side only. Temperature has little effect on the rate of loosening, but ammonia damages the skin tissues at or above 55° C. Heating the skin to 55° C. or above before treating with ammonia reduces the rate of loosening. The activity of ammonia solutions increases with rise in concentration, reaching a maximum approximately 0·6M. The rapid loosening effect of 0·1M. ammonia solutions is due to the action of both the ammonia molecules and hydroxyl ions. The more rapid wool loosening activity of ammonia, compared with that of other inorganic alkalis, cannot be correlated with the total alkali uptake or with swelling of the skin tissues. Aliphatic amines promote rapid wool loosening, but this decreases with increase in molecular size. Various quaternary ammonium and other organic nitrogen compounds were tested, and these have little or no activity at 0·1M. concentration and *p*H 11·0. The vapours of lipoid solvents loosen wool, but not to the same extent as ammonia. Ammonia may loosen wool by softening the base of the wool root and the material in and around the surrounding sheath. W.

X. Treatments which Tighten the Wool on Sheepskins. F. G. Lennox. *ibid.*, No. 184, 1945, 195-206. The depilation load of freshly-flayed sheepskin is raised by increasing or decreasing the moisture content of the tissues, by extraction with lipoid solvents, or by treating with protein precipitants, e.g. acetone or copper chloride. Wool loosened by treatment with ammonia can be tightened by removal or neutralisation of the ammonia. Treatment with solutions containing 0·1M. ammonia and 5M. sodium chloride or 1·5M. sucrose may cause the depilation load to fall, owing to the action of the ammonia, and then to rise, owing to the withdrawal of water by osmotic action. The effect of solutions containing 0·1M. ammonia and either acetone or cupric chloride is intermediate between the opposite effects of the two components. W.

XI. Recovery of Wool from Skin Pieces by Digestion with Mould Protease or Papain. F. G. Lennox. *ibid.*, No. 184, 1945, 207-226. The following methods are satisfactory for recovering wool from skin pieces on a laboratory scale:—(1) The skin is shrunk by immersion in water for 2 hr. at 65° C., and the skin tissues are then digested by incubating for 24 hr. at 40° C. in a solution containing a mould protease. The protease solution is prepared by growing a strain of *Aspergillus flavus-oryzae* on steamed bran and extracting the culture with water. (2) The unheated skin is incubated in 0·4 per cent. papain at 65° C. for 24 hr. Both methods depend on the susceptibility of shrunken sheepskin collagen to protease digestion. Neither method damages the wool. The mould protease method will be further investigated on the pilot-plant scale, as this enzyme can be produced with less expenditure of labour than papain. W.

XII. Histological Studies on the Wool Root. W. J. Ellis. *ibid.*, No. 184, 1945, 227-232. The morphology of the wool root in fresh and sweated skin has been studied to investigate the mechanism of wool loosening. The wool sheath is usually detached with the fibre when it is pulled from fresh sheepskin, and both the papilla and the root sheath may be partly or completely everted. During sweating the cells of the wool root sheath and a portion of the root bulb are digested and the base of the root becomes tapered. This suggests that degradation of the cells of the wool root bulb is mainly responsible for wool loosening. W.

(C)—VEGETABLE

Cellulose: Hot Alkaline Purification. A. Meller. *Paper Trade J.*, 1945, **121**, *TAPPI*, 119-131. A survey and discussion is given of the literature on the action of hot alkali on cellulosic materials. The behaviours of sulphite and sulphate pulp toward hot dilute alkali are compared. It seems that the suitability of the sulphite pulps for the hot alkaline purification process is associated with the more depolymerised pentosans present in such pulps which are removed by hot dilute alkali, whereas the pentosans in alkaline-cooked cellulosic materials are present in such a form that they resist removal by hot dilute alkali. The aspect of the action of alkaline solutions at higher temperatures on cellulose, pulps, and wood is treated under the following headings: (1) Solubility and reactivity of cellulose. (2) The action of alkali solutions at higher temperatures on (*a*) cellulose, containing appreciable quantities of accompanying substances, including hydro- and oxy-cellulose, (*b*) pulps, obtained by different pulping processes, including unbleached and bleached materials the latter containing practically only cellulose and hemi-celluloses, and (*c*) wood and other lignified plant materials. The literature references number 79. C.

American Cotton Varieties: Selection for South Georgia Farms. *Mimeo. Paper Ga. Coastal Plain Exp. Sta.*, 1945, No. 34, p. 1 (through *Plant Breeding Abstr.*, 1945, **15**, 254). The yields of the six highest-yielding varieties in five years' tests are given. Two new varieties, Wannamaker's Stonwilt and Coker's 100 W.R. are promising wilt-resistant strains. C.

Brazilian Cotton: Breeding. *Bol. Minist. Agric. Rio de Janeiro*, 1943, **32**, No. 9, 144-145 (through *Plant Breeding Abstr.*, 1945, **15**, 254). Reference is made to the cotton breeding work carried out at Pendência in the state of Paraná. The cotton Mocó Paraíba has the best and longest lint of any yet found, many plants having fibres of over 50 mm., which are exceptionally silky and almost pure white. C.

Chinese Cottons: Breeding. C. L. Hu. *Chinese J. Sci. Agric.*, 1943, **1**, 147-158 (through *Plant Breeding Abstr.*, 1945, **15**, 252-253). A brief survey is given of researches on cotton in China during the last 25 years. The five *Gossypium* species known to be in cultivation and their geographical distribution are reviewed. The introduction of American varieties and the adaptation studies conducted are described. The improved varieties obtained by acclimatization of imported varieties, pure line selection of local varieties, and hybridization are listed. Interesting discoveries have been made in the genetic studies. Some mutants have been found and shown to be simple recessives, a new parallel series of allelomorphs has been discovered and simple Mendelian inheritance has been shown for leaf nectar-glands, corolla coloration, and corolla base coloration. Statistical studies have been made on the quantitative inheritance of the number of valves, weight of fruit, and yield. C.

Cotton: Cultivation in Barbados. *Ann. Rept. Dept. Sci. Agric., Barbados*, 1944, 14 pages. The average yield per acre for all plantings in 1944 was 251 lb. and the total crop 227,188 lb. of seed cotton. Progeny row selections are briefly reviewed. No pink boll-worm has been found in the cotton crop, but there were several heavy attacks of leaf defoliator (*Alabama argillacea*) which could not adequately be kept in check. C.

Cotton: Cultivation in Queensland. W. G. Wells. *Queensland Agric. J.*, 1944, **59**, 264-267 (through *Plant Breeding Abstr.*, 1945, **15**, 195-196). A review of the 1943-44 season. Some of the advanced strains of Triumph are superior in quality to the parent stock in fibre quality and size of boll, and are not inferior in earliness of fruiting or yielding capacity. The most advanced strains of Lone Star and of Miller produce more uniform fibre and have a slightly higher lint percentage than the commercial stock. Promising new selections have been obtained from the varieties New Mexico, Acala and Qualla. The work of developing jassid-resistant types by selection of superior plants from commercial stocks of Miller or hybridization of jassid-resistant varieties with otherwise superior Miller strains has produced promising results. C.

Cotton: Productivity on High Plains of Texas. A. C. Magee, C. A. Bonnen and Thibodeaux. *Texas Sta. Bul.*, No. 652 (1944), 81 pages (through *Exp.*

Sta. Rec., 1945, **93**, 207). This *Bulletin* provides a mass of data on the return to the farmer following a variety of agricultural practices on cotton and mixed crops in the High Plains of Texas. It is estimated that the optimum acreage for an average farm family on cotton alone would be 100, 180, 250 and 450 acres according to the farm implement available, whether 1- or 2-row horse or 2- or 4-row tractor. With a 2-row harvesting machine of the stripper type two men can harvest as much cotton as 14-16 men by hand picking. C.

Cotton: Production in Nyasaland Protectorate, 1943. *Rept. Dept. Agric. Nyasaland Protectorate*, 1943, 15 pages. The cotton crop was the poorest for some years, due to insufficient rain in the planting period, weed growth, outbreak of Red Bollworm and early Jassid. Some areas suffered decline in cotton production because of the counter-attraction of other crops. The crop of seed cotton was 2,532 tons in the Southern Province and 879 tons in the Northern Province. It was marketed in two grades only, the better one being purchased at 1⅜-1½d. per lb. C.

Cotton Buds and Capsules: Shedding; Influence of the Length of Day. V. A. Novikov. *Bull. Acad. Sci. U.R.S.S., Sér. Biol.* 1944, No. 1, 29-37 (through *Plant Breeding Abstr.*, 1945, **15**, 253-254). In order to discover the nature of the connexion between the length of day and the shedding of the buds and capsules which has been observed in cotton plants, the varieties, Pima (*Gossypium barbadense*) and No. 8517 (*G. hirsutum*) were grown under two sets of conditions, viz. when the duration of daylight was long, and when it was short (10 hours). It was observed that, during 10-hour days, shedding of the buds and capsules was more frequent than during long days, and was the result of the reduced quantity of photosynthetic products formed during the shorter periods of daylight and available to the buds and capsules. As the days grew shorter and photosynthetic activity diminished, shedding increased, especially among the buds found late in the season. C.

Cotton Plant: Manuring. R. Coleman. *J. Amer. Soc. Agron.*, 1944, **36**. 970-975 (through *Exp. Sta. Rec.*, 1945, **93**, 126). Cotton responds strongly to the application of P provided that the available N is in large supply, but not otherwise. C.

Gadag 1 (Upland) Cotton: Cultivation. V. C. Pavate. *Indian Farming*, 1945, **6**, 112-113. Gadag 1 has been evolved since 1912 from the fair-staple Dharwar-American cotton originally introduced by the East India Company in 1830. It produces large, hairy leaves, long fruiting branches, white flowers and big round bolls and is superior in ginning out-turn, resistance to disease and staple. For its cultivation the same methods are followed as for Dharwar-American cotton. The Government seed multiplication plans aim at covering about 300,000 acres with this cotton. Premiums for the improved cotton are paid to the cultivators. C.

Indian Cotton: Improvement in Bombay Presidency. B. S. Kadam. *Indian Farming*, 1945, **6**, 353-356. Genetic improvement of cotton in Bombay Presidency is briefly described, with particulars of the fibre characters, yields and spinning values of new strains. *Suyog* has been evolved in South Gujarat, two strains 1-2 and 1-6 in Middle Gujarat, *Wagotar* in North Gujarat, *Jarila* in the Deccan and *Jayawant* in Khandesh. Reference is also made to the introduction of *Gadag* 1 in the Dharwar district. All these new strains are superior to either of their parents and comparative figures are given. C.

Sea Island Cottons: History and Development. J. B. Hutchinson and H. L. Manning. *Mem. Cotton Research Station, Trinidad*, 1945, Series A, No. 25, 80-92. The history of the Sea Island cottons, which form a well-defined agricultural race of the species *Gossypium barbadense*, is outlined, and a number of distinct strains of varying agricultural value are discussed. The agricultural and technological characters of the Sea Island cotton varieties are summarized and tabulated. The uniformity of these longest and finest cottons is achieved by selection of planting seed, and an account is given of the pedigree breeding. C.

Cotton Seedling Diseases: Occurrence in South-west Anatolia. H. Bremer. *Istanbul. Schr.*, 1943, **4**, 25 pp. (through *Rev. Appl. Mycology*, 1945, **24**, 229). Experiments were carried out in order to verify the hypothesis that parasitic agents do not play a decisive part in the development of cotton seedling diseases, which are primarily due to weakness incidental to adverse environment. Bornova seeds were sown in tin flats at different dates, at mean temperatures between 16° and 32° C. Half the flats were sterilised with formalin, filled with sterilised soil, and watered with boiled water, and half the seed was dusted with ceresan. In half the containers the soil was maintained in a moderately moist condition, and in the remainder in an extremely humid state. Seed treatment with ceresan noticeably increased germination, especially in unsterilised soil. In sterilised soil the increase in germination was already apparent at 19° C., whereas in untreated soil no comparable effect was observed until a temperature of 24° C. was reached. Further support was lent to the view that the fungal infection of cotton is secondary to injury of physiological origin by the microscopic detection of a diffuse brown discoloration, extending more or less all over the underground system and obviously of external origin, since the inner layers were sound until saprophytic or facultative parasites gained ingress through the damaged tissues. Predominant among the invaders were *Rhizoctonia* sp. and bacteria. In greenhouse and field seed treatment trials the relative values of ceresan solution and dust, Gassner's copper sulphate/ammonia solution, delinting with concentrated sulphuric acid, and dusting with caustic lime were compared. Ceresan gave the best results in the field, but it failed to counteract the damage inflicted by a dry spell, and even in plots where germination was powerfully stimulated the treatment did not prove to be economically advantageous. C.

Cotton Harvesting Machines: Costs and Effects on Grade. E. H. Helliwell. *Textile World*, 1945, **95**, No. 7, 123, 125. The writer reviews modern improvements in the harvesting of cotton by machinery. Hand-picking now costs about $40 per bale, but machine picking only 5 or 6 dollars, inclusive of interest, labour, petrol, maintenance and depreciation. One comparatively unskilled labourer can do the work of 40 field workers. It is an advantage to cause the plants to shed their leaves before picking begins. This defoliation is effected by dusting the plants with a powder that kills the leaves in about six days; a tractor or aeroplane is used. Cotton machine-picked by modern methods is about 1½ grades lower in quality than hand-picked cotton, and it is characterised by a bluish-gray tint. This darkening of colour is ascribed to the fact that the cotton is left on the plants longer than usual, but the rapidity of machine picking restores the balance to some extent. A comparison of machine- and hand-picked cottons used in 20s-60s warp yarns is tabulated. Yarns from the machine-picked cotton were slightly poorer in appearance and about 0·7 per cent. weaker. Cleaning and drying at the gin would improve the grade. Of the saving to the grower, about 3 to 5 cents per lb. may be expected to be passed on to the spinner in the S.L.M. and L.M. grades and more in the poorer grades. C.

American Cotton Price Margins, 1939. L. D. Howell. *U.S. Dept. Agric. Bur. Agric. Econ., Agric. Situation*, 1945, **29**, No. 3, pp. 18-22 (through *Exp. Sta. Rec.*, 1945, **93**, 209). A brief discussion is presented of the competition of cotton with other fibres, the marketing channels, and the approximate distribution of the consumer's dollar spent on cotton apparel and household goods. C.

Californian Cotton: Production and Local Consumption. *Textile World*, 1945, **95**, No. 8, 92-93. An engineering report recommends the building of a spinning, weaving and finishing plant with 15,000 spindles and 400 looms in the San Joaquin Valley, California. It would consume about 5 per cent. (8,000 bales) of the local Acala cotton. This has a staple of about 1$\frac{3}{32}$ inch, and though it tends to be neppy it will spin useful yarns if less severe opening and beating and lower card production are practised. The market for the planned mill and its versatility are discussed, and a list of the recommended manufacturing equipment is added. C.

Cotton Crop: Effect of Sunspots and Rainfall on Price. E. G. Misner. *Cornell Univ. Dept. Agric. Econ.*, 1944, A.E. 476, pp. 27 (through *Exp. Sta. Rec.*, 1945, **93**, 251). In an examination of meteorological data, a low sunspot number indicated a dry year correctly 78 per cent. of the time. A dry year predicted a decline in the price of the New York December cotton futures during August-December correctly 64 per cent. of the time. A high sunspot number (40 and more) indicated a wet year correctly 56 per cent. of the time, but a wet year predicted a rise in the price of the New York December cotton futures during August-December correctly 81 per cent. of the time. An appendix (in the original paper) tabulates the rainfall over periods of years for the corn belts of the United States and Argentina, respectively. C.

Cotton Crop: Estimation. H. M. Leake. *Fibres,* 1945, **6**, 95-97. The author discusses the possibility of making a first approximation to the yield of cotton in a new season (a "skirmish test") from correlation coefficients linking various influences. For the United Provinces, India, he provides the following coefficients:—

Area under irrigation and spring cotton/wheat price ratio	$r = +0{\cdot}53$
Area not under irrigation and spring cotton/wheat price ratio	$r = -0{\cdot}06$
Area not under irrigation and total rainfall to July 7th	$r = +0{\cdot}47$
Area not under irrigation and effective rainfall to July 7th	$r = +0{\cdot}77$

From a study of American data for the period 1900-1930 he deduces the following correlations:—

Cotton area and previous year's price	$r = +0{\cdot}61$
Cotton area and previous season's yield	$r = -0{\cdot}59$
Cotton area and cotton/corn price ratio	$r = +0{\cdot}34$
Cotton price and season's yield	$r = -0{\cdot}66$
Cotton price and cotton/corn price ratio	$r = +0{\cdot}78$
Season's yield and cotton/corn price ratio	$r = -0{\cdot}65$

The significance of these correlations is discussed. No such correlations are attempted for Egypt, the Sudan and Uganda, but some of the controlling influences are stated. Thus, in Uganda there is some evidence of the effect of competition from tobacco as an alternative crop. C.

Cuban Bast Fibre Plants: Identification. J. C. Crane and J. B. Acuña. *Bot. Gaz.,* 1945, **106**, 349-355 (through *Exp. Sta. Rec.,* 1945, **93**, 279). The species of *Hibiscus* being grown in Cuba for soft fibre has been correctly identified as kenaf (*H. cannabinus*) instead of roselle (*H. sabdariffa*). Differences in seed characters and colour of withered petals, as well as unlikeness in various floral parts and in appearance of stems, are suggested means of distinguishing these closely allied species. The botanical descriptions presented show that the two varieties of kenaf—*viridis* and *vulgaris*—identified as comprising the material grown in Cuba, are morphologically alike except for their leaves. Differences in plant behaviour within a particular variety suggest that these two are made up of several strains; this might offer a means of improving the plant for fibre purposes through selection of one or two of the most desirable characters. It is suggested that the differences in leaf shape are perhaps due to some ecological adaptation made during the evolution of the plant. C.

Fique Fibre: Production in Colombia. *Fibres,* 1945, **6**, 98. It is reported that the Colombian Government proposes to foster the production of fique fibre, the potential yield of which is about 40,000 tons per annum. The fibre resembles sisal to some extent and a probable outlet is the manufacture of bags for the adjacent coffee plantations. The plant is *Furcraea macrophylla,* Baker, order *Amaryllidaceae.* (N.B.—*F. gigantea* provides Mauritius hemp). C.

Malvaceous Bast Fibres: New Sources. D. R. Ergle, B. B. Robinson and J. M. Dempsey. *J. Amer. Soc. Agron.,* 1945, **37**, 113-126 (through *Exp. Sta. Rec.,* 1945, **93**, 278). *Hibiscus cannabinus, H. sabdariffa,* var. *altissima,* and *Urena lobata* grown experimentally in 1943 near Atmore, Alabama, were studied for possible use as emergency sources of bast fibre. Environmental factors seemed adequate for growth, but were not suitable for maturation of seed. Flowering occurred late or not at all, confirming results of others on the influence of photoperiodism. The yields per acre are deemed good, compared with yields reported in countries where these plants are grown commercially. A chemical method of fibre extraction, developed and used to follow changes in purified fibre content of plants throughout their growth cycle, gave lower but consistent and reproducible value as compared with results obtained by biological retting and subsequent mechanical extraction. Study of progress of fibre formation during growth and development of the plants showed somewhat similar increases in fibre content during early growth, and decrease in extractable fibre content near maturity. Fibres from water-retted plants were superior in strength and quality to fibres prepared by dew retting. Under the conditions of the experiment the fibres of *Hibiscus* var. *altissima* and *U. lobata* were stronger than that of *H. cannabinus*. The results on growth, fibre yields, mechanical processing, and fibre quality are held to justify consideration of these species as a domestic source of jute-like fibre if needed. C.

Ceresan Dust : Application in Cotton Seed Sterilisation. S. G. Lehman. *Res. & Farming* iii, *Progress Rept.*, 1945, 3, p. 5 (through *Rev. Appl. Mycol.*, 1945, **24**, 369). Germination and disease tests on several lots of cotton seed in N. Carolina, 1944, showed half or more to be infested with anthracnose spores (*Glomerella gossypii*). Dusting with improved Ceresan (a mercurial dust) in a barrel or drum, at the rate of 1-1½ oz. per bushel, costing 5-8 cents per bushel, was so effective that maximum yields were secured with five treated seeds per hill per ft. (2½ pecks per acre) instead of 10-12 seeds as commonly practised. C.

Cotton Linters: Application for Fine Paper Production. W. H. Jones. *Paper Trade J.*, 1945, **121**, *TAPPI*, 131-132. First-cut linters are a satisfactory raw material for " ray content " papers. The uniformity of linters saves sorting, and cooking time for linters has been considerably reduced. A wet lap pulp has been developed that can be added to the beaters without prior processing; its characteristics are given in brief. C.

American Cotton Prices, July, 1945. *Textile Weekly*, 1945, **36**, 596. A table of new American cotton parity equivalents in cents per lb., is given for (1) white and extra white, (2) spotted, (3) tinged, (4) stained and (5) grey cottons in the recognised grades and staple lengths rising by thirty-seconds from $\frac{13}{16}$ to 1¼ inch. C.

(D)—ARTIFICIAL

Keratin Protein Regenerated Fibres: Production. *Textile World*, 1945, **95**, No. 8, 99, 180-2. Experimental work at the U.S. Western Regional Research Laboratory on the production of regenerated fibres from keratin proteins derived from feathers, horns, hoofs, etc., is reviewed. The properties of fibres regenerated from fibrous proteins are superior to those obtained from globular proteins. Fibres from globular proteins converted by treatment to fibrous form are also considered. The tensile strength, dry, of these fibres is greater than that of wool and approaches that of silk. The tensile strength when wet, however, is not great. C.

PATENTS

Viscose Mixer. British Cellophane Ltd. B.P.571,502 of 28/8/1945 (Conv. 30/9/1942). More rapid dissolution of sodium cellulose xanthate in dilute caustic soda, with a minimum of trouble from air bubbles in the viscose, is claimed by compressing the xanthate and feeding it into the alkali in the form of shavings less than 0·02 in. thick or extruded rod or sheet about $\frac{1}{64}$ in. thick. The apparatus provides for continuous feeding of the xanthate and alkali and withdrawal of the viscose. It is said that xanthate rod of the above thickness absorbs on its surface sufficient alkali to be dissolved thereby. C.

Casein Solution: Spinning; Prevention of Putrefaction. Rudolf Signer. B.P.571,518 of 28/8/1945 (Conv. 12/4/1943). The dry spinning of highly concentrated alkaline solutions of casein is a slow process during which the viscosity may become too low and the solution and filaments may develop a disagreeable odour and minute gas bubbles that weaken the filaments. This is traced to putrefaction and the claim is for means to prevent it by the admixture of an antiseptic dye of the acridinium series including 2-ethoxy-6:9-diaminoacridinium lactate (e.g. 0·01 per cent. in an alkaline solution at *p*H 9·2 containing 24·5 per cent. of casein), or the 10-methyl-3-amino-9-(*p*-aminophenyl)-, 10-methyl-3:6-diamino-, or 2:8-diaminoacridinium hydrochlorides. C.

Twistless Multi-filament Nylon Yarns: Spinning. British Nylon Spinners Ltd., G. Loasby and L. Pownall. B.P.571,566 of 14/10/1943:30/8/1945. A process of making twistless yarns of nylon, suitable for the covering of wires and cables, comprises twisting together a number of nylon filaments in the usual melt-spinning operation, cold-drawing the twisted yarn, and then winding it on to a spindle or bobbin that rotates in the reverse sense so that when the yarn is subsequently wound off it will be free from twist. C.

Rayon Spinning Machine Filament Feeding Device. American Viscose Corporation (Assignees of Alex. Bruenner). B.P.571,578 of 30/5/1945 (Conv.

18/3/1943). An apparatus for feeding an aggregate of continuous filaments from a supply to a treatment device comprises a pair of godets arranged to cause lateral displacement of successive wraps of filaments and suction and scraper means between the godets for removing the leading portion of the filaments as they are discharged from the wrappings about the godets. This prevents the accumulation of excess lengths of individual filaments. C.

Viscose Spinning Machine Filament Moistening Device. Kirklees Ltd. and L. Helmsley. B.P.571,631 of 20/11/1943:3/9/1945. To prevent the formation of crystals of sodium sulphate on viscose filaments and the spinning equipment as the thread emerges from the spinning bath it is proposed to provide devices at the front of the spinning machine to maintain sprays of atomised water. C.

Alginate Filaments: Rapid, Continuous Spinning. Courtaulds Ltd. and H. J. Hegan. B.P.571,657 of 1/9/1942:4/9/1945. A solution of alkali alginate is spun into a bath of a metal salt that gives an insoluble alginate (e.g. acidified calcium chloride), the partially formed filaments are advanced over a godet where they encounter a more dilute, neutral solution of a salt of the same metal, the practically completely converted filaments are then advanced over other thread-advancing devices where they are washed and dried, and finally wound into packages. One example gives details of concentrations, speeds, etc., in the spinning of 100-den. Ca alginate filaments. C.

Mercapto-polyamides: Production. E. I. Du Pont de Nemours and Co. B.P.571,708 of 5/9/1945 (Conv. 17/9/1942). To obtain polyamides of the nylon type with reactive substituents it is proposed to heat together (at 150-225° C.) a diamine and a dicarboxylic acid having a mercapto group spaced by at least 3 C atoms from the amide-forming group. The examples mention hexamethylenediamine and the lactone of γ-mercaptopimelic acid (which is obtained by heating γ-ketopimelic acid with sulphur in the presence of cobalt polysulphide and hydrogen under 1,000-2,000 lb. per sq. in. pressure. The products include some that can be extruded at 230-235° C. into filaments. C.

Cross-linked Hydroxylated Vinyl Interpolymer Filaments: Production. E. I. Du Pont de Nemours & Co. B.P.571,826 of 11/9/1945 (Conv. 22/7/1942). Filaments spun from hydrolysed interpolymers of vinyl esters and ethylene are strong, but not of general utility since they become sticky at too low a temperature and dissolve in water. These drawbacks are overcome by treatment with cross-linking compounds, such as methylol or alkoxymethylol derivatives of ureas, melamine and diamides, polybasic organic acids and their halides, or compounds having several $-N:C:O$ (or S) groups. The preferred interpolymers are those in which the ratio of ethylene to vinyl alcohol is between 3:1 and 1:3. Ten examples of the treatment are provided; the details given include the properties of the filaments obtained. The filaments are useful for hosiery or weaving yarns, felts, pile fabrics, sewing thread, cordage, nets, screens, fish-lines, electrical insulation. Monofils are also claimed, for use as racket and bow strings, bristles, etc. C.

Fractionated High-viscosity Cellulose Esters: Application for High-tenacity Filaments. H. Dreyfus. B.P.571,954 of 23/11/1943:17/9/1945. Filaments and foils characterised by high tenacity, dry or wet, especially after saponification to regenerated cellulose, are obtained by starting with a "high-viscosity" cellulose ester (e.g. cellulose acetate that in 6 per solution in acetone has a flow time at least 40 per cent. of that of glycerol under the same conditions), removing the more hydrophile portion by fractional dissolution (e.g. by a 55/45 acetone/water mixture), dry spinning the less soluble fraction (e.g. from a 20 per cent. solution in 95/5 acetone/water), softening the filaments in superheated wet steam, and stretching the softened material to 10-20 times their length. C.

Hair: Reclaiming from Hides. V. Conquest and H. L. Keil (to Armour & Co.). U.S.P.2,362,540 of 13/11/1944 (through *Chem. Abs.*, 1945, **39**, 2,900). Hides are subjected to the action of peptic enzymes (from the lining of animal stomach) in water at *p*H 1·0-2·5. This treatment continues until at least part of the hide dissolves. The mixture is neutralised and then heated to dissolve any undissolved hide. Finally the hair is filtered off. W.

Hair : Reclaiming from Hides. V. Conquest and H. L. Keil (Armour & Co.). U.S.P.2,363,646 of 28/11/1944 (through *Chem. Abs.*, 1945, **39**, 3,174).

Hide is treated with papain in water at a temp. at which the enzyme is active. When the enzymolysis has progressed far enough, the hide is steam-treated under 5-20 lb. per sq. in. pressure. This dissolves the hide, and the hair is recovered from the solution. W.

2—CONVERSION OF FIBRES INTO FINISHED YARNS

(A)—PREPARATORY PROCESSES

American Opening and Carding Departments: Organisation. Textile Operating Executives of Georgia. *Textile World,* 1945, **95**, No. 8, 109-113. A summary is given of replies from 26 mills in Georgia to a questionnaire on the following subjects. (1) The types of opening and cleaning machines used, with notes on the "curling" of the cotton by some of them and on changes the mills would make if possible. (2) The types of scutcher beaters used and their speeds. (3) Practices followed in stripping and grinding the cards; the answers reveal a wide diversity of opinions, with a trend towards continuous stripping. (4) The effects of card output on yarn strength; most replies indicate an improvement in yarn appearance, but not in strength, as the result of reducing the rate of production. (5) The effect of card draft; some mills advocate increasing the draft; one mill gives a comparison of the variability in card sliver, draw-frame sliver, roving, yarn count and cloth strength as between a draft of 110 and one of 220 on a double lap. (6) The use of ball bearings on lickers-in and comb boxes and of bottle oilers on cylinder, doffer and licker-in shafts; most replies do not favour these practices. (7) The use of endless composition belts for driving the licker-in and comb box. (8) Single or double drawing and roving processes; a diversity of opinions is revealed. (9) The use of revolving top roller clearers on drawing and fly frames; most replies recommend them. (10) Creeling a high-draft speed frame and using the odd lengths of draw-frame sliver. (11) The use of compression rollers for increasing the amount of card or draw-frame sliver per can; most replies are favourable. C.

Combing: Advantages. E. H. Helliwell and H. J. Ball. *Textile World,* 1945, **95**, No. 5, 112-113, 202-204. The authors summarise the advantages of combing for improving the strength and appearance of cotton yarns, and give typical comparisons of carded and combed yarns. A method is described for counting neps and specks in laps, slivers and rovings, the main apparatus being glass plates ruled in half-inch squares. C.

Cotton Comber Laps: Preparation and Combing; Efficiency and Costs. E. H. Helliwell and H. J. Ball. *Textile World,* 1945, **95**, No. 6, 129-131, 204-208. Brief reference is made to American-built combers of the short-piecing (Heilmann), and long-piecing (Nasmith) types and to the utility of sorter diagrams for assessing the efficiency of a combing operation. Particulars of the methods used in eight American mills for the preparation of the comber laps and details of the combing process itself are tabulated with special reference to the labour costs. The wide diversity of practices is held to testify to the elasticity of the combing process but the wide range of costs suggests that the choice of the lap preparation is as important as the choice of the comber. The significant details are:—

Mill ...	1	2	3	4	5	6	7	8
Ccunt spun ...	12	20	30	40	40	60	80	117
Comber waste, per cent...	16	15	20	20	16	22	27	26
Lb. per machine, per honr ...	12·2	23	12·2	12·2	46·5	8	8	8
Cost of labour for lap preparation, cent. per lb. ...	·096	·167	·198	·096	·231	·221	·244	·244
Cost of labour for combing, cent. per lb. ...	·640	.326	·640	·640	·246	·977	·977	·977

C.

Cramerton Mills Combing Machine. C. M. Bowden. *Textile World,* 1945, **95**, No. 7, 96, 186-188. Illustrations are given of a new comber developed as part of the research programme of Crammerton Mills, N. Carolina. The special features are: (1) rate of production 36-40 lb. per hour as against 13-19 lb. for other combers on the same weights of sliver; (2) an automatic device for creeling the laps; (3) an electrically-controlled automatic device for doffing the cans at a pre-determined length of combed sliver. C.

Revolving Clearer for Drafting Rollers. C. M. Bowden. *Textile World*, 1945, **95**, No. 6, 147. An illustration is given of an effective roller clearer which is claimed to have reduced the cleaning time on draw frames by half and on slubbing frames by 85 per cent., and to have minimised the " eyebrowing " trouble. It has been fitted to 1,500 deliveries of draw frames and 20,000 roving spindles in the Riverside and Dan River Cotton Mills, Virginia, and is being tried also on spinning frames. It consists of a steel roller at the back and two wooden rollers, one over the front intermediate position. The clearer apron is driven by the steel roller at a somewhat lower surface speed than that of the back roller and thoroughly " scours " the faster middle and front top rollers. The short fibre and dust are formed into a tight felted mass which is allowed to accumulate for many hours before being pulled off by hand. C.

Roving Bobbin Stripping Apparatus. *Textile World*, 1945, **95**, No. 7, 142. An illustration is given of a simple device for stripping faulty roving bobbins by means of compressed air. The bobbins are mounted in a frame, provided with the usual creel eyelets, on the wooden lid of a container, in the wall of which are screened holes for the exit of air. A central hole is cut in the lid and just above it is fixed the end of a pipe connected to the compressed air line. The ends of roving are poked into the hole and the air stream proceeds to unwind the bobbins and deposit the material in the container. C.

Carding Engine Taker-in Control Member. *Textile Weekly*, 1945, **36**, 590-594. The special features of the B.C.I.R.A. modification to the taker-in region are brought out in a summary of the patent specification C.

Rayon Staple Fibre: Carding. B. McComb. *Rayon Textile Monthly*, 1945, **26**, 451. The fineness of the card wire is important for the carding of rayon staple fibre. As a general rule the finer the denier the finer should be the clothing and vice-versa. The writer recommends a No. 90 wire for 3-den. fibre and No. 80 or No. 70 for carding blends with wool. C.

Woollen Carding Engine Mechanism: Collecting Power. J. G. Martindale. *J. Textile Inst.*, 1945, **36**, T213-T228, P143-148. C.

Cotton Slivers and Rovings: " Drafting Wave " Periodicities. G. A. R. Foster. *J. Textile Inst.*, 1945, **36**, T229-T242. C.

Tape Condenser Surface Winding Drum: Mounting, Traversing and Driving. *Textile Weekly*, 1945, **36**, 648-650. The special features of Platt's improvements in the means for mounting, traversing and winding the surface winding drums and their bobbins, of leather tape condensers, are brought out in a summary of the patent specification. C.

Noble Combing: Drawing-off. " H.D." *Text. Rec.*, 1945, No. 748, 41-42, 45. The life of a leather can be lengthened (*a*) by using a modified type of drawing-off roller stand (the PSB), in which cams move simultaneously with the rotation of the handwheel, thus applying pressure equally on both sides of the leather, and (*b*) by traversing the leathers up and down the roller faces; traverse limits cannot be stated precisely. A damaged leather must be replaced. The problem of drawing-off roller speed is discussed, calculations being given to suit varying conditions. W.

Guard for Rag-grinding Machines. Wilson, Knowles & Sons. *Text. Mfr.*, 1945, **71**, 287. The guard may be used on rag or flock machines fitted with the ordinary feed-roller drive, or with the new patented drives in which the feed rollers can be reversed instantaneously. It consists of stout woven wire extending over the full width of the feed sheet; the wire is attached to 2 horizontal malleable iron bars which are riveted to 2 similar vertical bars suspended from the top of the cover of the ' bitter ' roller. An adjustable tin roller, loosely-fitted directly under the guard, revolves on contact with the rags, tending to prevent too thick a pile going forward; it ceases to revolve on contact with any large obstacle. The open wirework of the guard permits the operative to see what is happening at the feed rollers, yet feed rollers and swift are fully guarded. W.

Automatic Grinder for Rag Swifts. Dronsfield Bros. Ltd. *Text. Rec.*, 1945, No. 750, 41; *Text. Merc.*, 1945, **113**, 185. A grinder tube carrying a boss fitted with a solid emery wheel and traversing screw is mounted on a strong bed. The shafts of the grinder revolve in bearings which swivel with the adjustment of individual setting wheels, thus preventing locking or binding of the shafts, and facilitating the setting of the grinder. The grinder bed is bolted on the frame sides of the rag machine, and the grinding wheel is set in contact with the swift by means of the two setting wheels. W.

(B)—Spinning and Doubling

Duck Yarn Twisting Frames: Adjustment for Large-package Winding. H. L. Pratt. *Textile World*, 1945, **95**, No. 6, 106-107. An illustrated account is given of simple adjustments by means of which American mills have adapted their twisters for high-speed twisting and winding of yarn for duck in large packages. The changes include (1) lengthening alternate spindles on the creel to accommodate larger packages and (2) the use of separators so as to twist with lighter travellers and at higher speeds. C.

Ring Twisting Frames: Control of Operation. H. L. Pratt. *Textile World*, **95**, No. 7, 113-115. Practical hints are given on securing correct lengths in the twisting operation and an automatic counter is recommended that stops the ring frame when the pre-determined length of yarn has been twisted. Variations in spindle speed and consequently in yarn twists are held to be partly responsible; in a test on a tape-driven twister producing 7s/4 warp on 5½-inch rings, twenty spindle speeds ranged from 2720 to 2820 and the resultant twists from 3·70 to 4·30 t.p.i. The assignment of jobs in the twister room is also discussed. C.

Twisting and Doubling Frame. Atwood Division, Farrel-Birmingham Co. Inc. *Textile World*, 1945, **95**, No. 8, 135. Illustrations and brief particulars are given of two new models of a doubler-twister capable of covering the range of twists ½ to 70 t.p.i. One model makes packages up to 1½ lb. weight and the other up to 3 lb. An outstanding feature is a stop-motion that forms an integral part of the feed roll. All parts that might cause injury or collect waste, lint, etc. are enclosed, and most of the points that need lubrication are also protected so that not many of them require oiling more than a few times a year. C.

Spinning Room Cleaners and Oilers: Work Assignment. F. H. Gunther and M. Gross. *Textile World*, 1945, **95**, No. 6, 135-137. The writers briefly review the work of cleaners and oilers in the spinning room and discuss the problem of drawing up a detailed schedule of work for them. A typical schedule is reproduced. The various tasks are entered in the first column and the unit times allowed per frame in the next column, e.g. 10 mins. for oiling top rollers, 12 mins. for oiling spindles, 1½ minutes for sweeping down the sides, and 6 mins. for blowing down the frame. Then follow the day-by-day tasks with the number of frames to be tended and the total times allowed for the various tasks. The operative is allowed 10 per cent. of the time at work for rest and is expected to reach 90 per cent. efficiency, that is, to put in 2,105 minutes in a 40-hour week. C.

Casablancas High-draft Systems: Advantages. R. Howard. *Textile Weekly*, 1945, **36**, 834-838. A report of a lecture on the advantages of the Casablancas systems for mules, ring frames and speed frames, with particular reference to production costs. Figures are given for possible savings in cardroom wages. C.

" No-oilspray " Anti-splash Device for Mule Spindles. Farnworth Engineering Co. Ltd. *Textile Weekly*, 1945, **36**, 782-5, 788. Illustrations are given of a device for preventing the splashing of oil from mule spindles, for which Messrs. N. Miller, R. Fairclough and W. M. Balshaw have applied for a patent (Application No. 7,356 of 1945). A brass strip, bored with holes, is dropped over the spindles and rests on the top bolster bearing. Underneath it is firmly fixed a strip of oil-retaining felt, and an oil thrower ring is fitted to the spindle between the brass strip and the spindle bearing. Oil is applied at the usual groove and finds its way to the spindle through half-moon slots in the brass strip. Excess oil is thrown off by the ring and retained by the felt pad. An illustration is given of a sheet of tissue paper held before ordinary spindles for ten draws, showing an excessive number of oil splashes. A similar sheet held in front of spindles fitted with the above device shows no spots. C.

Travelling Spindle Spinning, Twisting and Winding Machines: Development. E. J. Abbot. *Rayon Textile Monthly*, 1945, **26**, 452. The writer discusses the possibilities of the application of the moving conveyor system to "bring the work to the operative" in the textile industry. The travelling spindle automatic weft bobbin or pirn winder, developed by the Abbot Machine Co. is described as a concrete example, and it is reported that the firm is experimenting also with travelling spindle spinning and twisting frames. C.

High Drafts in Worsted Spinning. L. Goodman. *Text. Mfr.*, 1945, **71**, 369-370. High drafts increase production and may reduce the number of drawing operations necessary. Investigations were therefore made on the possibilities of high drafting in the spinning operation as a commercial proposition. A batch of 64s Australian tops was French drawn in a dry state and allowed to condition in a normal atmosphere, after which the roving was spun (*a*) on an English type cap spinning frame (6,200 r.p.m.), and (*b*) on a Continental type ring spinning frame (4,250) r.p.m.), normal settings being used in each case, with drafts of 8, 16, 24, 32 and 40. In this way the relative merits of English and Continental drafting on the spinning frame were also compared. Fewer ends broke when spinning the thicker counts, even with high drafts. On the Continental system the spinning efficiency was slightly higher, and spinning was possible with drafts of 24 and 32. It is commercially possible to use drafts higher than those normally used. In both systems, high drafts increase waste. Yarns spun at the lower drafts were the most uniform, irregularity, possibly due to some increase of static electricity, increasing with increase of draft. Tested on a Goodbrand's machine, yarn strength and elongation fell regularly with increasing draft till a sudden drop occurred, indicating that judicious limits of high draft must be chosen for each count. Post-war high draft spinning machinery will probably be based on the Continental frame with modifications giving the increased fibre control necessary for the successful application of high drafts. W.

(C)—Subsequent Processes

Yarn Conditioning Machines. H. Cheetham & Co. Ltd. *Textile Recorder*, 1945, **63**, September, 39-41. Illustrations are given of (1) a German conditioning machine with travelling lattice for mule cops and ring bobbins, (2) a unit system for conditioning cops layer by layer as they are packed in cases, and (3) and (4) portable machines for cones and cheeses. C.

(D)—Yarns and Cords

Cotton Yarn Defects: Causes. *Textile Mercury & Argus*, 1945, **113**, 326-329. A broad review is given of defects in cotton yarns—weak places, snarls, "burring," dirty marks, badly built cops, periodicities in mule yarn that lead to "steepling" in cloth—and practical hints are given on their avoidance. C.

Nylon Yarn: Use in Tyre Cords. J. Loasby. *Trans. Inst. Rubber Industry*, 1945, **20**, 140-154. The different characteristics of a number of nylon yarns of the tyre cord type are described and discussed. Nylon is capable of being spun into yarns of low "growth factor," moderate inflation growth, and with high moduli of elasticity. Figures are given for nylon weaving and tyre cord yarns, at various temperatures, for the orientation factor and total moduli of elasticity calculated by a formula derived in this work, which takes into consideration delayed elasticity, orientation factor and viscosity effects. C.

Rayon Tyre Cord: Developments in the United States. (1) J. A. Van Laer. (2) F. R. Brown. (3) H. B. Kline. (4) W. C. Appleton. (5) United States Rubber Co. (6) E. T. Lessig. (7) Gates Rubber Co. (8) Buckeye Cotton Oil Co. (9) Southern Chemical Cotton Co. (10) Deering Milliken & Co. Inc. (11) H. and B. American Machine Co. (12) Draper Corporation. (13) Whitin Machine Co. (14) Zenith Products Corporation. (15) H. W. Butterworth & Sons Co. *Rayon Textile Monthly*, 1945, **26**, 329. A series of short illustrated articles on wartime developments of rayon tyre cord, as follows: (1) the "Tempra" high-tenacity yarns of the American Enka Corporation; (2) the "Cordura" high-tenacity yarns of the E. I. Du Pont de Nemours Co.; (3) the "Lektroset" electronic twist-setting process (high-frequency heating) and other features of the Industrial Rayon Corporation's scheme of yarn, cord and fabric production; (4) the programme of the American Viscose Corporation; (5) the place of synthetic rubber in the American programme; (6) rubberising sheets of tyre cord without inserting weft, by the B. F. Goodrich Co.; (7) treatment of tyre cord with G.R.S. (artificial) latex; (8) and (9) the use of linters and hull fibre for rayon: (10) a description of the Excelsior Mills, Clemson, S. Carolina; (11) a note on a new twister for rayon cord; (12) the Draper XD high-speed tyre cord loom; (13) special down-stroke and up-stroke twisters; (14) a spinning pump for the 1150-den. rayon, about three times as large as usual pumps; (15) a continuous-process range for impregnating rayon tyre cord. C.

PATENTS

Roller and Clearer Card Worker Roller Drive. Platt Bros. and Co. Ltd. and I. Marsden. B.P.571,550 of 12/4/1944: 29/8/1945. The claim is for variable speed gearing for driving the worker rollers and reversing their direction, without altering the relative speeds of the other rotating parts of a roller-and-clearer card. C.

Combing Machine Detaching Roller Drive. J. W. Nasmith. B.P.571,733 of 28/6/1943: 6/9/1945. The pivot of the toothed sector that imparts reciprocating rotary motion to the detaching roller of a combing machine through a toothed pinion is made movable so as to effect periodic engagement and disengagement of the sector and pinion. The degree of rotation of the roller, and therefore the length of fleece deliverd backwardly at each stroke for piecing up with the newly combed tuft, with proportionate variation in the forward direction, may be altered to suit the class of fibre being combed. C.

3—CONVERSION OF YARNS INTO FABRICS

(A)—PREPARATORY PROCESSES

"Universal" No. 90 Weft Winding Machine: Adjustment. Alfred King. *Textile World,* 1945, **95**, No. 6, 113. Illustrations are given of four common troubles encountered by those who have to adjust the No. 90 weft winder, and directions are given for correcting the defects. C.

Yarn Packages: Precision Winding. R. C. Pillsbury. *Textile World,* 1945, **95**, No. 5, 137, 186, 188. The writer explains the meaning of *wind* (the number of complete coils formed by the yarn as it is being wound from one end of the traverse to the other), *lay* (the spacing between adjacent coils), and *gain* [the adjustment of the winding mechanism which secures that the later coils are not laid exactly on top of their lower ones but either ahead ("head wind") or behind them ("after wind")]. Gain is secured either by adjusting the gear train, in which case it is a fixed quantity, or by varying the lay by expanding or contracting the driving belt pulley. Gear gain is commonly used for fine rayon yarns but belt gain is used when the package must be very compactly wound. A head wound package shows the V of the top layers of yarn pointing down to the traverse guide; after wind shows the Λ pointing away from the guide. Opinions in favour of either head or after wind are mentioned but no conclusive evidence appears to have been obtained. Most mills favour head wind. C.

(B)—SIZING

Compressed-air Oil Emulsifying Plant. Lucien Brunette. *Textile World,* 1945, **95**, No. 5, 150. A sketch is given of a simple tank for preparing an oil emulsion (as used in spinning wool), which is provided with (1) a perforated pipe at the bottom, connected to a compressed-air line (at about 90 lb. per sq in.), (2) a pipe connected to the hot water line, (3) a funnel inlet for oil, and (4) a run-off pipe (leading to the emulsion tanks on the spinning frames). C.

Spun Rayon Warps: Sizing on Silk System. Raymond Dodson. *Textile World,* 1945, **95**, No. 8, 129, 174, 176. Hints are given on the sizing of spun rayon and mixture warps on the silk system. The following sizes are recommended:—All rayon, spun on cotton system; adhesive (gum, converted or roasted starch) 8 oz., plasticizer 0·8 oz. and softener 0·4 oz. per gallon. All-rayon, spun on worsted systems and Rayon/wool blend (50/50); adhesive 0·8-lb. per gallon. All-acetate rayon; adhesive 12 oz., plasticizer 2.4 oz. and softener 0·6 oz. per gallon. The warps should not be allowed to stretch by more than 0·5 per cent. C.

Tape Frame Electrical Tension Control. R. B. Moore. *Textile World,* 1945, **95**, No. 8, 115-117, 186-188. An electric motor winder drive, of the centre-wind type, is described for continuous regulation and indication of tensions in winding and beaming operations at the tape frame. Tension control and speed control are independent functions, permitting ready change of one without affecting the other. An ammeter measuring the motor current gives a direct, reliable indication of tension, and values of tension can be accurately duplicated. Constant-tension winding is discussed and major requirements and limitations for a successful application of the constant-current type of winder drive are reviewed. C.

(C)—Weaving

Heald Sets: Economy. H. E. Wenrich. *Textile World,* 1945, **95**, No. 6, 141, 208-214. Practical hints are given on the use of old heald sets to save "drawing in" for new fancy weaves that have become fairly standard, e.g. sand crêpes. It is recommended, for example, to leave a half-yard heading attached to the heald set before removing it from the loom so that the designer can determine whether the same set can be used again without much modification. Examples are given. C.

Heavy-fabric Looms: Driving with Multiple V-belts. W. L. Fluke. *Textile World,* 1945, **95**, No. 5, 148. Particulars are given of the successful change of some Draper tyre cord looms and Crompton and Knowles heavy duck looms from gear drives to multiple V-belt drives. The chief advantage lies in the shock-absorption possible with resilient belts. C.

Loom Harness Motion. A. J. Bartson Inc. (Charlotte, N. Carolina). *Textile World,* 1945, **95**, No. 7, 133-134. An illustrated description is given of a patented harness motion that is driven from the side of the loom by an extension of the cam-shaft which carries a crank and planetary gear, in mesh with a large gear that is bolted to the loom frame and encircles the cam-shaft without being affected by it. The crank, guided by the small planet gear, actuates an eccentric shaft that carries the harness lifting rod. The harness "dwell" can be adjusted to various widths of shed by a simple movement of one bolt in the lever and shaft arrangement at the top of the loom, so that the loom can be changed speedily from one type of fine weave to another. On dobby looms the eccentric shaft is made to "dwell" at the top and bottom of its stroke. C.

Loom Reeds: Maintenance. H. Mochrie. *Textile World,* 1945, **95**, No. 7, 127-129. A practical article on the repair and maintenance of reeds and their proper mounting in the loom. C.

Loom Whip-roll Setting Gauge. H. H. Wenrich. *Textile World,* 1945, **95**, No. 7, 140. An illustration is given of a simple gauge for adjusting the height of the whip-roll. It consists of a length of pipe fitted with a foot and carrying an ˥-shaped piece in its open end, at a height that can be set as desired. C.

Saurer 60-B High-speed Single-shuttle Ribbon Loom. Crowther Ltd. *Textile Recorder,* 1945, **63**, September, 47-48; *Silk J. Rayon World,* 1945, **21**, September, 32-33. An illustrated description is given of a new compact ribbon loom which can be mounted in groups of 3, 6, 9 or 12 units and is fitted with warp and weft stop motions and a simple regulator for changing the number of picks per inch without changing gear wheels. It is claimed that one girl can operate 9-24 looms running at speeds up to 300 picks per minute. C.

Shuttle Box Motions: History. C. W. Bendigo. *Textile World,* 1945, **95**, No. 8, 87-91. A review is given of the development of loom box motions with chain control from Squire Diggle's first invention, B.P. No. 10,465 of 1845, and several of the types are illustrated. C.

Warp Stop Motions: Application in Rayon Weaving. J. H. Strong. *Textile Mercury & Argus,* 1945, **113**, 322-324. A brief review is given of mechanical and electrical warp-stop motions that are suitable in weaving rayon on Lancashire looms. C.

Rayon Fabrics: Weaving. H. E. Wenrich. *Rayon Textile Monthly,* 1945, **26**, 395-396. Practical hints are given for rayon weavers on loom adjustments, pick finding, shuttle tensions, and removing broken picks. C.

Laminated Plastic Picker Stick: Application. E. H. Jacobs Manufacturing Corp., Charlotte, N.C. *Rayon Textile Monthly,* 1945, **26**, 487. Picker sticks made from "Pregwood" laminated plastic are reported to have been tested by several mills and found to outwear hickory sticks by 12 to 16 times. For example, on a 54-inch Crompton and Knowles loom, one stick lasted for 16 months at 152 p.p.m., three shifts a day. C.

Multiple-fabric Heavy Dobby Loom. Wilson and Longbottom Ltd. *Textile Weekly*, 1945, **36**, 656-662, 704-708. A detailed description is given of a heavy dobby loom with metallic shuttles, capable of weaving four heavy webbings at the same time. The intricate design for weaving pouched webbing is also explained. The loom runs at 194 picks per minute and one weaver can tend 2-4 looms according to the quality of the work and the length of yarn on the weft bobbins. C.

New Shuttles: Utilisation. H. E. Wenrich. *Rayon Textile Monthly*, 1945, **26**, 453-454. The three principal methods of placing bobbins in shuttles are discussed. Attention is drawn to the importance of selecting the most suitable shuttles for a particular loom, and hints are given on the proper handling of new shuttles. C.

(D)—Knitting.

High-speed Tricot Machine. Robert Reiner Inc. *Textile World*, 1945, **95**, No. 6, 151. An illustration is given of a new two-bar 28-guage tricot warp-knitting machine designed for high speed working. The beam tube is 4½ ins. diam. and takes a section beam 21 ins. diameter. C.

Hosiery Mill: Management Problems. E. Mauldin. *Textile World*, 1945, **95**, No. 8, 106-107. A description is given of the steps taken by the management of a Southern knitting mill in an effort to maintain better relations with employees and to ensure satisfactory working conditions. By analysing the answers to a questionnaire a picture of the worker's attitude toward fellow-workers, management, and his job was obtained and remedies were found for the complaints. The questionnaire is reproduced. C.

(E)—Braiding, Lacemaking and Embroidering

Lace Hosiery: Production. I. G. Sanford. *Textile World*, 1945, **95**, No. 6, 133. It is reported that some American makers of fully-fashioned hosiery have effected economies in the use of rayon by cutting out leg portions from cotton lace fabric and using sewing machines to join the parts. Welts are knitted on full-fashioned machines from 100/40 viscose rayon, turned and knitted with about half an inch of after-welt. Fabric for the feet is knitted from the same sort of rayon on circular machines and cut to shape, or formed feet are knitted on half-hose machines. The leg, foot and welt parts are dyed before cutting, either to match or in contrasting shades. The welt is stitched to the leg by the first operative. The foot portions are seamed together (if cut from fabric) by the second operative and then passed to the third operative who stitches them to the leg. A fourth operative finally seams the back of the leg. C.

(G)—Fabrics

Seamless Nylon Stockings: Production. *Textile World*, 1945, **95**, No. 5, 133, 192, 194. It is explained that on modern circular knitting machines for hosiery shaping is effected in the leg by gradually tightening the stitch, by lowering the needle cylinder. Thus, on a 3¾-in. cylinder machine with 400 needles ($\equiv$52 per 1½-in., *i.e.* a gauge of 52), the stitches might vary from about 42 at the welt to 60 at the ankle. The writer claims that nylon yarn will lend itself readily to circular knitting and that the additional possibility of setting the stockings to a permanent shape by a boarding operation, due to the thermo-setting property of nylon, will lift seamless stockings of nylon into a higher range of quality and price. C.

American Army Cotton Insect Netting. J. E. Goodavage. *Textile World*, 1945, **95**, No. 5, 139, 184, 186. To protect men from insect bites the American Quartermaster Depot developed a cotton marquisette netting, finished with an alkali-soluble cellulose hydroxyethyl ether ("Ceglin") or a zincate solution of cellulose ("Celfon" or "Kopan"). The solution is applied by padding and contains pigment and fungicide as required. The finished netting is specified thus:—Weight per sq. yd. 1·8 oz., ends and picks 50-52 per inch, breaking load ($1 \times 1 \times 3$ in. grab test) at least 28 lb. warp-way and 20 lb. weft-way, meshes per sq. inch 625-676, size of hole 0·03 – 0·0325 inch. C.

Industrial Products: Design Promotion. *The Economist*, 1945, **149**, 530-531. In connection with the creation of a Council of Industrial Design, the beginnings of the Manchester "Colour, Design and Style Centre," which was founded in 1940, are related and some of its achievements and the difficulties it encountered are discussed. Design centres contemplate consumer research at home and abroad regarding design and products. The aim of such research is to collect the fullest information about the opinions, the ideas and the needs of the buying public, in relation to the planning and function of an Industry's goods, as well as their form and appearance. C.

Water-tight Cotton Fabrics: Production and Properties. C. F. Goldthwait and H. O. Smith. *Textile World*, 1945, **95**, No. 7, 105-7, 197-8. A popular account is given of "Shirley" close cotton cloths and similar cloths developed at the U.S. Southern Regional Research Laboratory that owe their water-tightness to the fact that the yarn and cloth structure permit the fibres to swell when wetted and thus close the gaps in and between the yarns. An alternative to the British use of mercerised yarns for securing a high degree of swelling is the American application, especially in fire hose fabric, of a 6 or 7 per cent. deposit of cellulose hydoxyethyl ether, on the yarn, from an alkaline solution.

American Rayon Crêpes: Construction. I. Teplitz. *Rayon Textile Monthly*, 1945, **26**, 456-457. The basis of the crêpe effect is described, and the governing factors in crêpe construction are summarized. Various types of commercial crêpes made of viscose and cellulose acetate rayons, and combination yarns are described. C.

Handkerchiefs: Construction. J. H. Strong. *Textile Mercury & Argus*, 1945, **113**, 462-465. The writer gives cloth particulars of typical high-class cotton handkerchiefs with plain and fancy borders, including those with patterns based on the use of cords and satin weaves. C.

Patents

Circular, Independent-needle Knitting Machine Yarn Feeder. Hemphill Co. B.P.571,702 of 5/9/1945 (Conv. 5/9/1942). The claim is for simple splicing yarn feeding means and a trimmer and binder coacting therewith. C.

Creeled Warp Looming Device. C. H. Baddeley. B.P.571,707 of 17/9/1943: 5/9/1945. The object of the invention is to dispense with reeds, thread guides and back beams and to insert the warp into the loom direct from a creel. It comprises a parallelogram of links supporting holed plates through which the warp is threaded. The plates are pivoted and the links can be adjusted so that the angles of the parallelogram can be varied as desired. C.

Moulded Plastic Bobbin Heads. A. H. Stevens (for Columbian Rope Co.). B.P.571,728 of 11/5/1943:6/9/1945. The claim is for bobbins with heads moulded from a mass of fibre tufts and a thermo-setting or thermoplastic resin. C.

Portable Electric Cloth Cutting-out Machine Guard. Abraham Bellow. B.P. 571,766 of 20/11/1943:7/9/1945. The guard comprises a detachable cap or cover secured over the knob or wheel that adjusts the knife, so that the knife is enclosed or covered while the machine is in operation. C.

Loom Shuttle Guard. Boardman and Baron Ltd. and J. and W. Sim. B.P. 571,773 of 2/12/1943:7/9/1945. The shuttle guard comprises a pair of looped brackets mounted on the slay cap of the loom and loosely holding a flat bar that lies in a plane parallel to the warp and just above it when the loom is in action and lies against the slay cap when the loom is inoperative, so that full access can be had to the warp when the loom is at rest. C.

Shuttles for Looms with Grid-like Guides. Sulzer Frères Soc. Anon. B.P. 571,828 of 11/9/1945 (Conv. 26/8/1942). The claim is for a shuttle to run in a grid-like guide instead of the usual race. (The guide is constituted by a series of transverse members spaced apart by a certain "pitch" to the right and left of the shuttle path.) The shuttle is shaped with identical inclined planes at either end and on opposite sides, and the planes are longer than the "pitch" of the spaces between the grid members. If the shuttle begins to rock in its traverse through the clearance in the grid it will not collide seriously with any of the transverse members. The inclined planes make with the axis of the shuttle angles whose tangents are equal to the clearance between the shuttle and the guide divided by the length of the mid-portion of the shuttle that is not cut away. C.

Warp Protector Stop Motion. H. S. Cargill and J. A. Galloway. B.P.571,861 of 10/11/1943:12/9/1945. A warp protector stop motion is characterized by the feature that the loom buffers or frogs, on actuation by the warp protectors, effect shift of the warp beam so as to reduce the distance of the warp line between the last pick in the cloth and the point where the warp yarn leaves its beam. The warp beam bracket is not bolted to the loom frame, but mounted on a horizontal pivot and linked by a connecting rod to the buffer or frog. C.

Hydraulic Dobby, Picking and Shuttle Box Motions. Thomas Hindle & Co. Ltd. B.P.571,947 of 18/10/1943:17/9/1945. The claims are for power pistons working in hydraulic cylinders under oil pressure, for (1) lifting and lowering heald frames, (2) controlling the picking motion, and (3) controlling the shuttle box motion of a loom. The oil supply is controlled by a piston valve and/or sleeve, in turn controlled by a floating lever one end of which is connected to the power piston or the loom part actuated by it, and the other, sensitive end, or an intermediate point of the lever, is given a tuned, harmonic motion by a suitable mechanism for controlling direction and velocity. Eight sheets of drawings accompany the specification. C.

Shuttle Tongue Pivot Pin. James Pilkington and Pilkingtons Ltd. B.P. 571,972 of 17/1/1944:17/9/1945. The risk of damage from a steel pivot pin for a shuttle tongue and the weakness of a wooden pin are met by forming the pin out of hardwood or compressed fibre with a steel core. C.

4—CHEMICAL AND FINISHING PROCESSES

(A)—Preparatory Processes

Sulphonated Oils: Application to Textiles and Leather. C. J. Ratto. *Actos y trabajos congr. peruano quim.*, 1943, 2, I, 391-393 (through *Chem. Abstr.*, 1945, **39**, 3681[8]). A discussion of the developments in this industry with reference to Peru. The preparation of castor oil and sulphonated castor oil is described in detail. C.

Wetting Agents: Theory. R. Dubrisay. *C. r. Acad. agric. France*, 1941, **27**, 746-752 (through *Chem. Abstr.*, 1945, **39**, 3682[8]). A theoretical discussion of wetting and the equilibrium conditions of the tensions on contact of solid, liquid, and gaseous phases. The following wetting agents are discussed: triethanolamine stearate and oleate, sulphuric esters of alcohols of high molecular weight, and the Sapamines. C.

(D)—Milling

Milling : Theory and Practice. *Wool Rec.*, 1945, **68**, 408-412. Reply to Williams (these *Abs.*, 1945, A408). Disagreement is expressed with the statement that cover is primarily caused by serration interlocking. In the combined machine, pieces can be crushed by the pressure of the rollers and the mouthpiece, but milling must occur when the lid of the trough is lowered to come in contact with the pieces. The reasons given by Williams for efficient milling, i.e. pressure, temperature, amount of moisture left in the cloth before soaping-up, and strength of the soap solution, are critically examined. Good milling depends upon correct scouring, and under identical conditions potash soaps mill faster than soda soaps. *p*H values play a much greater part in milling heavy tank felt than so-called critical temperatures. The size of the combined machine permits ease of handling under certain conditions, but the principle is not new; the machine lacks a movable trough to accommodate 1-8 drafts, in width. W.

(E)—Drying and Conditioning

Infra-red Radiation: Application in Drying; Mechanism and Rate. L. E. Stout, K. J. Caplan and W. G. Baird. *Trans. Amer. Inst. Chem. Engrs.*, 1945, **41**, 283-314 (through *Chem. Abstr.*, 1945, **39**, 3468[3]). A study is presented which illustrates a method of applying the near-infra-red drying procedure to a specific chemical. The mechanism of infra-red drying is also compared with atmospheric and vacuum drying. In general, near-infra-red radiation permits drying at rates which are substantially higher than can be achieved by the other two methods. Radiant energy is merely another and more rapid method of heat transmission, one which is independent of air film or liquid film resistances to heat flow. The mechanism of water flow to the drying surface is not different from that encountered in air or vacuum drying. The work shows that under "infra-red lamps" the rate of drying decreases with increasing air velocity and distance from the source of radiant energy. Thickness of the material to be dried has little effect upon the constant-rate period of drying. C.

(G)—Bleaching

Active Chlorine Compounds. A. G. Chenicek. *Interchemical Review*, 1945, 4, 13-19. A survey is given of some of the more important of the active chlorine compounds described in patents and the scientific literature. Hypochlorites, N-chloramines, N-chloramides, and N-chlorosulphonamides are included. Their formulæ, active chlorine contents and uses are summarised in a table. C.

Pulp: Bleaching; Scandinavian Methods. E. C. Jahn. *Paper Trade J.*, 1945, **121**, *TAPPI*, 113-115. A general survey is given of the pulp bleaching processes employed in Scandinavian mills. The af Schultén continuous bleaching process which includes only towers for carrying on the various reactions, and the Kamyr continuous system are described. Some general methods for bleaching sulphite pulp for viscose, pulp with high α-cellulose content, and sulphate pulp are outlined. Chlorine dioxide bleaching is briefly discussed. C.

(H)—Mercerising

Mercerised Elastic Cotton Gauze: Production. C. F. Goldthwait and J. H. Kettering. *Textile World*, 1945, **95**, No. 8, 131. Illustrations are given of a new surgical gauze bandage with improved elasticity and clinging power that has been developed from mercerised-shrunk cotton yarn. A piece of the gauze 10 in. long stretched to 12 in. and recovered to 10½ in. C.

(I)—Dyeing

Fluorescent Signalling Fabrics. J. M. Johnston. *Textile World*, 1945, **95**, No. 5, 110-111. An illustrated account is given of the uses in war of "Conti-glo" daylight fluorescent fabrics which provide very brilliant markings in daylight, visible from high altitudes, or, under ultra-violet illumination, provide visible markings at night. They have been used in panels, 2½ × 12 ft., for marking friendly weapons and sites, and for signalling to aircraft at night. The fabric used is a cellulose acetate rayon 5-shaft satin, 235 ends per inch of 120-den. warp and 74 p.p.i. of 200-den. weft. This is impregnated with "complex organic compounds" to give a range of colours—Neon Red, Fire Orange, Arc Yellow, and Saturn Green. The panels are lacquered and kept clean by wiping but they whiten on exposure to sun, more quickly than ordinary dyed materials and thus need frequent renewal if intended for long exposures. C.

Mineral Khaki Dyed Cotton: Control of Chromium and Iron Contents. E. Race, F. M. Rowe and J. B. Speakman. *J. Soc. Dyers and Col.*, 1945, **61**, 224-233, 233-236. Two batches of cotton yarn dyed with mineral khaki according to large-scale practice have been analysed for their Cr, Fe and alkali-soluble Cr contents. Considerable variations in the figures seem to be due mainly to differences in the amounts of chrome-iron liquor retained by the yarn during impregnation, which in turn are caused by unequal pressures applied during hand wringing. With both Na hydroxide and Na carbonate development, an increase in the alkaline developing liquor leads to a decrease in the alkali-soluble Cr content of the yarn and to an increase in both the Fe and Cr contents. In developing liquors containing progressively increasing proportions of sodium carbonate, iron oxide tends to be preferentially precipitated on the yarn, whilst the Cr salt in solution on the yarn tends to pass into the developing liquor and to be precipitated there instead of on the fibre. When the concentration of developing liquor is maintained constant, however, the Cr, Fe and alkali-soluble Cr contents of the yarn are also constant. The use of a concentration of sodium carbonate in the developing bath not greatly in excess of the stoichiometric amount required for the complete precipitation of Cr and Fe held by the impregnated yarn, together with the maintenance of this concentration by controlled additions of sodium carbonate, led to the large-scale production of a mineral khaki dyed material which did not require subsequent washing or treatment in mildly acid solutions, provided that the final wax treatment was carried out in a slightly acid medium. C.

Cellulose Acetate Dyeings: Gas Fading. *Rayon Textile Monthly*, 1945, **26**, 350-351. A review of the problem of the fading of certain cellulose acetate dyeings in the fumes from burnt gas, with emphasis on the various types encountered in practice and on remedial treatments. Patchy garments may be restored by partially stripping them in ammoniacal butyl-cellulose and then adding Glauber salt to the bath to fix the dye again on the fabric. Partial hydrolysis with caustic soda, sufficient to reduce the acetyl content from, say, 53·2 to 50·7 per cent. is also claimed to secure a "fadeless" ground for acetate dyes. C.

Cellulose Acetate Dyeings: Gas Fading. N. D. Lobar. *Textile World*, 1945, **95**, No. 8, 94-95, 188-192. The fading of acetate dyes in fumes of burnt gas and some preventive methods and their limitations are discussed. Some colours are not susceptible to gas fading so a proper selection of dyes will be of some help. Protective agents, such as glue, gelatin, a number of gums, resins, fats and waxes, applied as a film on and over the dyed acetate fibres aid greatly, but they are likely to impart stiffness to the cloth or to create "breakmarks" ("scratching white") on the material. Various organic and inorganic chemicals are effective inhibiting agents, yet questions of their compatibility with finishing agents, efficiency and cost of the compounds, and method of application, have to be considered in practice. C.

Direct Dyes: Absorption by Sheet Cellulose. H. F. Willis, J. O. Warwicker, H. A. Standing and A. R. Urquhart. *Trans. Faraday Soc.*, 1945, **41**, 506-541. The absorption of Chrysophenine G by cellulose sheet has been studied over a wide range of temperature and salt concentration. The results obtained, in conjunction with other sets of data recorded in the literature, have established facts about the uptake of dyes by cellulose and an attempt has been made to develop a theory of the dyeing process consistent with these facts. This theory is fully described and agrees well in most respects with experimental data. It offers a means of simplifying the presentation of the data corresponding to any one temperature. The theory in its present form is not applicable to dyes that aggregate in solution to form ionic micelles. C.

Direct Dyes: Aqueous Diffusion. F. H. Holmes and H. A. Standing. *Trans. Faraday Soc.*, 1945, **41**, 542-567. The aqueous diffusion of chrysophenine G and of Direct Fast Orange SE has been investigated and the influences of temperature and of concentration of dye and of electrolyte have been studied. The diffusion coefficient has been calculated from the experimental observations. The coefficient for Direct Fast Orange SE decreased steadily when the concentration of sodium chloride was increased to give a salt/dye ratio of over 100, whereas the coefficient for chrysophenine became independent of the salt concentration when the salt/dye ratio was greater than about 20. Chrysophenine is only slightly aggregated in the presence of sodium chloride whilst Direct Fast Orange SE is appreciably aggregated. On comparing the influence of different electrolytes it is found that a salt containing bivalent cations such as Mg reduces the diffusion coefficient more than an equivalent concentration of a salt containing only univalent cations. The mobilities of the dye anions were calculated from their diffusion coefficients obtained in the presence of excess sodium chloride and the values found were higher than those measured from the conductance of pure dye solutions. This discrepancy seems to be due, either to an inclusion of Na ions in the micelle or to an increased aggregation in the presence of sodium chloride. C.

Direct Dyes: Electrolytic Conductance of Aqueous Solutions. F. H. Holmes and H. A. Standing. *Trans. Faraday Soc.*, 1945, **41**, 568-574. The electrolytic conductances of solutions of chrysophenine G, Direct Fast Orange SE and Chlorazol Sky Blue FF were measured by means of a Wheatstone Bridge over a range of dye concentrations and temperatures. The aggregation numbers were calculated from the conductance data. Although these calculated values may well be inaccurate they show by comparison with the values obtained from diffusion measurements that all the three dyes are only slightly aggregated in pure solution, though Direct Fast Orange SE and Chlorazol Sky Blue FF are appreciably aggregated in the presence of sodium chloride. C.

Loose Cotton: Dyeing for the Woollen Trade. A. Ellis. *Textile Weekly,* 1945, **36**, 798-806, 850-2, 898-902. Practical hints are given on the dyeing of loose cotton for blending with wool, including the choice of the dyestuff. C.

Luminescent Pigments : Application. M. A. Heikkila. *Rayon Textile Monthly,* 1945, **26**, 477-478. The uses of luminescent textiles for decorative effects and safety applications are discussed, and the application of both fluorescent and phosphorescent types of luminescent pigments to fabrics is described. Almost any textile printing or coating method may be used with fluorescent pigments. The phosphorescent pigments, being coarser in particle size, are best adapted to silk screen printing and to coating methods. C.

Sulphonated Azo-2-naphthol Dyes: Identification. R. F. Milligan. S. Zuckerman and L. Koch. *Ind. Eng. Chem., Anal Edn.,* 1945, **17**, 569-570. A rapid and simple method has been developed for the identification of sulphonated azo-2-naphthol dyes by the catalytic reduction of the azo bond, and the separation of the scission products with ethanol. Equivalent weight determination by titration with 0·1N sodium hydroxide of the aminosulphonic acid and its conversion to the S-benzyl isothiourea derivative permit the differentiation between isomeric compounds. A table gives data for 24 diazotised arylaminosulphonic acids. C.

Wool Dyeing: Recent Developments. H. E. Millson. *Amer. Dyes. Rep.,* 1945, **34**, P284-P290. A review of recent developments in the use of minimum chrome, metallized dyes, and continuous dyeing methods. (See these *Abs.,* 1942, A404; 1943, A246; 1944, A198; 1945, A296). W.

Wool Dyeing: Theory and Practice. C. L. Bird. *Text. Rec.,* 1941, No. 704, 25-26; 1942, No. 706, 30, 33, No. 707, 34, 36, 39, No. 709, 30, 32, 35, No. 710, 30-32, No. 711, 30, 33-34, No. 712, 32, 35-36, No. 714, 33-34, 36, No. 716, 42-43, 45, No. 717, 38, 40-41; 1943, No. 718, 47-48, 50, No. 719, 35-36, 38, No. 721, 32, 34-35, No. 723, 41-42, 44, 46, No. 726, 50, 52-53, No. 728, 42, 44-45; 1944, No. 732, 62-64, No. 734, 52, 54-55, No. 737, 53-54, No. 739, 68-71, 73, No. 741, 56-57, 59, 61; 1945, No. 744, 52, 55-57, No. 746, 49, 51-52, No. 747, 45-46, 58, No. 748 53-54. A comprehensive survey of the theory, practice and chemistry of wool dyeing. The following are reviewed:—Dyeing in relation to other textile processes; the nature of dye solutions; the chemistry and methods of application of acid dyes, chrome dyes, Neolan (S.C.I.) and Palatine Fast (I.G.) colours, and indigo; methods of union dyeing; levelling and stripping; machinery for dyeing loose wool and rags, slubbing, hanks, cheeses, pieces, and hose, felt hats and garments. W.

Dyeing for the Toy Trade. *Dyer,* 1945, **94**, 139-140, 179-181. The dress, facial features, etc. are printed on cotton or linen rag-dolls, using non-poisonous colours fast to laundering. The paws of mohair plush and worsted bearskin dogs, etc, are tipped with a spirituous solution of a brown or black basic dye; a small addition of a green shading dye is made to Bismarck Brown. Bone counters are soured in a cold sulphuric acid solution, and dyed with acid colours; they are processed either in cotton bags or in a multi-chambered wheel-like container capable of being slowly rotated in the dye vessel; after drying, they are polished in a buffing machine. Bone dice, etc. are coloured black by boiling and then steeping first in logwood extract and then in bluestone and green vitriol; they are then washed and polished. For dolls' hair, wool or mohair is dyed with fast chrome colours and then curled; cotton wadding is dyed with inexpensive direct cotton colours. Cork is bleached first in a cold solution of permanganate of potash crystals and then in a bisulphite of soda solution; after washing in cold water it is dyed with basic colours in a weakly acidulated bath; prolonged boiling causes swelling and ultimate splitting; another method consists of brushing the cork surface with a solution of basic colour in methylated spirit, a quantity of shellac being used in the stain to bind the dye and prevent rubbing. Celluloid is coloured by immersion in a cold, neutral solution of an acid or basic colour, or by brushing the surface as for cork. Wood is coloured with a strong solution of basic dye. Vegetable foliage, raffia, etc. are mordanted with tannin and then coloured with basic dye; a cheaper method consists of steeping in a weak solution of soda crystals and then colouring in a boiling bath with direct cotton colours. Doll body composition containing lime or plaster of Paris is dyed with certain coal-tar dyes, e.g. Rhodamine, or with certain mineral and pigment colours, e.g. Red Oxide; body compositions cast from sawdust and boiled linseed oil are dipped in a plaster paste tinted with madder or alkanet. Brief notes are given on the colouring of papier mache composition, marbles and beads, imitation stone or brick building blocks, miniature roof coverings, and toy facial casts. Sawdust must be thoroughly wetted before dyeing, and if necessary degreased; basic or acid colours are generally used; there is no special machinery, but adapted plant which is inexpensive and reasonably efficient is described. For coated paper, coloured sawdust or rice is sprinkled on to paper smeared with casein glue. The rice is dyed in a strong, lukewarm solution of basic dye, after steeping in cold water. W.

(J)—Printing

Gum Tragacanth: Application in Printing. *Textile Recorder,* 1945, **63,** September, 52-53. The writer describes the origin and commercial forms of gum tragacanth, quotes old references to its use in standard text-books, enumerates its advantages as a thickener of printing pastes, and briefly discusses its application in printing, especially in admixture with wheat starch. C.

Starch Enzymes: Application in Printing. T. N. Patrick. *Textile World,* 1945, **95,** No. 6, 145, 198-204. The writer advocates the use of diastatic and pancreatic enzymes, especially those that are effective at 170-180° F., for the removal of starch in the preparation of cotton or rayon fabrics for printing and for desizing after printing. Styles that respond to those uses of enzymes are indicated. C.

(K)—Finishing

Electrically-conducting Tape. Pacific Mills Inc. *Textile World,* 1945, **95,** No. 7, 95. An announcement is made of experiments in the production of tape that is graded in electrical resistance from about 10^6 megohms to a few thousand ohms. It is intended for discharging static electricity, for electrostatic flux grading, elimination of the corona effect and so forth. A typical tape, 7 mils thick, is described as made of 66s warp and 56s weft, 3 oz. per sq. yd., breaking load 45-60 lb. per inch width, elongation under 20 lb. in 5 mins. 1 per cent., air permeability 170 c. ft./min./sq. ft. under a static pressure of half an inch. The nature of the finish is not disclosed but it is compatible with various types of surface finish and it can be made resistant to oil and/or water. C.

Dry Finishing Machines: Review. *Textile Recorder,* 1945, **63,** September, 49-51, 63. Illustrated descriptions are given of the following machines: Cloth conditioning machines (Sjostrom, brush damping and spray damping machines), a belt stretching machine, calenders of different types, a beetling machine, and a tamponing machine for closing " cracks " in satins. C.

" Redmanized " Shrink-proofed Fabrics: Production. *Textile World,* 1945, **95,** No. 6, 143. It is reported that a board of five trustees will exploit the Redman process (U.S.P.2,325,545) for shrink-proofing knitted cotton and rayon and other fabrics. Three trustees are appointed by the U.S. Underwear Institute and two by Mr. Redman. The process is described as " pushing " the fabric along in the presence of steam by means of corrugated rollers that bear on the fabric as it is carried by a conveyor. The fabric is dried, calendered without tension, and folded as it leaves the machine. C.

Plastic Coatings: Application to Fabrics: J. B. Cleaveland. *Textile World,* 1945, **95,** No. 6, 117, 119, 194-198. The writer reviews the respective merits of three methods for applying coatings of thermoplastic resins to fabrics, (1) by the knife spreader, (2) by the roller spreader, these two using viscous solutions and involving the evaporation and recovery of solvents, and (3) by the multi-roller hot calendar. Machine costs and skill in operation rise in the order 1, 2 and 3. The first method is useful when a very thin, smooth film is desired, and it is frequently used to provide a foundation for later coatings. The second method is good for materials that do not so readily take a coating but the solution tends to sink into the fabric and the coated material usually reveals the weave. The third method is recommended for thicker coatings. C.

Synthetic Resins: Uses for Finishing Bookcloth. R. A. Borton. *Textile World,* 1945, **95,** No. 8, 104-105. Preparation of bookcloths and their sizing and coating with plasticized resins are briefly discussed. A typical process using pyroxylin is photographically illustrated. C.

" Syton " Colloidal Silica: Application in Slip-resisting Finishes. D. A. Powers. *Rayon Textile Monthy,* 1945, **26**, 347-348. In a brief review of the " application of synthetic resins to textile fibres and fabrics " the writer mentions a " sub-microscopic aqueous dispersion of a silica polymer (Syton) " which increases yarn friction in extremely low concentrations and is used for slip- and run-proofing of rayon materials. C.

Resin Finished Fabric: Curing Methods. J. W. Reinhardt. *Rayon Textile Monthly,* 1945, **26**, 459-460. In the curing stage the resin-impregnated fabric is subjected to high temperatures for a short period of time in order to " set " the finish. Two types of curing machines which maintain uniform temperatures are described. In the roller type curer, goods are carried through in festoons by means of motor driven rolls. In the loop curer, the goods are formed into loops over glass-covered rods and carried through the curing chambers by a moving endless conveyor. The temperatures employed range from 300° to 450° F. and are produced by means of high pressure steam or gas. C.

Textile Fabrics: Electro-coating. Behr-Manning Corporation. *Rayon Textile Monthly,* 1945, **26**, 458. The principle of the electrostatic deposition of cut fibre to produce fabrics of the suede type is explained and the possibilities for future applications are described. An illustration shows a raised floral pattern obtained by depositing cut fibre on a ground cloth on which the design was traced out in an adhesive. C.

Finishing Machinery for Woollen and Worsted Fabrics. C. S. Whewell. *Text. Rec.,* 1944, No. 739, 60-67, 100, No. 740, 52-54, No. 741, 51, 53, 55; 1945, No. 743, 49-51, 66. A description, with diagrams and illustrations, of machinery (developed immediately before the war) for fabric scouring, hydro-extracting and hydro-exhausting, milling, drying, raising, cutting and shearing, blowing, conditioning, and pressing. Published data (these *Abs.,* 1941, A73) on electric power requirements in a finishing plant are summarised. W.

(L)—PROOFING

Electrical Equipment: Mildewing. A. C. Titus. *Gen. Electr. Rev.,* 1945, **48**, 19-22. A review is given of fungus growths observed on electrical equipment in the Tropics and of typical fungicidal treatments. Parts affected are textiles, paper, grease and laminated plastics. Decomposition and toxic effects associated with incautious use of various fungicides (especially mercurials) are discussed). C.

Cellulosic Materials: Mildew Proofing. H. C. Borghetty. *Rayon Textile Monthly,* 1945, **26**, 479-481. The U.S. Quartermaster Depôt has listed 10 requirements of methods and products for protecting cellulosic materials from rot and mildew. The most important of the mildew-proofing compounds approved by the Quartermaster are listed and some practical mill trials made with these products are outlined to indicate the flexibility of the processing. C.

PATENTS

Tentering Frame Slotted Vacuum Tube Closure Device. British Celanese Ltd. B.P.571,575 of 30/8/1945 (Conv. 19/11/1942). Tentering frames are sometimes fitted with a slotted vacuum tube for sucking up some of the moisture in the wet cloth as it is fed to the table of the machine. It is necessary to close the lengths of slot extending beyond the width of the cloth without introducing anything against which the cloth might be chafed. The invention now claimed is for a pair of casings that house coiled steel tapes. These are carried on brackets attached to the movable chain tables of the machine so that they keep step with changes in the width of the cloth. One end of the tape is fastened to the vacuum tube and the other to a spring winding device so that at any moment just sufficient tape is uncoiled to close the bare slot. C.

Crinkled Cloth: Production. Cincinnati Industries Inc. (Assignees of W. W. Rowe). B.P.571,625 of 3/9/1945 (Conv. 25/5/1942). A process for contracting cloth to make an expansible material like crinkled paper comprises binding cloth to a crêpeing surface by means of a thin layer of thermo-setting resin adhesive characterized by sufficient discontinuity to permit the crowding together of the threads, and stripping the cloth from the surface so that the interspaced portions of the adhesive layer pull together and make contact. C.

Blue Anthraquinone Dyes for Wool, Silk and Nylon: Production. Sandoz Ltd. B.P.571,673 of 4/9/1945 (Conv. 24/12/1942). Dyes that give pure blue shades on wool, silk and nylon and do not redden in artificial light are obtained by condensing anthraquinone compounds having replaceable groups in positions 1 and 4 and halogens in position 6 and/or 7 with amino alcohols or their sulphuric esters of the formula $R \cdot CH(NH_2) \cdot R_1 \cdot O \cdot R_2$ and sulphonating the products if necessary to make them soluble in water. R=alkyl, R_1=alkylene and R_2=H or a sulphonic acid or sulphonic acid salt group. Four examples are given in detail. C.

Cellulose Acetate Dyeings: Protection against "Acid Fading" (=Gas Fading). British Celanese Ltd. B.P.571,677 of 4/9/1945 (Conv. 9/1/1943). Cellulose acetate dyeings (of the anthraquinone series) are protected against fading in the fumes of burnt gas by impregnating them with triethanolamine assisted by a swelling agent (alcohol in particular) and drying. Solutions containing 1-5 per cent. of triethanolamine and 15-57 per cent. of alcohol are recommended, about 2 per cent. of the base being left in the material. C.

Self-aligning Calender Roller Bearings. Hunt and Moscrop Ltd. and E. F. Hunt. B.P.571,792 of 20/12/1943: 10/9/1945. The claim is for a bearing for the bowls or rollers of a calender wherein two rollers against which the journal of the roller revolves are rotatably mounted in a housing that can swivel on two pivots carried by the usual main housing, the pivots being arranged transversely to the longitudinal axis of the journal and the axes of the two rollers being parallel thereto, whereby the faces of the rollers are self-aligning with the roller journal. C.

Felt Production: Lap Hardening. W. O. Street. B.P.569,796 of 8/6/1945. The partly felted lap is returned through the hardening apparatus in the reverse direction, by means of an additional driving mechanism at the back or feed end of the machine. During the reverse passage the lap is unbatched and turned over, so that opposite faces of the felt are presented in succession to the oscillating top plate of the hardener. A better felt results, and the time and labour saved in handling and carrying are of considerable importance, especially in treating heavy felts and for simultaneous hardening of several layers of felt separated by cotton cloths. W.

Jute Materials: Solvent Extraction for Bleaching and Dyeing. Lumsden & Mackenzie Ltd. and C. Garrett. B.P.571,799 of 3/1/1944: 10/9/1945. Bleaching, scouring and dyeing of jute fibre, yarn or fabric is greatly facilitated by a preliminary process of solvent extraction. C.

Fabric Shrinking Machine. F. R. Redman (U.S.A.). B.P.571,821 of 16/6/1943: 11/9/1945. The claim is for a process (and apparatus) for shrinking textile fabrics that comprises lengthwise and widthwise "rumplings" in the presence of moisture and heat, by means of rotary "bunching" devices that act as the fabric is carried forward without tension on a conveyor belt. The specification ascribes the usual shrinking of fabrics to the fact that the original irregularities of the component fibres have been straightened out by the numerous tensions imposed in spinning, weaving and finishing, shrinking being the return to the natural, set condition. His "rumpling" process is claimed to secure this return. Nearly 200 lines of the specification review the processes in which fibres experience tension. [The shrinking treatment is already called "Redmanizing" in American technical literature.] C.

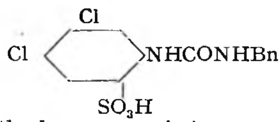
Urea or Guanidine-Formaldehyde Resins: Application in Waterproofing. J. R. Geigy, A.-G. B.P.571,919 of 14/9/1945 (Conv. 23/6/1942 and 12/1/1943). Cellulosic materials are waterproofed by impregnation with an acid solution of a condensation product of formaldehyde with a urea or guanidine compound having the group $\gtrless {}^{N}_{N} > C{:}O$ (or NH), e.g. dicyandiamide or biguanide, the solution also containing a salt of a metal of Groups II, III or IV, then baking at 120° C. to form an insoluble resin, and completing the treatment by soaping, centrifuging and drying. C.

Sulphur Dyes: Preparation. Imperial Chemical Industries Ltd. B.P.571,931 of 14/9/1945 (Conv. 21/11/1942). Sulphur dyes are obtained by the interaction (heating if necessary) of carbocyclic hydrocarbons (e.g. acenaphthene, perylene, pyrene, phenanthrene, retene and fluorene) with the complex addition product $AlCl_3 \cdot 2S_2Cl_2$. The dyes are isolated by drowning the reaction mass in ice water and purified by washing with dilute alkali. They are very readily vatted by means of sodium sulphide. C.

Thermoplastic Films: Jig Dyeing. Courtaulds Ltd. and R. C. Greenlees. B.P.571,961 of 13/12/1943:17/9/1945. Films of thermoplastic resins (e.g. cellulose acetate) usually take up so little dye liquor in passing from roller to roller in a jig dyeing machine that dyeing is very sluggish. This is overcome by running the film between two layers of an absorbent fabric, e.g. cotton. C.

Cellulose Ester or Ether Dyeings: Increasing Fastness to Gas Fumes. British Celanese Ltd. B.P.571,971 of 17/9/1945 (Conv. 14/1/1943). The fastness to gas fumes of dyeings on cellulose esters or ethers is improved by treatment with a solution of 3-amino-4-heptanol, 3-diethanolamino-4-heptanol, 3-amino-3-methyl-2-butanol, 2-amino-2-methyl-1:3-propanediol, 3-diethanolaminopropanediol or N-dibutylaminoethanol. C.

Moth Repellent. H. Martin and Ors. (to J. R. Geigy A.-G.). U.S.P.2,363,074 of 21/11/1944 (through *Chem. Abs.*, 1945, **39**, 3,099). For durable moth repellents use is made of the sodium salts for haloacylamino sulphonic acids of the aromatic series corresponding to



(Bn=a halo substituted radical of the benzene series). W.

Pile Fabrics: Sheening. J. D. MacMahon and L. D. Taylor (to The Mathieson Alkali Works). U.S.P.2,369,399 of 13/2/1945 (through *Chem. Abs.*, 1945, **39**, 3,165). The pile of wool rugs is sheened by treatment at 60-95° F. for 15-90 min. with hydrogen peroxide (0·55-2·2g./l., expressed as g. of peroxide group) at *p*H 10-12·5. The addition of 0·1-1·0 g./l. of various detergents often improves the sheen and the condition of the pile. W.

5—ANALYSIS, TESTING, GRADING AND DEFECTS

(A)—Fibres

Fibre Stain: Application in Papermaking. N. F. Wilson. *Paper Ind. Paper World*, 1945, **27**, 215-216 (through *Chem. Abstr.*, 1945, **39**, 3664[7]). A new stain that produces distinct characteristic colours on the various paper-making fibres consists of iodine 0·8 gm., cadmium iodide 35·0 gm., water 50 c.c., to which the following are added in order when solution is complete at 110° F.: water 90 c.c., formaldehyde 7 c.c., calcium nitrate cryst. 70 gm., cadmium chloride cryst. 20 gm. Some of the colours obtained are: soda pulp, purple; linen rag, pink; unbleached sulphite pulp, none; bleached sulphate pulp, blue; bleached sulphite, lavender; cotton, red; straw fibres, mostly green. C.

Textile Fibres: Microscopy; Application in Dyeing. C. W. Bendigo. *Textile World*, 1945, **95**, No. 7, 97, 98 and full-page plate in colour. The writer describes some of the applications of microscopy in researches on dyeing by the Calco Chemical Division, American Cyanamid Co. Illustrations are given of (1) a table model of the electron microscope and of a disintegrated cotton fibre, (2) section-cutting, (3) microscopy by ultra-violet light, (4) apparatus for ordinary and kinematographic photomicrography, and (5) 24 cross-sections of dyed specimens of typical fibres. C.

Cotton Fibre: Relation of Imperfections to Neps and Yarn Quality. G. J. Harrison and Edna E. Craig. *Textile Research J.*, 1945, **15**, 247-256. Common imperfections occurring in cotton fibres are described. The responsible growth factors are considered and the relation between fibre imperfections and neppiness is examined. Several hundred neps were analysed and found to consist of ten different elements. More neps contained immature fibres than any other element. Extreme tapering, fibre roughness, fibres of large diameter, and deformities are factors that contribute to neppiness and thus to spinning difficulties in greater proportion than their prevalence in cotton would indicate.

Seed coat particles and fuzz hairs are of common occurrence in neps. Fibre fragments found in neps are probably a product of the various handling operations. C.

Cotton Fibre: Relation of Properties to Strength of Carded Yarn. R. W. Webb and H. B. Richardson. *U.S. Dept. Agric., War Food Admin., Office of Marketing Services, Prelim. Rept.*, 1945, 58 pages. Abridged versions in *Textile World*, 1945, **95**, No. 5, 123-125 (with comments by E. H. Helliwell), and *Textile Weekly*, 1945, **36**, 14, 70, 128, 172, 218, 324, 454, 508. This report is the first in a series of studies on the relationships between cotton fibre properties, behaviour in processing, and yarn and fabric qualities. Data are provided on the fibre properties of 766 cottons covering a wide range of American Upland types and conditions of growth, and on the lea strengths of 22s and 60s yarns spun from them without combing. Multiple, partial and simple correlation analyses are recorded so as to reveal the contribution of various fibre properties, separately and in combinations, to the lea strength. The results demonstrate that the properties rank in decreasing order of importance thus: fibre strength, length variability, upper quartile length, fineness, grade and percentage of mature fibre in the sample. In 22s, these six properties together account for 87 per cent. of the total variance of lea strength and the correlation coefficient between them and lea strength is $0{\cdot}935 \pm {\cdot}006$. In 60s the correlation coefficient is $0{\cdot}937 \pm {\cdot}006$. Some 66 regression equations, involving different combinations of fibre properties, are presented, by means of which the strength of a carded yarn can be calculated from some of the fibre data. The correlation coefficients are nearly as great as those for the six properties, above, if only the first four properties are considered. C.

Cotton Fibre: Relation of Properties to Strength of Tyre Cord. R. W. Webb. and H. B. Richardson. *U.S. Dept. Agric., War Food Admin., Office of Marketing Services, Prelim. Rept.*, 1945, 46 pages and 26 correlation diagrams. Abridged version in *Textile World*, 1945, **95**, No. 8, 121. Data are provided on the fibre properties of 377 American Upland cottons of known history and grown in duplicate, which were used for the production, by standard practice, of 23s/5/3 carded tyre cord. Multiple, simple and partial correlations of the data are used to determine the contribution of fibre properties, separately and in various combinations, towards the breaking load, elongation under a 10-lb. load, and elongation at break of the cords. A coefficient of multiple linear correlation of 0·920 is found for the relationship between cord strength and the group of six fibre properties—upper quartile length, coefficient of length variability, strength, fineness, percentage of mature fibre, and grade. These six properties account for 84·6 per cent. of the total variance of cord strength. Nearly the same degree of correlation was found for the single properties—fibre strength, fineness, coefficient of length variability and grade. Only fibre strength and fineness significantly influence the elongation of the cord under a 10-lb. load, but coefficient of length variability and grade also affect elongation at break. Each 1 per cent. increase in cord elongation under a 10-lb. load is accompanied by a reduction of 0·58 lb. in breaking load; a 1 per cent. elongation at break is associated with an increase of 0·08 lb. A small but significant negative correlation is shown between cord strength and elongation under 10-lb. load, and an insignificant positive correlation between cord strength and elongation at break. The coefficient for the correlation between the two elongations is +0·871. A coefficient of +0·897 is found for the correlation between cord strength and lea strength of the 23s single yarn spun with optimum twist factor and 80 per cent. of the variance in cord strength is accounted for by the strength of the singles yarn. In fact, an equation is given whereby the strength of the tyre cord can be predicted from the lea strength of the singles. C.

Cotton Neps: Relation to Variety, Location and Season of Growth. N. L. Pearson. *U.S. Dept. Agric. Tech. Bull.*, 1944, No. 878, pp. 18 (through *Plant Breeding Abstr.*, 1945, **15**, 254). Variety, location and season, and their interactions affected significantly the number of neps in cotton yarn. The effect of variety was greatest. Varietal differences in neppiness may be largely accounted for by heritable differences in fibre length and in fibre weight per inch. β-Coefficients show that fibre length is first in importance, with weight per inch almost as important. The percentage of thin-walled fibres by itself accounts for little of the varietal differences in neppiness. C.

Silk: Stability in Light. K. M. Markuze and S. N. Tyuremnova. *Shelk*, 1940, **10**, 18-20 (through *Chem. Zentr.*, 1941, II, 1697 and *Chem. Abstr.*, 1945, **39**, 3936[9]). Natural silk is very sensitive to light and in the presence of moisture and air is easily weakened by ultra-violet or visible sunlight. The tensile strength is reduced by 30 per cent. and the elongation by 40 per cent. of their original values on 20 days exposure to the summer sun. Various chemicals, dyes, etc., improve the retention of tensile strength. Effective treatments are with (1) tannin followed by tartar emetic, (2) thiourea followed by formaldehyde, and (3) ammonium thiocyanate, 10 gm. per litre. C.

United States Testing Company: History. *Rayon Textile Monthly*, 1945, **26**, 443-447. A brief resumé of the conditions existing in the silk industry in the early days of the 19th century is given, and the origin and the history of the United States Testing Company are fully related. The company now serves all fields of industry. It covers all types of tests on textiles (especially silk), chemicals, plastics, foods, insulation, acoustics, drugs, precision instruments, packaging, and many more. The main block of laboratories, at Hoboken, New Jersey, is a five-storied building (and basement), 256½ × 90 feet, with railway sidings. It is claimed that more raw silk has been stored here than in any other building in the world. C.

Glass Fibres: Strength. J. B. Murgatroyd. *J. Soc. Glass Tech.*, 1944, **28**, T368-388, T388-397 (through *British Abstr.*, 1945, B I, 293). I. *Elastic Properties.*—The Young's modulus and the modulus of rigidity of glass fibres decreased with decrease in fibre diameter, and the viscosity was markedly lower than that of the massive glass. The changes were most marked at diameters smaller than 0·04 mm. Heating the fibres to 400° C. increased the modulus of rigidity, but Young's modulus was increased only if the fibre was heated to about 520° C. The abnormally low viscosity of fibres was associated with a marked tendency to "permanent set" at temperatures as low as 100° C. The results suggest that the fibre-drawing process destroys the lateral bonds and leaves a long chain-orientated structure. The heat-treatment partly restores the lateral bonds and so stiffens the structure (increase of viscosity). II. *Effect of Heat-treatment on Strength.*—The breaking strain of a glass fibre was rapidly determined by bending it to an increasing degree between two anvils and measuring the radius of curvature of the elastica when failure occurred. The heat-treatment of the fibres for 30 minutes at 400° C. and at 520° C. reduced the tensile strength by 70 per cent. and 50 per cent., respectively. The distribution curves of the strength values are consistent with the random occurrence of flaws in the structure, and the frequency of occurrence appears to be increased by the heat-treatment. The great strength of glass fibres is due to a profound constitutional change in the glass, and it is improbable that only a surface layer of molecules is affected. C.

Karakul Sheep: Skin Texture Peculiarities. N. V. Popova. *C.R.* (*Dokl.*) *Acad. Sci., U.R.S.S.* 1944, N.S., **44**, 72-75. Breeders usually class Karakul sheep as delicate, robust and coarse, according to their external characteristics; every type of constitution is matched by a corresponding property of the skin and of the curl. The skin of the three types is examined microscopically to arrive at an objective analysis. Sections are embedded in celloidin-paraffin and stained with haematoxylin-eosin, and skin thickness, depth of location of hair bulbs and cross section of sebaceous glands measured. Skin thickness and depth of location of hair bulbs vary according to sex and constitution, the delicate and coarse types showing the greatest differences; the cross section of the sebaceous glands increases with coarseness of type. The historical differences of the skins of the three types are compared. Sex determines the structure and functions of the sweat glands, and also of the pigment present in the epidermis in spring. Seasonal variations of skin samples are also measured, these being noticeable in robust rams. W.

(B)—Yarns

Photo-electric Yarn Regularity Tester. United States Rubber Co. *Textile World*, 1945, **95**, No. 6, 139. A photograph is reproduced of a "yarn scanner" instrument in which yarn is run through one of two slits in front of photo-electric tubes that are illuminated from a common source. The other slit is adjusted to give a convenient zero reading on the electric registering device and the deflections reproduce the variations in the shadow cast by the yarn. The variations are registered on automatically-controlled charts. Calibration is against wires of known diameter. Fluctuations in diameter over half-inch lengths of yarn can be ascertained. C.

Tyre Cord: Fatigue Testing. L. Larrick. *Textile World*, 1945, **95**, No. 5, 107-109, 194-202. A description is given of a new model of a "Tension-Vibrator" machine for testing tyre cord in which a length of cord, under a load that is only a fraction of the breaking load, is suspended in a heated tube from a grip and subjected to simple harmonic vibration the frequency of which is 4-5 times the natural frequency of the system, and a record is obtained of temperature variations and the time of failure. Its application is illustrated by a series of tests on cotton and rayon tyre cords, which provide the following data:—(1) Average, median and range of the "fatigue life" of nine rayon cords, (2) Fatigue life of equally strong rayon and cotton cords when tested under different loads and at different temperatures, (3) Breaking load and fatigue life correlations for nine supplies of rayon cord, and (4) Effects of ageing on the breaking load and fatigue life of rayon and cotton cords. Because of inherent variability, it is calculated that for routine work tests should be made on 16 specimens for rayon and 32 for cotton, but for critical work these numbers should be doubled. The above and other test data are also expressed graphically and used in a discussion of (1) the effect of temperature, (2) the effect of the load, (3) a comparison of rayon and cotton, and (4) the nature of the fatigue test. C.

American Rayon Yarns: Deniers and Filament Numbers, September, 1945. H. R. Mauersberger. *Rayon Textile Monthly*, 1945, **26**, 448-450. Revised particulars are tabulated of the deniers, filament numbers and qualities of the ordinary, high-tenacity and hosiery yarns now offered by the American rayon producers. Changes since the publication of the previous table are discussed. C.

Colour Matching: Systematised. (1) G. E. Sheard, (2) W. M. Munro, (3) G. E. Sheard. (1) *Text. Mfr.*, 1945, **71**, 206-212, (2) *ibid.*, 295, (3) *ibid.*, 295-296. (1) Practical methods are suggested for the colour matching of worsted yarns by blending. A set of three colours is suggested which, with white and black, can be used to reproduce the majority of colours. A set of recipes for blending for particular customers is also suggested. The importance is stressed of a true north light, unmodified by reflection from coloured surfaces either within or without colour matching room. The necessary machinery for preparing the blend is described; this should be outside the colour matching room. The desirability of a uniformly graded range of greys is emphasised. A simple method of showing lack of uniformity in blending is described. In viewing, samples should match for two different methods, i.e., normal and tangential to the surface. (2) A letter pointing out the difficulty of determining how to correct errors in matching. (3) Reply, describing very briefly the methods of numerical specification of colour. [No method is suggested for determining the correction required from these measurements]. W.

(C)—FABRICS

Electric Strain Gauge: Application in Textile Measurements. H. Hindman and C. M. Kroak. *Textile Research J.*, 1945, **15**, 233-246. The principles and advantages of the bonded "metalectric" strain gauge are described and the effects of variable factors are considered. Three applications are reviewed, namely, an impact tensile test for yarn and fabrics, a slow-speed compression test, and a moisture regain test for samples of either loose fibre or fabric. The factors which must be considered in the selection of the proper component parts of the weighing and recording systems in order to use the methods of stress measurement to best advantage are discussed. C.

Photo-electric Recording Spectrophotometer: Applications. Harrison Johnston. *Textile World*, 1945, **95**, No. 5, 127-131, 182, 184. A simple account is given of the General Electric Co.'s photo-electric recording spectrophotometer and its applications in colour matching, standardising and specification, colorimetric analysis, and gloss measurement. C.

Rayon Lining Fabrics: Abrasion. W. J. Hamburger and H. N. Lee. *Rayon Textile Monthly*, 1945, **26**, 341-4, 385-8. The authors review the literature of the past 20 years on abrasion testing of textiles and select for their own investigations the Taber Abraser as testing instrument and graphs of abrasion cycles against per cent. reduction in breaking load as the means of expressing results. Typical results are recorded for (1) fabrics, 2 × 1 twills, 144 × 68, 150-den. bright yarns in warp and weft, (*a*) of Celanese and (*b*) of viscose rayon, and (2) the component yarns wound into panels on the Seriplane. (Other relevant particulars of the materials and conditions of test are recorded.) Comparisons are drawn between the two rayons at various degrees of abrasion. The appearance of the abraded filaments under the microscope is also described with the help of drawings of cross sections and the types of wear found in the abraded fabrics are analysed. C.

Wearing Apparel Fabrics: Inflammability Testing. F. Bonnet. *Rayon Textile Monthly*, 1945, **26**, 326-328. The writer describes recent attempts by the California Legislature and the U.S. House of Representatives to frame legislation governing the sale of dangerous clothing fabrics. The problem appears to have roused Congress because of the death of some small boys whose " cowboy " suits caught fire while they were at play round a brushwood fire. Apparently the " chaps " of the suits were covered with long-pile rayon fabric. The writer recalls the flannelette problem in England, which was the subject of a conference at the 8th International Conference of Applied Chemistry, in New York, 1912. An American committee has been formed to study the inflammability of textile fabrics and appears to have been able to prevent the passing of hasty legislation that includes an inflammability test. (The first draft of the Californian bill specified " material more highly inflammable than cotton cloth in its natural state ".) The committee has already approved of an apparatus and method of test. Details are given. C.

U.S. Government Specifications. *Bull. Natl. Assoc. Wool Manufacturers*, 1944, **74**, 304-486. Details are given of U.S. Army, Navy and Marine Corps specifications for wool and part-wool cloths and blankets, and of Federal specifications for wool bunting and textile testing methods. The latter cover determination of moisture content; fibre identification and quantitative determination; sizing, finishing and other non-fibrous materials in textiles; breaking strength, grab and strip methods; elongation; tearing strength; weight; cloth construction and dimensions; colour fastness; shrinkage in laundering and sponging; water and air permeability. W.

(D)—Other Materials

Cellulose Acetate and Cellulose Nitrate Sheet Plastics: Weathering. T. S. Lawton, Jr., and H. K. Nason. *Trans. Amer. Soc. Mech. Engrs.*, 1945, **67**, 259-266 (through *Chem. Abstr.*, 1945, **39**, 3967[9]). In outdoor exposure tests conducted in Florida and Massachusetts, it was found that considerable denitration of cellulose nitrate took place during weathering, but little deacetylation of the cellulose acetate. Loss of the plasticizer by evaporation and leaching caused an increase in the modulus of elasticity, but a decrease in the impact and tensile strength. Plasticizer loss in Florida was 33 per cent. in 6 months for cellulose nitrate, and 20 per cent. in 12 months for cellulose acetate. Both plastics released stress which was " frozen " in the sheet during fabrication, causing a reduction in surface quality. In water immersion tests cellulose nitrate was found to be more resistant to moisture than cellulose acetate. C.

Pulp: Yellowing. H. W. Giertz. *Svensk Papperstidn.*, 1945, **48**, 317-334 (through *Chem. Abstr.*, 1945, **39**, 3927[8]). Pulp samples were heated for 16 hours at 120° C. in a ventilated drying oven and the yellowing was determined by reflectance measurements. The discoloration of a bleached pulp cannot be traced to any decomposition product of lignin and the resins are only partly responsible. The main cause is the decomposition products formed during bleaching. Therefore, it is important to carry out the bleaching under as mild conditions as possible; chlorine peroxide is a suitable reagent, because no decomposition products are formed which would cause yellowing. Some of the wood polyoses of the hemicelluloses cause a pronounced yellowing effect. These polyoses are present in strong sulphite pulp, but rarely in washed soft sulphite pulps, and not in sulphate pulps. By fractionation of a strong sulphite pulp, the finest fraction (containing the mucilage and damaged short fibres) was found to contain the highest percentage of constituents having a yellowing tendency. The degradation products found during bleaching can be removed by an alkaline treatment; acidifying the pulp after bleaching will increase the yellowing tendency. C.

Sheet Cellulose Wrappings: Resistance to Aqueous Penetration; Temperature Factor. C. R. Oswin. *J. Soc. Chem. Ind.*, 1945, **64**, 224-225. A modified half-life equation for hygroscopic packages has been developed by which the enormous effect of temperature on the " life " of wrapped packages is brought out. It is based on the fact that the resistance of sheet cellulose to aqueous penetration varies roughly as the inverse square of the saturation vapour pressure of water at the temperature in question. The new equation offers a means of predicting package performance in actual use. C.

Moisture Meter for Curved Packages. Moisture Register Co. *Rayon Textile Monthly*, 1945, **26**, 488. A new moisture register, Model K-2, is shown for testing a wide variety of materials having curved, rough or flat surfaces. It incorporates a new type of electrode which maintains contact regardless of the contour of the material tested. C.

Power-Driven Stiffness Gauge. Taber Instrument Co. *Rayon Textile Monthly*, 1945, **26**, 487. A brief description is given of a new Taber V-5 power-driven stiffness gauge for standard measurements of the stiffness and resilient qualities of flexible materials up to ⅛ in. in thickness, such as laminated plastic, cardboard, light metallic sheet and wire. The instrument is portable, its operation is simple and it gives quick readings. C.

Paper: Vapour and Gas Permeability Determination. Institute of Paper Chemistry. *Paper Trade J.*, 1945, **121**, No. 13, p. 68, and *TAPPI*, 151-160. A bibliographical study is presented of methods and instruments for the determination of the water vapour and gas permeability of papers. C.

7—LAUNDERING AND DRY CLEANING

(A)—Cleaning

Sodium Soaps: Water-softening Characteristics. E. E. Ruff. *Oil & Soap*, 1945, **22**, 125-127 (through *British Abstr.*, 1945, B II, 273). The water-softening characteristics of some sodium soaps were measured by titrating artificial hard waters with soap solutions. Practical tests in a washing machine showed good correlation with the result of the titration method. The soap from soya-bean fatty acids seemed slightly more effective than the tallow soap, whilst 1½-2 times as much coconut oil soap as tallow soap was required, the amount increasing with the ratio of Mg:Ca hardness. From 3 to 8 times as much rosin soap as tallow soap was required, but, whilst all fatty acid soaps were most effective in water that owed all its hardness to Ca and least in Mg-hard water, the rosin soap was least effective in Ca-hard water. Calculations of the theoretical amount required to soften and to lather show that 37 per cent. and 55 per cent. excess of tallow soap and 300 per cent. and 85 per cent. excess of rosin were required to soften Ca-hard and Mg-hard water, respectively. The water-softening properties of tallow and rosin soaps are additive for mixtures containing up to 70 per cent. of rosin soap; above this proportion, however, more soap is required than when no tallow soap is present. The theoretical implications of the findings are discussed. C.

Stained Textiles: Cleaning. *Rayon Textile Monthly*, 1945, **26**, 486. A table (copied from *McCall's Magazine*) indicates suitable methods for the removal of various stains (22 types) from washable and non-washable materials. C.

Scorched Shirts: " Sunlamp " Bleaching. E. W. Beggs and A. Dusault. *Rayon Textile Monthly*, 1945, **26**, 451. The electric " Sunlamp " has been used successfully for the elimination of scorch marks in laundered white shirts. C.

Textile Fabrics: Safe Ironing Temperatures. Good Housekeeping Institute. *Rayon Textile Monthly*, 1945, **26**, 466. The following " safe " ironing temperatures have been ascertained in a test, particulars of which are given: Rayon (low) and nylon, 300° to 350° F.; rayon (high) and silk, 350° to 400° F.; lightly starched cottons, 400° to 450° F.; wool pressing, 450° to 500° F.; heavy cottons and linens, 500° to 550° F. C.

8—BUILDING AND ENGINEERING

(A)—Construction and Maintenance of Buildings and Plant

Cotton Mill Machine Shop: Organisation. T. O. Ott. *Textile World,* 1945, **95**, No. 5, 119-121. An account is given of the modernization of the machine shop attached to the Spartan Mills, S. Carolina. One feature is the use of a colour scheme for the walls, dado and frames, with dangerous moving parts in orange, fire plugs and switches in red, and motors in grey. The mill has 85,000 spindles and also a weaving department. The organisation of labour in the machine shop to meet the requirements is described and a sample of a work order on the shop is reproduced. C.

Electronic Devices: Textile Applications. H. E. Reed. *Textile World,* 1945, **95**, No. 7, 83-90. After explaining the principles of electron tubes, with the aid of diagrams, the author describes a survey of their textile applications in 796 mills employing more than 1,400,000 people and having already in use 16,800 electronic devices. These applications are analysed into control, counting and inspection, safety, and regulation, and sub-divided into such items as door-opening, humidity control, colour matching, speed regulation, weft straightening, etc. The relative interest in electronic devices for these purposes is shown in histograms of the percentages of replies collected in the inquiry. Illustrations are given of typical applications. Three full pages are devoted to a chart indicating actual and potential applications in the cotton, wool, rayon and knitting industries. C.

Glass Blocks: Applications in Building Construction. J. W. Taylor. *Textile World,* 1945, **95**, No. 7, 117, 119, 198, 202. An illustrated account is given of the use of glass blocks instead of conventional windows at the bleachery and dyehouse of the Ware Shoals Manufacturing Co. Steel framed windows required replacement every 6 or 8 years and wood frames (in the weaving room) at the end of seven years, and the glazier was always at work on repairs. Hollow glass blocks have proved efficient and economical, and the outside temperature has to fall much lower than was the case with sash windows before moisture condenses on the inside surface. Ventilators are fitted at eye level to provide outlook for the workpeople. Above eye level the blocks are shaped to throw the light into the room; below eye level they are of an anti-glare type. C.

Magnesium and Stainless Steel: Application in Textile Machinery and Equipment. H. Miedendorp. *Rayon Textile Monthly,* 1945, **26**, 401-402. The possible use of magnesium in textile machinery is briefly discussed, and illustrations are given of a sample dyeing machine, a laundry truck, and a fully-enclosed dyeing machine fabricated in stainless steel. C.

Metallised Plastics: Electroplating. H. Narcus. *Electrochemical Soc. Preprint,* 1945, **88**, No. 5. The uses and advantages of metallised plastics are discussed. Plating increases the resistance to weather, the tensile, impact and flexural strengths, and resistance to abrasion and distortion under heat. The metallic deposit has a greater corrosion resistance when it is applied to a plastic than to the usual metallic base. The chemical reduction method for the metallisation of plastics is compared with other methods. The operation involves the roughening, cleaning and " sensitizing " of the plastic surface and the application of a conductive and adherent bond coat of metallic silver, by reducing an ammoniacal silver nitrate solution, followed by the electrodeposition of an intermediate layer of copper and finally a top layer of the desired metal, such as Cr, Zn, Fe, Pb, Ni, Au, Ag or Cd. The thickness of the silver films can be determined by the direct or " weight " method, or the optical or " ring " method, which are both described. C.

Vinyl Plastics: Electrodeposition. M. Feinleib. *Electrochemical Soc. Preprint,* 1945, **88**, No. 6, 47-58. Research has been carried out on the possibility of obtaining, by electrophoresis of the vinyl group of plastics in non-aqueous suspensions, removable plastic films suitable for direct use. Experiments with vinylite, vinyl chloride, vinylidene chloride, and polyethylene are described. The effects of the type of plastic, solvent and precipitant, anode materials, concentration of suspensions, bath temperature, and other variables have been investigated. C.

Termites: Protecting Timber against —. G. N. Wolcott. *Caribbean Forester,* 1945, **6**, 245-256 (through *Chem. Abstr.,* 1945, **39**, 3894[5]). Wood samples impregnated with the following agents, in the concentrations given, were not eaten by West Indian termites even one year after treatment: Cu pentachlorophenoxide 0·2 per cent., Na pentachlorophenoxide 0·5 per cent., hexachlorophenol 2 per cent., pentachlorophenol, pentabromophenol, DDT insecticide, Cd, Cu or Hg cyclopentanepropionate ("Nuodex" D-22, 23 or 26), 2:4-dichlorophenoxyacetic acid, tetrabromophenol 5 per cent., and 2-chloro-*o*-phenylphenol. A large number of less effective agents are also named. C.

Aluminium Corrosion Inhibitors. G. G. Eldredge and R. B. Mears. *Ind. Eng. Chem.,* 1945, **37**, 736-741. Published information on the inhibition of the attack of aluminium is reviewed and is supplemented by data from tests by the authors. Inhibitors for aluminium behave differently in various acids. Tables are given listing chemicals of the types found to be effective inhibitors of corrosion in hydrochloric acid, and showing the effectiveness of chromic acid inhibitor in phosphoric acid. No inhibitors are needed in nitric acid, and no effective inhibitors for aluminium in sulphuric acid are known. In alkali hydroxides no satisfactory inhibitors for aluminium are known, but silicates are very effective in alkaline carbonate and phosphate solutions. Chromates, silicates, and soluble oils are useful for waters containing small amounts of salts, In brines sodium chromate is generally used, where it functions by increasing the anodic polarisation. The inhibition of the galvanic corrosion of aluminium in contact with copper in brine was studied and the test data are tabulated. Inhibitors used in alcohol and polyalcohol solutions, in insulating materials and petrol tanks are also discussed. Water may be an inhibitor of corrosion in some nearly anhydrous organic chemicals. There are 52 references. C.

Chromate Corrosion Inhibitors: Application for Bimetallic Systems. M. Darrin. *Ind. Eng. Chem.,* 1945, **37**, 741-749. When dissimilar metals are in contact in an aqueous medium, the corrosion of one of them is accelerated, but chromate acts as an inhibitor by anodic polarisation. The effects of time of exposure, temperature, aeration, submergence of panels, initial *p*H, silicate, and chromate concentration in the corrosion of various bimetallic systems, are discussed. Data include corrosion scores, weight loss, depth and type of pits, changes in *p*H, and chromate consumption. Practical applications are described for air conditioning systems, refrigeration brines, automobile systems, Diesel engines, power rectifiers, and other circulating and quiescent systems. C.

Corrosion Inhibitors: Fundamental Principles. U. R. Evans. *Ind. Eng. Chem.,* 1945, **37**, 703-705. The same substance may promote or inhibit corrosion according to circumstances. If the immediate corrosion product is sparingly soluble it may stifle further attack. If, however, only a secondary product is sparingly soluble, the attack will usually continue. Since most dangerous corrosion processes follow an electrochemical mechanism, in order to stifle further attack substances must be chosen that will yield a sparingly soluble anodic or cathodic body. These anodic and cathodic inhibitors are discussed and it appears that, in general, anodic inhibitors are efficient but dangerous, whilst cathodic inhibitors are inefficient but safe, in that no intensification of attack should result from an insufficient amount of inhibitor. Several examples of both types of inhibitor are given. C.

Phosphate Corrosion Inhibitors: Efficiency Tests. G. B. Hatch and O. Rice. *Ind. Eng. Chem.,* 1945, **37**, 752-759. Laboratory tests of the effect of flow velocity upon the corrosion rate in the presence of an inhibitor were made at various flow velocities with steel tubing, both with raw and Calgon-treated waters. Two types of batch tests, designed to ensure agitation, have been investigated and found to yield results subject to the same interpretations as those obtained from continuous flow tests. The effects of agitation, alternate motion and stagnation, temperature, bimetallic couples, brines and inhibitor reactions upon the inhibition of corrosion by a glassy phosphate have been determined by batch tests. In all of them, weight loss was employed as the means for evaluating corrosion. C.

Sodium Nitrite Corrosion Inhibitor: Application. A. Wachter. *Ind. Eng. Chem.,* 1945, **37**, 749-751. Sodium nitrite is a highly effective corrosion inhibitor capable of preventing corrosion of steel by water and oxygen under many conditions. Maximum effectiveness is generally achieved in alkaline solutions. Tables are given showing the effects of nitrite with rusted steel and with different ferrous and non-ferrous metals. Sodium nitrite effectively inhibits corrosion of steel and also tends to protect other metals in aqueous alcohol solutions. C.

Sodium Silicate Corrosion Inhibitors: Application. W. Stericker. *Ind. Eng. Chem.*, 1945, **37**, 716-720. The life of piping and plumbing fixtures can be greatly increased by the addition of small amounts of sodium silicates to the water passing through them. Hot water can be treated by by-passing a small part of it through a tank containing water glass ($Na_2O:3.3\ SiO_2$). Various methods may be used to feed sodium silicate solutions to cold water. The use of silicate solutions is of value in laundries using zeolite-softened water. The silicate process can be used in much longer piping systems than was reported previously. Laboratory and field tests are compared and examples of discrepancies are given. The present status of the sodium silicate treatment is briefly summarized. C.

Steel/Nickel Unions: Inhibition of Galvanic Corrosion; Effects of Chromate and Lime. H. R. Copson. *Ind. Eng. Chem.*, 1945, **37**, 721-723. Galvanic corrosion tests were made on steel coupled to nickel in tap water. With a 3 to 1 area ratio of nickel to steel the galvanic corrosion was not excessive. The addition of 300 parts per million of sodium chromate to the water effectively inhibited corrosion, provided the steel was rubbed once in a while to prevent pitting. Lime did not seem suitable as the inhibitng agent; although it cut down the total galvanic effects, it also localised corrosion, part of the steel becoming passive and the rest being attacked at an excessive rate. C.

Zinc, Manganese and Chromic Salt Corrosion Inhibitors: Application. R. S. Thornhill. *Ing. Eng. Chem.*, 1945, **37**, 706-708. Experiments on the addition of Zn, Cr, and Mn salts to Cambridge tap water indicate that Zn and Mn reduce the corrosion to about 20-30 per cent. Whilst Zn sulphate provides the more efficient inhibition, its use is associated with excessive penetration along the water line; Mn sulphate is free from this defect. Chromic salts are not inhibitive except at low concentrations. Zinc and chromic salts must, in some circumstances, be regarded as dangerous inhibitors. C.

Plastics: Properties and Application in Chemical Industry. E. H. G. Sargent. *Industrial Chemist*, 1945, **21**, 521-525. Some newer commercial plastic materials, such as asbestos resins, glass laminates and fabric reinforced laminates, are reviewed and their properties are tabulated. Polyvinyl chloride and polyvinyl acetate are rapidly becoming important in chemical industry. Polyvinyl chloride is used mainly for flexible and hard tubing. Trials with polyethylene and various foamed resins are also reported. Low heat resistance and low modulus of elasticity are the chief disadvantages common to most plastics. C.

(C)—Steam Raising and Power Supply

Boiler Flue Cleaning Plants: Installation and Advantages. R. P. Nuki. *Textile Weekly*, 1945, **36**, 560-4, 602-4. The writer gives typical figures for the heat losses due to soot and dust accumulation in Lancashire boilers, and describes (1) a typical combined blower and suction plant, and (2) a simple blower plant for cleaning flues. C.

Industrial Furnaces: Heat Balance. C. S. Darling. *Mech. World*, 1945, **118**, 235-7, 247-8. An examination of the status of rejected heat from furnace walls and other sources, and its value in terms of heat input, and also how this value is reflected in the auxiliary heat rejections. La.

Heating Appliances: Thermal Efficiency. M. W. Thring and J. W. Reber. *Mech. World*, 1945, **118**, 479-81. The article is based on a paper read to the Institute of Fuel and gives details of a new theory which explains how improved thermal efficiency can be obtained from boilers by increasing heat transfer rates or from furnaces by reducing wall sizes. Formulæ are given which enable probable performance curves of a system to be calculated. La.

Coal and the Engineer. I and II. D. Scorer. *Steam Engr.*, 1945, **15**, 3-5, 44-6. Figures on the output, usage and waste. La.

Power Factor and Energy Loss. I and II. C. S. Darling. *Steam Engr.*, 1945, **15**, 22-25, 61-63. The effect of the improvement of power factor on fuel economy. La.

Low Grade Fuels: Mechanical Stokers and other Systems. B. M. Thornton. *Steam Engr.*, 1945, **15**, (168), 376-8. Experiences with war-time fuels, followed by a discussion on properties of low grade fuels. La.

Steam Engines: Lubrication. VI. E. V. Paterson. *Steam Engr.*, 1945, **15**, (168), 367-370, 378. Notes on pressure-fed circulation systems for totally enclosed vertical and Uniflow engines. La.

Boiler Furnace Tube Walls: External Corrosion. " Observer." *Steam Engr.*, 1945, **15**, (169), 9-12. An account of the extensive co-operative investigation of the subject carried out by the U.S. Bureau of Mines and the Combustion Engineering Co., of New York. La.

Boiler House Instruments: Automatic Control. A. L. Hancock. *Steam Engr.*, 1945, **15**, (170), 52-57. Factors relating to plant, adjustments, plus diagrams and a discussion for and against instruments. La.

(D)—Power Transmission

Power Transmission Systems: Selection. H. Miedendorp. *Rayon Textile Monthly*, 1945, **26**, 357-360. A broad review of modern methods for securing smooth power transmission, under the headings (1) motors, (2) group drives, (3) unit drives, and (4) belts, gears, chains, etc. Recommended drives with flat belts for motors from 1 to 40 h.p., each over a range of speeds, are shown in a table. Multiple V-belt drives and variable-pitch sheaves are also discussed and the considerations affecting the choice of flat or V-belts are indicated. C

Cotton Mills: Electrification. R. H. Harral and J. B. Ashworth (Blackburn Electricity Department). *Electrical Review*, 1945, **137**, 579-583. A special study has been made of the problem of electrifying cotton mills. The advantages presented by electrification, financial saving and improved efficiency, are pointed out. A typical entry from a register of installations is reproduced. Electricity tariffs are considered and the installation of group drives in weaving sheds is discussed. Recent progress in the lighting of mills is described. C.

Textile Mill: Electrification. F. J. Stevenson. *Textile Weekly*, 1945, **36**, 640-646. A report of a lecture on the cost aspects of utilising public electricity supplies for driving, heating and lighting in a textile mill under modern economic conditions. C.

Textile Mill Power, Lighting and Heating Equipment: Developments. H. Miedendorp. *Rayon Textile Monthly*, 1945, **26**, 467-471. Modern equipment and methods for ensuring lower costs and better textiles are reviewed. The importance of automatic control of machinery and processes is stressed. New electronic applications, improvements in power transmission, and new multiple V-belt drives are discussed. Progress in lubrication is reported in many mills. The use of self-sealed bearings has been extended. The lighting problem is discussed. Methods for water purification and softening are described. Infrared drying and automatic conveying are also reviewed. C.

Textile Mills: Use of Electric Motors. G. H. Brook. *Wool Rec.*, 1945, **68**, 494-498. Data compiled from 50 recent woollen mill conversions from steam to electric power showed that it is now cheaper to run by motors; in one case, the annual saving on fuel paid for the total conversion in under 8 years. Grid supply is cheaper than private generation, except when process steam plays a major part. In 26 recent conversions the average proportions of total costs were 43 per cent. for motors and switchgear, 26 per cent. for millwrighting and 31 per cent. for wiring and installation. The approximate number of units/hr. consumed for each 100 h.p. installed (test figures) were rag grinding, 50, teasing and willeying, 40, carding, 65/75, mule spinning, 40/45, ring spinning, 65/70, twisting, 60/65, weaving (group), 50, weaving (individual), 35, milling, 60, finishing, 25/30 and dyeing, 30. Individual driving of looms has been successfully used for a number of years; individual driving of mules is now possible, using a motor with a speed fluctuating in accordance with the variable load of the mule; spinning frames can be either group or individually driven, the ' Textart ' rotor having been developed to give a smooth accelerating torque, starting the frame without jerk; carding sets, and machinery for rag grinding, milling, scouring and finishing are usually group-driven; no generalisation can be made about tentering machines. In all cases each conversion must be considered individually. W.

Engineering Units: Systems Compared. G. W. Stubbings. *Mech. World*, 1945, **118**, 459-60. The engineers' gravitational system is open to serious objection from the scientific point of view since it is based on force, length and time while the C.G.S. system is based on mass, length and time. The practical drawback of the C.G.S. system is that the dynamical derived units are so exceedingly small. The M.K.S. system prepared some years ago by Giorgi overcomes this difficulty since in this system the unit of mass is the kilogram, of length the metre, and of time, the record. The name proposed for the unit of force—that which applied to a mass of 1 kilogram gives it an acceleration of 1 metre per second per second—is the "newton". Dynamically one "newton" acting through one metre is equivalent to one joule of work and one "newton" per second is the equivalent of one watt of power. La.

(E)—Transport

Laundry and Dye-house Hoists. A. G. Arend. *Textile Weekly*, 1945, **36**, 606-612. A general account is given of recent developments in the type of light hoisting equipment that is suitable for handling the relatively small loads in a power laundry or dye-house. C.

(F)—Lighting

Cotton Mill: Lighting. J. B. Ashworth. *Textile Weekly*, 1945, **36**, 734-742. A report of a lecture giving a useful survey of problems to be considered in selecting a lighting system for a cotton mill, including notes on intensities suitable for various operations and the advantages and disadvantages of fluorescent lamps. C.

(G)—Heating, Ventilation and Humidification

"Dustex" Tubular Fabric Dust Collector. Dust Filter Co., Chicago. *Rayon Textile Monthly*, 1945, **26**, 363. An illustration is given of a portable dust extractor made in units from 36 to 48 inches high and weighing 150 to 250 lb. The air current is maintained by 3-phase, 60-cycle A.C. motors, $\frac{3}{4}$ to $1\frac{1}{2}$ h.p. The filter surfaces are bottomless tubes of fire-proofed fabric and the largest unit is said to present 60·8 sq. ft. of filtering surface. The tubes are shaken periodically by hand and the dust collects in a pan at the bottom of the unit. The filtered air is discharged through a sound-deadening muffler. C.

Electrostatic Dust Precipitation Devices: Principles and Efficiency. L. R. Koller. *Gen. Electr. Rev.*, 1945, **48**, 13-15. The basic theory of electrostatic precipitation is outlined. A simple nomographic method of calculating the efficiency of the precipitation is described. A nomogram is given that applies to the cylindrical type of precipitation only, but a similar equation with different geometrical constants would cover the problem of a flat-plate device. C.

Tyre Cord Mill: Atmospheric Control. W. E. Vecsey. *Textile World*, 1945, **95**, No. 8, 123, 192. A suitable humidity in a tyre cord plant is 60 per cent., compared with 75 per cent. for a sheeting mill and tyre cord should have a low moisture regain (5-$5\frac{1}{2}$ per cent.) for ease of working in the tyre mill. An automatically-controlled evaporative cooling system is described which has been installed in the Aldora Mills, Georgia. It maintains the following conditions:—

	Dry bulb, °F.	Wet bulb, °F.	R.H. %
Forming twister room	80	71	65
Cotton cable twister room	84	76	73
Rayon beam twister room	87	68	55
Rayon cable twister room	87	68	55
Spinning room	84	75	65

Ventilating Fans: Selection. R. H. Holbeche. *Osram Bulletin*, 1945, **22**, 54-60. The types of propeller and centrifugal fans employed for ventilation are reviewed and the selection of fans for different purposes is discussed. C.

Factories: Ventilation. W. N. Witheridge. *Heating, Piping & Air Conditioning*, 1944, **16**, 712-717 (through *Bull. Hygiene*, 1945, **20**, 476). Many common causes of failure or waste in industrial ventilating equipment are listed. These include inadequate air supply for an exhaust system; short-circuiting of a ventilating fan or hood by the effect of a window or other opening (a very common fault); bad placing of exhaust-hoods; use of general ventilation when local exhaust would cause much less waste of heat; reversal of centrifugal fans. There is urgent need for a more intimate relationship between heating and ventilating engineers and public health and industrial hygiene engineers. C.

Rotating Fans and Pumps: Development of Flow Boundary Layers. J. M. Burgers. *Proc. Kon. Ned. Akad. Wet.*, 1941, **44**, 13-25. Some problems which arise in the study of the boundary layers formed in various parts of rotating pumps or ventilators are considered, in particular the influence of the centrifugal forces upon the flow in such boundary layers. First equations are derived for the flow in the boundary layer developing along a surface of revolution, it being assumed that the motion is wholly symmetrical with respect to the axis of rotation. Then those parts of hydrodynamic or aerodynamic machinery are considered where the field, owing to the presence of the blades, no longer possesses perfect rotational symmetry. In general there will be a tendency towards a centrifugal flow of the fluid in the boundary layers along the blades, a marked one at the upper sides and a less significant one at the under sides. C.

Mixture of Air and Water Vapour for Atmospheric Conditions: Characteristic Data. "Polytrope." *Mech. World,* 1945, **118**, 547-52, 591-3. Part I gives a set of curves showing:—(1) Glaisher factor for determining the dew point temperature from wet and dry bulb readings. (2) Absolute pressure of saturated steam at various temperatures. (3) Relation between depression in wet bulb temperature, dry bulb temperature and the relative humidity. (4) Specific weight of water vapour relative to dry air. (5) Gas constant for saturated steam at various temperatures. (6) Water vapour content of air per lb. and (7) per cubic foot. (8) Water vapour in lb. in humid air. (9) Ratio of degree of saturation to relative humidity. (10) Relation of relative humidity to degree of saturation. Part II has another series of charts showing:—(1) Specific weight of mixtures of air and water vapour at various relative humidities. (2) Total heat of air and water vapour at various degrees of saturation and temperature. (3) Psychrometric chart 30° F. to 110° F. La.

(H)—Water Purification

Water Systems: Corrosion Control by Threshold Treatment. G. B. Hatch and O. Rice. *Ind. Eng. Chem.*, 1945, **37**, 710-715. Threshold treatment, the dosage of water with very low concentrations of the molecularly dehydrated phosphates, offers a means for the control of corrosion, and the deposition of calcium carbonate and iron oxide. The concentration of the glassy phosphate, Calgon, required for maximum inhibition of calcium carbonate scale is 2 p.p.m. To prevent the precipitation of hydrous ferric oxide the glassy phosphate must be added to the iron-bearing water prior to exposure of the water to air or chlorine. A weight ratio of Calgon to iron of 2 to 1 is generally required for the stabilisation. As a means for corrosion protection threshold treatment leads to the formation of a thin adsorbed film of the glassy phosphate or of one of its complexes on the metal surfaces. The rate of formation of the protective film is a function of the rate of supply of the glassy phosphate to the metal surface. Several applications of threshold treatment which indicate the scope of the treatment are considered. C.

(I)—Waste Disposal

Kier Liquor Waste: Chemical Precipitation. R. Porges, R. K. Horton and H. B. Gotaas. *Sewage Works J.*, 1942, **14**, 685 (through *Water Pollution Research Summ. Curr. Lit.*, 1944, **17**, 218-219). Experiments on the coagulation of waste kier liquor have been carried out in a pilot plant with aluminium sulphate, ferrous sulphate, calcium chloride, and aluminium sulphate and lime. Further studies on the re-use of sludge have been made on a laboratory scale. The results of the tests indicated that with ferrous sulphate or aluminium sulphate, when slightly less than the optimum of coagulant was used, the addition of returned sludge gave results which were almost as good as those obtained with optimum amounts of coagulants alone. C.

Laundry Wastes: Characteristics and Disposal. H. W. Gehm. *Sewage Works J.*, 1944, **16**, 571 (through *Water Pollution Research Summ. Curr. Lit.*, 1944, **17**, 215-218). Typical waste waters from commercial laundries and from domestic laundering were analysed for total solids, total alkalinity, volatile matter and ash in total solids, biological oxygen demand, and grease. From a short literature review on the treatment of laundry waste waters the conclusion is drawn that the most economical chemical method for treatment of laundry wastes is by acidification with sulphuric acid or carbon dioxide and coagulation with alum or ferric sulphate. Series of tests were carried out on coagulation in order to produce sludge which settles rapidly and compacts well. C.

Wool Alcohols in Official Ointments. I. Michaels. *Chemist and Druggist*, 1945, **143**, 200-202 (through *Chem. Abs.*, 1945, **39**, 2378). A discussion with six formulæ. W.

PATENTS

Water: Lime Treatment. Permutit Co. Ltd., W. G. Prescott, E. I. Akeroyd and E. L. Holmes. B.P.571,929 of 12/11/1943:14/9/1945. This is a process for softening water by means of lime, with or without soda, in which the water is caused to flow upwards through a mass of particles or granules consisting of or coated with calcium carbonate at a speed high enough to maintain the mass in suspension, characterised in that in order to increase the amount of the calcium carbonate which crystallises from the water on the particle or granules a small amount of a compound which on dissolving in the water introduces PO_4 ions into the water is added to the water not later than the lime or lime and soda. The added compound may be an alkali or ammonium orthophosphate. La.

Sterols: Isolation from Fats and Oils. L. Yoder, Assr. to Iowa State Coll. Res. Foundation. U.S.P.2,322,906 of 29/6/1943 (through *Brit. Chem. Abs.*, 1945, BII, 221). Wool grease is saponified, the unsaponifiable matter separated and then dissolved in a non-alcoholic solvent, e.g. ethylene dichloride or acetone, the solution treated with an anhydrous acid free from oxygen, e.g. a hydrogen halide, at 5-20°, and the precipitated sterol-hydrogen halide additive product, containing one reactive ethylene linkage in the hydrophenanthrene nucleus, separated and treated with alkali to give the sterol, e.g. cholesterol. W.

Sterols: Isolation and Purification. L. Yoder (to Iowa State Coll. Res. Foundation. U.S.P.2,362,605 of 14/11/1944 (through *Chem. Abs.*, 1945, **39**, 2849). Sterols having a single double bond in the hydrophenanthrene nucleus are precipitated as oxalates, the precipitate is separated and the sterol isolated from it. For effective precipitation the sterol should be in the form of a free alcohol. In substances where these sterols are present as esters, the esters are first hydrolysed to liberate the free alcohols. The substance containing the sterols is dissolved in an anhydrous solvent, preferably ethylene chloride. The precipitation is carried out with anhydrous oxalic acid at 60-70°. The precipitation is filtered off after cooling the reaction mixture to room temperature. The crystalline sterol-oxalic acid addition product is decomposed either in water or alcohol. The pure sterol is then filtered off and the oxalic acid recovered for re-use. W.

9—PURE SCIENCE

Nomograms. J. W. Ashley. *Mech. World*, 1945, **118**, 488-492, 531-535. Full instructions are given to enable nomograms to be constructed to solve equations of the following types:—(I) $x+y=w$, (II) $w=\frac{x}{y}$, (III) $\frac{x}{y}=\frac{v}{w}$, (IV) $x+y=\frac{v}{w}$ (V) $x+y.f(w)=g(w)$, (VI) $\frac{1}{v}+\frac{1}{y}=\frac{1}{w}$ La.

Elastic Structures: Tensorial Analysis and Equivalent Circuits. G. Kron. *J. Franklin Inst.*, 1944, **238**, 399-442. The electrical analogy is extended to mechanical structures in which each member has six degrees of freedom. Equivalent circuits are developed for one-, two-, and three-dimensional elastic structures that enable their solutions by means of a Network Analyser under steady small deformation and under forced or natural vibration. The elastic structure is assumed to consist of long, thin beams and rigid bodies having different elastic coefficients (tension and shear, bending and twist) along three perpendicular directions and interconnected into an arbitrary network either rigidly or by various constraints (pin joints, hinges, rollers, etc.) in any combination. For the approximate numerical solution of structures Southwell's relaxation method is given, and for their exact solution a tensorial method is presented. Both methods employ matrices to systematise and hasten the calculations. C.

Elastic Structures: Network Analyser Solution of the Equivalent Circuits. G. K. Carter and G. Kron. *J. Franklin Inst.*, 1944, **238**, 443-452. The equivalent circuits of elastic structures developed above (preceding *abstract*) are numerically checked for two known frames. Both structures are also measured on the A-C Network Analyser for the case of known impressed forces. In each case the measured values checked very satisfactorily with the calculated values, showing that existing analysers can be used to good advantage to determine the forces and displacements in statically indeterminate structures. C.

Elastic Systems: Deflection; Approximation to the Influence Function. E. Saibel. *J. Franklin Inst.*, 1942, **234**, 535-547. A method is presented for obtaining directly approximate numerical values of Green's influence function—i.e. the function which expresses the deflection of an elastic system at any point due to a unit load at any other point—at a number of points from the differential equation and the boundary conditions, without having to integrate the differential equation. It is a method based on finite differences. It can be applied to many specific problems for which no exact solution is known. Such problems as bodies with non-uniform mass or stiffness, or bodies subject to complicated boundary conditions are amenable to this treatment C.

Free Pseudo-linear Oscillatory Systems: Periodic Processes. B. V. Bulgakov. *J. Franklin Inst.*, 1943, **235**, 591-616. The paper deals with a mechanical or an electrical system with many degrees of freedom governed by pseudo-linear differential equations. On the basis of Poincaré's theory (1892), periodic solutions representing an important type of steady oscillations are obtained. These solutions are then applied to explain the self-excited oscillations of the follow-up systems. C.

Metals: True Stress-Strain Tension Test. C. W. MacGregor. *J. Franklin Inst.*, 1944, **238**, 111-135, 159-176. A discussion is given of the true strain values used in the tension test, the different methods available for determining true stress/strain curves, the true stress/strain curves resulting from these methods, the ductility values based on true strain, and of the effects of various mechanical conditions on true stress and strain values such as high and low testing temperatures, the speed of testing and the proportions of the test bar. The effects of different metallurgical conditions on the true stress/strain properties are described, such as the effects of heat treatment, alloying additions, cold-work, over-heating, and directional properties. In addition, the rôle of this form of tension test in modern materials testing is discussed, especially as to its use in connection with the metal forming processes, notched-beam impact tests, fatigue tests, notch-effect tests, and combined stress tests. C.

Non-linear Springs: Forced Vibrations. C. R. Wylie, Jr. *J. Franklin Inst.*, 1943, **236**, 273-284. A quantitative study is presented of the problem of determining the amplitude of the forced vibrations of non-linear springs. Several methods of approximate solution in relation to accurate solutions obtained by numerical integration are compared. One of these methods, which seems to be of rather wide applicability to problems formulated in terms of non-linear differential equations, or differential equations with periodic coefficients, is found to be of high accuracy over most of the range of the parameters of the problem, and admits of a simple graphical representation. This is given in the form of a pair of nomograms which constitute a reasonably complete numerical solution of the problem. C.

Static Friction: Nature. W. Claypoole and D. B. Cook. *J. Franklin Inst.*, 1942, **233**, 453-463. The factors concerned in friction are discussed and the limitations of the approaches of various previous investigators are reviewed. Emphasis is now placed on the mechanism of static friction. First the probable behaviour of simple hypothetical systems having ideal surfaces is considered, and then the discussion is related to conditions in the best obtainable practical situation, in an attempt to find what changes may be expected when a specified departure occurs from the conditions of the ideal model. C.

Stress-Strain-Time Relation: Generalisation. P. G. Nutting. *J. Franklin Inst.*, 1943, **235**, 513-524. A general formula (Nutting, 1921), representing strain as a simple exponential function of time and stress, is reviewed and discussed in the light of its application in research on such materials as paints, plastics, asphalts and food products. C.

Thin-walled Structures: Bending, Torsion and Buckling Theory. S. P. Timoshenko. *J. Franklin Inst.*, 1945, **239**, 201-219, 249-268, 343-361. Deformation and instability of widely used thin-walled members of open cross section have been studied. The bending has been analysed and the notion of "shear centre" established. By the use of Maxwell's reciprocal theorem the problems of pure torsion and non-uniform torsion have been approached and the identity of shear centre and "centre of twist" has been established. After the discussion of combined bending and torsion, instability problems are taken up. Torsional buckling and lateral buckling of beams has been studied and the stability of thin-walled members under bending and compression is discussed. In this way a considerable simplification in presentation of the theory of thin-walled structures is obtained and some clarification of the phenomenon of torsional buckling is accomplished. C.

Air Flow Analysis Equipment. N. F. Barnes and S. L. Bellinger. *J. Optical Soc. America*, 1945, **35**, 497-509. The operation of the schlieren method is described and the various schlieren systems—lens, single mirror and twin mirror—their different arrangements and applications are discussed. The shadowgraph method and its uses are outlined. A bibliography of 127 references is added. C.

Fluids: Flow; Reaction of Fluids and Fluid Jets. R. Eksergian. *J. Franklin Inst.*, 1944, **237**, 385-410. Some simple principles are applied to fluid flow problems with special emphasis on methods of analysis for the reactions on constraining channels, both stationary and moving. Consideration is given to the energy relations involved in such fluid systems. The subject is of particular interest in connection with jet propulsion and in the dynamical relations of moving blade systems with expanding fluids. C.

Electron Microscopy: Modern Developments. R. G. Picard. *J. Franklin Inst.*, 1945, **239**, 421-436. The resolving powers of light and electron microscopes are compared and the Universal and Console Electron Microscopes are discussed. A new high-speed microtome, the "cyclone knife" microtome, for cutting ultra-thin sections is described and a specimen staining technique based upon atomic weight and a replica technique are outlined. Reference is made to stereoscopy and to the use of the electron microscope as a diffraction camera. C.

Ultra-violet and Electron Microscopes: Development. R. E. Seidel and M. Elizabeth Winter. *J. Franklin Inst.*, 1944, **237**, 103-130. New types of microscopes and their principles of construction and of illumination are discussed. The electron-microscope is described. The resolution and magnification of ordinary microscopes are reviewed, and it is shown how the theoretical limits of resolution and visibility have been reduced in the Graton-Dane microscope and how further improvements have been achieved in Rife's "Universal Microscope" (ultra-violet and quartz) and his smaller microscopes. There are 83 references. C.

Systems Containing Varied Amounts of a Volatile Component: X-Ray Examination. S. S. Marsden, Jr. *Rev. Sci. Instruments*, 1945, **16**, 192-193. It is often desirable to follow the effects of changing the amount of a solvent in a material without removing the specimen from the X-ray apparatus. A method is described in which such systems may be prepared and studied in evacuated soft glass capillaries containing a known initial amount of the volatile components. X-ray photographs are taken of the system (solid with liquid or with liquid crystal) in one end of the capillary while the vapour pressure is controlled by a cooling mixture surrounding the other end of the capillary. With some modifications the procedure can be adapted for the study of hydrates of various compounds at different vapour pressures, for systems in which the liquid component is an organic compound, and for systems in which the ratios of the various constituents are important, such as certain gels, jellies, and sols, particularly soaps. C.

Cinema Integraph: Application in Differentiation. C. L. Pekeris and W. T. White. *J. Franklin Inst.*, 1942, **234**, 17-29. A method is described by which the cinema integraph can be adapted to perform differentiation. The method is based on the realization that standard methods of numerical differentiation of a function $f(x)$ at $x=x_0$ consist essentially in the summation of the values of $f(x)$ in the neighbourhood of x_0 after these values have been multiplied by suitable weighting factors. Continuous weighting functions for central differentiation and for forward or backward differentiation are derived and the manipulation of the cinema integraph for differentiation is described with examples. C.

Graphical Integration: Technique. Ll. H. Donnell. *J. Franklin Inst.*, 1942, **223**, 331-348. Methods of graphical integration are described which are applicable to ordinary differential equations of the first order and may sometimes be applied to equations of higher order. "Equal slope lines" are first plotted that conform with equations obtained by substituting tan $n\theta$ for the derivative in the differential equation, θ being, say, 15° and n being 0, 1, 2, 3, etc. The integral curve is then found by finding on a French curve or on an adjustable, flexible drawing device, a portion that will cross several of the equal slope lines, each at the proper slope. A more laborious method is a refinement of the method of drawing straight lines of proper slope through the equal slope lines and smoothing out the resulting jagged line. It consists in finding out where the straight lines should really intersect by a method that depends on studying the variation in the curvature of a rough first approximation to the integral curve. This is explained with the aid of diagrams and examples. C.

Asiatic Cottons: Inheritance of Lintlessness. G. K. Govande. *Current Science*, 1944, **13**, 321-322 (through *Plant Breeding Abstr.*, 1945, **15**, 196). In a further study of the gene li_d, the Baroda lintless mutant was crossed with the white pollen mutant Cocanadas 45, the Burma laciniated A8, and a new multiple recessive which was isolated from a cross of N6 multiple recessive with Cocanadas 45. Results show that li_d gene for lintlessness in the Boroda lintless mutant is linked with the leaf-shape locus with a cross-over value of 17·05 per cent. ± 1·72, and with the lint colour locus with a cross-over value of 20·46 per cent. ± 1·97. The leaf-shape gene is linked with the lint colour gene with a cross-over value of 26·93 per cent. ± 2·28, a value which confirms the linkage reported by Hutchinson. C.

Cotton Flower Gametes: Genetic Diversity. D. V. Ter-Avanesjan. *C. r. Acad. Sci. U.R.S.S.*, 1944, **44**, 345-347 (through *Plant Breeding Abstr.*, 1945, **15**, 254). The effects of pollination by a limited number of pollen grains were observed, in order to study the character of the male gametes. Up to 20 pollen grains were transferred to a stigma; the number of seeds formed was found to vary between 8 and 15 per boll. Upland and Egyptian varieties were used. The F_1 plants so obtained consisted of plants inferior in all characters to the controls, and others excelling the control plants. No segregation was observed in the F_2 plants. The author ascribes the nature of the F_1 population to the qualitative heterogeneity of the male gametes of a single flower, and the lack of segregation in the F_2 to the effect of intrafloral hybridization, and is of the opinion that the so-called method of limited pollination may be applied in practical breeding, to improve a variety or to obtain a new variety from an existing variety in a short time. C.

Cotton Leaf: Inheritance of Shape. S. G. Stephens. *J. Genetics*, 1945, **46**, 345-357; *Mem. Cotton Research Station, Trinidad*, 1945, Series A, No. 24. The leaf shape throughout the genus *Gossypium* has been examined pheno-genetically. All the evidence available suggests that mutations at the leaf-shape locus occur in steps and not completely at random. Only five mutations appear to be possible in so far as the development mechanism of the leaf is affected. Characters dependent on a canalized system of development may be expected to show a restricted capacity for modification. These limitations are considered in relation to two evolutionary phenomena, namely, the expression of dominance and the occurrence of non-adaptive trends. C.

Old World Diploid Cottons: Cytology. S. G. Stephens. *J. Genetics*, 1945, **46**, 303-312; *Mem. Cotton Research Station, Trinidad*, 1945, Series A. No. 24. The compatibility of tetraploid *G. arboreum*, obtained by the colchichine technique, with other Old World species and the cytology of the resulting triploid hybrids has been investigated. Crosses within the Old World group and within the American group produce viable seeds if fertilization is effected. In crosses between American and Old World species fertilization is readily effected, but the majority of seeds obtained are inviable. Incompatibility is apparently due to some post-fertilization disharmony between the hybrid zygote and the surrounding tissues, and is a result of gradual differentiation of the parental genotypes rather than of specific complementary lethal effects. The conception of a gradual quantitative differentiation during evolution—arrived at as a result of genetic analyses of the species *arboreum, herbaceum,* and *anomalum* still holds when comparison is transferred to the cytological level. The triploids obtained by crossing tetraploid *arboreum* with a range of diploid species show a continuous range from Skovsted's autotriploid to the allotriploid *armourianum* hybrid. Gross structural changes should be regarded as accessory to, rather than basically responsible for, the speciation of *G. arboreum* and *G. anomalum* When, as a result of divergence, gene exchange between species can no longer be effected experimentally, estimates of species affinity become speculative and available evidence is often conflicting as it is in the case of the relationship between *G. sticksii* and other Old World species. C.

New World Cottons: Leaf Shape and Identity of Alleles. S. G. Stephens. *J. Genetics,* 1945, **46**, 313-330; *Mem. Cotton Research Station, Trinidad,* 1945, Series A, No. 24. Methods for the measurement of leaf indices and the materials used for the genetic study are reviewed. It is shown that the major phenotypic differences in leaf shape are controlled by a single allelomorph series comprising at least four members. The allelomorphism of Upland and Sea Island leaf types was studied and the distribution of leaf-shape alleles in perennial strains is surveyed. No critical evidence could be obtained from the purely genetic methods of analysis for deciding whether two similar leaf types were controlled by identical or rather similar alleles. A development comparison of four narrow leaf shapes is presented and the limitations of the transference technique are discussed. The interspecific distribution of the four distinct alleles is considered in relation to the evolution of New World cottons. C.

New World Cottons: Developmental Analysis of Leaf-shape Modification. S. G. Stephens. *J. Genetics,* 1945, **46**, 331-344; *Mem. Cotton Research Station, Trinidad,* 1945, Series A, No. 24. Developmental studies of gene action in New World cottons have been undertaken in an attempt to resolve the differences of opinion concerning the rôle of the modifier (polygene). Modifications of the course of development were observed by comparing developmental tracks of the same alleles on different genotypic backgrounds. Transference from a late- to an early-flowering background accelerated the rate of leaf-shape development considerably but arrested it at an earlier stage. If exact compensation existed the shape of the climax leaf would be unaffected by the changes in flowering habit, but over- and under-compensation occurred in the cases studied, so that the shape of the climax leaf is shifted. This shift is particularly typical of interspecific crosses. The fact that flowering habit has been a character of undoubted selective value during the evolution of cotton, whereas any selective value of leaf shape has yet to be proved, shows that modifiers are not necessarily genes of minor importance. Neither is there any reason to suppose that modifiers have individually small effects. C.

Aspergillus Cell Wall: Structure and Theory of Cellulose Particles. E. S. Castle. *Amer. J. Bot.,* 1945, **32**, 148-151 (through *Exp. Sta. Rec.,* 1945, **93**. 261). Both the primary wall at the growing tip of the conidiophore of *Aspergillus* and the older and thicker secondary wall were found to have a coherent fine-textured structural skeleton of chitin. There was no real evidence that the walls contain cellulose, or that identifiable particles of cellulose or of chitin exist in the cytoplasm. At the growing tip the entire cell wall was less than 0·5μ thick and could not be constituted of particles 1μ or more in diameter. Theories of cell wall formation by the deposition of visible cytoplasmic particles of cellulose are not supported by these observations. C.

Aspergillus Niger: Effect on Amino Acids. A. Gorter. *Proc. Kon. Ned. Akad. Wet.,* 1940, **43**, 721-727. A number of enzymes are listed which play a part in the amino acid breakdown by animal tissues and bacteria, and it has been investigated whether one or more of these might be of importance in the breakdown of amino acids by *Aspergillus niger.* The experimental method uses starved fungus mats. None of the known enzymes was found to have a part in the deamination of amino acids by *A. niger.* With this organism the amino acid oxidation is closely connected with the cell respiration, and is probably caused by " unspecific " oxidation enzymes. C.

Aspergillus Niger: Nitrate Assimilation. S. de Boer. *Proc. Kon. Ned. Akad. Wet.,* 1940, **43**, 715-720. Studies on the assimilation of nitrate by *Aspergillus niger* are reported. The culture methods and the nitrate determination by means of xylenol are described. It is shown that nitrate is not accumulated in *A. niger,* but is metabolised after uptake. The influences of *p*H and glucose addition have been studied. The *p*H has no effect in the case of starved fungi, but in growing fungi the nitrate assimilation is greatest at *p*H 4. Addition of glucose increases nitrate assimilation. C.

Dextrinogenic Amylase: Occurrence in Malt. K. Myrbäck and P. J. Palmcrantz. *Arkiv. Kemi, Mineral. Geol.,* 1944, **18A**, 10 pp. (through *Chem. Abstr.,* 1945, **39**, 3799[4]). From studies with various quantities of adsorbing agents such as carbon, kaolin, alumina and silica gel the authors are led to the assumption that there is only one dextrinogenic amylase (α-amylase). This same enzyme dextrinises starch to α-dextrin and saccharifies it to glucose and maltose. C.

Starch: Saccharification by Amylase; Effect of Temperature and the Concentration of Enzyme and Starch. S. A. Barinova. *Microbiology U.S.S.R.,* 1944, **13**, 82-87 (through *Chem. Abstr.,* 1945, **39**, 3619[5]). The optimum conditions for maltose production by amylase (obtained from *Aspergillus oryzae* cultures on wheat bran) action on potato starch are: 4 per cent. enzyme, 30 per cent. starch mash, at 60° C. C.

Chromatographic Adsorption: Kinetics. J. E. Walter. *J. Chem. Phys.,* 1945, **13**, 332-336. The process of chromatographic adsorption is studied from the kinetic viewpoint, on the assumption of a bimolecular reaction between adsorbent and solute. Close approximation to the discontinuous adsorption predicted by the equilibrium theory is obtained only if the time of passage of the solution is of the order of 100 times the " half-life " of the chemical reaction. Equations to satisfy all the boundary conditions are derived. C.

Indicators: Effects of Organic Solvents. J. F. Masi and S. B. Knight. *J. Amer. Chem. Soc.,* 1945, **67**, 1558-1562. The effect of certain organic solvents on the indicator constant of thymol blue and bromothymol blue has been investigated. H-ion activities have been determined in hydrochloric acid solutions in which the solvent is water, or water-ethanol, or water-ethylene glycol. H-ion activities were also determined in citrate and phosphate buffers in the same solvents. These H-ion activity values were used along with spectrophotometric data to calculate the apparent indicator constants in each of the solvents. C.

Colloidally Bound Water: Determination. H. R. Kruyt and H. de Bruyn. *Proc. Kon. Ned. Akad. Wet.,* 1940, **43**, 656-663. The determinations of colloidally bound water by different authors have led to contradictory conclusions. Oakley's dialysis method and Greenberg's ultrafiltration method have been applied to sodium arabinate and a complete description is given of the measurements taken. In order to make the two methods as much alike as possible, the same collodion membrane was applied in the ultrafiltration as in the Oakley experiments. The apparently paradoxical results are confirmed: in Oakley's method there is bound water, in Greenberg's there seems to be none. C.

α-Cellulose: Determination. H. Tydén. *Ing. Vetenskaps Akad. Handl.,* 1943, No. 175, 1-83 (through *Chem. Abstr.,* 1945, **39**, 3928[9]). A critical survey of the literature. An evaluation of the methods used in α-cellulose determination is given and an extensive experimental study of the influence of varieties, such as fineness of division of the sample, presence or absence of air, ratio of alkali to cellulose, temperature, and time. Experiments were carried out with standard cellulose and with pulp samples. The precipitation of β-cellulose, the dependence of the non-precipitable cellulose content of alkaline solutions on the technique used in the original alkaline treatment, and the relationship of the various cellulose fractions obtained on treating pulps with alkali have also been studied and are discussed. The original paper gives 206 literature references, 33 tables and 4 graphs. C.

Amylose and Amylopectin Solutions: Viscosity. R. Speiser and R. T. Whittenberger. *J. Chem. Phys.*, 1945, **13**, 349-350. Frith's and Huggins' equations for solutions of high polymers have been combined in order to discuss the constant *h'* which is characteristic, and independent of the intrinsic viscosity for a given polymer-solvent system. The results obtained for *h'* for amylose and amylopectin, respectively, suggest that this method may provide a means of detecting branching in high polymers. For pectin nitrate/acetone solutions, *h'* for the nitrate made from untreated pectin is greater than that for acid de-esterified pectin nitrate. C.

Wheat Starch: Extraction of Fat and Phosphorus. L. Lehrman. *J. Amer. Chem. Soc.*, 1945, **67**, 1541-1542. Raw and disintegrated starch were extracted with (*a*) methanol and (*b*) 80 per cent. aqueous dioxane (constant boiling mixture). It is shown that the phospholipid is increasingly removed by extraction, but that a small amount of the phosphorus is present in another form. C.

Ground Nut Proteins: Extraction. D. Traill and A. McLean. *J. Soc. Chem. Ind.*, 1945, **64**, 221-224. Ground nuts in the form of commercial oil cakes and solvent-extracted meal have been extracted with dilute sodium hydroxide solution to isolate the globulins. It is shown that the solubility of the globulins decreases as the temperature of the pre-treatment increases, especially when the temperature is above 100° C. The constancy of composition of the proteins obtained from solvent-extracted meal from nuts grown in latitudes from the equator to outside the tropics is remarkable. The oil content of the nuts shows a regular decrease, but the N content an increase, as the distance of the country of origin from the equator increases. More than 90 per cent. of the nitrogen present is extractable from ground nuts by dilute alkali, the precipitable protein, however, varies between 55 and 85 per cent. C.

Ground Nut Protein: Reaction with Caustic Soda Solution. R. H. K. Thomson and D. Traill. *J. Soc. Chem. Ind.*, 1945, **64**, 229-231. Experiments on the reaction between ground nut protein and caustic soda were conducted for various ratios of reactants, at 20° C. with time as variable factor and for a reaction period of 20 hours with temperature varied. The ratio variations were set out on the basis of the Latin square with caustic soda and protein as independent variables and water as a dependent variable. The components of the Latin square which were gels are shown. The diagrams can be interpreted in the light of the Astbury hypothesis of unfolding globulin molecules. C.

Silk and Gelatin: Leucine Content. E. Brand, F. J. Ryan and E. M. Diskant. *J. Amer. Chem. Soc.*, 1945, **67**, 1532-1534. The leucine content of a number of common proteins and of certain crystalline preparations was determined by the microbiological method using the leucine-less strains of *Neurospora crassa*. The data are tabulated. Among others silk fibroin is reported to contain 0·8 per cent. of leucine, gelatin 3·6 per cent., and casein 9·8 per cent. C.

N-Alkylethylenediamines. F. Linsker and R. L. Evans. *J. Amer. Chem. Soc.*, 1945, **67**, 1581-1582. The even-numbered straight chain alkylethylenediamines from C_8 to C_{18} have been prepared by condensation of the alkyl halides with anhydrous ethylenediamine. They are low-melting, white, waxy solids which combine with two acid equivalents to yield neutral salts whose solutions have low surface tensions and form stable foams. C.

Explosive Diazo Sulphides: Warning. P. Nawiasky, F. Ebersole and J. Werner. *Chem. and Eng. News*, 1945, **23**, 1247. Attention is drawn to certain potentially dangerous explosive reactions of diazonium compounds with sulphides of sodium which have generally been considered safe. Powerful explosions occurred when 4-chloro-*o*-toluidine was diazotised in the usual manner and neutralised, and the solution was added slowly to solutions of Na bisulphide, sulphide or polysulphide. Explosions also occurred under reversed conditions and at temperatures as low as 5° C. C.

"Gammexane" Insecticide: Development. R. E. Slade. *Chem. and Ind.*, 1945, 314-319. A Hurter Memorial Lecture. The preparation of the pure γ-isomer of hexachloro*cyclo*hexane (gammexane) is described. The structure of the isomers is discussed and the properties of the 1:2:3:4:5:6- hexachloro-*cyclo*hexanes (666) are considered. Gammexane was originally developed as insecticide as a substitute for derris powder. Gammexane is highly toxic to many insects and certain other pests. Tables are given showing the range of action of preparations containing gammexane and comparing the toxicity of the α, β and γ isomers, and certain standard insecticides. Even the crude material 666 is highly toxic. Agricultural and general uses are discussed. As an insecticide the product acts as a stomach poison, as a contact agent or as a fumigant. C.

Phenol-Formaldehyde Resins: Hardening Process. A. Zinke, E. Ziegler, E. Martinowitz, H. Pichelmayer, M. Tomio, H. Wittmann-Zinke and S. Zwanziger. *Ber. deut. chem. Ges.*, 1944, **77**B, 264-272 (through *Chem. Abstr.*, 1945, **39**, 3524[9]). The hardening process of phenol-formaldehyde resins has been investigated. This process leads in the first stage (up to 170° C.) to the formation of ether chains and their partial thermal cleavage. In a secondary stage (above 170° C.) there evidently occur reactions which result in deep-seated changes in structure, especially disappearance of the ether bridges, which are presumably converted into CH_2 bridges, with loss of formaldehyde. The formaldehyde probably reacts further with the reactive H-atom on the phenol nuclei. Experimental evidence is also presented that alkalis favour the formation of CH_2 bridges in the hardening process. C.

Charged Oil/Water Interface: Adsorption of Proteins. J. J. Elkes, A. C. Frazer, J. H. Schulman and H. C. Stewart. *Proc. Roy. Soc.*, 1945, **184**A, 102-115. The adsorption of proteins to positively and negatively charged oil/water interfaces has been studied. When finely dispersed oil-in-water emulsion was used to provide the interface, adsorption of protein resulted in flocculation of the oil droplets and was dependent on *p*H. Flocculation occurred on the acid side of the isoelectric point of the protein with negatively charged and on the alkaline side with positively charged oil globules. The effect of protein concentration and interfacial area on the flocculation phenomenon has been investigated. The addition of sodium chloride affected the flocculation range so that overlapping occurred and also altered the point of maximum clarification. The reversibility of protein adsorption on to charged oil/water interfaces has been demonstrated. The effect of adsorption and desorption on the structure of the protein molecule has been studied with hæmoglobin. Experimental results showed that the protein molecule has three main configurations: form before adsorption, adsorbed protein, and desorbed protein. A mixture of albumin and hæmoglobin has been separated by the adsorption mechanism. Some applications of the flocculation technique are indicated and the significance of the phenomena described are discussed. C.

Water Vapour: Adsorption on Carbon Black. P. H. Emmett and R. B. Anderson. *J. Amer. Chem. Soc.*, 1945, **67**, 1492-1494. Carbon black samples were degassed at temperatures up to 1200° and adsorption isotherms were determined for nitrogen at −195° C. and water vapour at 20-30° C. The blacks showed scarcely any change in total surface area, in the shape of the nitrogen adsorption curves, or in porosity, but there was a striking alteration in the water adsorption isotherms. Monolayers of adsorbed water vapour do not appear to form on the carbon blacks below relative pressures of about 0·85 or 0·9. C.

Prismatic Celloidin Cell Tissues containing Biocolloids: Preparation and Properties. H. G. Bungenberg de Jong, B. Kok and D. R. Kreger. *Proc. Kon. Ned. Akad. Wet.*, 1940, **43**, 512-521, 728-731, 732-740. A method is described for the inclusion of biocolloid sols in celloidin membranes, whereby the cells are obtained as tissues. The formation of a complex coacervate of gum arabic with gelatin in the cells of the tissue and its final position in the cell compartment are described. The coacervation of gum arabic by toluidine-blue and the phenomena accompanying the suppression of the coacervate with a very weak salt solution (e.g. 5 m. mol. NaCl) have been studied. The behaviour of complex coacervates of gelatin and gum arabic in the electric field was investigated. By assuming that in the electric field concentration differences of the ions in particular of the H ions, arise between either side of the celloidin walls of the cell-compartments, the principal phenomena (i.e. those whereby the sign of charge of the coacervate has no part) can be explained by two hypotheses:

(*a*) a *p*H gradient develops inside each cell, and (*b*) a gradient of the average *p*H develops over the whole cell-group. An account is given of experiments, with bromophenol-blue and resorcinal, which confirm both these hypotheses. C.

Silver Iodide Sol: Effects of Electrolytes. H. R. Kruyt and Marga Klompé. *Proc. Kon. Ned. Akad. Wet.*, 1940, **43**, 975-978. The effects of potential-determining and non-determining ions in sols have been investigated on a negatively charged "repeptisation" silver iodide sol of *p*I 4, *p*I 5, and *p*I 6. The flocculation concentration for the indifferent electrolyte barium nitrate was determined and showed that such electrolytes indirectly change the potential leap, especially in a sol with a low concentration of potential-determining electrolyte (high *p*I in negative, high *p*Ag in positive sols, respectively) and a large development of colloid surface (high sol concentration). C.

Emulsions: Formation in Turbulent Flow. P. H. Clay. *Proc. Kon. Ned. Akad. Wet.*, 1940, **43**, 852-865, 979-990. The mechanism of the preparation of coarse emulsions with the aid of the effect of a turbulent field of flow has been investigated experimentally and theoretically with special reference to technical applications. Two elementary processes are to be distinguished: a droplet of the dispersed phase may be broken up or it may meet another droplet with a chance of coalescence into one larger droplet. The effects of these processes lead after some time to the equilibrium of the dispersion. The state of dispersion has been studied by direct photography of the emulsion in turbulent motion; the optical arrangements and method used are described. The size distribution measurements are tabulated. It is shown that nearly all droplets keep their spherical shape. The properties of the turbulent field of flow are discussed and the processes of coalescence and twisting of droplets are considered on this basis. The analysis of the experimental measurements shows that both these processes actually take place. The size distributions existing in the emulsions seem to be caused chiefly by an interaction between the smallest and the largest droplets in the emulsion, except in the case of direct coalescence. C.

Emulsion Polymerisation: Theory. E. W. Montroll. *J. Chem. Phys.*, 1945, **13**, 337-348. It is shown how the process of emulsion polymerisation can be treated mathematically. An aqueous emulsion of the monomer is prepared by using soap as an emulsifier. Polymerisation of the emulsion is initiated by a catalyst after an inhibition period which increases with the initial mean radius of the suspended globules. It is shown that the mean radius of the suspended spheres decreases linearly with increasing emulsifier concentration. A relation between mean radius and extent of reaction is derived. It is assumed that the initiation period is due the presence of an inhibitor distributed between the water and the monomer phase. The catalyst reacts with that part of the inhibitor which is dissolved in the water phase, so that in order to restore the equilibrium some of the inhibitor must diffuse out of the monomer. Polymerisation rate curves are derived on this basis and the added assumptions: (*a*) polymerisation occurs at the monomer-water interface after the inhibitor concentration has reached a low threshold value, (*b*) the radius distribution function of monomer has a single maximum. C.

Soap-suds Froth Chambers: Shape. S. T. Bok. *Proc. Kon. Ned. Akad. Wet.*, 1940, **43**, 1180-1190. The shape of froths with chambers of the same order of size has been investigated. In these froths the shape approaches that of polyhedra and two well-known laws apply to such a froth: (1) three walls always meet in one edge under equal interfacial angles, and (2) four edges always meet in one point of junction under equal angles. The author puts forward theoretical arguments in favour of the froth chamber shape being a regular dodecahedron and shows that the regular dodecahedron is more in keeping with the actual proportions in a froth than other shapes mentioned in the literature. Photographs are given of froths from soap-suds; most of the walls are slightly curved pentagons, few are hexagons and fewer still quadrilateral figures. C.

Multimolecular Absorption Isotherms: Calculation. A. B. D. Cassie. *Trans. Faraday Soc.*, 1945, **41**, 450-458. A general statistical method is given for deducing equations for multi-molecular absorption isotherms. It is shown that the equation for multimolecular absorption which takes place in the presence of localised sites is identical in form with that derived by Brunauer, Emmett and Teller using their evaporation-condensation mechanism. The equation conforms to a sigmoid curve which is concave to the pressure axis at low pressures. It is shown further that a mobile monolayer must be gaseous to give an absorption isotherm or surface absorption that varies with concentration. The isotherm for multimolecular absorption with a gaseous film is everywhere convex to the pressure axis. The absorption of water vapour by carbon is an example of this type of absorption which has been fully established by experiment, and the empirical isotherms are in excellent agreement with the theoretical ones. C.

Varnish Films: Permeation and Sorption of Water Vapour. A. M. Thomas and W. L. Gent. *Proc. Phys. Soc.*, 1945, **57**, 324-349. Experimental methods have been developed for determining the sorption of moisture before equilibrium is reached and the movement of sorption at equilibrium (permeation) of varnishes and polystyrene as free films. The preparation of test materials and the experimental procedures are described and the results are tabulated and discussed. There is reason to believe that the mechanism of permeation is one of osmotic diffusion. Not sufficient evidence was found to show the effect of temperature and vapour pressure on the permeability constant. The factors determining the absolute diffusion rate and sorptive capacity depend on the structure of the material. C.

Powders: Surface Area Determination by Krypton Adsorption. R. A. Beebe, J. B. Beckwith and J. M. Honig. *J. Amer. Chem. Soc.*, 1945, **67**, 1554-1558. The method of Brunauer, Emmett and Teller (1938) was applied to the calculation of surface areas from the adsorption data with krypton vapour at liquid nitrogen temperatures. The method may be used with a fair degree of accuracy on solids of specific surface area as small as 0·04 sq. m./g. With a sample of anastase, the surface of which had been measured by the absolute method of Harkins and Jura (1944), the value of the area occupied by the krypton atom in the monolayer was found to be $19{\cdot}5 \pm 0{\cdot}4$ sq. A. C.

Starch and Quartz Suspensions in Apolar Liquids: Thixotropy. H. R. Kruyt and F. G. van Selms. *Proc. Kon. Ned. Ahad. Wet.*, 1940, **43**, 1171. Thixotropy seems to occur when starch is suspended in air-dry condition in carbon tetrachloride, but not when the starch is first dried in a vacuum desiccator over calcium chloride. Similarly, suspensions of finely divided quartz do not show thixotropy in carbon tetrachloride if it has first been dehydrated for 1½ hours at about 360° C. Hence, previous explanations of the phenomena of suspensions in an apolar medium are in need of revision. It almost seems that it is not the apolarity of the organic liquid that causes the phenomena but its " unmixing " with water. C.

Ultracentrifuge: Influence of Hydrostatic Pressure on Sedimentation Velocity. H. Mosimann and R. Signer. *Helv. Chim. Acta.*, 1944, **27**, 1123-1127 (through *Chem. Abstr.*, 1945, **39**, 3476[9]). By use of Mosimann's data on nitrocellulose dissolved in acetone, it is shown that the decrease of specific sedimentation constant with distance from the centre of rotation almost disappears when allowance is made for the effect of pressure on viscosity, density, etc. Though negligible in water, this correction is required for all organic solvents, for acetone is typical of such compounds in the dependence of viscosity and density on pressure. C.

Protein Molecules in Solution: Determination of Shape. J. M. Burgers. *Proc. Kon. Ned. Akad. Wet.*, 1940, **43**, 307-315, 425-435, 645-652. In this study it has been assumed that the values of the specific viscosity η_{sp} as measured by Polson (1939), and the data given for the molecular weights and for the sedimentation constants of the protein can be regarded as trustworthy; and that they are not affected by electro-viscous effects, by effects of concentration, or by non-linear effects connected with the velocity gradient in viscosity measurements. The author has then attempted to check the theoretical relation between these quantities, which will follow when a certain shape is assumed for the molecule. The values of M, V and η_{sp} were used to obtain the dimensions of the molecule and from these the sedimentation constant was calculated and compared with the experimental value. Formulæ have been developed for the cases where the suspended particles (i) have the form of oblate ellipsoids of revolution or (ii) can be represented by systems consisting of a few rigidly connected spheres. In all cases it has been assumed that the Brownian movement is sufficiently intense to make all positions in space of the particles equally possible. A probable means for removing the discrepancies between calculated and experimental results is to suppose that the mass of the molecule, instead of being concentrated mainly at the centre, is more displaced outward. It has been found that both a model system consisting of two spheres, and one consisting of eight spheres at the corners of a cube, may fit the experimental results equally well. The latter system is the more probable form. All sphere systems fit better than the ellipsoids. C.

Dye Solutions: Polarised Fluorescence. K. Choudhari. *Indian J. Physics,* 1944, **18**, 74-83 (through *Brit. Abstr.*, 1945, AI, 216). The variation of polarisation with viscosity of the solution, temperature, and concentration of the dye is reported. The polarisation tends asymptotically to a single minimum value at high viscosity, or at low temperature, or at low concentration, and to zero at low viscosity, high temperature, or high concentration. The results are discussed on the basis of Perrin's theory, and the average life of the excited state so calculated is constant. All polarisations depend on the exciting wavelength having a minimum (negative) value at a wave-length value characteristic of the dye. The behaviour is compared with the dependence of the absorption on wave-length. C.

Groundwood: " Fading "; Physical Mechanism. P. Nolan, J. A. Van den Akker and W. A. Wink. *Paper Trade J.*, 1945, **121**, TAPPI, 101-105. Experiments were carried out to determine the part played by such conditions as atmospheric oxygen, humidity, temperature and wave-lengths on the ultraviolet light fading of groundwood hand-sheets. Groundwood paper fades more rapidly in the presence of atmospheric oxygen, at higher humidities, and at higher temperatures. The greatest fading per unit intensity of light occurs at shorter wave-lengths (maximum effect at 313·2 mμ.). It is shown that the absorption of light by lignin in groundwood is responsible for initiating at least a portion of the reactions that give rise to the characteristic yellowing of exposed groundwood. Observations indicate definitely at least two photochemical reactions in the discoloration of groundwood. First, a slight bleaching action caused by radiations longer than 385 mμ, with a maximum value of the increase in reflectance of about 2 points in normal brightness, and second, the normal dulling and yellowing of the groundwood sheet produced by radiations shorter than 385 mμ. C.

Organic Molecules: Spectroscopy in Vacuum Ultra-violet. J. R. Platt and H. B. Klevens. *Rev. Modern Physics,* 1945, 13, 182-223. The present state and some future possibilities in the field of organic absorption spectra in the vacuum ultra-violet are summarized. Extensive tables of organic spectra below 2000 A are given. There are 150 references. C.

Phenol Vapour: Near Ultra-violet Absorption Spectrum. F. A. Matsen, N. Ginsburg and W. W. Robertson. *J. Chem. Phys.*, 1945, 13, 309-316. The absorption spectrum of phenol was studied with a 3-m. grating spectrograph of the Eagle type and over 300 bands were observed in the region 2490-2830 A. A tentative analysis has been made on the basis of the fundamental goundstate frequencies 245, 397, 527, 811, 824 and 999 and the fundamental excitedstate frequencies 208, 374, 476, 562, 783, 935, 975 1274 and 1565. These agree well with Raman data. The wave-length, wave-number, intensity, and assignment of these bands are tabulated. C.

Polymers and Related Monomers: Infra-red Spectra. H. W. Thompson and P. Torkington. *Proc. Roy. Soc.*, 1945, **184A**, 3-41. A survey has been made of the infra-red spectra of three classes of compounds: (1) hydrocarbon-type polymers such as polythene, polyisobutylene, rubber and polystyrene; (2) halogenated polymers such as polyvinyl chloride, polyvinylidene chloride, neoprene and halothenes; (3) oxygenated substances such as polymethyl acrylate and methacrylate, polyvinyl alcohol, polyvinyl acetate, and substances containing the peptide linkage such as nylon. The results reveal the existence of methyl groups in polythene, and also of a small number of carbonyl groups. The vibration frequencies of the series of vinyl halides are correlated. The rotational structure associated with some of the vibration bands is discussed in relation to the molecular structure. C.

Colour: Specification. W. C. Granville. *Interchemical Review*, 1945, **4**, 3-12. The author explains the argument of a system that permits the use of a spectro-photometric curve as the basis of a colour specification, and shows how a colour map based on this system is constructed. C.

Colour: Specification and Measurement. G. S. J. White and T. Vickerstaff. *J. Soc. Dyers & Col.*, 1945, **61**, 213-224. A "John Mercer" lecture. The subject of colour specification is treated with special reference to the art of dyeing and colouring. Different types of light sources are discussed and the methods of colour measurement are reviewed. The principle of the photo-electric recording spectro-photometer is described. The Young-Helmholtz theory of colour vision is outlined and colour blindness and colour-blindness tests are discussed. It is shown how the specification of colour in terms of impersonal factors, which are universally accepted, has been achieved by chromaticity diagrams. Reference is made to researches into problems such as the sensitivity of the eye in various colour regions, colour harmony and colour preference and adaptation of the eye. The problem of determining the limits of colour which are theoretically possible is also considered. C.

Colloidal Particles. Determination of Refractive Indices. Wilfried Heller. *Physical Review*, 1945, **68**, 5-10. A new mixture rule has been developed for determining the refractive index of colloidal particles from differential refractometric measurements. The rule is valid when the difference between the refractive index of the dispersed substance and that of the medium of dispersion is very small and if the dispersed particles are large enough to scatter considerably more light than the molecules of the medium. If the difference between the refractive indices is larger, the refractive index of the particles can still be obtained with accuracy by using an empirical correction equation. C.

Spheres: Fluid Resistance; Definitive Equations. C. N. Davies. *Proc. Phys. Soc.*, 1945, **57**, 259-270. For the interpretation of the fluid resistance offered to the motion of spheres equations are derived quantitatively from critically selected data from a number of experimenters and give explicit solutions for the terminal velocity of a falling sphere. The wide range of sizes and speeds which must be covered has been split into two. The equation covering the lower section tends to Stokes's law, in the limit, and at the same time is accurate for spheres of any size, large compared with the mean free path, and weighing less than 1·5 μg falling freely in normal air; hence it is useful for most problems concerned with air-borne particles and also provides the best available assessment of viscosity experiments. The other equation continues, using logarithms on account of the large range, up to a Reynolds' number of 10,000. This region covers all spheres falling through normal air which have masses between 1·1 μg and 0·48 g. The effect of slip for motion through gases in the Stokes's law region is discussed in the light of the best available experimental data. C.

Turbulent Flowing Fluid: Theory; Application of Statistical Mechanics. J. M. Burgers. *Proc. Kon. Ned. Akad. Wet.*, 1940, **43**, 936-945, 1153-1159. A hypothesis is introduced in order that a statistical method, applied to a system of mathematical equations illustrating various relations occurring in the theory of turbulent fluid motion, should lead to a "spectrum" of elementary components. The hypothesis describes schematically the influence of the non-linear terms of the equations upon the distribution of weights over the phase space. The introduction of a regular point lattice with finite spacing, instead of a continuous field, into the phase space for the variables ξ_n and η_n, has made it possible to derive formulæ for the average statistical values of ξ^2_n and η^2_n which do not lead to a divergent expression for the total dissipation of energy. The average values of ξ^2_n and η^2_n are directly connected with the magnitude of the "exterior force," and a relation is obtained between the "exterior force" and the "velocity" of the principal motion which leads to a quadratic "resistance law." The results are discussed, especially the form of the dissipation equation which has been chosen as the basis for the statistical calculations, and the problem whether the introduction of a point lattice into the phase space also may serve in the investigations on turbulence. C.

Electrolytic Resistance Variometer. G. G. Blake. *J. Sci. Instruments*, 1945, **22**, 174-176. A microammeter fitted with a zero-shunt is employed to record the current changes when variations of electrolytic resistance are made, such changes in plate-current representing variations in the *Q* of the oscillator. The apparatus can be used with either a variable or a fixed liquid column. An application is described for relay control of the concentration of a solution flowing through a pipe system. C.

Plastics: Electrical Properties. D. J. Mead and R. M. Fuoss. *J. Amer. Chem. Soc.*, 1945, **67**, 1566-1570. The electrical properties of the system polyvinyl chloride-diphenylmethane (80:20)—tetrabutylammonium picrate (10^{-4} to 0·05N) have been measured at 45°, 55° and 65° with d.c. and with a.c. over the range 60 cycles to 8 kilocycles. The total observed a.c. loss is greater than the sum of the losses due to polymer relaxation and to normal ionic conductance as measured by d.c. Electrolyte in a plastic solvent exhibits an anomalous high conductance when measured at low frequencies and furthermore produces an increment in the dielectric constant, which must indicate ionic motion out of phase with the field. C.

Quartz: Piezo-Electric Modulus. A. Langevin. *J. Physique et le Radium*, 1940, [viii], **1**, 189-196. A critical review is presented of studies of the piezo-electric modulus of quartz by previous authors. Several methods for its determination are discussed and that used by the author is described. The results obtained lead to the conclusion that slight differences in the value of the modulus are due to unavoidable minute impurities in the quartz, like microscopic macles, gaseous, liquid or solid inclusions, and that the main piezo-electric modulus of quartz is a constant slightly higher than 7×10^{-8} c.g.s. C.

Solid Dielectrics: Resistivity; Influence of Humidity. E. M. Cohn and P. G. Guest. *U.S. Bur. Mines*, 1944, *Inf. Circ.* 7286, 41 pp. (through: *Brit. Abstr.*, 1945, BI, 243). The measurement of resistivity is discussed in detail and data for the resistivities of ebonites, bakelites, waxes, etc. at various R.Hs. are presented in tables and curves. Data for various animal, vegetable, and artificial fibrous materials are also summarised. C.

Moist Air: Supersonic Dispersion in-. M. Mokhtar and E. G. Richardson. *Proc. Roy. Soc.*, 1945, **184A**, 117-128. A hot-wire method for studying the effect of humidity on the propagation of sound in air is described, with details of the apparatus used. Measurements of amplitude were obtained by the hot wire in the standing waves produced by supersonic sources at five different frequencies. Propagation constants were obtained by measuring the position and amplitude at successive maxima and minima in the pseudo-stationary waves set up between the source and the reflector, and the absorption coefficient μ was obtained by plotting log amplitude against distance from the source. Absorption coefficient/humidity and velocity/humidity curves are shown for the five frequencies. The conclusion is reached that the velocity in dry air is independent of frequency, that $\mu\lambda^2$ decreases as the frequency increases, that μ reaches a maximum in humid air, two or three times its value in dry air, at a vapour pressure which decreases as the frequency increases, and that the maximum of dispersion in the velocity decreases as the frequency increases. The results are discussed in connection with some investigations of the disposition of the supersonic field in front of the quartz source. C.

"Parallel Resonance" Electronic Strain Recording Device. H. J. Blach. *Electronic Engineering*, 1945, **17**, 737. Experiments were carried out on a method of measuring and recording photographically small changes in the physical dimensions of materials, due to strain, temperature changes, etc. The apparatus is based on a parallel resonant circuit so designed that the potential difference across it will vary considerably with small changes of capacitance. C.

Oak and Spruce Planks: Stress Systems round a Hole. A. E. Green and G. I. Taylor. *Proc. Roy. Soc.*, 1945, **184A**, 181-195. The fundamental stress functions are used to find the stress distribution in an infinite aeolotropic tension member which contains a circular hole. These stress functions which satisfy the equations of equilibrium and which produce single-valued expressions for the corresponding stresses and displacements, are combined in an infinite series so as to satisfy the boundary conditions. The resulting formal solution may be expressed in a finite form which represents the stress distribution in the whole of the plate. Numerical work is carried out for certain specimens of oak and spruce. C.

Rotating Shafts: Critical Speeds. C. B. Biezeno. *Proc. Kon. Ned. Akad. Wet.*, 1940, **43**, 1144-1152. A rotating shaft, bearing n centred and concentrated masses, may whirl at most at n different angular speeds. A proof of this theorem is presented. It is shown that the reciprocal squares of the critical angular speeds are roots of a so-called secular equation of the n^{th} degree. Evidence is given that all these roots are real, positive and unequal. The theorem proved only holds for rigid, non-clamping supports. C.

Rubber: Dynamic Properties; Measurement by Vibration Methods. J. E. Moyal and W. P. Fletcher. *J. Sci. Instruments*, 1945, **22**, 167-170. Experiments have been undertaken in order to obtain on the same test pieces and the same mechanical system, measurements of resilience by both free vibration and resonant forced vibration methods. The electrical vibrator and the methods used are described. The resilience results obtained by the two methods agree within the limits of experimental error and thus justify the use of a simple mechanical model for rubber, consisting of a purely elastic spring with a viscous dashpot in parallel, with the additional assumption that the viscosity coefficient is inversely proportional to frequency. C.

Thin-walled Circular Tube: Buckling under Bending Load. C. B. Biezeno and J. J. Koch. *Proc. Kon. Ned. Akad. Wet.*, 1940, **43**, 783-796, 923-935. The authors report on a study of the buckling problem for a straight thin-walled circular tube, loaded at its ends by linear changing bending stresses. The phenomena are studied that occur for certain critical values of the bending moment, characterised by the simultaneous appearance of longitudinal and circumferential waves in the cylindrical shape of the tube. Some preliminary questions of detail are solved, such as (1) the formulæ for the displacement and stresses of a cylindrical tube submitted to prescribed radial, tangential, and axial stresses; (2) the "elementary normal loads" and the corresponding "elementary normal deformations"; (3) the differential equations of the buckling problem; and (4) the development of the "total normal deformations" into a series of the "elementary normal deformations." It is shown further how by iteration the smallest total characteristic number μ for which buckling of the tube is possible can approximately be calculated. The minimum or critical buckling moment is then calculated and it is demonstrated how the skew-symmetrical buckling can be investigated along the same line as the symmetrical type. Calculations made in connection with a technical problem, proved that the critical value of the buckling moment for the anti-symmetrical case exceeds that of the buckling moment which produces symmetrical deformation. C.

Two-dimensional Elasticity: Complex Potentials. A. C. Stevenson. *Proc. Roy. Soc.*, 1945, **184A**, 129-179, 218-229. These papers give an approach to two-dimensional isotropic elastic theory (plane strain and generalized plane stress) by means of the complex variable. The investigation of such problems is facilitated by (i) considering especially the transformation of two-dimensional stress; and by (ii) the introduction of two complex potentials each a function of a single complex variable in terms of which the displacements and stresses can be very simply expressed. Simple formulæ for the transformation of stress in two-dimensional orthogonal curvilinear co-ordinates are given. The nature of the complex potentials is discussed, and the condition that stresses must be single-valued or at most of the possible dislocational types is found to relate the cyclic functions of the complex potentials. Solutions in cartesian and polar co-ordinates, in elliptic, bipolar, and in cyclic co-ordinates are considered. The complex potentials are found for two elastic problems, involving body forces, for a circular disk. C.

Electron Microscope: Application to Plant Cytology. J. Elvars. *Acta Hort. Berg.*, 1943, 13, 149-245 (through *Plant Breeding Abstr.*, 1945, **15**, 215-216). A detailed account is given of the technique and usefulness to the cytologist of electron microscopy. Techniques for the suitable preliminary treatment of cytological material are given, covering embedding, digestion, preparation of replica, etc. The reliability of these techniques and of the observations made by light microscopy are discussed. The conclusion is drawn that the desiccation involved in electron microscopy and the damage sustained by the cells from the electron beam do not invalidate the results obtained. On the other hand, optical illusions and psychological difficulties in the interpretation of sense data are believed to detract seriously from the value of high-power light microscopy. Artefacts probably occur to a comparable extent both in electron and light microscopy. All the author's investigations have been made on the pachytene chromosomes of *Lilium* sp. and the results are reported. Both coiling and differentiation into chromomeres could be demonstrated, and on the basis of this observation a theory of spiralization is propounded, considering the chromosomes as a pile of chromomeres lying across the chromosome axis and behaving as dipoles. Nucleic acids are believed to be largely concerned with the formation of these dipoles. A final note refers to the cytoplasm which is held to consist principally of a three-dimensional reticulum of protein chains. C.

Magnetic Electron Microscope: Resolving Power. V. E. Cosslett. *J. Sci. Instruments*, 1945, **22**, 170-174. The imperfections of resolving power of electron microscopes arising from spherical and chromatic aberrations are discussed and methods of approach to the correction of aberrations are reviewed. C.

Factorial Experiments: Design and Statistical Analysis. J. C. R. Li. *Res. Bull. Ia Agric. Exp. Sta.*, 1944, No. 333, 453-492 (through *Plant Breeding Abstr.*, 1945, **15**, 203). This is a useful exposition of some new practical designs of factorial experiments that help to fill up the previous gaps in the list of designs available. They are presented after a review of previous work on confounding in factorial experiments. Full details of design and statistical analysis of each new type are given. C.

Peroxidase: Chronometric Estimation. H. G. Derx. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 718-725. A simple chronometric method for the estimation of peroxidase activity is based on the blue coloration developing on the addition of *o*-tolidine to a mixture of ascorbic acid, peroxidase and hydrogen peroxide. The peroxidase extract (5 c.c.) and 0·5 c.c. N/100 ascorbic acid are placed in one test tube, and 22·5 c.c. buffer solution at *p*H 5, 1 c.c. N/10 hydrogen peroxide and 1 c.c. 0·5 per cent. *o*-tolidine solution in another. The latter mixture is then added to the first and the time is measured from this moment until the appearance of the blue coloration. The peroxidase activity is then calculated in normal units (1 normal unit peroxidase reduces one millimol of hydrogen peroxide (=200 c.c. N/100 H_2O_2) per minute. C.

Peroxidase: Chronometric Estimation; Influence of Experimental Conditions. H. G. Derx. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 844-849. In connection with the above chronometric method for the estimation of peroxidase activity, the reactions taking place between the ascorbic acid, the tolidine, and the hydrogen peroxide under the influence of the peroxidase have been investigated. The reaction is mainly an oxidation of the ascorbic acid with a simultaneous reduction of an equivalent quantity of hydrogen peroxide. The ascorbic acid could be replaced by any other suitable reducing agent (hydroquinone, alloxanthine). The peroxidase activity increases with the increase of the hydrogen peroxide up to an optimum concentration, which in turn increases with increasing *o*-tolidine concentration. The investigation of various buffer solutions at *p*H 5 has shown that none of them changed the duration of the reaction. Citrate buffers are preferable, however, as traces of iron ions contained in vegetable extracts will not give a blue coloration with *o*-tolidine in a citrate solution. The partial regeneration of peroxidase activity after thermal inactivation is considered. C.

Cascade Impactor for Sampling Coarse Aerosols K. R. May. *J. Sci. Instruments*, 1945, **22**, 187-195. A new instrument is described for sampling wind-borne and stationary aerosols such as natural fogs and clouds, fine sprays, insecticidal mists, dusts, pollen, spores, etc. The cascade impactor consists essentially of four progressively finer jets and sampling slides in series. A size-grading into line deposits is obtained which is the most suitable form for microscopic analysis. The most useful range of the impactor is from 50μ to 1μ, but valuable information may be obtained for particles up to 200μ. Some theoretical aspects of impaction are considered. Slide treatment for sampling solid particles and droplets and the microscopic counting technique used for analysing impactor samples are described. In some cases the size-grading enables approximate size-distributions to be obtained by bulk estimations of the samples without the need for microscopic sizing. C.

Sodium Carbonate: Application as Acidimetric Standard. W. R. Carmody. *Ind. Eng. Chem., Anal. Edn.*, 1945, 17, 577-579. The transformation of sodium bicarbonate to the carbonate has been investigated. Results of time/temperature studies verify the fact that transformations at temperatures below 300° C. produce a product containing less than 0·1 per cent. of moisture and that this moisture may be partially eliminated by pulverisation of the sample and re-ignition. No measurable amounts of sodium hydroxide were found in sodium carbonate transformed from the acid salt at temperatures below 300° C. Samples of five leading brands of reagent grade sodium carbonate were found to be satisfactory for a standard of reference in acidimetry. C.

Calcium: Polarographic Determination. I. Zlotowski and I. M. Kolthoff. *J. Phys. Chem.*, 1945, 49, 386-405. The polarographic behaviour of calcium in water and in water-ethanol mixtures has been investigated. Lanthanum is a good suppressor of calcium wave maximum in water, whereas barium is more suitable in water-ethanol mixtures. After elimination of the maximum the half-wave potential of calcium is independent of the concentration, and the diffusion current in water and water-ethanol mixtures is proportional to the calcium concentration. The Ilkovič equation is found to describe the calcium wave. Ba, Sr, and Ca in a mixture can be determinated polarographically without separation. More than traces of Mg interfere with the polarographic estimation of Ca. The relative change of the mobility with increasing ethanol concentration is the same for K, Na, and Li; it is also the same for Ba, Sr, and Ca, but the change is much greater for the alkali ions than for the alkaline earth ions. Apparently, it is the valence of these cations which determines the effect of ethanol upon their relative mobilities. C.

Carbon Disulphide: Determination in the Presence of Carbon Tetrachloride. R. L. Bishop and E. Louise Wallace. *Ind. Eng. Chem., Anal. Edn.*, 1945, 17, 563-564. A satisfactory method for the determination of small amounts of carbon disulphide in carbon tetrachloride involves the formation of a xanthate and its potentiometric titration with 0·001N iodine to the dead-stop end point. The method is rapid, precise and accurate, and especially useful in routine work. C.

Chlorate in Caustic Soda Solutions: Determination. D. Williams. *Ind. Eng. Chem., Anal. Edn.*, 1945, 17, 533-535, 535-538, 538-542. (1) *By reduction with ferrous sulphate.* The chlorate content of chlorine/caustic soda cell liquor and of commercial 50 per cent. caustic soda can be determined by reduction with excess ferrous sulphate in sulphuric acid solution or in a mixture of sulphuric acid and phosphoric acid. The excess ferrous sulphate is titrated with K dichromate using diphenylamine sulphonic acid as indicator. The effects of acid, ferrous sulphate, and chloride-ion concentration, and of temperature on the time required to complete the reduction have been evaluated. The method gives useful results at chlorate concentrations down to 0·01 per cent. (2) *Iodometric Method.* Commercial rayon-grade 50 per cent. caustic soda, which contains only a few parts per million of chlorate, is analysed by an iodometric procedure at boiling temperature in the presence of excess hydrochloric acid. Corrections must be applied for ion and manganese. Results must be multiplied by the empirical factor 1·04. (3) *Colorimetric Method.* As much as 300 μg of sodium chlorate in a 10 gram sample of 50 per cent. caustic soda can be determined colorimetrically by means of the stable yellow colour formed by *o*-tolidine in strongly acid solutions. Corrections are applied for Fe and Mn. C.

Copper Naphthenate Preservatives: Copper Content Determination. A. A. McLeod. *Ind. Eng. Chem., Anal. Edn.*, 1945, 17, 599. Three methods for determining copper in copper naphthenate, namely the extraction method, the ash method, and a method using Kjeldahl digestion to destroy organic matter, were found to give accurate results if sufficient care was used. The extraction method is considered to be the quickest and easiest, and the procedure adopted is described. C.

Mercurous Perchlorate: Application as Volumetric Reagent for Iron. W. Pugh. *J. Chem. Soc.*, 1945, 588-589. Mercurous perchlorate, like the nitrate, reduces the ferric thiocyanate complex to the ferrous condition, and this reaction can be used for the direct titration of ferric ion without previous reduction. Certain conditions necessary for accurate work have been determined. The method is simple and is applicable to a wide variety of materials. The reagent is remarkably stable. C.

Rubeanic Acid: Application in Polarographic Analysis. *Industrial Chemist*, 1945, **21**, 546-548. A recent investigation by Malyuga (U.S.S.R.) has shown that rubeanic acid ($NH_2 \cdot CS \cdot CS \cdot NH_2$) can be used for the quantitative separation of Cu, Ni, Co, Cd and Zn in one operation from Fe, Mn, Ti, Al, Mg and the alkaline earths. After the removal of Co by means of α-nitroso-β-naphthol, Cu, Ni, Cd and Zn can be accurately determined on a single polarogram. Details of the preliminary separations and the polarographic determinations are given. C.

Silica: Colorimetric Determination. M. F. Adams. *Ind. Eng. Chem. Anal. Edn.*, 1945, **17**, 542-543. A generally applicable method for the determination of small amounts of silica is based on the development of the yellow molybdisilicic complex. The method is reproducible within ± 1 per cent. for a sample containing 0·5 mg of silica. C.

Sodium Nitrite: Polarographic Analysis for Nitrate. J. Haslam and L. H. Cross. *J. Soc. Chem. Ind.*, 1945, **64**, 259-260. A polarographic method is described for the determination of nitrates in sodium nitrite. The nitrite is first decomposed by sodium azide in hydrochloric acid solution. The solution is then made faintly alkaline, concentrated, and 2 c.c. are mixed with 2 c.c. of lanthanum base solution (La acetate stabilised by Cellofas). This mixture is polarographed over the applied voltage range 1·2 to 2·1 volts of a Cambridge instrument, and the sensitivity is adjusted to $\frac{1}{200}$th. From the observation of the step height obtained on examination of the unknown sample, the proportion of nitrate is deduced by reference to the calibration curve prepared from known mixtures of sodium nitrite and nitrate. C.

Water: Electrometric Titration. R. J. Carter and L. Williamson. *Analyst*, 1945, **70**, 369-371. A simple electrical method employing direct titration has been devised for the routine determination of water in solutions of resins. The method depends upon the fact that when a small potential difference is impressed upon electrodes immersed in a methanol solution of moist material, the current which flows in the closed circuit on the addition of Karl Fischer reagent remains fairly constant during titration, but suddenly increases at the end-point of the titration. Details of the apparatus and the procedure are given. C.

Amino Acids and Proteins: Micro-Kjeldahl Nitrogen Determination. Lila Miller and Jean A. Houghton. *J. Biol. Chem.*, 1945, **159**, 373-383. A critical study is presented of the micro-Kjeldahl method as applied to amino acids and proteins. The limits of accuracy of the distillation procedure have been determined. The digestion conditions have been investigated and the inadequacies of cupric sulphate as sole catalyst were evident in the analysis of lysine dihydrochloride and β-lactoglobulin, but not for alanine. Quantitative results were obtained with mercuric oxide catalyst. For solutions containing 0·4 – 1·4 mg. N in 1 – 2 c.c. the recommended procedure is digestion with 500 mg. potassium sulphate, 50 mg. of mercuric oxide, and 1·5 c.c. of concentrated sulphuric acid for a 6-hour period. With the standardised conditions employed quantitative values for the nitrogen content have been obtained for thirteen amino-acids and six proteins, and the results are tabulated. C.

Glutamic Acid and Glutamine: Determination by Lactobacillus Arabinosus. L. R. Hac, E. E. Snell and R. J. Williams. *J. Biol. Chem.*, 1945, **159**, 273-289. A turbidimetric or titrimetric method is described for the determination of *l*(+)-glutamic acid in protein hydrolysates by means of *Lactobacillus arabinosus* as test organism. The values obtained are in good agreement with those obtained by similar microbiological techniques, and with the most reliable chemical analyses. Glutamine is more active than *l*(+)-glutamic acid; activity of the latter is increased toward that of glutamine as a limit by increasing the size of the inoculum, lengthening the incubation period, lowering the initial *p*H of the medium, and adding ammonium salts to the medium. These data indicate that glutamic acid is converted to glutamine before utilization. This is probably also true for $d(-)$-glutamic, and α-ketoglutaric acids, and glutathione, which are less active than $l(+)$-glutamic acid, but which permit maximum growth at high concentrations. For some samples, the method appears adaptable to the determination of glutamine as well as glutamic acid. C.

Aspartic Acid: Determination by Leuconostoc Mesenteroides. L. R. Hac and E. E. Snell. *J. Biol. Chem.*, 1945, **159**, 291-294. A reliable turbidimetric method is described for the determination of $l(+)$- aspartic acid in protein hydrolysates by means of *Leuconostoc mensenteroides* P-60. Asparagine is less readily available for growth of micro-organisms than aspartic acid, which is interpreted to mean that asparagine must be converted to free aspartic acid before assimilation. This is in direct contrast to the utilization of its homologue, glutamic acid. (See above Abstract). C.

Chlorine Dioxide: Small-scale Generation. W. S. Hutchinson and R. J. Derby. *Ind. Eng. Chem.*, 1945, **37**, 813-815. Three methods are described for small-scale production of chlorine dioxide, based on the reaction of dry gaseous chlorine with dry, powdered sodium chlorite. One method yields chlorine dioxide and chlorine in the effluent gases, the second yields chlorine dioxide free from chlorine by controlling the dioxide output by the chlorine input. The third method produces pure chlorine dioxide gas at controlled partial pressures. The gas produced by these methods can be used in any reaction involving chlorine dioxide diluted with air or other inert gas at substantially atmospheric pressures and temperatures. C.

Iron Blues: Alkali Resistance. H. Holtzman. *Ind. Eng. Chem.* 1945, **37**, 855-861. New iron blues of improved alkali resistance, resulting from the addition of Ni and Co salts during manufacture, have recently appeared on the market. Since iron blues have been formulated as salts of a polynuclear "berlinic acid," investigations have been undertaken on the possibility of forming Ni and other "berlinates" with properties differing from those of the ferrous and ferric compounds. Experimental work directed along these lines is recorded, correlated with an extensive literature survey, in an attempt to establish a theoretical basis for the improved alkali resistance of the nickel blues. C.

Alcohol: Drying for Use in Organic Synthesis. E. S. Gyngell, M. A. Phillips, and E. Lester Smith. *Industrial Chemist*, 1945, **21**, 526-532. Methods are described for drying ethyl alcohol by physical and chemical procedures, and for the determination of very small amounts of water in methanol and ethanol, especially by the sodium/ester method and the Karl Fischer method. The uses of dry alcohols are discussed, and the experimental details of the preparations of phenyl malonic ester and of phenyl ethyl malonic ester are given. C.

Gelatin: Preparation; Hydrolysis of Peptide Linkages. W. M. Ames. *J. Soc. Chem. Ind.*, 1945, **64**, 242-243. Experiments have been carried out in order to determine if the lime soak applied to gelatin precursors before extraction interferes with peptide linkages. Formol titrations made on the gelatins show that, during a length of soak sufficient to convert practically the whole of the collagen into gelatin, the rupture of peptide linkages is very slight. The evolution of ammonia seems to be of far greater importance. On soaking the precursor for excessively long periods, however, changes in structure become more marked, which explains the higher formol titration figures found by other authors. C.

Peanut Protein Hydrates: Preparation and Properties. R. S. Burnett. *Ind. Eng. Chem.*, 1945, **37**, 861-864. Peanut protein hydrates are described which are capable of binding increasing amounts of water, from 38 per cent. to about 70 per cent. by weight of the sol, as the *p*H value of the system is increased from 4·5 to 9·0. Three methods of preparation of proteins from solvent-extracted peanut meal are described, and the properties of their hydrates within or near the iso-electric range (*p*H 6·0 to 9·0) are discussed. The ability of the protein to bind more water as the *p*H increases makes it possible to prepare sols that have sufficiently low viscosities between *p*H values 6·0 and 9·0 to permit their practical use as adhesives. The sols are tacky if excess water is absent, but above *p*H 9·0 this tackiness becomes too slight to be of practical value, and the more concentrated mixtures undergo gelation. The consistency of protein-water systems increases with removal of salts and other non-protein materials. C.

Sodium Stearate: Polymorphism and Transitions. R. D. Vold. *J. Phys. Chem.*, 1945, **49**, 315-328. A study has been carried out of the transitions occurring in dry and hydrous sodium stearate. Results are based on dilatometric, microscopic and calorimetric measurements and are presented in tables and diagrams. The ascertained transformations are also summarised in a diagram. The transition from α to β occurring at 52° C. is not generally reversed on cooling, as the reversibility is dependent on the relative humidity of the atmosphere. The genotypic transition from β to λ is reversible, and its temperature shows no systematic variation with water content. Both λ and α stearates transform to super-curd close to 90° C. On cooling α is almost always formed, particularly for samples containing more than 1·5 per cent. water. C.

Sorbitol: Esterification with Linseed Fatty Acids. J. D. Brandner, R. H. Hunter, M. D. Brewster, and R. E. Bonner. *Ind. Eng. Chem.*, 1945, **37**, 809-812. The effect of acid ratio and other variables on the preparation and properties of drying oils from linseed fatty acids and sorbitol has been investigated. The rate of esterification of sorbitol was increased not only by raising the temperature but also by using an excess of linseed fatty acids or by adding Ca and Ba acetates, carbonates, oxides, and hydroxides as catalysts. The degree of esterification was raised greatly by increasing the mole ratio of linseed fatty acid to sorbitol, and slightly by lowering the reaction temperature. Comparison of varnishes made from sorbitol drying oils of various degrees of esterification showed that the higher the degree of esterification, the faster drying was the varnish and the harder the film. The optimum ratio was found to be about 4·5 moles of linseed fatty acids per mole of sorbitol. A sorbitol drying oil with this ratio of reactants was found superior to pentaerythritol, mannitol, glycerol and natural linseed drying oils, with respect to drying time, and about equal to the best of them in hardness and alkali resistance. C.

Powders and Porous Solids: Assessment of Specific Surface by Adsorption Methods. F. A. P. Maggs. *Brit. Coal Utilis. Res. Assoc. Monthly Bull.*, 1945, **9**, 253-261. A review is given of the theoretical considerations which lead directly to the determination of absolute surface area, including only those theories which have been applied to the interpretation of physical adsorption. The theories of Langmuir and of Brunauer, Emmett and Tiller are outlined. Gregg's method for estimating surface areas is described. Reference is made to some heat-of-wetting methods for surface area determinations, especially one recently developed by Harkins. C.

Serum Albumin and Globulin: Determination by Spreading. E. Gorter and P. C. Blokker. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 151-154. The magnitude of the spreading has been compared with the quantity of protein calculated from nitrogen determinations by the Kjeldahl method, and measurements of spreading are shown to provide a ready means of determining albumin and globulin. The details of the method are described. Average spreading factors of 0·93 for globulin, 1·04 for albumin and 1·01 for total protein were found. C.

Gliadin: Spreading on Water. E. Gorter and P. C. Blakker. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 228-232, 335-340. The properties of gliadin and gliadin/tannic acid films have been studied by measuring the surface pressure, the surface potential, and the surface viscosity at different *p*H values. A not very sharp maximum spreading of gliadin occurs in the vicinity of the isoelectric point (*p*H about 6·5). The *p*H has little influence on the character of the gliadin films. Gliadin films are of the liquid type. Gelation occurs at pressures above about 7 dynes/cm. Above a pressure of 20 dynes/cm the compressibility strongly increases. Tannic acid diminishes the compressibility of gliadin films considerably at *p*H values below 7, and this influence strongly decreases at higher *p*H values. Tannic acid exerts a great influence on the viscosity. C.

Serum Albumin and Globulin: Determination by Spreading. E. Gorter and J. J. Hermans. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 802-803. In the above method, total protein and globulin were measured directly and the albumin content was calculated from the difference between the spreading areas for both. In order to spread the globulins, tedious manipulations are involved in washing them. The method can be simplified considerably by spreading the albumins directly from the centrifugate and calculating the globulin content of the serum as the difference between total protein and albumin. C.

Ovalbumin/Oleic Acid Complex: Spreading. E. Gorter and J. J. Hermans. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 808-809. The films obtained by spreading an ovalbumin (40 per cent.)—oleic acid (60 per cent.) complex show lipoid behaviour at *p*H below 6. The minimum in the area/*p*H curve at the acid side has disappeared, showing that the oleic acid combines with the amino groups of the protein. At *p*H above 7, however, the films show protein-like behaviour, and pressures larger than 25 dynes/cm. cannot be maintained any longer. If ovalbumin is made to react with smaller quantities of oleic acid, the films show partial collapse at a certain pressure. Part of the protein is squeezed out of the monolayer until a film with a liquid content of about 60 per cent. is left. C.

Liquid/Solid Contact Angles: Theory. H. M. Scholberg and W. W. Wetzel. *J. Chem. Phys.*, 1945, **13**, 448. The equation for the law governing the shape of the meniscus is given and it is then shown how the two expressions (1) for the work necessary to stretch the liquid surface and to raise the water and (2) for the free energy available to do this work, can each be differentiated with respect to the angle of tilt of the solid surface with the horizontal so as to make the two expressions equal. The final equation is experimentally obeyed well within the limits of error for measurements on paraffin against water. C.

Saponin Solutions: Surface Tension. Sydney Ross. *J. Phys. Chem.*, 1945, **49**, 377-386. Data for the change of surface tension with time in aqueous saponin solutions are interpreted on the basis of an auto-catalytic reaction between molecules already sorbed upon the surface and molecules captured by them from a layer just underneath. This hypothesis is strengthened by the well-known phenomenon of solid surface films and denaturation in aqueous saponin solutions. C.

Solids: Surface Chemistry. W. D. Harkins. *Science*, 1945, **102**, 263-268, 292-295. In a single solid (e.g. a metal) the tensile strength is ultimately related to the surface energy. In a finely divided solid the surface area becomes the characteristic property. An absolute and a relative method for measuring the surface area of a fine crystalline powder are described. It is shown that it is then possible to calculate the area occupied by a molecule, and facts are given to demonstrate the real effects with which these areas correspond. The orientation of molecules in surfaces and interfaces and the molecular attraction of polar and non-polar solids are discussed. The manufacture of laminated glass is cited to illustrate the use of polar groups in industry. The problem of the distance to which molecular attraction extends and the related problem of the thickness of adsorbed films are considered. Phases and phase changes in adsorbed films on solids are briefly outlined. C.

Biocolloids: Flocculation by Alkaloid Salts and Basic Stains. H. G. Bungenberg de Jong and C. v. d. Meer. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 593-600. The flocculation of negative biocolloids with alkaloid cations or stain cations is of an auto-complex nature. Statistics concerning the flocculation of eleven biocolloids—divided into 3 groups— by 31 alkaloid chlorides and 14 basic stains are presented, and the methods used for judging the flocculation power are described. The resulting affinity order is checked by some electrophoretic measurements and is found correct. The flocculability of each of the three groups of biocolloids increases with increasing charge density. With equal charge density the order is: phosphate colloid>sulphate colloid>carboxyl colloid. From the affinity order : apomorphine>thebaine>heroine>ethylmorphine>morphine>codeine, it is assumed that an alcoholic hydroxyl has a weakening effect on the affinity of the alkaloid cation for the biocolloid anion, whereas the effect of a phenol hydroxyl is strengthening. C.

Coacervate Drops: Morphological Changes and Behaviour. H. G. Bungenberg de Jong. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 393-400. An apparatus for the study of morphological changes of coacervate drops is described. The *p*H region was determined in which coexisting coacervates occur with the ratio gelatine:gum arabic:Na-nucleinate=3:1:1. It is about *p*H 2·9—4·3. The method used for preparing the composite drops is described, and their behaviour with respect to added salts and dyes is discussed. Toluidine blue is a convenient stain for distinguishing the two coexisting coacervates, namely, the slightly vacuolised complex coacervate of high nucleinate percentage embedded in the homogeneous complex coacervate of high arabinate percentage. Foreign particles are taken up by the composite drops and are localised on the separation plane of the two coacervates. Slow gelatinisation of the drops in their own medium is accompanied by the formation of a wreath of vacuoles on the boundary plane of the enclosed coacervate, whereas the gelatinised objects obtained by rapid gelatinisation in cold water show a clearly visible structure of the wall of high arabinate percentage. The behaviour of the latter gelatinised objects with respect to dyes is discussed in detail. C.

Coexisting Complex Coacervates: Preparation and Properties. H. G. Bungenberg de Jong and E. G. Hoskam. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 387-392. The occurrence of coexisting coacervates in mixtures of purified gelatine, Na-arabinate, and Na-yeast nucleinate in the presence of dilute buffers at *p*H about 3·7 has been investigated and the results are presented in ternary diagrams. Correct measurements of the location of the area of the coexisting coacervates have been made by electrophoresis. The probable direction of the connecting lines of coexisting complex coacervates in the ternary diagram could be determined. C.

Complex Coacervates: Effects of Neutral Salts. H. G. Bungenberg de Jong and E. G. Hoskam. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 59-66. At constant *p*H and constant mixing proportion of the colloids (gelatine, gum arabic) in the total system the addition of salts causes a change, not only of the water percentage in a complex coacervate, but also in the proportion of colloid in the coacervate. The continuous valence rule is applicable to the colloid proportion, namely: 3-1...1-1...1-1...1-2...1-3, in which 1-1 does not modify the proportion, 2-1 and even more 3-1 increase the gum arabic percentage of the coacervate, whereas 1-2 and even more 1-3 increase the gelatine percentage of the coacervate. The proportion of the two colloids in the equilibrium liquid is modified in a reversed sense from that in the coacervate. C.

Complex Coacervates: Formation in the Presence of Buffers and Non-Electrolytes Preventing Gelatinisation. H. G. Bungenberg de Jong and E. G. Hoskam. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 585-592. Acetate buffers can be used in the study of complex coacervation. When the effect of the *p*H is to be investigated buffers are indicated with constant Na-acetate concentration and varied acetic acid concentration. Complex coacervation can be realized at room temperature in the presence of a mixture of 10 per cent. urea + 4 per cent. resorcinol in which the condensing effect of the resorcinol entirely destroys the swelling effect of the urea. Simple experiments at 40° with buffers, and at room temperature with buffers + urea + resorcinol are indicated for the purpose of demonstrating some properties of the complex coacervation. C.

Gelatine/Gum Arabic Coacervate: Factors Determining the Effect of Neutral Salts. H. G. Bungenberg de Jong and C. v. d. Meer. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 490-497. Neutral salts affect the coacervate volume by a change of the degree of coacervation and of the water percentage. With optimal coacervation neutral salts decrease the coacervate volume according to the double valence rule, because here the decrease in the degree of coacervation surpasses the increase of the water percentage of the coacervate. On preliminary removal of a sufficient quantity of equilibrium liquid, however, neutral salts in small concentrations increase the coacervate volume. At higher concentrations the decreasing effect of the decreasing degree of coacervation predominates again. With coacervates of strongly negative or positive charge, certain salts (with polyvalent cations in the negative, with polyvalent anions in the positive coacervate) in smaller concentrations can cause an increase of the degree of coacervation. The salts then arrange themselves in the order of the continuous valence rule. C.

Phosphatide Coacervates: Influence of Cations on the Water Percentage. H. G. Bungenberg de Jong and G. G. P. Saubert. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 401-406. The coacervate volumes of phosphatide sols coacervated with chlorides has been measured, and the order of increasing volume was found to be: Ca<Mg<Sr<Ba<Li<Na. This order is the one of increasing reversal of charge concentration. As with phosphatide coacervates

the coacervate volume is a measure of the water percentage the results are in accordance with the theory of autocomplex coacervates which indicates that the water percentage of the coacervate will increase in the order of increasing reversal of charge concentrations. The effect of increasing NaCl-concentrations with constant $CaCl_2$-concentration has been measured, and it was found that if the latter is not too great sodium chloride causes an increase in the coacervate volume (water percentage). C.

Tissues of Prismatic Cells Containing Biocolloids: Structure and Properties. H. G. Bungenberg de Jong and B. Kok. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 51-58, 67-75, 76-81, 200-203, 204-5. In this series of papers the authors describe the effect of the *p*H, of some neutral salts and non-electrolytes, on a complex coacervate formed in the prismatic cells of a celloidin membrane. Some morphological changes have been observed which are vacuolization processes (i.e. unmixing of new equilibrium liquid from the coacervate) in spite of the fact that the water percentage of the coacervate increases. Complex coacervation of the mixture of three sols, gelatine, gum arabic, and Na-yeast nucleinate in the cells of the celloidin membrane has been investigated with the object of finding the relationships between the two unmixing co-existant complex coacervates and the equilibrium liquid. Analogies with the morphology of the mature plant cell are noted. Further, the composition of degenerated hollow spheres formed from the complex coacervate gelatine/gum arabic has been investigated and the conclusion is drawn that they are complex coacervates with negative charge. The inflow and outflow effects observed with a number of salts and non-electrolytes on the complex coacervate gelatine/gum arabic added to 0·01N acetic acid have been studied further. They have been observed in 5/9 mol glucose, saccharose, glycerin and 20M. aq. potassium chloride. A general interpretation of these stagnation effects is given and illustrated; they are considered to be practically local outflow effects. C.

Tri-complex Colloid Systems: Flocculation. H. G. Bungenberg de Jong and C. H. Rering. *Proc. Kon. Ned. Akad. Wet.*, 1942, **45**, 705-712, 713-717. (1) The flocculation of a mixture of 2 vol. egg lecithin sol + 1 vol. carragheen sol with added crystalloid cations has been studied. The tendency to flocculation of the sol decreases in the following sequences of Cd>Ca>Mg>Sr>Ba and Li>Na>K, which are also the series of increase of the reversal of charge concentrations for egg lecithin sols. When tricomplex flocculation is brought about with a neutral salt the accompanying anion does not play a part. On neutralization of the tricomplex flocculation by neutral salts (Ca, Li) there are specific differences of the cations and anions: K>Na (>Li) and CNS>J>Br>NO_3>Cl. This indicates that the neutralization is determined by the degree in which the bond between carragheen and the positive group of the phosphatide ampho-ion is weakened. (2) The flocculation of gelatine + carragheen with alkali and alkaline earth cations has been studied and great differences between the salts were found. The tendency to flocculation decreases in the sequence: Ca>Ba>Sr>Mg>Li>Na>K. The intensity of the flocculation with salts of type 1–1 is much less than salts of type 2–1. The above series is again in agreement with the series of the reversal of charge concentrations obtained by electrophoretic measurements. The experiments were made at *p*H 5·5–10 and even in the region well above its iso-electric point (about 5·1) still behaves very markedly as an ampho-ion. C.

Lyogels: Ultramicroscopic Studies. E. A. Hauser and D. S. LeBeau. *Ind. Eng. Chem.*, 1945, **37**, 786-789. The "Ultrapak," the ultramicroscope construction used in the investigation of lyogels of natural and synthetic rubber, is described. It makes use of ultra-illumination with indirect light. Results obtained in the study of natural and synthetic rubbers, soaps, and other lyogels are discussed. Several photomicrographs are reproduced as examples of the applicability and versatility of this simple technique for studying the morphology of lyogels. C.

Emulsions: Polymerization in—; General Theory of the Reaction Loci. W. D. Harkins. *J. Chem. Phys.*, 1945, **13**, 381-382. An outline is given of the theory of reaction loci in emulsion polymerization. There are two types of loci: (1) Loci for initiation of polymer particle nuclei, which are represented by soap miscelles, or monomer droplets the relative efficiency of which depends upon the amount of soaps and other factors; (2) Locus for the formation of most of the polymer, which is represented by the monomer in the polymer-monomer (latex) particles. Some polymer appears in the emulsion droplet also. C.

Oil Emulsions: Film Formation and Structure. Irma M. Felber. *J. Agric. Res.*, 1945, 71, 231-254. Plant spraying materials, which are oil-in-water emulsions, have been studied microscopically with respect to their film formation and structure on glass and other surfaces. The materials used were of two types: (1) dispersions of vegetable oils in water, with added ammonium salts of fatty acids, proteins and bentonite as emulsifying agents, and (2) commercial oil sprays (insecticides), consisting of dispersions of more or less refined petroleum oils in water, with unspecified emulsifying agents. Finally, dried and fixed films obtained from thinly spread layers of the emulsions of these two groups were compared. In general, the films of the materials of group 2 showed far less tendency, on glass surfaces, towards definite configurations, formed by aggregates of the original particles. Different types of surfaces, besides glass, were prepared and used for the materials of both groups. The substratum was found to exert considerable influence on the formation of the films imposed upon it as well as on the patterns of the film. The study is illustrated by 37 photomicrographs. C.

Charged Particles: Orientation of Water Molecules. J. F. van Elteren. *Proc. Kon. Ned. Akad. Wet.*, 1941, 44, 930-932. Two orientations of water molecules round charged particles are possible, one symmetrical and the other not. The potential energy of the water molecule in relation to a charged particle was computed in dependence on the radius of the charged particles and the results are shown in a graph. The F-ion appears to deviate from the Cl−, Br−, and I-ions. With an equal ionic radius, positive ions seem to bind water molecules more strongly than negative ones. A possibility of computing hydration-energies is offered. C.

Sparingly Soluble Substances: Dissociation Constant Determination. H. A. Krebs and J. C. Speakman. *J. Chem. Soc.*, 1945, 593-595. The relationship between the dissociation constant of a sparingly soluble acid or basic substance, its solubility, and the *p*H of the solvent is stated. The relationship was tested and found suitable for the investigation of the solubilities of sulphonamides in various buffer solutions. The procedure adopted is suggested as convenient for determining the dissociation constant of an acid, or base, too insoluble to be dealt with by the usual methods. The measurements made on "sulphadiazine," an amphoteric compound illustrating both acid and basic effects, are described. C.

Diffusion: Irregular and Systematic Motion. J. M. Burgers. *Proc. Kon. Ned. Akad. Wet.*, 1941, 44, 344-353. Diffusion is the consequence of irregular movements to which the particles of the diffusing matter are subjected. These "irregular" movements do not show any preference for a particular direction; a given particle has the same chance to be driven in a positive as in a negative direction. When this equality of chances is not found, there is present a certain "systematic" motion, caused by the action of forces which tend to drive the particles in a definite direction. Formulæ are derived for "irregular" and "systematic" motions, and an equation has been developed in which a separation between "systematic motion" and "diffusion" and the connection between the latter and the intensity of the "irregular" movements is obtained. C.

Porous Membranes: Geometrical and Electrical Structure. K. Sollner. *J. Phys. Chem.*, 1945, 49, 265-280. The empirical permeability characteristics of real membranes cannot be explained without the assumption of their heteroporous structure. The heteroporosity of collodion and other real membranes is due to the more or less random aggregation of the macromolecules and irregular micelles which form the membrane. The pore systems of real membranes can be represented as a sequence of narrow channels and wider cavities which, inter-connected at random, traverse the membrane. Their electrical behaviour is governed by the ability or inability of the ions of an electrolyte to enter purely on the basis of size into the various parts of the pore system, and by the repelling forces emanating from fixed dissociable groups on the pore walls. The bearing of the heteroporosity of membranes of porous character in general on the Teorell and Meyer-Sievers theory is discussed. The weakness of this theory is due to the neglect of any real structure factors. The discrepancy between the sensitivity constants determined from electromotive measurements and from base-exchange studies is a necessary consequence of the heteroporosity/fixed-charge theory. Several membrane phenomena, such as electromotive action, osmotic action, Donnan equilibria, electro-osmosis, the Bethe-Toropoff effect, anomalous osmosis, etc., are discussed from the point of view of the machine character of membranes. C.

Suspensions: Ion Activities. R. Loosje and A. C. Schuffelen. *Proc. Kon. Ned. Akad. Wet.*, 1941, **44**, 475-482. A simple procedure is given for determining activities in suspensions of ions (adsorbed on "Dusarit," a charcoal treated with sulphuric acid) not measurable with a specific electrode. The method has been tested in different circumstances by determining the silver ion activity and also electrometrically, and has given satisfactory results. It is applied to the determination of Ca and Na ion activities, and the results are given in five tables. The influence of the different cation species on each other's activity is shown. C.

Suspensions: Sedimentation Velocity; Influence of Concentration. J. M. Burgers. *Proc. Kon. Ned. Akad. Wet.*, 1941, **44**, 1045-1051, 1177-1184; 1942, **45**, 9-16, 126-128. A general picture is given of the problem of the sedimentation velocity of small particles in a viscous liquid. In order to calculate the velocity imparted to the liquid in consequence of the fields of flow produced by all other sedimenting particles, the field produced by an arbitrary particle A is considered first. To this particle all positions are given which it may take relatively to another particle B, and the mean velocity of the flow over the surface of B is calculated. This mean velocity is then multiplied by the total number of particles present. Due account must be taken of the fact that the liquid containing the particles is enclosed in a vessel and thus a return flow must occur. It is found that there is one case only in which the problem can be treated in a simple way, viz., when the suspension is enclosed between two parallel plane walls, both being perpendicular to the X-axis. In this case the presence of the walls will have no particular influence upon the concentration effect. A provisional expression for the value of the sedimentation velocity in an infinitely extending field is obtained. The motion of a cloud of particles of finite extent, carrying along with themselves the liquid contained in the cloud is considered. C.

Gels: Swelling Stresses and Elastic Constants. W. W. Barkas. *Forest Products Research, Special Report* No. 6, 1945, 1-62. A report covering the work done at the Forest Products Research Laboratory up to May, 1944, on the calculation of the swelling properties and elastic constants of gel structures from their moisture-absorbing properties. The subject is treated under the following headings: (1) General considerations. (2) Swelling of solutions; solutions at constant moisture content; varying moisture contents; sorption at constant vapour pressure; influence of bulk modulus; change in sorption due to pressure. (3) Swelling of rigid gels; general considerations; gels at constant moisture content; varying moisture content. (4) Swelling pressures and elastic constants; pure hydrostatic pressure; gel held in cylinder; gel held between parallel plates. (5) Influence of applied stresses on the sorption isothermal; external mechanical restraints; internal stresses set up during swelling; limited adsorption of gels. (6) Elastic constants of gels; measurement of elastic constants from mechanical tests; measurements of elastic constants from swelling properties. (7) Sorption compression and bulk modulus; general considerations; application of equations; estimation of stress-free swelling data in natural gels. (8) The specific volume of water in tension; calculation of specific volume; tests of equation. (9) Sorption hysteresis. (10) Natural wood as a gel structure; general considerations; sorption data for wood; swelling pressures of a hollow gel of any shape; properties of isolated gel material; other properties deduced from these; discussion of results on wood. C.

PATENT

Non-hygroscopic Cellulose Ether-Esters. J. W. Fisher (British Celanese Ltd.). B.P.571,572 of 5/11/1943:30/8/1945. Cellulose ether-esters characterised by low moisture regain (less than 5 per cent. of that of cellulose acetate) and free solubility in lacquer solvents are obtained by esterifying a cellulose dialkyl ether with the anhydride of an organic monocarboxylic acid with at least 6 C atoms, in the presence of a metal halide catalyst. The first example describes the esterification of ethyl-cellulose of about 48 per cent. ethoxyl content with stearic anhydride in the presence of zinc chloride, ethylene dichloride being the solvent. C.

10—ECONOMICS

American Textile Industry: Post-war Readjustment. Gladys Montgomery. *Textile World,* 1945, **95**, No. 6, 91-94, 95-96, 97-98, 99-100, 149. A series of notes on the "effects of redeployment" on the American textile industry, dealing with (1) possible outlets for American textiles, including new war fabrics, (2) technical problems of mill readjustments, (3) Government steps to increase the supply of labour, and (4) Government directions for terminating war production in the cotton and woollen and worsted industries. C.

British Cotton Industry: War-Time Activity. The Cotton Control. *Board of Trade J.*, 1945, **151**, 406-407. Output and export in terms of singles cotton yarn and in terms of cotton, rayon, and mixture fabrics are tabulated. Figures on employment, machine activity, and yarn and cloth production are given. All data relate to the war years and are compared with the figures for 1937. C.

British Rayon Tariff: Influence on Export Trade. *Silk J. Rayon World,* 1945, **21**, September, 44, 47. The influence of the British Tariff on the rayon trade since 1931 is reviewed, and it is shown how foreign competition found means to overcome the British barrier. Import figures are given for rayon yarn (1933-39) rayon crêpe yarn (1936, '37 and '38) and all-rayon fabrics (1938 and '39). It is strongly recommended that imports should be reduced in the post-war era. C.

Callaway Mills Production Control System. G. H. Williams. *Textile World,* 1945, **95**, No. 6, 108-109. Illustrations are given of report forms used in the Callaway Mills, Georgia, to keep a check on production. These forms are studied by the men in the sales department and help them to carry out the firm's policy of accepting orders only in proportion to the equipment available and delivering goods strictly on time. C.

Clothing Industry: Production and Employment. *Board of Trade J.*, 1945, **151**, 477-479. The results of a Board of Trade enquiry into the production and employment in the clothing industry in 1942 are published. Tables are given covering regional make-up of the labour-force in each section of the industry, age distribution of the factory workers, analysis of the labour force according to the size of the factory, production values, channels of distribution, methods of production in different sections of the industry, and sewing machines in working order in and out of use in the various sections of the clothing industry. C.

Cotton Fabrics: Production in the United States, 1944. *Rayon Organon,* 1945, **16**, 76-77. Figures given for the production of "broad woven" cotton goods in the United States show an annual decrease of 9·8 per cent. from 1943 to 1944. Declines took place on all items except tyre fabrics and specialities. Labour shortages account for much of the decline. C.

Cotton and Spun Rayon Yarn for Sale: Production in the United States, 1944. *Rayon Organon,* 1945, **16**, 77-78. The total production of yarn for sale decreased by 12·1 per cent. to 44,994,000 lb. of rayon and blends, and 967,081,000 lb. of cotton. All items except cotton twines (+6·7 per cent.) showed a decrease. C.

Rayon Fabrics: Production in the United States, 1944-45. *Rayon Textile Monthly,* 1945, **26**, 378-379 and *Rayon Organon,* 1945, **16**, 74-75. The following statistics are tabulated and discussed. (1) Number of looms employed and output for the first quarters of 1944 and 1945 and the last quarter of 1944 under the headings (*a*) all-filament rayon (taffetas, twills and serges, satins, crêpes, etc.), (*b*) all-spun rayon (poplins, etc.), (*c*) combinations of filament and spun rayon (fujis, shantungs, etc.), (*d*) pile, upholstery, drapery, tapestry and tie fabrics, (*e*) mixtures of rayon and wool or cotton or other fibres, (*f*) silk, nylon, glass and other fabrics, and (*g*) tyre cord and fuel cell fabrics (by weight); (2) machinery in use for the above fabrics, and (3) yarn consumed. C.

Rayon Yarns and Fabrics: Production and Trade. J. G. Oliver. *Silk and Rayon,* 1945, **19**, 822-3, 896; 924-5; 1122-3. A series of articles, with tables of statistics, on the activities of the rayon industry during the war period. (1) A review of changes in trade outlets and organisation. (2) Statistics of imports of rayon yarns by the various countries from 1937 onwards, so far as available. (3) Statistics of imports of rayon and mixture fabrics for the same years. C.

Spinning Room Auxiliary Labour: Cost Control. J. H. Witherspoon. *Textile World*, 1945, **95**, No. 5, 116-117. The writer describes a system for deciding what auxiliary labour can be spared or allowed for in costing when any frames in the spinning room are stopped. A "Spinning Indirect Labour Control" sheet is drawn up with a column describing the jobs ("oiler and bander" and so forth) and against it the number of frames supervised by one such man. Other columns give the corresponding wages for 1, 2 . . . . 8 hours. Another sheet called "Spinning Indirect Labour Distribution" shows the auxiliary wage costs that must be made up if 1, 2, 3 . . . . 223 frames are stopped for 1, 2, 3 . . . . 8 hours. The man in charge of spinning enters the number of frame-hours lost on the first "Control" sheet and the corresponding wage saving required for the manager to take appropriate action. C.

Textile Wholesale Prices, July and August, 1945. *Board of Trade J.*, 1945, 151, 430. The Index numbers for July and August are Cotton 162·9, Wool 184·1, Other textiles 138·6, "All articles" 170·8, 170·5 (1930=100). C.

Tyre Cord and Fabric: Production in the United States, 1944. *Rayon Organon*, 1945, **16**, 77. The output of rayon and cotton tyre cord and fabric in the United States increased steadily during 1944, but there is developing a rapid shift in the importance of rayon and cotton fibres in the total output. Cotton has declined by 7·5 per cent. from the middle of 1943 to the end of 1944 and rayon has risen by 140·9 per cent. in the same period. C.

American Cotton Textiles: Progress Report, 1935-1945. W. R. Bell. *Rayon Textile Monthly*, 1945, **26**, 429. A report of the 14th annual survey by the Association of Cotton Textile Merchants of New York. The decline from the peak production of 12,402,161,000 square yards in 1942 was mainly due to man power shortages. With the easing of the man power and machinery situations, the chief remaining hindrance to a higher rate of operations will be costs. The annual chart "Ten Years of Cotton Textiles" is reproduced, giving basic statistical data for equipment in place and in operation, cloth output, and population. C.

Hosiery: Production in the United States, 1940-1944. *Rayon Textile Monthly*, 1945, **26**, 464. Statistics are compiled on a basis of fibre content for three types of hosiery, women's full-fashioned, women's seamless, and men's seamless half-hose for the years 1940-1944. Deliveries of both silk and nylon constructions had practically ceased by the end of 1943. C.

India: Wool Textile Industry. Federation of Woollen Manufacturers in India. *J. Sci. Ind. Res.*, 1945, **3**, 573-587. Contribution to 'Dictionary of Economic Products and Industrial Resources of India.' The history and development of the Indian wool industry are surveyed since the eighteen-seventies when power began to be applied in manufacture. Raw materials, manufacturing processes, variety and quality of products manufactured, markets, and the future of the industry are surveyed and discussed. Much of the information is taken from the Report of the Indian Tariff Board on the Woollen Textile Industry. W.

Woollen Industry: Post-war Problems. L. Bellwood. *Text. Rec.*, 1945, No. 749, 36-37, No. 750, 42-43. Methods for the recruitment, selection and training of labour are discussed. Processing methods must be improved and costs reduced to meet future competition. The fullest use should be made of automatic machinery, the possibility being discussed of new types of automatic devices (some already in existence) in the following operations:—Wool scouring and drying; rag grinding; wool blending; carding and spinning; winding, warping and weaving; fabric scouring and milling, and drying. Research is necessary into the possible uses of synthetic fibres in blends with wool, with the object of improving processes and products. W.

11—INDUSTRIAL WELFARE, INDUSTRIAL PSYCHOLOGY, AND EDUCATION

Cotton Employees: Selection and Training. G. W. Swallow, C. Barnes and Anne Willard. *Textile World*, 1945, **95**, No. 7, 102-103. An account is given of an "entrance programme" now followed by the Nashua Manufacturing Co.

(New Hudson), a spinning and weaving concern employing about 5,000 people. The scheme has greatly reduced labour turnover. The main features are (1) careful selection of suitable work for the new employee, (2) thorough orientation of the new worker to the mill, department and job, and (3) a "follow-up" after two or three weeks to determine whether or not the worker had any difficulties or problems. At the interview the applicant is told about the history of the mill, the system of wage payment, the amenities, safety rules, absenteeism, and so forth. These points are also set out in a neat pocket book entitled, "You . . . . and Your Job with Nashua," which is presented to the applicant for guidance and future reference. C.

Hazardous Chemicals: Storage and Handling. National Fire Protection Association, Boston. *Chem. and Eng. News,* 1945, **23**, 1248-1256. Hazardous chemicals are listed and particulars of their usual containers, fire and life hazards, storage, and fire-fighting methods are given in tabular form. Additional cautionary remarks are added where necessary. C.

Hosiery Workers: Visual Efficiency Tests. G. L. Weibel. *Textile World,* 1945, **95**, No. 8, 125-127. Visual performance tests, made with the "Ortho Rater," were applied to applicants for work and employees of the Magnet Mills, Tennessee, in order to find out whether they were suitable for the tasks of pairing, looping, matching, etc. With the new system of determining visual efficiency a substantial saving in training costs of operators has been effected. The Ortho-Rater is referred to as an optical eye-testing instrument developed by the Bausch and Lomb Optical Co. and industrial psychologists. C.

Safety Propaganda: Application. R. E. Tugman. *Occupational Psychology,* 1945, **19**, 148-154. Industrial accidents are classified and the use of safety propaganda in each type of accident is discussed. Main propaganda effort should be directed at the management, to reduce mechanical hazards and to ensure proper medical, educational and instructional methods, and at the workpeople, against laziness and lack of attention. Ways are outlined to show how the interests of management and workers in safety measures can be aroused. C.

American Post-war Scientific Research Programme. Vannevar Bush. *Chem. and Eng. News,* 1945, **23**, 1420-1430. A summary is given of a report on a programme for post-war scientific research, submitted to the President of the United States by the Director of the Office of Scientific Research and Development. The importance of basic scientific research for the war against disease, for national security and for public welfare is stressed. The Government is urged to provide a reasonable number of undergraduate scholarships and graduate fellowships in order to develop scientific talent in American youth. The establishment of an independent Government agency, devoted to the support of scientific research and advanced scientific education, is recommended. This agency should have a stability of funds so that long-range programmes may be undertaken. It should recognise that freedom of inquiry must be preserved and should leave internal control of policy, personnel, and the method and scope of research to the institutions in which it is carried on. It should be fully responsible to the President and through him to Congress for its programme. C.

Hot and Humid Working Environment: Physiological Effects. L. W. Eichna, W. F. Ashe, W. B. Bean and W. B. Shelley. *J. Indust. Hyg. & Toxicol.,* 1945, 27, 59-84 (through *Bull. Hygiene,* 1945, **20**, 480-481). A study is described of the physiological responses of 13 soldiers working at temperatures at or near the limit of tolerance. Dry bulb temperatures ranged from 93° to 121° F., and wet bulb temperatures from 90°-96° F. At wet bulb temperatures below 91° F. men work easily and efficiently, and with only mild physiological changes. At wet bulb temperatures of 91° to 94° F. prolonged and moderately hard work can be done, but with difficulty and inefficiently, and men may become heat casualties. At wet bulb temperatures of 94° F. or above, most men are soon disabled by moderately hard work, and they exhibit disturbing physiological changes. At the limiting temperatures there is very profuse sweating, from 2 to 3·5 litres per hour. C.

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