THE

TEXTILE MANUFACTURER:

WITH WHICH IS INCORPORATED

The Textile Machinist, The Hosiery, Lace, and Silk Manufacturer, and The Textile Colourist.

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NOTES OF THE MONTH.

The Tendency of Trade Combines.

THE general opinion regarding trade combines has undergone a revolution during the last couple of years, and experience has proved that they come far short of what might have been expected. As in many other cases, the idea is sound, but when carried out it is open to so much abuse that most combines will soon be, if they are not already, looked upon with suspicion. As working concerns, it is found that the management is frequently more lax, and the interest much smaller, than when the different places stood on their own feet; and to sum up the situation, it may be said that combines form a nucleus for all the abuses subject to a limited company, without the accompanying advantages. Unfortunately, combines are now planned by financiers who, possessing all the shrewdness of business men, lack the expert knowledge necessary for a permanently successful issue. The result is that the anxiety to embrace as many firms as possible, and have a formidable list of connected firms, overbalances the discretion necessary for paying a reasonable price for each concern. Many firms or factories are in this way acquired at prices far exceeding their actual value, and all these hang like weights upon the future career of the combine. In time they have to be dropped, which means a heavy if not a total loss of the purchase money. Naturally, no real blame can be put on the persons who sell these worn-out concerns to the syndicate. A man, at anyrate a business man, would feel himself degenerating if he offered anything for less than he could get; ordinary morality would suggest asking what the business was worth. But business has, unfortunately, a morality of its own. Then, apart from the worth of the concerns, there has been verified what was predicted when combinations first came to the front. When a man has disposed of his business, he has also disposed of some of his personal interest in that business. He may continue as manager, but neither his reputation nor his income is, as a rule, at stake, or only proportionately so to what it was before. Regarding the quality of work turned out, it is said that in many cases this is deteriorating. The Americans find that they can dye and finish as well or better than many of the examples exported from England, and that other classes of work are easier to excel. Then, taking printing: the printing works in France have more work in hand than they can get through, whilst a printing trade is being built up in India with a success and rapidity which are startling when the comparatively unskilled labour is considered. In treating these matters it must be remembered that only recently—in fact, only a few months ago—the finish of English textiles was unrivalled, the standard of dyeing was high, whilst as for printing, there was almost a monopoly in the better grades. Coming to finances, a glance at any daily paper shows the true state of affairs. The older combines, those formed strictly with the aim of combination for working protection and economy, show the advantages of the system when worked in its true light, while the experience of later combines, many of which were formed because the others had shares valued above par, provide any but pleasant reading, especially to hard-working investors who see the savings of years suddenly cut down to half their original value. Only recently one Lancashire textile combine has been subjected to some strong criticism on the part of its shareholders, and is likely to receive more. Another, floated only a little over a year ago in Yorkshire, with a capital of £2,500,000, finds now that it is unable to pay any dividend. And a third, floated about the same time for £1,000,000, has already had to close six of its works, and the rest are working short time; yet it has recently had the assurance to issue a request for £1,000,000 more capital. This also was a combine which had practically a complete monopoly of the work it was engaged in. Something should be done, and done soon, to protect investors—perhaps foolish investors—from results like these. It would be unjust to attribute fraud as a factor in the proceedings, for everything has been done on legal lines; but it will be generally agreed that some restraint, some oversight, and more publicity are necessary in the formation of these syndicates.

Female Labour.

THE recent troubles at Rochdale, and the constant recurrence of the question it raises, show that the problem relating to female labour is far from being settled. It will probably never be settled until men realise their true position. It is an established fact that in the struggle for anything, it is the fittest who survive, whether the goal is the acquisition of a country or a pair of looms. We cannot add that the *best* survive, but in the long run it is the strongest or ablest who gain the coveted post. This law of nature, which is far from being confined to human beings, is necessary for upholding the standard of man, beast, and even of plant life, although perhaps not discernible at the time, and perhaps only taking effect after more than one generation has elapsed. But to shorten this digression, why do owners of weaving sheds prefer female to male labour in many cases? If the lords of creation sincerely asked themselves this question, they would not waste time on strikes. A woman weaver is preferred because (1) she requires less wage, (2) she keeps better time, and (3) she is defter, quicker, and tidier in her work. These points apply to the sex generally, whilst admitting that, as in everything else, there are individual exceptions. Taking first the wage question, it may be of interest to consider why women as a class require less wages than men for work which they are capable of performing. There are the same items necessary for existence in one sex as in the other, yet in most cases a woman will live, and live respectably, on a far smaller sum than the sterner sex. The woman weaver has no tobacconist to pay; her debts to the publican are smaller, if present at all; she has no club to uphold, no favourite football team to follow round the country, and, we might add, greatly reduced clothing bills.

When a woman has finished at the mill she attends to other duties. She perhaps makes her own clothes, and she certainly mends them. When the men have finished for the day, they as a rule spend the evening killing time. This would be allowable after a heavy day's work, as is the case with men's labour in some trades; but weaving is not heavy work, its monotony being the worst that can be said of it, and that is not so evident as when tending many other kinds of machines. The second point is not quite so noticeable, but it is generally admitted that a woman keeps better time than a man. Most men weavers would consider it a disgrace to be in their places waiting for the engine to start. They knock the ashes out of their pipes just as the gates are being closed, and then saunter leisurely to their work. A special night at the club or public-house frequently means a quarter off, and slight indispositions mean excuses to stay at home. The third point is much more evident than either of the others. Women make much better weavers than men; in fact, with the exception of special fabrics requiring heavy and complicated loom fittings, weaving is not man's work. In the old hand-loom days weaving was a calling requiring strength of an enduring nature. In the early power-loom days strength was still required to attend the first cumbersome and badly-designed machines. Even until recently some of the broad coating looms required a man's strength for turning the loom over or lagging back; but now all is changed. The looms of to-day are light and easy running: attachments do all that is considered practicable in the saving of labour, and the work is more one of deftness, requiring a sharp eye, nimble fingers, and neat methods. These are scarcely what may be considered masculine attributes, and it is therefore natural that employers should prefer women weavers. The majority of manufacturers refuse to employ men weavers, even at women's wages, well knowing the trouble which accompanies them. There are far more trades open to men than women, trades to which women can never aspire, and it seems unreasonable that the sterner sex should pander to quarrelling over the matter of a trade to which woman is more fitted. We have not considered the question relating to the employment of mothers of young families; this is quite a separate matter, for there is a large supply of girls and unmarried women weavers.

Fencing Machinery.

IT is now a few years since the question of fencing machinery was taken up in an energetic and business-like manner, yet according to the last report of the Chief Inspector of Factories much remains to be done. His chief complaint is that new machinery, even improved machinery, is continually being sent out from the maker without being equipped with the safety devices which have been previously suggested and adopted on the older working machines. He suggests that the fencing and safety devices should be built on the machine while it is being made, when it is much easier to arrange such in place, and when it is more possible to obtain an effective and reliable safeguard. It is also more economical to so build in the safeguards, for after-additions are much more expensive, in addition to being less effective and clumsy. Continental and American machine makers have lately done much in offering for export properly-guarded machines, and it is hinted that we may lose business by non-conformance with this principle. In many respects Mr. Whitelegge is quite right, but in others he is rather far from getting at the true state of affairs. Regarding machinery for export, no machinists send out better-guarded machinery than the Lancashire makers, for the simple reason that foreign customers order and pay for the safeguards. In most other countries the fencing of machinery is enforced to a very particular degree, and spinners or manufacturers know exactly what they must have. This known, it is an easy matter for the machine maker to design and fix the safeguards while the machine is being built, and this they invariably do. In England, however, things are different. We have some indefinite idea that fencing is necessary, but it is far from being known how far it must be carried out. With a few notable exceptions millowners go as far as they are positively compelled in this matter, and not one whit further. When they get new machinery they refuse to pay for the fencing, and as fencing means money both for labour and material, machine makers cannot be expected to be benevolent enough to give it away. The machinery is therefore delivered with the minimum safeguards required, and the factory inspector reproaches the innocent builder. Apart, however, from the indifference of millowners, much has been gratuitously done by textile machinists in a general way, and in a new machine such things as exposed revolving set-screws and similar dangerous details of the machine itself will rarely be found.

The Bombay Piece Trade.

FOR many years a large amount of trade has been done between Lancashire and India, and by far the most important portion of the imports into Bombay have been Lancashire cotton piece goods. Last year the trade received a noticeable check, and the imports of this article were greatly reduced, although, fortunately, the rise of prices left profits about the same as on the trade of the previous year. The falling-off was chiefly in grey goods of the shirting and dhootie class. The former of these fell off from 3,950,000 pieces in 1899 to 2,325,000 in 1900, whilst the 3,650,000 pairs of dhooties in 1899 were reduced to 1,325,000 in 1900. The decreased imports, however, do not necessarily mean a demand reduced to the same extent, for last year saw an increased trade in Indian-made cloths. When cotton prices rose, the Bombay market was supplied with large quantities of material from the mills in Ahmedabad. These mills held large stocks twelve months ago, but have been enabled to clear them, with the result that the Indian trade has now been put upon a healthier footing than it was in 1899. The Ahmedabad mills were able to sell off their goods at a lower rate than the imported English cloths, with the result that these latter suffered. It is very likely also that the Indian mills will continue to hold this position until the prices of English goods, which have lately been much above the average level of recent years, are again lower. Of course the famine resulted in a smaller demand for cotton cloths, but not to anything near the extent shown by the above figures. Other types of cloth, if not suffering from the competition of native mills like grey shirtings and dhooties, felt the result of the famine to a large degree, but these, together with jaconets, drills, and madapolams, did not fall off more than could be reasonably expected under the circumstances. One thing has been settled which is of special interest to the shipping trade, and that is the renewal of the freight contract with the chief steamship lines. This has resulted in a fixed rate of freight being arranged from the beginning of this year until the end of 1905. The commencement of the new year has seen a great impetus to the trade with England, which looks as if both Lancashire and India were going to have better times. That Lancashire has begun well is evinced by the January returns of the Board of Trade, which show that 90,902,700yds. have already been sent to India this year. This amount almost equals the combined amounts for the same month of the two previous years, which were 58,684,200 in 1899 and 42,127,600 in 1900. That Indian weavers are benefiting also is shown by the increased exports of yarn to Bombay.

Anglo-Saxon Commercial Supremacy.

SOME very hard things are said of England by our effervescent neighbours across the Channel, but it is very possible that these come second only to the language used in America on the slightest pretext, and sometimes on no pretext at all. There is, however, a vast difference between the two, for one is malicious, whilst the other is critical, and the bad names we are called in America are more to be compared with the stimulating, if unpleasant, language used within the homes of some of the most loving families, where terms are used which would not be borne from any outsider. We have many proofs of a friendship between England and America which is almost as strong as, and perhaps stronger than, that of the units of one empire. The educated American never forgets that we are one race, descendants from one nation, and this has been recently emphasised by the New York "Press." This paper comments on the supremacy of the Anglo-Saxon race in the commercial dealings with the world, and shows that more than one-half of the trade is now in the hands of Great Britain, the United States, British India, Canada, and Egypt, whose total amounts to £1,220,200,000. All other countries reported—namely, Germany, France, Austria-Hungary, Belgium, Italy, Russia, Switzerland, Spain, and Argentina—have an aggregate of £1,116,600,000. The vastness of these figures gives but a faint idea of the extent of the total exchange of mankind, but it illustrates the point under consideration — namely, that the Anglo-Saxon, without having imposed his flags or his speech upon the majority of nations, has conquered the world empire of commerce with every prospect of increasing his preponderance for an indefinite but considerable period to come. It is doubtful whether India and Egypt should be included under the head of Anglo-Saxons, but as the trade of those countries is chiefly in British hands, it may be safe to allow them to remain. The main point, however, is whether we shall retain this supremacy. During the century which has just closed the population of the world has grown from 640,000,000 to 1,500,000,000, or an increase of 135 per cent. In the meantime international exchanges have increased nearly ten times as rapidly, or to the extent of 1233 per cent. This means that the world generally is waking up to international activity, and that the best race of men will come to the front. In a few years, colour and nationality will stand second to education and training, but in spite of these latter a great deal depends upon the energy, perseverance, insight, and bodily health of the men who make up the nation. As regards England, she will for years, perhaps centuries, remain the centre of the world's commerce, in spite of the direct dealings and shipment which are coming more and more into vogue, but it is somewhat doubtful if our industrial position will hold for that time. The vast natural resources of large continents and the vitality and energy of new countries will in time result in the centre of industry being transferred. Where, it is hard to say. Perhaps to the United States, although it is just as likely to be to some virgin soil whose mineral wealth and natural resources are as yet unknown.

Boiler Scale.

MANY readers will recollect a paragraph—which at one time made its appearance with persistent regularity in the technical press, but which is now usually found only in the advertisements of boiler-compound manufacturers—purporting to give the loss of fuel due to various thicknesses of boiler scale. The statement was to the effect that scale $\frac{1}{16}$in. thick on the inside of a boiler required an extra expenditure of 15 per cent. fuel, and that an increasing ratio required 60 per cent. more fuel for $\frac{1}{4}$in. scale, 150 per cent. more for $\frac{1}{2}$in. scale, and so on. Probably many have relied upon these figures as being reasonably accurate, but at least one engineer, Mr. W. H. Bryan, has taken the trouble to trace their origin, and he found they were based upon the hazy authority of a paper read by a doctor before some local medical or scientific association. Mr. Bryan states that it has now been shown repeatedly that scale has very little effect upon the capacity or efficiency of a boiler. It is a common experience for locomotives to come into the shops with the spaces between tubes coked solid with scale, but without any deterioration either in capacity or fuel economy having been noticed. The principal, and practically the only, objection to scale deposits is that they increase the danger of burning. On the other hand, a coating of soot carries with it little or no danger, but causes a great dropping-off in both capacity and efficiency. The incidental advantages of smokeless combustion in this direction are rarely recognised.

ARTICLES.

Printed Silks for Spring.—I.

PRINTED silk foulards are always more or less in fashion for ladies' dress goods, and even have a limited demand when other styles of printed silks are utterly ignored. But never before have printed silk foulards been in such favour as during last

FIG. 1.

season, and it is easy to predict that the coming spring and summer will see a still greater

FIG. 2.

display. The printed fashions of next season will not be confined to silk foulards, or even

FIG. 3.

the addition of silk muslin, which has increased in demand. Printed silk cloths of every description, both pure silk, and silk with cotton, are being made. There will be a gradation from the cheapest cotton-warp pongee—whose actual silk is so small in quantity that it is merely theoretical—to the richest and heaviest damasks in both large and small jacquard designs, and to the printed velvets which are rapidly growing in favour. Some of the printed silks are worked with metallic threads, whilst gold and silver impressions are also used.

The revival of the present fashion tendency dates back to about five years ago, when the chief retail drapers of Paris, London, New York, and

FIG. 4.

other centres displayed the well-known type of foulard, with large white designs block printed on a navy-blue ground. The style originated in Lyons, where one or two manufacturers conceived the idea of making use of some old blocks, but, what seemed queer at the time, printed only the blue ground and left the floral or other effects entirely white, without afterwards printing the *rentrures*. Clever dressmakers, always fond of oddity in style, if not too vulgar, took up these printed goods, adding laces or guipure trimmings, and producing novel, yet pretty, dresses which fell in with the ideas and fashionable tendencies of the time.

Cotton printers lost nothing by the success of the silk foulard, and the large orders of the Lyonnese manufacturers for Manchester printers have

FIG. 5.

had a good run for the last two years on cotton imitations, many of which, thanks to the mercerising process, are difficult to distinguish from the genuine article. Last year there was a great demand for English cotton muslin prints, fine cotton taffetas and sateens, which were shipped in thousands of cases to all parts of the world. The supremacy in silk printing, however, is still held by Lyons, where it will probably remain for some years to come. English, Russian, and American printers and even printers in other parts of France, are studying the question, but cannot come up to the

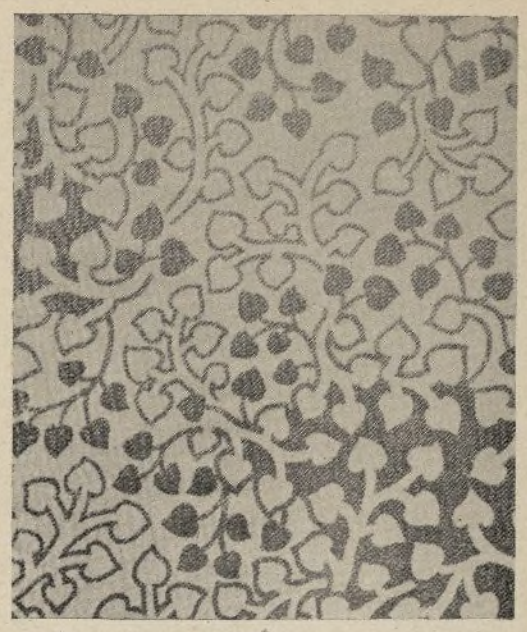


FIG. 6.

Lyonnese productions. When they do, printed silks will no longer be highly fashionable, for their cheapened manufacture will put them into the hands of all classes, and over-production will glut the market.

FIG. 7.

At the present time, silk printing in Lyons is in full sway, and silk prints predominate over any other silk fabric in that city of silks. The following

FIG. 8.

are the classes of silk which are being printed for the coming spring season :—Pongees Lyonnais and Shanghai, twills Lyonnais and Japonnais, ordinary

and Liberty satins, peau de soie, silk muslins and Chinese muslins (both silk and union armures), crêpes de Chine, gauzes, pannes, and vélours. Four tyles of printing are in vogue, which in Lyons are

Fig. 9.

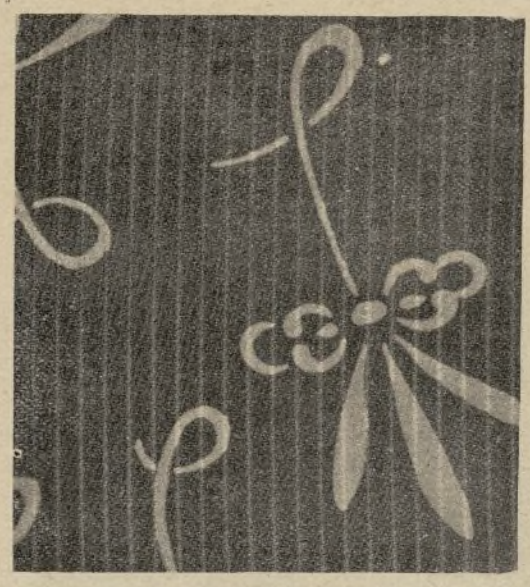


Fig. 10.

Printed Silks for Spring.

known as :—(1) Impressions enlevage blanc et couleur, (2) application, (3) rongeants, (4) enluminés plusieurs couleurs.

The following are a few prominent styles and designs :—

Fig. 1 is a pongee Lyonnais printed with an *art nouveau* design in dark blue and white. The weave is plain, the warp has 144 ends per inch of grège silk, whilst the weft is tram, 96 picks to the inch. The design is reproduced about half its natural size.

Fig. 2 is printed after the *ancient manner*, and reproduced half-size. The weave is a 2-and-2 twill, 128 ends of organzine warp per inch, and 100 picks of schappe weft.

Fig. 3 is the reduced design of an *art nouveau* print of the same weave and particulars as the previous pattern.

Fig. 4 is an *art nouveau* design reduced to half its natural size. The weave is 2-and-2 twill, 132 ends and 86 picks per inch of organzine warp and schappe weft respectively.

ends per inch of organzine warp and 106 picks per inch of tram weft.

Fig. 8 is a sateen in *art nouveau*, reproduced its actual size. It is woven with 10 shafts, 400 ends per inch of grège warp and 102 picks of tram weft.

Fig. 9, also full size and *art nouveau*, has an 8-satin ground, on which a small jacquard figure is worked. The warp is grège silk, 340 ends per inch, and the weft schappe, 106 picks per inch.

Fig. 10 is of a very novel appearance, and the figure, instead of the usual white, has a pink shade. The pattern is shown full size, and is an *art nouveau* design. The groundwork is a stripe worked on the 5-satin base, the warp is grège and the weft schappe silk, with 400 ends and 112 picks per inch respectively.

(To be continued.)

Jute and Linen Weaving.—XIV.

By Thomas Woodhouse and Thomas Milne
(Head and Assistant Textile Masters, Dundee Technical Institute).

THE method adopted for driving the dobby, described on page 6, is shown in Fig. 82. The connecting rod P (provided with a union screw for adjusting the level of the lifting knives) imparts motion from a crank or eccentric on the crankshaft to the outer arm of the lever Q, fulcrumed at R, the extremity of its inner arm being connected to the lifting knife A by the vertical connecting rod S. The reciprocating grate B receives its motion from the same lever Q, through the rods T and cantilever U. This will be better understood by referring to Fig. 83, where the solid lines represent the machine when the lifting knives are level, and the dotted lines similar parts when the shed is open. The connections clearly show that any upward movement imparted to A will produce an approximately equal but downward movement in B. A and B in the figure have been moved through an angle of 90° from their true position.

Referring again to Fig. 82, the card cylinder N is supported at each end by similar arms V screwed to the rocking shaft at W, motion to which is imparted by the lever X connected to the lever Q, as shown. An ordinary spring hammer Y is introduced to aid in levelling the cylinder and in preventing vibration when selecting the hooks. The downward movement of the rod P raises the lever X, throws out the arms V and the cylinder N, the corner of the latter, in its outward movement, being caught by the catch Z and forced to rotate towards the needles. The cylinder N is double decked—*i.e.*, provided with two rows of holes on each face,—and may thus be adapted for cross-border or similar work, such as seamless bags. When intended for this kind of work, either the needle-plate must be depressed or the cylinder N raised, so that the bottom row of holes may face the needles To effect this change slight additions to the machine are necessary.

The arrangement for reversing the cylinder is shown in the front view of the dobby in Fig. 84. The lever 2, actuated by the cord 3 and fulcrumed at 4, carries the pulling catch 5 and lifting bar 6. The cylinder N, being thrown out clear of the needles, is reversed by pulling down the cord 3, and therefore the catch 5, the lifting bar 6 meanwhile raising the catch Z clear of the cylinder. Short chains of cards are kept taut by means of a roller 7 carried by adjustable brackets on sliding rods 8, which move in and out with the cylinder N. Long chains of cards are wired and pass over the roller 7 from the card race 9.

Keighley Dobby.—Since its introduction by Messrs. George Hattersley and Sons about the middle of last century, the Keighley dobby in its various forms has been exceptionally successful in obtaining wide recognition and extensive adoption. Especially is this the case for light and medium goods, as for these classes of fabrics there are probably more dobbies in use of this type than of any other. Although machines on this principle are made by several different firms, their general characteristics are in all respects the same, and will be readily understood from the following illustrations and description of those made by Messrs. Ward Brothers, of Blackburn. Fig. 85 is a sectional elevation of a right-hand, double-lift, negative open-shed dobby, viewed from the front of the machine. Being a double-lift machine, motion is imparted from a crank on the bottom or wyper shaft, through the connecting rod A, to the ⊣ lever B, the rod A being connected to the lever by a universal swivel joint. The lever C corresponds with the arms of the ⊣ lever B at the other side of the machine, both being outside the framing, keyed to shaft D, and therefore moving in unison. Each arm of the lever C, and the corresponding arms of the lever B, carry near their extremities, an eye-bolt E, through the eye of which the end of the corresponding horizontal drawing knife is passed ; each eye-bolt being also attached to an arm of the driving lever by a knuckle joint F. The camb shafts are attached by straps or cords to the long arms of the bell-crank lever G, fulcrumed at H, and connected at I to the beam levers J, the drawhooks K and K¹ being connected to the levers J as shown. The octagonal lag or pattern barrel L is driven negatively from the lower arm of the

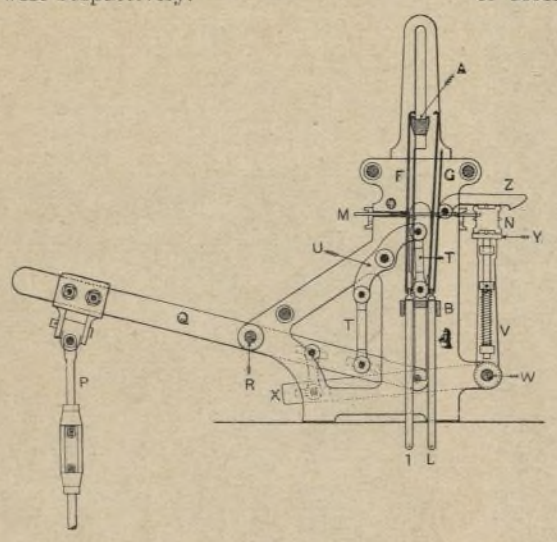


Fig. 82.

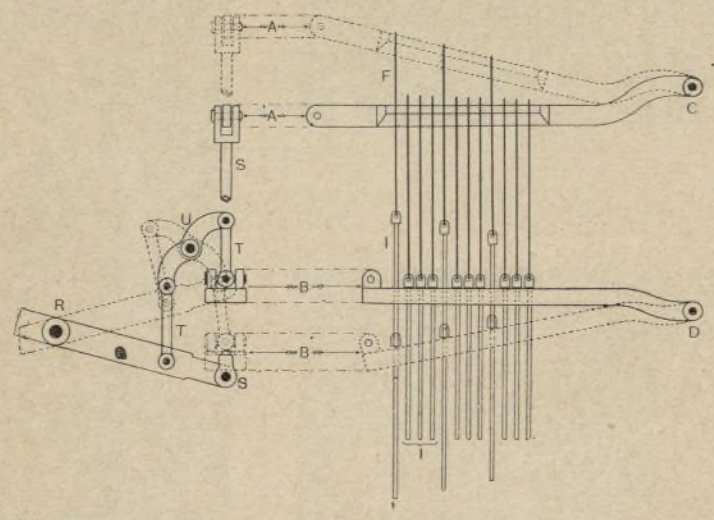


Fig. 83.

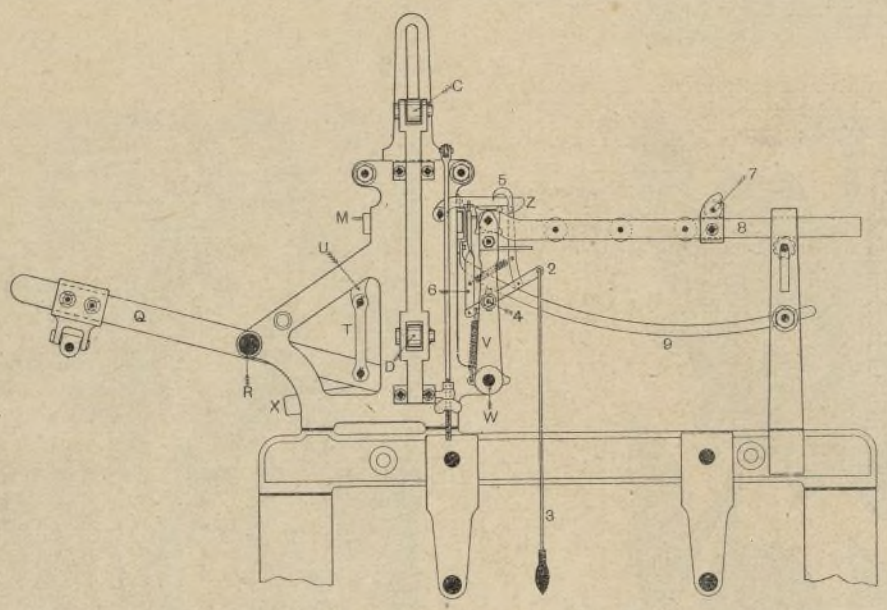
Jute and Linen Weaving.

Fig. 5 is a Persian design, actual size, the ground being a dark blue, almost black in appearance. The design is 2-and-2 twill, with 146 ends per inch of organzine warp and 100 picks per inch of three-fold tram weft.

Fig. 6 is a half-size representation of an *art nouveau* print, the ground being a medium purple, which makes it conform with the present state of mourning. The cloth is a 2-and-2 twill, with 136 ends and 100 picks per inch of organzine warp and schappe weft respectively.

Fig. 7 is a very pretty cloth printed in the *art nouveau* style, the design being shown half-size. The weave is a 6-shaft serge (5 and 1), having 320

lever C by pushing the pawl M, which, through the ratchet wheel N at the head of L, turns the latter one-eighth of a round every revolution of the wyper shaft. It will thus be seen that one lag must determine the position of the levers G for two picks. The drawhooks K, K¹ are supported by the inner arms of the levers O and O¹, the top hook by



JUTE AND LINEN WEAVING.—FIG. 84.

means of a steel needle P, and the bottom hook direct by a suitable bend on the arm of the corresponding lever. The fulcrum V of the levers O, O¹ is so situated, and the outer arms of the levers so weighted, that the tendency of these levers is always in favour of keeping the drawhooks K, K′ clear of the horizontal drawing knives. In their normal positions the outer arms of O, O¹ will rest on the lag barrel, and so long as the corresponding hole in the lag remains unpegged, no change in the position of the drawhooks will take place, the knives simply moving to and fro in the guide slots Q in the framework. If, however, a lag be pegged, the outer arm of the corresponding lever O or O¹ will be lifted, the inner arm will fall, and at the same time the supported drawhook will fall over the drawing knife as shown in Fig. 86. When this occurs, the driving crank on the wyper shaft will be at, or near, its bottom centre, and will have caused the arms of the levers C and B to place the drawing knives in the position indicated. From the figure it will be seen that it is the lower drawhook K that has come into contact with the drawing knife, the top hook K¹ being still clear, due to the fact that no peg has been inserted in the lag at the position immediately underneath the lever O¹. The crank, in moving from the bottom to the top centre, reverses the positions of the arms of the levers C and B, and therefore of the drawing knives, as shown in Fig. 87. In performing this change the lower end

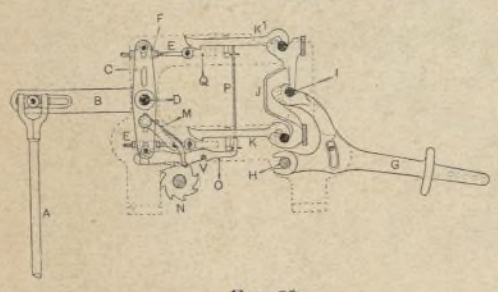


FIG. 85.

of beam lever J is withdrawn from R¹, at the same time raising the bell-crank lever G and the shaft attached. R and R¹ are parts of the framework which are utilised as fulcra for the ends of the beam lever J; when K¹ is in action R¹ is the fulcrum, and when K is in action R is the fulcrum. When the crank again reaches the bottom centre, the lag barrel will have been rotated one-eighth of a revolution clockwise, and a peg will be under each lever O and O¹, and both drawhooks will fall, and be acted upon in turn by their respective drawing knives. When this occurs—*i.e.*, when a shaft has to be up two or more picks in succession—the beam lever J simply moves about its connection with the bell-crank lever G at I, imparting little or no movement to the lever. With the bell-crank lever G prolonged, as in Fig. 85, the connection to the leaves must be by means of bow bands; but with connections S and T, as in Figs. 86 and 87, a more direct and steady lift is obtained. By making the connections to the leaves nearer to, or farther from, the extremities of the levers S and T, a varied lift may be acquired. Variation of lift may also be obtained by adjusting the knuckle joint F in the slots of the driving levers C and B.

(To be continued.)

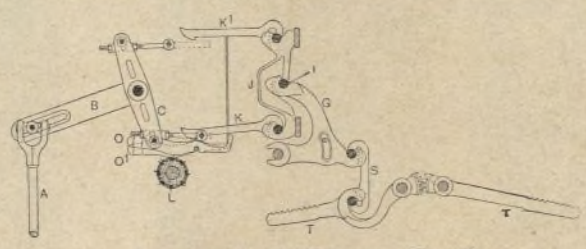
Cotton Fibres in Spinning and Manufacturing.—II.

By W. I. HANNAN.

[ALL RIGHTS RESERVED.]

DEAD COTTON is a term used in the spinning, manufacturing, and dyeing divisions of the textile trades. Whenever the term is rightly applied it is an indication of something faulty in the fibres, in the yarn, or in the woven cloth.

The origin of the so-called dead fibres must be traced to the cotton capsules or pods when they are fully mature, with their segments ready open to the light, or in the best stage for the seed cotton to be picked. If all cotton capsules of the bottom or of the top crop ripened at the same time, there would rarely be any dead cotton. The fibres attached to the seeds in the cotton pod are termed seed cotton. They form collectively a plexus of fibres having a triangular shape agreeing with the form of the inner parts of the pod segments. The compression of the fibres in the pod is kept up until the segments open, when they distend, and those fibres which do not undergo this distention, or only in a smaller degree, become wrinkled and matted after the ginning process. Such are known as dead, gin cut, unripe, or half-ripe cotton.



JUTE AND LINEN WEAVING.—FIG. 86.

A few years ago the Egyptian crop contained large quantities of dead cotton fluss and flocked fibres. The flocking of fibres cannot be traced to the development, but rather to the extra curling propensity, of the staple when the fibres are being detached from the seed under the action of the roller type of gin. In the Macarthy gin, if the beater is set too close to the doctor knife, the long-stapled fibres of Egyptian are apt to become jammed between the two; the fibres are very much bent as a result, and assume an excessive curl. The short and dead fibres become entangled with the mass: some assume the form of matted, dense slubs; others are overstrained or repeatedly crossed, and in the first pulling of the staple show an extra resistance until the curl has been drawn out and the fibres lie in one direction of the pulled staple.

In American samples, gin cut, unripe, and immature fibres may be ranked more or less with dead cotton as being injurious to the spinning of good yarns. Short fibres often accompany the tufts of dead fibres at the lower part of the capsule segments, and where a greater compression is exercised on the fibres of those seeds that are seated in the lower part of the capsules most dead cotton will be produced. When seed cotton is picked before the capsules are widely opened there is more liability for dead cotton and short staple being produced. The cotton gin is well adapted for cleaning the fully-ripe fibres from the seeds which ultimately become the lint of the cotton markets.

If the fibres of seed cotton are unripe they aggregate together and are taken from the seeds in dense opaque tufts, and for spinning purposes may be regarded almost as useless, hence their name of dead cotton. In the opening, scutching, and carding processes much of the dead cotton is eradicated, but in many cases tufts are passed on, and give rise to an occasional neppiness or a weakening against the pulling strains, and also a cloudiness due to parts where the short or immature fibres have lost their hold on the surface of the yarn. The dense white speck which they exhibit has left a gap to be filled up by the twist, which always runs into the thinnest parts of yarns during spinning.

The seeds of American cotton have a woolly down attached to their surface, which is left on the seeds after the fibres have been ginned as lint. This down is of very short matted fibres, but is sometimes stripped with the lint when the gin is working defectively. These downy, short matted fibres are difficult to remove on account of their lightness—even more difficult than leaf. If tufts of this short down are passed on they give rise to white specks of fluff, and may be classed as dead cotton. The cotton crops of different countries are always liable to produce a certain amount of dead cotton. Its production may be great or small, depending upon natural causes or bad picking seasons. To determine the presence of dead cotton involves some amount of acute observation in the sampling, mixing, and spinning operations.

(To be continued.)

Designs for Cotton Fabrics.

SPECIALLY CONTRIBUTED.

PATTERN No. 173* is a cotton shirting of a shade somewhat too dark in its present state, but allowing for loss of colour after a few treatments at the laundry. The design is chiefly 2-and 2 twill, with slight deviations as shown in the design given in Fig. 1. The different ways of marking the squares in this design indicate where the different colours in the warp fall, whilst the wefting is 12 white and 12 blue throughout. The actual face design of this shirting is by no means striking, but the dark blue stripe produces, on the back (as shown), a pattern both novel and effective. If brought on to the face of the cloth, this combination

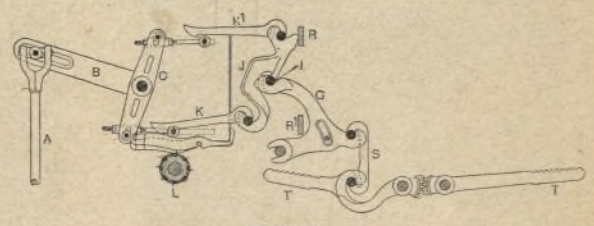
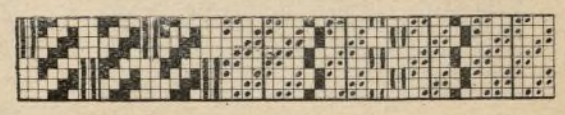


FIG. 87.

of weave and colour should give designs of an attractive and useful nature. Fig. 1 can be woven on six shafts, but will be a better weave if eight, or even ten, shafts are used, an extra one being added for each series of double ends.



COTTON DESIGNS.—FIG. 1.

Pattern No. 174* is a rather pretty shirting design weavable on five shafts. The arrangement of the design given in Fig. 2 shows where the differently-coloured warp threads are loomed, and the weft is

* See facing page 42.

all white, with the exception of two picks of blue shot across every 23rd and 24th pick.

Fig. 3 is a design for an all-over pattern, with leno figure. It would require about a 96 reed, shot with 90 picks per inch. The black should be weft, with not too much float, and the ground tabby. The white in the centre of the flowers might be 4-and-1 warp satin.

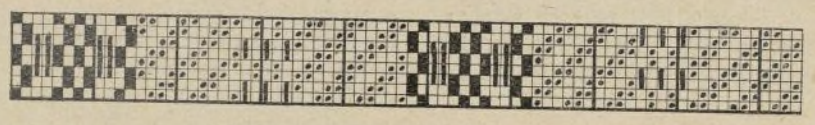


Fig. 2.

Cotton Designs.—Fig. 3.

Fig. 5.

Fig. 4 is a suggestion for coloured goods to be made in a 70 reed with 96 picks to the inch. The black should be weft bound with 7-and-1 satin, and the ground tabby with the stripes put in a different colour, which might be 3-and-1 warp twill, or tabby like the ground.

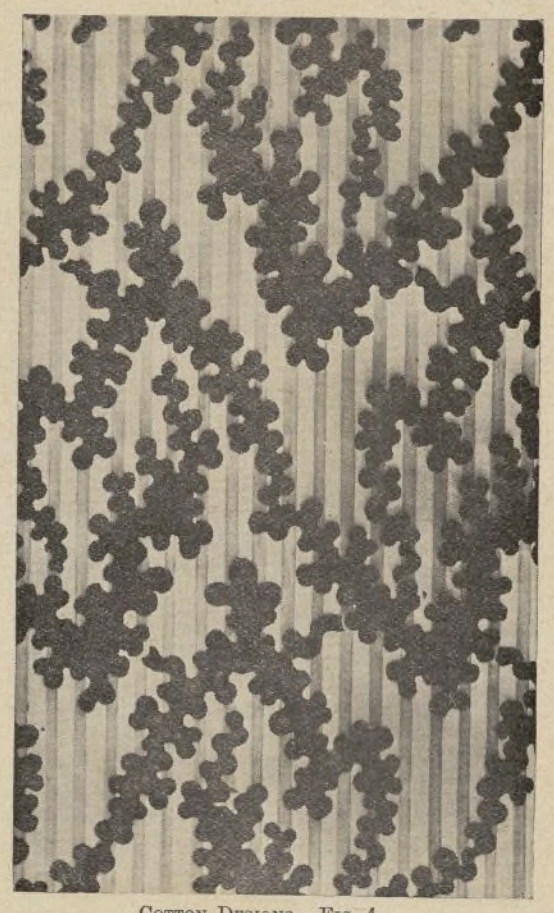
Fig. 5 is a design for cotton dress goods, with a white warp in an 80 reed, having a pretty effect when shot with about 90 picks of light blue weft. The black should be weft with grey warp, and the ground small flecks of weft on tabby.

Fig. 6 is a sketch for cotton linings, and should be made with a 70 reed, and shot with about 100 picks per inch. The black should be weft, the grey 4-and-1 warp satin, and the ground tabby. The weft spots on the ground will take away the plainness of the tabby without loosening the weave too much, besides making the cloth look richer.

Fig. 6.—Cotton Designs.

Fig. 7 is a design for a bordered handkerchief in a 96 reed, and shot with 100 picks to the inch. The black should be weft with grey warp, and on a 4-and-1 warp satin or 3-and-1 warp twill ground. The grey edging to the border should be 4-and-1 weft satin.

Fig. 8 is a design for a cotton brocade made in a 96 reed, and shot with 120 picks to the inch. The black figure should be warp well floated, the bindings being cuttings and satins, the ground to be 4-and-1 weft satin; the white in the figure should be weft bound with 7-and-1 satin. Patterns in this style come out very effective when the cloth is dyed and finished.



Cotton Designs.—Fig. 4.

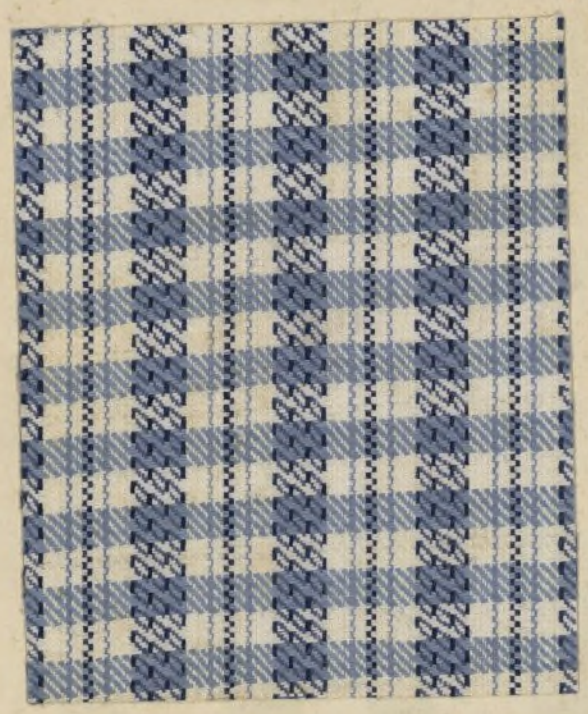
Fig. 7.

Designs for Woollens and Worsteds.

Pattern 175 is a trousering pattern worked with a weave which is capable of giving a large and novel assortment of stripe designs. It is adapted for subdued effects, which are most required for this class of fabric, and it would make a coarse-looking cloth if colours of violent contrast were used. Although the pattern is backed, this warp backing does not cover the whole fabric, and the small stripe portion worked in a seven-shaft screw is solid. The face design is shown in Fig. 1, whilst the whole pattern is shown

PATTERN SHEET No. 92.

Samples of Cotton Cloths.



PATTERN No. 173.

PATTERN No. 174.

NOTE.—*The samples of Woven Fabrics—except those marked as specially designed and woven for this Journal—may have been registered under the "Patents, Designs and Trade Marks Act."*

PATTERN SHEET No. 93.

Samples of Woollen and Worsted Fabrics.

PATTERN No. 175.

PATTERN No. 176.

in Fig. 2. In this latter design the solid squares represent the face, as also do the dots of the solidly-woven portion, whilst the lines represent the seven-shaft satin warp back. Two-fold

Cotton Designs.—Fig. 8.

worsted yarns have been used throughout; the weft is all black, whilst the warping is as follows :—

Face Warp.

4 times { 1 end dark slate.
1 „ light slate.
1 „ black.
3 „ dark slate.
1 „ black.
4 times { 1 „ light slate.
1 „ dark slate.
7 „ slate (common to both).

Back Warp.

8 ends twist.
1 „ black.
3 „ twist.
1 „ black.
8 „ twist.
7 „ mentioned on face.

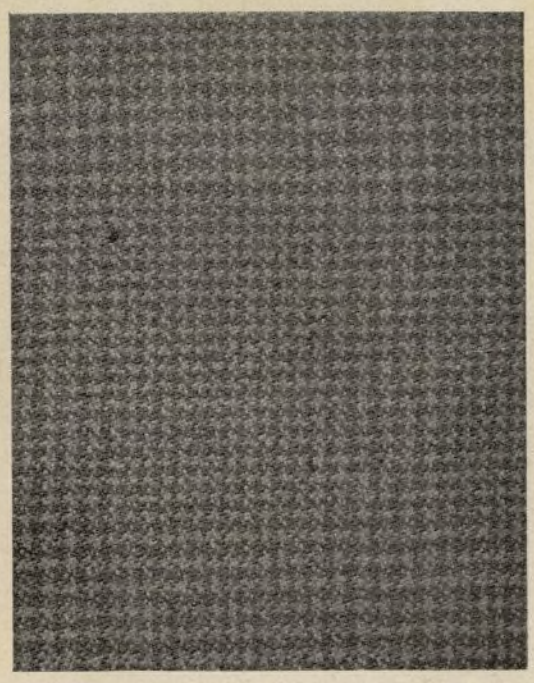


Fig. 4.

Pattern 176 is a neat worsted checking in a spring weight, being a 16oz. cloth. With the exception of the faint green overlines, the contrasting colours are nearly of the same tone, being only just sufficiently distinct to show the checking effect. The weave is shown at A in Fig. 3, and makes a full and soft-handling fabric.

Fig. 4 shows a spring weight suiting in which the colour effect is the main feature. The weave is the ten-shaft design shown at B in Fig. 3, and the various effects are developed by different arrangements of threads of the same colour. The yarns are all two-fold worsted of a soft Botany quality, and are arranged as follows :—

Warping.

12 times { 3 ends twist.
3 „ colour.
6 times { 4 „ twist.
4 „ colour.

Designs for Woollens and Worsteds.—Fig. 1.

Wefting.

17 times { 3 picks twist.
3 „ colour.
6 times { 4 „ twist.
4 „ colour.

A suggestion is got from the back of this pattern which is shown in Fig. 5. For some purposes this reversed design is the better of the two and more novel in appearance. For neat effects in a finer cloth, or for louder patterns in coarse goods, the back has the advantage over the face design.

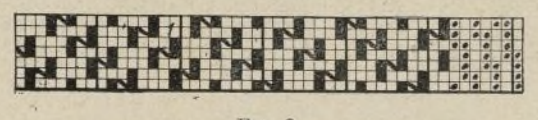
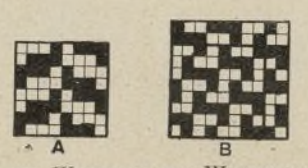


Fig. 2.

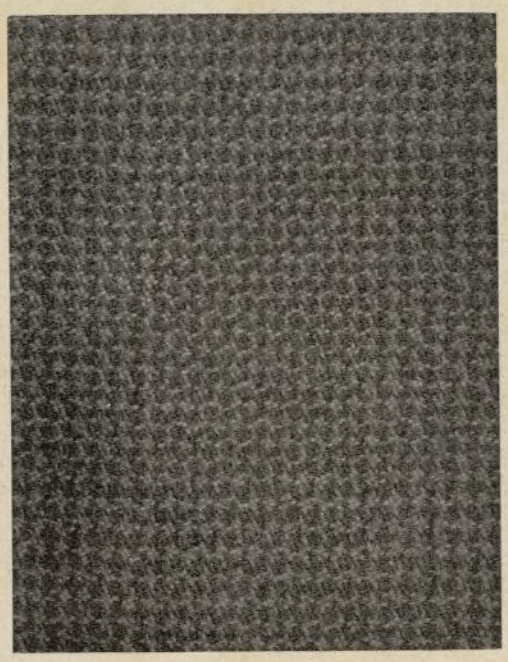


Designs for Woollens and Worsteds.—Fig. 3.

Fig. 6 is a light suiting still more dependent upon colour arrangement. The design is a simple 2-and-2 twill, the pattern being obtained by arranging the threads as follows :—

Wefting.

8 times { 2 picks black.
3 „ twist.
2 „ black.
1 „ twist.
10 times { 1 „ black.
1 „ twist.
1 „ black.
2 „ twist.
2 „ black.
1 „ twist.

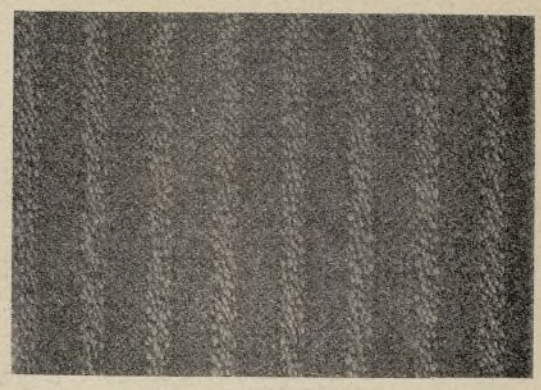


Designs for Woollens and Worsteds.—Fig. 5.

Warping.

8 times { 2 ends black.
3 „ twist.
2 „ black.
1 „ twist.
8 times { 2 „ black.
2 „ twist.
1 „ black.
1 „ twist.
1 „ black.
1 „ twist.

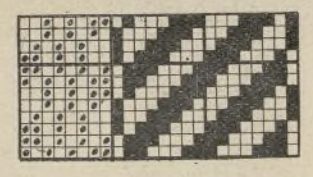
Fig. 7 shows a good method of easily obtaining fancy stripes. The pattern, which is all worsted, is drafted in six shafts, the ground being 3-and-3 twill. The arrangement is shown in Fig. 8, where



Designs for Woollens and Worsteds.—Fig. 7.

the eight ends shown by dotted squares are grandrelle yarns, whilst the ground (full squares) is all mixture worsted, as is also all the weft.

Fig. 9 is a very pretty effect which is obtained in a very simple way. This will be seen by reference



Designs for Woollens and Worsteds.—Fig. 8.

to Fig. 10, which gives the design. The wefting is all black, whilst the warping, commencing at the left-hand side of the design, is :—

1 end colour.
1 „ black.
2 „ light.
2 „ grey.
2 „ light.
9 times { 2 „ black.
2 „ light.
2 „ grey.
2 „ light.

Worsted Spinning.

By M. M. Buckley

(Lecturer on Worsted Spinning at Halifax Technical School).

(*Continued from page* 10.)

WHEN the yarn is caused to revolve around the cap by the motion of the bobbin, it forms a curve, or "balloons."

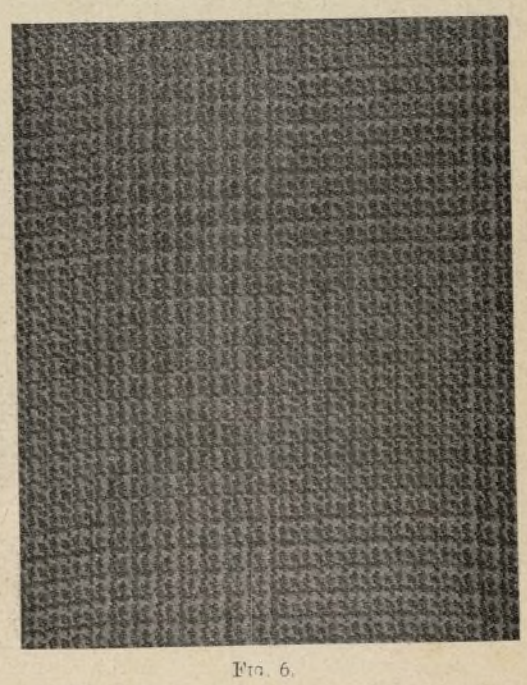
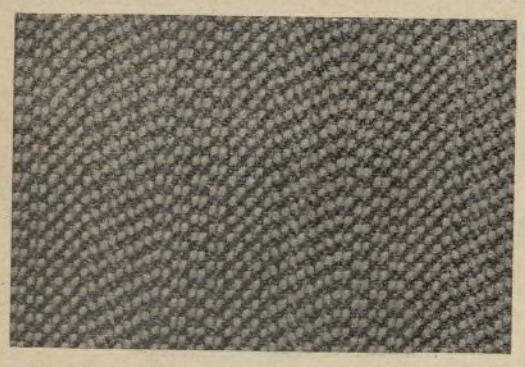


Fig. 6.

The extent to which this takes place depends upon several factors. Its variation may easily be observed by watching a frame in motion, or comparing frames spinning different counts under similar conditions. Its size largely depends upon the tension created by the bobbin, though the friction between the yarn and the cap has some influence, as well as the yarn itself; hence we may say that the amount of ballooning will depend upon the weight of the end, the speed at

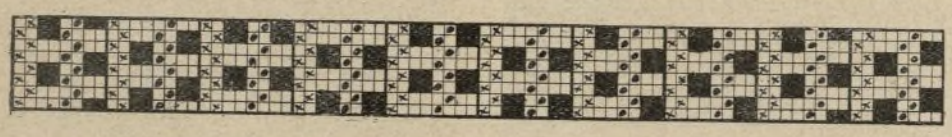
which it is revolving, and the size of the cap employed. To prevent the ends interfering with each other, tins are placed between, against which they balloon and are constantly beating ; this makes the fibres loose and produces a wild appearance. It is extremely difficult, under the present conditions, to perfectly control the balloon, since it varies during the building of the bobbin, and even in the same traverse, in the case of spools ; but apart from this it is necessary that for all counts the conditions of ballooning should as far as possible be the same, or the tension on the end should be varied according to its weight or thickness. Where the tension is small it results in a large balloon. To attempt a full demonstration of all the points concerned would lead us too far into mechanics and mathematics for our purpose ; we shall therefore just enumerate



Designs for Woollens and Worsteds.—Fig. 9.

what they show us. Two forces govern the winding—viz., the pull on the end by the bobbin, and the centrifugal force arising from the bobbin acting on the end. This latter must always be in the ascendant, for if the pull is most powerful the ends break. In practice it is known that thick counts must be spun at a slower speed than fine ones, but we have found few overlookers who could explain this, or the relation existing between the weight and speed. It depends upon the influence of the two factors just mentioned. If we double the speed of the bobbins we increase the tension on the end fourfold, and *vice versâ*. If we halve the speed, the tension is four times less ; when the size of the cap is enlarged, the tension increases in the same proportion.

Everything depends upon the proper adjustment and relation of the various parts in the spinning frame. The yarn must be constantly examined to ascertain its regularity, not only in white, but more particularly in the case of colours, because of its influence upon the effect when woven. Numerous expedients have been designed to facilitate this testing, such as



Designs for Woollens and Worsteds.—Fig. 10.

winding several lengths of the threads side by side upon a card, the colour of which contrasts strongly with that of the yarn, so as to bring out the defects. However, a black card for a white yarn, or a white one for dark shades, only yields indifferent results. The best and most practical method is to twist the end with another which contrasts strongly with it upon the twisting frame ; or, if this is not available, it may be done by reversing the band or tape, and running down the spinning frame, the threads going over the back rollers and through the front. The twist in the end and the contrast between the two colours serve to render any irregularity very pronounced, because the thick places are slack and the thin ones hard, while the predominance of one colour over the other affords conclusive evidence. These trials can be easily made, and the results are much better than a comparison of single threads side by side. If the trials be afterwards reeled and tabulated, they may be kept for comparison and reference. In this way valuable information may be obtained with regard to the effect produced by alterations, and the difference which the various settings of the ratch in relation to the staple affect regularity can be readily seen. The draft trials of this kind should never be omitted when starting a new lot, and should be insisted on in preference to the rule-of-thumb methods almost universally in vogue. Another feature requiring attention is the amount of twist in the yarn. A difference invariably exists between the actual number of turns and the theoretical estimation. Several types of twist testers are available, and one should always be at the disposal of the spinner. Some are well adapted for testing all kinds of folded yarns, but when applied to single yarns some difficulty is experienced in determining when all the twist is out, because of the intertwining of the fibres. The microscopical attachments are of little real practical value, as with them only short lengths can be taken, which do not yield a reliable average. It is better to take two spun threads and run them through the front rollers of the frame being tested, and afterwards try them on the tester, since the threads can be afterwards readily separated and a much longer length taken. In practice the manufacturer seldom intimates how much twist he requires in the thread. It is of little consequence to him so long as the yarn is satisfactory and produces the desired effect in the piece ; while in most mills it is customary to put a certain quantity of twist in the twofold ; it should be borne in mind that the harder the twist the less is the turn-off and the sharper the yarn. If the spinning is bad, a remedy is sought by increasing the twist, which sometimes alters the appearance of the thread. In the case of left twist yarns, special care should be taken to ascertain that they are right, because they require more turns than the right twist to produce the same result, owing to the fact that the individual fibres retain a certain amount of twine derived from the previous operations of drawing which has to be taken out. The setting of the topboards, which should be fitted either with porcelain or enamelled eyes, has considerable influence upon the spin. They are attached to the roller beam by small slotted brackets, and should be slightly inclined to reduce the strain and bending of the ends. When adjusting the edges of the eyes, these should be exactly plumb with the centre of the spindle, so that the points with which the end comes in contact during its revolutions are concentric. Many bad spins are caused by improper setting, and the edges should be occasionally tested with a small plumb-bob to ascertain whether they have slipped or not. When spinning coloured yarns, a difficulty is often experienced in seeing the ends and consequently keeping them up. Many attempts have been made to render them more visible, amongst which perhaps the most general is to stretch a piece of broad white tape behind them along the topboard. This, however, soon becomes covered with fly and waste, which impairs its efficiency. A bevelled porcelain plate about 1½in. wide, screwed on to the board, answers the purpose best. Being smooth, it can be readily cleaned, and if properly fixed it neither interferes with the movement of the board or the rollers, as the tape does. There is no reason why an enamelled plate should not be used for the same purpose ; the cost is trifling, and the advantages undoubted, in addition to rendering the work of the spinner more comfortable and healthy by removing the necessity for straining the eyes. In fact, their adoption should be made compulsory in the case of coloured yarns.

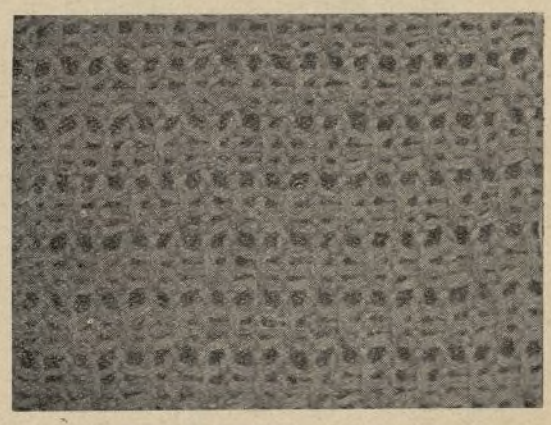
(To be continued.)

Fancy Dress Fabrics.—XIV.

By G. Washington.

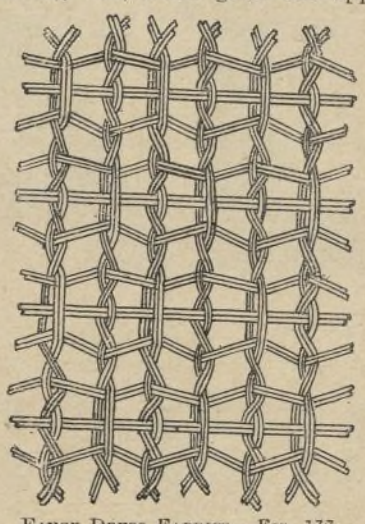
THE gauze fabric illustrated in Fig. 136 is very fleecy and soft in appearance. This is obtained by using double threads and picks of soft twisted yarn, which lie very lofty and spread out from each other. Fig. 137 shows the scheme of interlacing.

Warp.
2/36's worsted
4 threads in 1 reed.
1 empty reed.
20 reeds per inch.
Weft.
2/36's worsted.
14 double picks per inch.



Fancy Dress Fabrics.—Fig. 136.

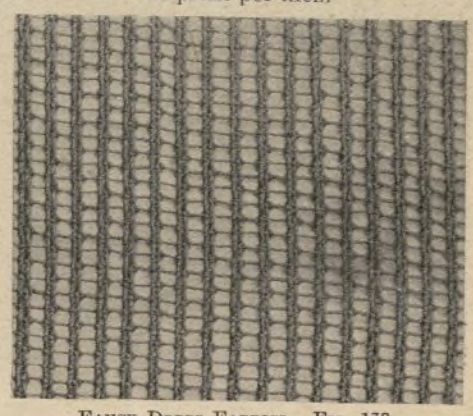
The fabric photographed in Fig. 138 presents a great contrast in every respect to the last. The yarns are hard twisted, and the douping threads, which scarcely show on the face, are only used to bind the two threads weaving plain closely together, and thus keep the spaces between them as open and distinct as possible. This is clearly shown in Fig. 139, which gives the appearance



Fancy Dress Fabrics.—Fig. 137.

of the face. On the back the douping threads form a honeycomb effect which is sketched in Fig. 140. The crossing thread requires a separate beam, as it is half as long again as the others.

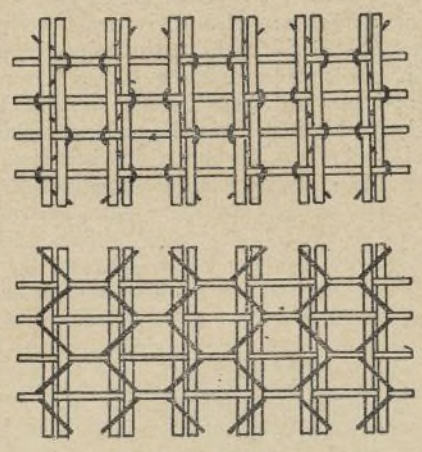
Warp.
2 ends 3/15's worsted.
1 „ 2/30's worsted.
In 1 reed.
1 reed empty.
20 reeds per inch.
Weft.
2/30's worsted.
18 picks per inch.



Fancy Dress Fabrics.—Fig. 138.

A very rich-looking and effective silk fabric is shown in Fig. 141, which illustrates what a variety of effects can be obtained in the plain weave by irregular reeding and the employment of different thicknesses of yarn. The fine yarn makes a closely-woven lustrous fabric, which contrasts with the dull open effect of the thick yarn. The thick weft and small warp form a warp cord which contrasts with the weft cord made by the small

weft and thick warp. The open spaces which separate the various squares are another pleasing feature of the design, and add much to the effectiveness of the whole. Fig. 142 shows how these spaces are kept open in the fabric. At the edge of each portion of warp four very fine threads are woven, leno or half-gauze, two threads crossing two. These bind the warp firmly in position, and prevent it from encroaching upon the open spaces. The difference between leno and plain gauze crossings is that in plain gauze there is a complete crossing between each pick, and the same warp threads are up for every opening of the shed ; in leno the warp weaves plain over and under alternate picks, and two picks are required to make a crossing. Leno is like gauze, with an extra pick inserted in the



Figs. 139 and 140.

centre of each crossing, and draws the small weft into groups of three and one alternately. There are 46 picks in the design, and as leno is 4 picks to the round, two gauze crossings have been used, as shown at either side of the fifth pick in Fig. 142. By comparing these two crossings with the remainder the difference will be clearly seen. The spaces across the piece are kept open by the insertion of four very fine picks, which are so small that they are scarcely perceptible in the fabric ; these picks are shown by single lines in Fig. 142.

Warp.

10 ends 3/20's worsted .....in 10 reeds.
4 „ silk, 7000yds. per ounce..in 1 „
Empty 2 „
4 ends silk, 7000yds. per ounce..in 1 „
30 double ends 70/2 silk .....in 10 „
4 ends silk, 7000yds. per ounce..in 1 „
Empty 2 „
4 ends silk, 7000yds. per ounce..in 1 „
24 reeds per inch.

Weft.

10 picks 3/20's worsted.
24 picks per inch.
4 picks silk, 14,000yds. per ounce.
28 „ 40's silk.
4 „ silk, 14,000yds. per ounce.
60 picks per inch.

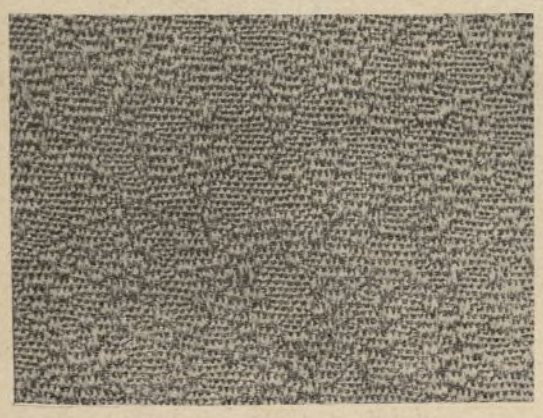


Fig. 143.

An indefinite all-over pattern is illustrated in Fig. 143. The ground is plain weave, and makes a very rough warp cord effect The close setting of the warp causes it to stand up prominently on the surface, and the thick warp yarn gives the cords a very rough appearance. The weft is smaller than the warp, and also set farther apart. This fabric contains nearly three times as much warp as weft. The pattern is obtained by allowing the warp to float for 3 or 5 picks at intervals, as shown in Fig. 144, thus causing it to stand up more prominently on the surface.

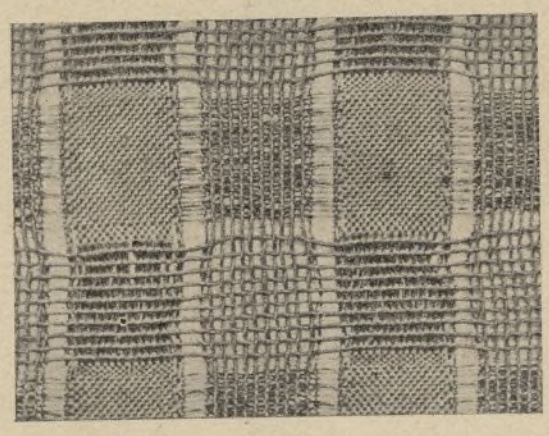
Warp.

2/36's black lustre worsted.
80 ends per inch.

Weft.

30's black worsted.
48 picks per inch.

Figs. 145 and 146 illustrate the appearance and structure of a black silk fabric. Like the last example, the ground weave is plain and produces a cord effect; but as the warp is smaller than the weft, the cords are smooth and distinct in appearance. The weft floats loosely on the back of the solid warp figures, and is stitched in position by every seventh warp thread, thus forming a firm,



Fancy Dress Fabrics.—Fig. 141.

smooth foundation under the raised figures.

Warp.

Silk, 4500yds. per ounce.
150 ends per inch.

Weft.

4/30's worsted.
56 picks per inch.

(To be continued.)

The Mechanism of Spinning.—X.

By H. R. Carter.

COTTON-WASTE SPINNING MACHINERY —Continental manufacturers have always led the way in this branch of the spinning industry, and at the present time are taking at least half of the waste produced in England and America. Their study of the subject has led them to adopt the most suitable machinery, and they are now able to produce goods of superior quality from wastes cast aside by other mills. The various qualities of cotton waste comprise : (1) The soft and short strippings from the cylinder, roller, or flats of the carding engine ; (2) waste resulting from the breakage of the material in its passage through the drawing, speed, and spinning frames ; and (3) the

Fancy Dress Fabrics.—Fig. 145.

waste made after the yarn has been twisted—viz., in the reeling, bundling, winding, warping, and weaving. The first two species are termed "soft wastes," and may be spun into low numbers of yarn over machinery such as we have described in our previous articles. The third class, termed "hard waste," is more difficult to deal with, as it consists of hard twisted threads, and even of cop bottoms, which are masses of tangled thread which formed the foundation of the cop, and which, having become ravelled, cannot be wound off. To render such material suitable for spinning even the coarsest yarns, a machine termed a hard waste opener, or "breaker up," is required. A suitable form of this machine resembles a double opener in general outline. It has a feed lattice upon which the hard waste is spread and delivered to a set of three feed rollers which gradually deliver to a strong steel cylinder clothed with wooden staves set with strong steel points, which approach fairly close to the nip of the feed rollers and open out the waste as it is held by the latter. The threads and fibres carried away by the cylinder are thrown off and pass between a pair ot revolving dust cages as in the ordinary opener. These in turn deliver it to

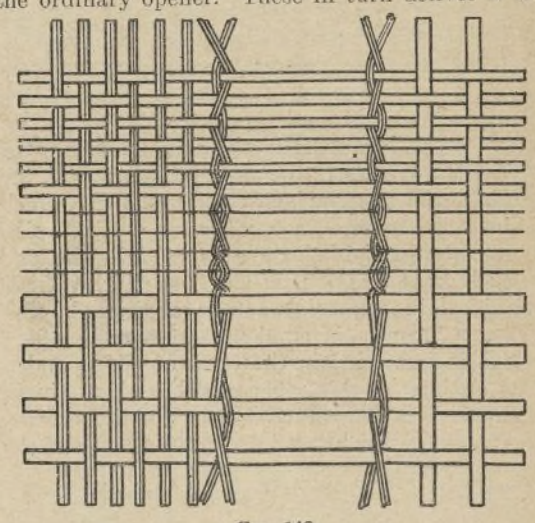


Fig. 142.

a pair of consolidating rollers, from whence it passes on to another set of feed rollers, cylinder, and dust cages, which continue the opening process, and so on, over as many cylinders as the nature of the material requires, until, being delivered from the last pair of cages, it is deposited on the ground or carried away by a travelling lattice. Sometimes a fine spray of soapy water is thrown over the material as it issues from the machine, in order to increase its spinning qualities and reduce waste. Needless to say, anything of this nature must be very regularly and sparingly applied.

Poor waste of this sort can only be satisfactorily spun on what is known as the carder and condenser system. Shortness and inequality in the length of the staple, together with the presence of threads, render it impossible to draw it by rollers in the same way as pure cotton, or even "soft waste." The carder and condenser system is that upon which woollen yarns are spun ; in fact, the cotton-waste plant of this description resembles woollen machinery very much. In this method of spinning, all the intermediate processes of doubling and drawing are dispensed with, and the raw material

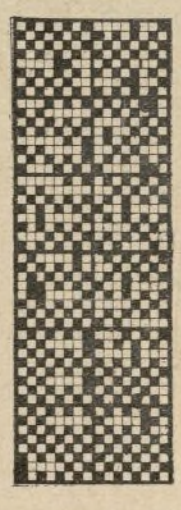


Fig. 144.

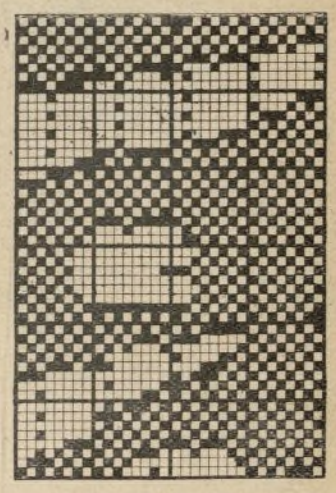


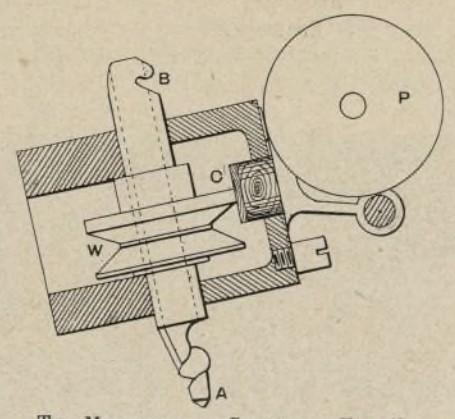
Fig. 146.

goes in at one end of the machine to come out in the form of slubbing at the other. Such a system undoubtedly effects a saving in the number of hands required, but the yarn produced differs essentially in the arrangement of its fibres. In the case of yarn which has been prepared and spun over machinery in which the drafting has been done by rollers, the fibres present a much more parallel aspect than they do in the case of yarn

which has been prepared and attenuated upon the card.

In spinning cotton waste the best results are obtained by employing two cards, the first of which may be called a breaker or scribbler, and the second a finisher. The cards are of the roller type, very similar to that described in Article V. of this series. The breaker may be fed with opened material by a hopper feed, or by two laps of material which have been put over a scutcher as previously described. The material is thus conveyed in an even layer upon the feed lattice to a pair of feed rollers, which may be fluted or covered with leather fillet, and kept from lapping by a third small roller on the top. The "licker-in" or "taker-in," about 8in. in diameter, carries away the material as delivered, and passes it on to a cylinder 50in. in diameter. Over the top of the cylinder are seven pairs of workers and strippers, or clearers, the former about 6in. and the latter about 2½in. in diameter, which exercise their functions in the ordinary way. As in the ordinary roller card, the straightened material is taken off by a doffer, which is in turn stripped by a vibrating doffing knife. Since the material being used is itself a waste, and as such containing much short fibre which there is no object in separating out, an additional roller called a "fancy" is employed to raise the fibre which is embedded in the teeth of the cylinder. The clothing of this roller, which is about 8in. in diameter, is of comparatively long and limber wire, the points of which just intersect the teeth of the cylinder, and in consequence of their greater surface speed raise the short and embedded fibres so that they are deposited with the rest upon the doffer. Were this roller not used, the card cylinder would require to be "stripped" or "fettled" much more frequently, causing a large waste of time and material.

The "Scotch feed" is a convenient and serviceable way of conveying the material from the breaker card doffer to the feed lattice of the finisher card, since its use is equivalent to two doublings. The fleece of cotton, as displaced by the doffing knife from the doffer of the breaker card, is drawn away in a long sliver upon a narrow cross lattice moving parallel with the knife and the face of the doffer. This lattice delivers the sliver thus formed through a conductor to the condensing rollers, from which it passes up to an overhead lattice creeper, half of which is balanced and can swing up and down, for a reason which will be explained. From the end of the swing balance the sliver passes down to a pair of rollers in a frame which is moved backwards and forwards, from one side of the finisher card lattice to the other, by a slowly travelling belt. As it moves from one side to the other, the rollers which it contains deposit the sliver regularly upon the feed lattice just underneath, the speed of which can be so regulated that the thin edge of one sliver overlaps another, thus producing a very regular feed. A cord is attached to the travelling frame, and, passing round a pulley fixed in the centre of the card, is made fast to the swing balance of the overhead creeper, the end of which is also vertically over the middle point of the traverse of the frame. In this way the end of the overhead creeper is drawn down as the travelling frame approaches the ends of its course, rising again as it approaches the centre, and thus compensates for the difference in distance of the travelling frame from the middle point of the overhead creeper.



THE MECHANISM OF SPINNING.—FIG. 25.

The tin rollers in the travelling frame have pinions on the ends of their axles, which gear the one with the other. The ends of the rollers work in a piece pivoted in the centre, which enables each of the rollers in turn to be put in gear with a stud pinion compounded with a band pulley around which a cord passes and is attached at each side of the card. This third pinion first turns in one direction and then in the other as it travels backwards and forwards, while the rollers in the frame always run in the same direction, since they are put alternately in gear with their driver at each extremity of their travel.

The finisher lattice carries the material forward to a card similar to the breaker, but finer, and in conjunction with which a machine called a condenser is used to divide up the fleece, which is taken from the card cylinder, into narrow ribbons which it rubs into round slubbings between reciprocating surfaces.

There are two broad types of these condensers—those in which the fleece is taken from the doffer in a sheet, and then cut or separated into narrow ribbons; and those in which the material is taken from the card cylinder by "ring" doffers, in which the clothing is put on in endless and parallel rings with spaces between. Such a condenser should have at least two such doffers, in order that the cylinder may be uniformly stripped, while some American machines have three, in order to give more room for the rubbing of the threads and to facilitate the separation of long fibres. Whether there be two or three doffers, the rings should be properly spaced, so that every ring may be opposite a blank on the other doffer or doffers, and so that each may get an equal quantity of material and produce threads of equal thickness. The top doffer is generally found to take more than its share, since it drags off some of the long fibres. For this reason the rings of the top doffer are generally made narrower than those of the bottom. The ring doffers are cleared by small stripping rollers clothed with fine fillet, the points of whose teeth lift the narrow ribbons of fleece from the rings and present them to the rubbers, being themselves sometimes cleared by a small plain or finely-clothed roller. Even with a space of say ¾in. between the rings long fibres sometimes extend across from one ring to the other, causing one thread to rub into the other while being condensed. A divider with V-shaped grooves placed between the ring stripper and the rubbers will sometimes do away with any trouble on this score.

In that type of condenser which has one large plain doffer the slubbing may be formed by ringed strippers acting upon the doffer in a somewhat similar way to the ring doffers upon the cylinders; or the web or fleece may be taken from the doffer in one piece, and separated into ribbons by fixed plates, or by a number of endless straps or bands of steel or leather working into grooved rollers. Such condensers are known as tape condensers, and are particularly suited to the working of comparatively long fibres, or short fibres containing long threads. When narrow ribbons have been formed from the fleece in any of these ways they must be rubbed into a round slubbing before they will have sufficient consistency and strength to undergo any further process. The rubbers may be either leather-covered rollers or endless leather aprons stretched upon carrying rollers. In the "roller" condenser the ribbons are passed in between a pair of these leather-covered rollers, about 3in. in diameter, lying one upon the other parallel with the face of the doffer, which, in addition to a movement of rotation, have a rapid reciprocating, endwise motion given to them by eccentrics. Each moving in the opposite direction to the other, tends to rub the ribbon into a compact round slubbing, which is indeed accomplished

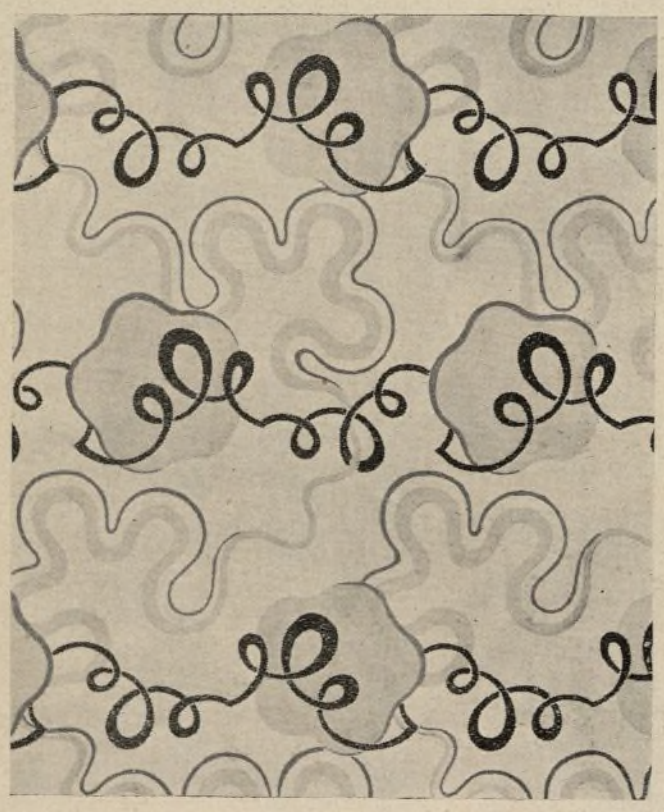


FIG. 1.

SILK DESIGNS.

FIG. 4.

after it has passed through a succession of such rollers. The rollers may have slightly-increasing surface speeds, producing a very short draft, which aids in producing a finer slubbing without reducing production.

Rubber condensers may have either single or tandem pairs of rubbing leathers for each doffer. A slight draw may be produced with tandem rubbers, while the space between the rubbers is sometimes employed to introduce a divider when difficulty is experienced in keeping the threads separate. The rubber leathers are stretched on rollers, and act in a manner similar to the rubbing rollers. Difficulty is sometimes experienced in getting the rubbers to turn the material over, owing to the leather becoming smooth and dry, and they may have to be oiled occasionally if no oil or saponaceous matter is introduced in the batch. Scored or ribbed leathers are sometimes used to give the necessary grip on the material, and to prevent the threads running together.

On leaving the rubbers, the now round and fairly strong slubbing is led through traversing guides and wound upon condenser bobbins which rest upon drums having the same surface speed as the front rubber. The bobbins contain twelve or more ends, built cheese form, side by side, by the quickly traversing guide. Attempts have been made to spin yarn directly from or upon the condenser—that is to say, to provide the machine with spindles and flyers, or their equivalent, to twist and wind the thread upon bobbins. There is one such machine which, although not yet in general use, will probably sooner or later be adopted for spinning cotton waste, especially in the coarser counts, such as are used for weaving cleaning cloths, etc. It is a most interesting machine, in that it involves an entirely new principle in the mechanism of spinning—*i.e.*, the spinning of the yarn without spindle, flyer or ring, merely by the rotation of the thread round its longitudinal axis, using the fibres of the material, as supplied, as free ends. The apparatus, which is called "Drury's Patent Spinning and Winding Machine,"* is applied instead of a condenser to the delivery end of a finisher carding engine such as we have described, which should be provided with two ring doffers. The rings are in reality stripped by the running up of the twist, combined with the drawing off and winding up of the yarn. Curved needles are also employed, which, depending from a bar stretched across the face of the doffer, assist in clearing the rings and guiding the ends into eyeholes in a bracket underneath. After passing through the eyehole, the end is drawn between the inner surfaces of a narrow strap which runs round a plain roller parallel with the face of the doffer and a flanged pulley, the two sides of the belt being pressed together by means of tension pulleys. The surface speed of the thread is thus the same as that of the roller round which the twisting band passes, while the number of turns per inch given to it depends upon the relative velocity of the band, the winding on of the thread, and the diameter of the latter. The diameter of the thread being so small, a hard twist may be given by a comparatively slow running band. The yarn may be conveniently wound upon spools or cheeses by the ordinary drum winding arrangement.

The most general way of spinning waste which has been made into slubbing on the condenser system, is upon the self-acting billy, which is similar in general principle to the mule described in Article IX. Instead of a creel, it has surface drums to deliver the slubbing from the condenser bobbins which lie upon them to the feed rollers. As the material is not to be roller drawn, rollers are merely provided to regulate the delivery and keep all strain off the untwisted slubbing. In order that they may hold the slubbing firmly, there are often two lines of bottom rollers and one of top self-weighted rollers lying between them. For the numbers 2 to 4 a mule of 2½in. gauge, and for numbers 4 to 8 a mule of 1⅝in. gauge will be found most suitable. The comparatively small production of the mule for the large floor space occupied has led some Continental machinists to experiment with a view to providing a "constant" spinning machine which will spin from the condenser bobbin, drafting the slubbing at the same time. We know of only two machines of this class—a ring-spinning frame built by La Société Anonyme Celestin Martin de Verviers, Belgium, and a "cap" spinning frame known as Chapon's, built, we believe, by Messrs. Platt Brothers, of Oldham. Some of our readers may have seen the former machine working at the late Paris Exhibition. Its chief feature is the "twist-tube" arrangement, shown in Fig. 25, which is introduced between the top and bottom drafting rollers with the object of so regulating the drafting that the short fibres are not drawn away from the long as they would be were no such arrangement introduced. The theory of the tube is somewhat similar to that of a mule, in which a draw is given to the slubbing, after it has got a little twist, through the stoppage of the rollers before the carriage has reached the end of its outward run. It is well known to spinners that if their slubbing or rove has any irregularities, the twist will always run into the thin places first, leaving the slubs or thick places still soft and susceptible to elimination by a draw. In this way woollen yarns are often rendered more regular than the slubbing from which they are spun, and so in this Belgian frame there is a chance of a thick portion of the slubbing getting more than its share of the draft, and being in consequence considerably reduced in size, while the yarn gains in levelness.

The general arrangement of the frame is as follows :—The condenser bobbins are placed on surface drums occupying the upper portion of the frame. They deliver the slubbing over a top retaining roller, furnished with self-weighted pressings, from which it passes down in a slanting direction over a bearing rod, then through the twist tubes shown in the figure, and then immediately to the drawing or delivery roller, also with self-weighted pressings, which drafts it and delivers it through a thread plate to the action of the spindles, rings, and travellers arranged in the ordinary way. The delivery roller is brought well forward, the spindles being, in fact, tangential with the delivering surface, so that there is no unnecessary bearing or strain on the thread plate, an arrangement particularly suitable for weak or slack twisted yarns.

The construction of the twist tube, which is the novel feature of the frame, is as follows :—The body of the tube is of steel, specially tempered at the point A to prevent wear. The edges of the nick B in the upper portion of the tube are well rounded, in order that they may not cut the thread. The extremity of the body of the tube is formed into a conical point, in which is a spiral groove, semi-circular in section, as shown, whose depth reaches the centre line of the tube. The tube is revolved by a band passing round the wharve W, while a friction brake C, covered with leather, serves to stop the tube when it is desired to piece an end. While at work the brake is kept out of contact with the edge of the wharve by a spring. When the spinner wishes to piece an end, he merely lifts down the pressing roller P and places it as shown, when its weight pushes forward the brake and stops the tube. Then introducing a wire hook into the tube he draws down the end, pieces it, and replaces the roller, when the brake springs back, and the twist tube rotates once more.

(To be continued.)

* For further particulars of this machine see page 49.

FIG. 3. SILK DESIGNS.

FIG. 2.

FIG. 5.

SILK DESIGNS.—FIG. 6.

Designs for Silk Fabrics.

SPECIALLY CONTRIBUTED.

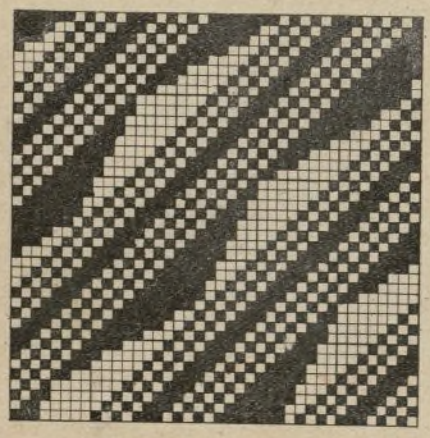
FIG. 1 is a design for a muffler with a 2000/2 (Macclesfield count) spun or net silk warp, which should be black or some dark colour, shot with about 96 picks to the inch of tram. The black part of the figure is tissued or extra shuttle, and should be of a bright colour. The grey should be obtained from the ground weft and be of a sombre colour. The tissue figure is floated as much as possible so that it will stand well above the ground weft, which should be bound down with 9-and-1 satin, letting the edges of the larger objects float a little more. All the white ground is a 2-and-2 twill, except that in the ground figured edging, which should be 7-and-1 warp satin. By using 2-and-2 twill for the ground the tissue shuttle can be firmly bound at the back without showing on the face. In binding this, care must be taken that the dot is covered by a ground dot which will hide it, as shown in Fig. 2.

Fig. 3 is an idea for a cheaper muffler, using a warp of 2/100's cotton about 100 ends to the inch (1800/2), and tram for weft 100 shots to the inch.

The white ground should be 3-and-1 weft twill, with the grey portions 4-and-1 or 5-and-1 weft

SILK DESIGNS.—FIG. 7.

satin, and the black should be weft floated as much as possible. There should be an edging of tabby round the figure to lift it above the ground. The black stripes should be warped in net silk of some bright colour, and arranged with about 6 ends in a dent (6 dents in each stripe), which will make a very good and effective stripe.



SILK DESIGNS.—FIG. 8.

Fig. 4 is a design for a silk brocade, and should have a good net silk warp about 132 ends to the inch (2400/2), and shot with 100 picks of tram The black figure should be weft and the grey 7-and-1 warp satin. The ground of pattern may be either a 3-and-1 warp twill or tabby.

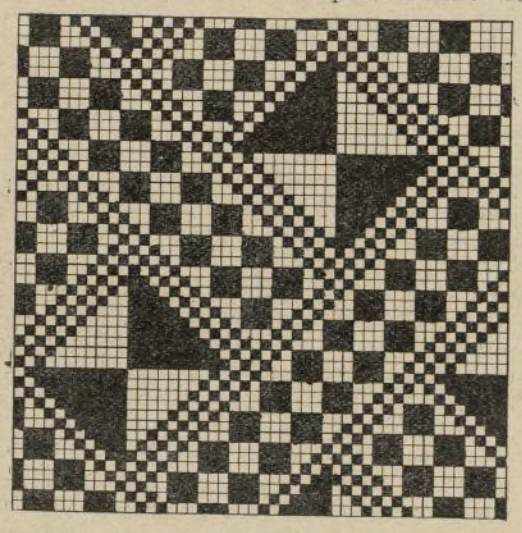
Fig. 5 is a good design for an effect with striped warp, and should have a net silk warp about 222 ends to the inch (2400/4) and shot with 90 picks of

SILK DESIGNS.—FIG. 9.

tram. The black figure should be floated weft with grey 7-and-1 warp satin, and the white ground tabby. The spots on the grey stripe should be made tabby weave. This pattern, made with a nice fine warp and with stripes contrasting in a different colour to the ground, has a good effect, as the weft and warp satin show up well.

Fig. 6 is a design similar to the above, but can be made with a cheaper warp on account of there being no plain satin. About 111 ends to the inch (2000/2) of net silk or spun will be sufficient, shot with 96 picks of tram. The black should be floated weft, and the dark grey floated warp with light grey in a 3-and-1 warp twill ; the white ground should be tabby.

Fig. 7 is a sketch for a dress goods pattern, and should have spun silk warp with about 122 ends to the inch (2200/2), shot with 120 picks of tram. The



SILK DESIGNS.—FIG. 10.

black figure should be floating weft with grey in the figure warp ; the leaf shape should be tabby or 4-and-1 warp satin, and the grey ground should be a fancy weave. Either of Figs. 8, 9, or 10 would look well and not be too loose. This design should be made as a shot to show the best effect.

REVIEWS OF BOOKS.

BLEACHING LINEN AND COTTON YARN AND FABRICS. By L. TAILFER Translated from the French. London : Scott, Greenwood and Co. 12s. 6d. net.

THIS, work will be welcomed by linen and cotton bleachers as an up-to-date book which treats on every aspect of the bleaching processes. Although translated from the French, there is very little to suggest such, for with the exception of the handling of a few technical terms, the work has been put into perfect English. One advantage of its French source is seen in the manner in which the scientific merges into the practical, an aspect of Continental practice which gives foreign works a great advantage over English ones. After a general consideration of the objects and methods of bleaching, the author discusses steeping, and then passes on to the various washing processes and machines, the latter of which are illustrated. Lye boiling, kiers, and soap are then considered, followed by grass bleaching, the systems and methods of chemicking, and the properties and effects of the various sours. After treating on the methods of drying by steam or air, the various ways in which goods may be damaged in the processes are discussed, along with the different remedies or preventives. After these few chapters of general treatment different fabrics are specialised, and the best methods appertaining to each type of cloth described. The various chemicals, their properties, treatment and tests, are very fully taken, followed by a few pages on water, its qualities and tests. After a chapter devoted to yarn bleaching, the machines, kiers, tanks, and other installations of a bleachworks are taken, followed by addenda which concisely describe processes which are more or less directly connected with bleaching or bleaching chemicals.

COTTON FACTS. New York : Alfred B. Shepperson, Cotton Exchange Building. 3s. 2d.

THIS useful little book has again been brought up to date, and, like its predecessors, contains all the statistics and information which have been previously found most useful to all who are connected with the cotton trade, the figures taking up to the end of December last. The cotton acreage of the United States and other countries in the cotton belt is given, crops and stocks are tabulated, and the fluctuations in price shown. The book contains much useful information connected with the growing, picking, and other treatment of cotton, while dates relating to the different processes, frosts, rainfalls, temperature, etc., are included. In addition are a few articles on recent cotton questions, which, written on the authority of a well-known expert, are of special interest.

VERZEICHNIS DER OESTERREICHIS-CHEN BAUMWOLL-SPINNEREIEN. Vienna : Wilhelm Braumüller. 10s.

THIS is a directory of the Austrian textile industries, giving particulars relating to the different firms, number of spindles, and such information. The chief feature is entirely separate from, although accompanying, the directory itself, and consists of a large map printed in colours on thick paper, and arranged on novel lines. It is, in fact, essentially a textile map, and shows every place in the empire where textile mills are situated. Not only this, but by different distinction marks and different colourings the localities of spinning, weaving, bleaching, and other industries are seen at a glance.

SELL'S DIRECTORY OF TELEGRAPHIC ADDRESSES. London : Henry Sell, 176, Fleet-street. 21s.

THE growth of the telegraph system has made this class of directory a necessity to commercial and business men, and the number of registered telegraphic addresses used is only too evident when it is noticed that they cover 1500 pages of the directory in question. The work is compiled from official lists supplied by the Post Office, and is brought up to the date of January 1 of the present year. The new edition also contains a list of British Consuls abroad, for the use of shippers, in addition to a large list of commercial houses and other information valuable to buyers and travellers. A feature of the present issue consists of a large coloured map of South Africa.

WILLING'S PRESS GUIDE FOR 1901. London : James Willing, jun., Limited. 1s.

THIS is the twenty eighth annual issue of this guide, which is compiled with the chief aim of providing advertisers with a ready reference to all the papers at their disposal. Apart, however, from the above reason, the book is specially useful as affording a reliable index to all British papers, magazines, reviews, annuals, etc., and its utility is increased by the different subdivisions, which are arranged in addition to the alphabetical index. The chief American and Continental papers are included in separate lists, as also other useful information in relation to the Press of the world.

WE have also received :—The "Sprinkler Bulletin," which contains, amongst other things, particulars and photograph of a large Italian cotton mill which has been supplied with Grinnell sprinklers. The mill machinery is driven by three-phase electric motors.—The "British Weather Chart for 1901," by B. G. Jenkins, F.R.A.S. (London : R. Morgan ; 1d. and 6d.), which, based upon astronomical data, forecasts the state of the weather throughout the year.—A pamphlet on "Teon" belting, giving the tests, capabilities, prices, etc., of this brand made by Messrs. Fleming, Birkby and Goodall Limited, Halifax.—Catalogue of the American School of Textiles, New Bedford, Mass., containing information relating to a wide and varied series of home-taught textile courses.

QUERIES AND REPLIES.

*** Names and addresses must in all cases accompany inquiries. A stamped addressed envelope must be enclosed if a reply by post is desired.

E. B. I. (Putney).—Sateen cloth like your sample is made by Messrs. Thornton, Barraclough and Co., Wibsey, Bradford.

L. S. (Norwich).—Messrs Robert Hall and Sons (Bury) Limited, Bury ; and Messrs. William Smith and Sons, Heywood. We have written your clients.

V. AND B. (Vilvorde).—Messrs. Edward Ripley and Sons Limited, Bowling Dyeworks, Bradford ; and the Cravenette Company Limited, Moss-street, Mill-lane, Bradford.

H. J. S. (Bury).—Bleach blues are made from ultramarine, alkalene, or methylene blues. For tests see Sansone's, Knecht-Rawson-Loewenthal's, or some other standard book on dyeing.

D. C. N. Co. (Montreal).—The committee report on "Futures" may be obtained from Mr. G. Griffith (secretary), British Association for the Advancement of Science, Burlington House, London, W.

L. W. Co. (Larne).—Cotton is almost pure cellulose. We should recommend "Cellulose," by Cross and Bevan, 12s. 6d. net. Each new and improved process relating to artificial silk has been described, soon after its introduction, in THE TEXTILE MANUFACTURER.

R. M. (Dublin).—We do not think there is any other way than fastening the tassels on by hand. The connecting or fringe threads are woven by the employment of false warp ends, and there are small reeling machines to facilitate the making of the tassels.

P. K. (Alford).—(1.) Messrs. Hutchinson, Hollingworth and Co. Limited, Dobcross ; Messrs. Robert Hall and Sons (Bury) Limited, Bury ; and Messrs. William Smith and Sons, Heywood. (2.) See page 3 of our January issue. We shall be glad to supplement this if it does not meet your requirements.

THE TEXTILE MACHINIST:

Devoted to Machinery, Apparatus, Tools, Etc.

The Drury Spinning Apparatus.

THE DIRECT CARDING AND SPINNING SYNDICATE, SOHO MILLS, BRADFORD.

THE advent of any new machine, and one with radically changed features, is always met by a large amount of suspicion, especially in our own country. In the years gone by, England used to take the initiative, but in recent years we have seemingly been content to let other countries do much of the experimenting and then to take advantage of the experience so gained. Sometimes much expense and worry have been saved by this system, but in many cases we have stepped in too late. As notable examples, it might be worth while to remember that there are more than 60,000 automatic looms at work in the United States to-day, and not one in England, except on exhibition. We are at present ordering immense quantities of electrical plant from the States, where the most practical apparatus is produced. The control of the dyestuff industry has been almost monopolised by Germany, whose makers are fast tieing our hands by the rapidity with which they patent every new colouring matter in our own country.

There are other sides to this question, and redeeming features in our omissions, but there is no doubt less anxiety now in this country than there formerly was to fight out a new thing until success is attained. There is another matter which is also noticeable, although we sin less in this respect than do our energetic American cousins. This feature is the growing tendency of the daily press, or at any rate some part of it, to prefer sensation to fact. A new machine is described in terms which a practical man knows to be impossible, with the result that all practical men at once put it down as a fraud. Many inven tions have received their death-blow in this manner, having never rallied from the criticism of men who had never seen the machine, but who put it down as worthless after reading the impossible account of some too-enthusiastic reporter.

There is some risk of the new spinning machine which we are about to describe suffering in this respect. We have seen in more than one daily paper that the apparatus is going to revolutionise the spinning industry; that slubbing frames, roving frames, and other machinery will become extinct, and that many hands will be thrown out of work; in fact, that there will be a general upheaval of the spinning industry when the new system comes into vogue. This is, of course, far from the truth. The new machine is a success: it does its work, and does it well; and after a careful examination of its working powers we feel confident that it will meet a long-felt want in the spinning industry. However, this is very different from revolutionising it, and is much more useful.

The new spinning machine spins up to about 16's cotton counts, although with a good quality of material it would go to 20's. Therefore all counts, woollen or cotton, finer than that thickness will be unaffected by its introduction. Coming to low counts, however, the machine promises to be of great utility, especially for spinning very low fibres and waste materials, although it is far from being restricted to these A perusal of old patent specifications will show that the idea it embraces has been frequently attempted before, but without success, showing that the need of such a machine has long been felt, without the ingenuity to perfect it being forthcoming until Mr. Drury took the matter up. The failure of previous attempts has been due to the inability to put sufficient twist into the yarn, and the way this is done is the main feature of the new machine, in addition to being the feature to which it owes its success. Other parts are very similar to what we are already acquainted with.

The machine is shown in Fig. 1, from which illustration its resemblance to the usual finisher-card will be noticed. The new parts are, in fact, only supplementary to the ordinary card, or, more correctly, replace the usual condensing apparatus. In the machine we examined, an ordinary wool card of American manufacture was used. The main cylinder is 48in. in diameter, and 48in. across the wire, covered with spirally-wound filleting. This cylinder runs at 80 revolutions per minute, and has five rollers, five clearers, and two doffers, making 40 revolutions per minute. The doffers are of the ring type, being divided into inch strips—*i.e.*, an inch of wire (approximately, for the top doffer has narrower card rings than the lower one in practice) and an inch of space alternately, the spaces of one corresponding to the clothed portion of the other, and *vice versâ*.

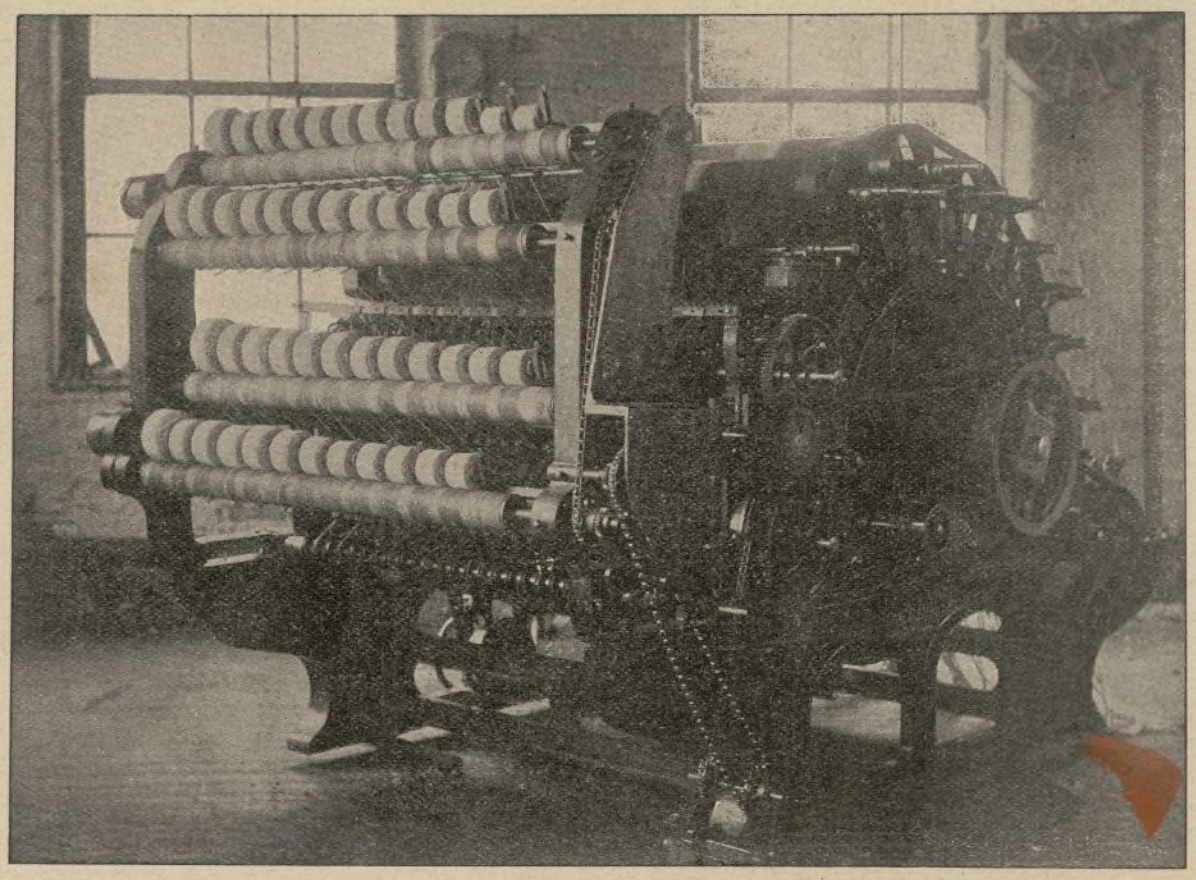


FIG. 1.

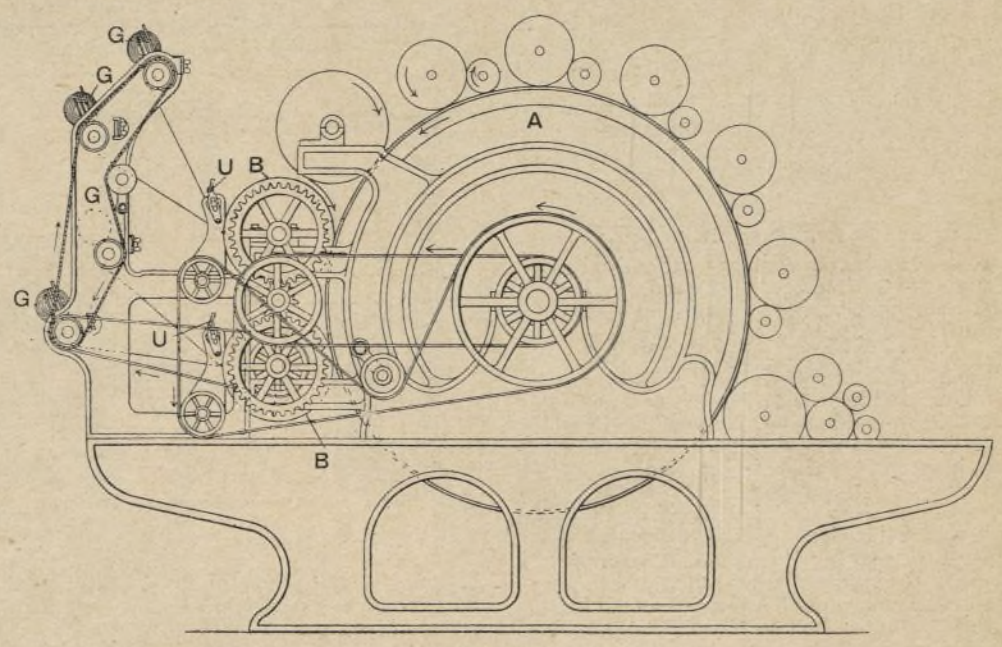


FIG. 2.

The various parts will be best understood by reference to Figs. 2, 3, and 4. Fig. 2 is a side elevation of the complete machine, Fig. 3 a front elevation, whilst Fig. 4 shows, in side elevation, the

parts which have recently been added. The main cylinder just mentioned is shown at A, and the two ring doffers at B. Up to reaching this point the fibre is treated in the usual well-known way, but on leaving the doffer the new system comes into play. For ordinary purposes the rings on the doffer are cleared by a long wire, slightly narrower and bent towards its lower end. Each ring is supplied with one of these wires, which are set nearer to or farther from the twisting device, according to the length of the fibres being treated. If very greasy material is being worked, it is necessary to replace these single wires by combs, but such should only be used when absolutely necessary. As soon as the fibres are stripped they pass through the twisting device, which, as mentioned before, is the strong point of the machine. It will be seen best in Fig. 4, where T is a small endless strap running round the top pulley C and the bottom pulley D. The two sides of the strap T are brought together in the centre by the blocks between the plates E, so that the inner surfaces rub against each other. It is by means of these rubbing surfaces, which always run in contrary directions, that the twist is imparted to the yarn.

The fibres are stripped off the doffer ring, pass as untwisted sliver through the hole F in the plate E, and between the sides of the strap T, emerging at the other side as finished yarn, well twisted and of even diameter. It will be readily seen that by this arrangement the amount of twist can be

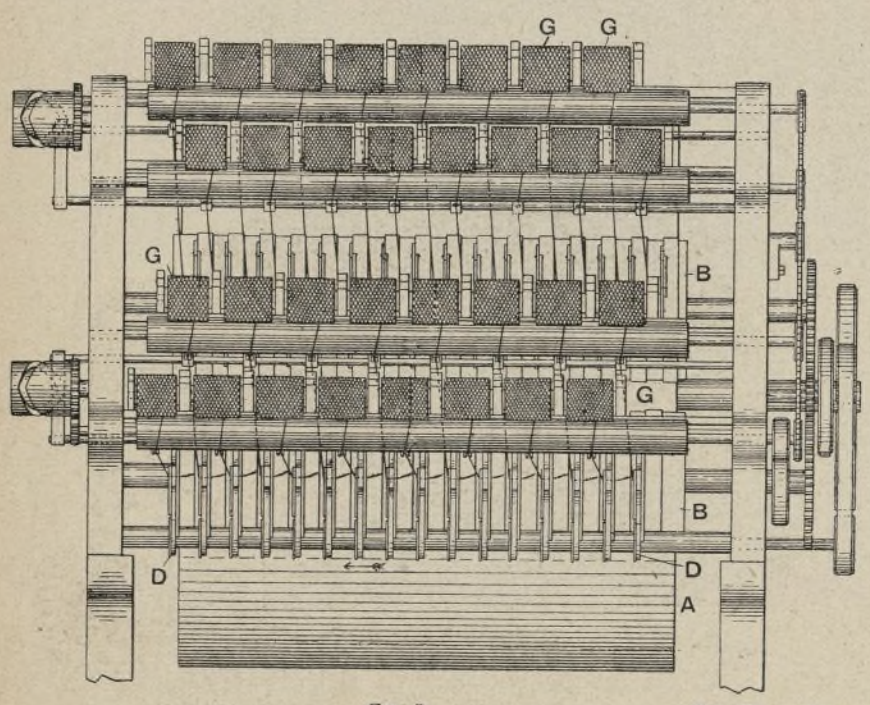


Fig. 3.

easily regulated by altering the speed of the pulley D. If the card has the same delivery, a speeding of the strap T means increased twist, and this can be carried out to give an almost unlimited number of turns per inch. The action of the strap not only imparts a rubbing action, giving false twist, but acts precisely in the same manner as a flyer, twisting the yarn from a loose, unfixed end, which is practically what the stripping point can be termed.

After the twist is imparted, the yarn is wound on to cheeses or spools G, although improvements are now being tried with the view to winding direct on to cops or bobbins which can be used in the weaver's shuttle. The piecing of a broken thread is a very simple matter. A hook very similar to a weaver's looming hook is used. It is a little longer and stronger, and about ¾in. from the end is bent at right angles to the handle. This needle is inserted through the eye F, between the rubbing surfaces of the strap T, and out of the eye at the other side. In this position it immediately gathers a little fibre from the ring doffer, when it is withdrawn, the fibre following it through the eyes and rubbing surfaces of the condensing strap. This done, an end of twisted yarn is obtained, which, when long enough, is started on an empty spool or tied to the broken end.

The machine is not only ingenious, but fills a want which has long been felt for the cheap working of waste fibres. It does not touch the fine or medium trade, and will probably still come second to the mule for the spinning of all better-class thick counts; but for low, short material, whether of vegetable or animal fibre, we know of no machine which so economically does the work. It must not be thought that the reduction of processes means a reduction of regularity, for the yarn which was being spun during our visit compared favourably with any but combed yarns. We also inspected samples of the many kinds of material which had been treated, several of which were of fibres hitherto considered unfit for spinning.

The Drury Spinning Apparatus.

Amongst these samples were the various kinds of soft and hard waste from cotton and wool spinning mills. There was also yarn made from flax sweepings, which are generally burnt or used as littering. This, although making 50 per cent. waste during the spinning, is practically making yarn from material of no value. A strong and regular yarn was made from peat moss mixed with cotton; whilst a thick yarn, suitable for carpets or matting, was made from peat moss alone. A pure asbestos yarn had been spun; on other machines it has been necessary to mix in a little cotton to help the asbestos to spin, afterwards burning out the cotton; but the use of any helps of this description has been found unnecessary with the new machine, making the after-process unnecessary. There was wire covered during the process of spinning, showing the advantageous use of the machine for insulating wires for electrical purposes. In this case the wire is run direct between the condensing leathers, where it meets the fibre which is to cover it. The wire lies as a straight core, whilst the fibre is wrapped around it. The same process has been applied to cotton threads, using these as a core, and wrapping wool around the outside. By this means the cotton is completely hid, and a full, soft handling yarn obtained. Silk noils, mixtures of colours and fibres, have been spun, as also various kinds of sweepings, even the latter making yarn of incredible evenness.

Coming to the economy of machinery and labour, it may be mentioned that the sliver comes to the combined spinning machine direct from the breaker card. The first part of the new machine acts as finisher card, and then the yarn is produced in a completed state. Thus there is saved the work of the slubbing and roving frames in many cases, and of the mule in all cases, along with the power, floor space, outlay, depreciation loss, and attendance required for all these. Regarding material put through the combing machine or drawing frame, there is no cause to compare the working of such, for the new machine does not pretend to compete with the class of yarns put through those processes.

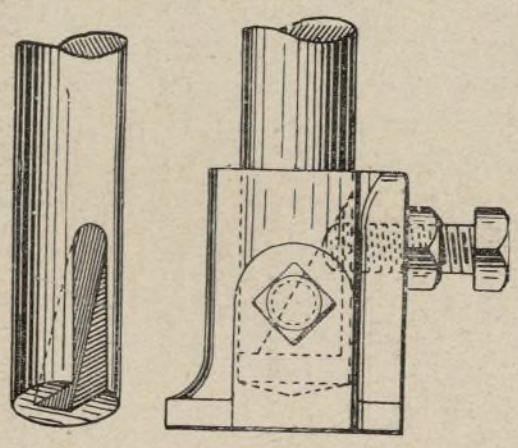


Fig. 1.—Adjustable Poker Foot.—Fig. 2.

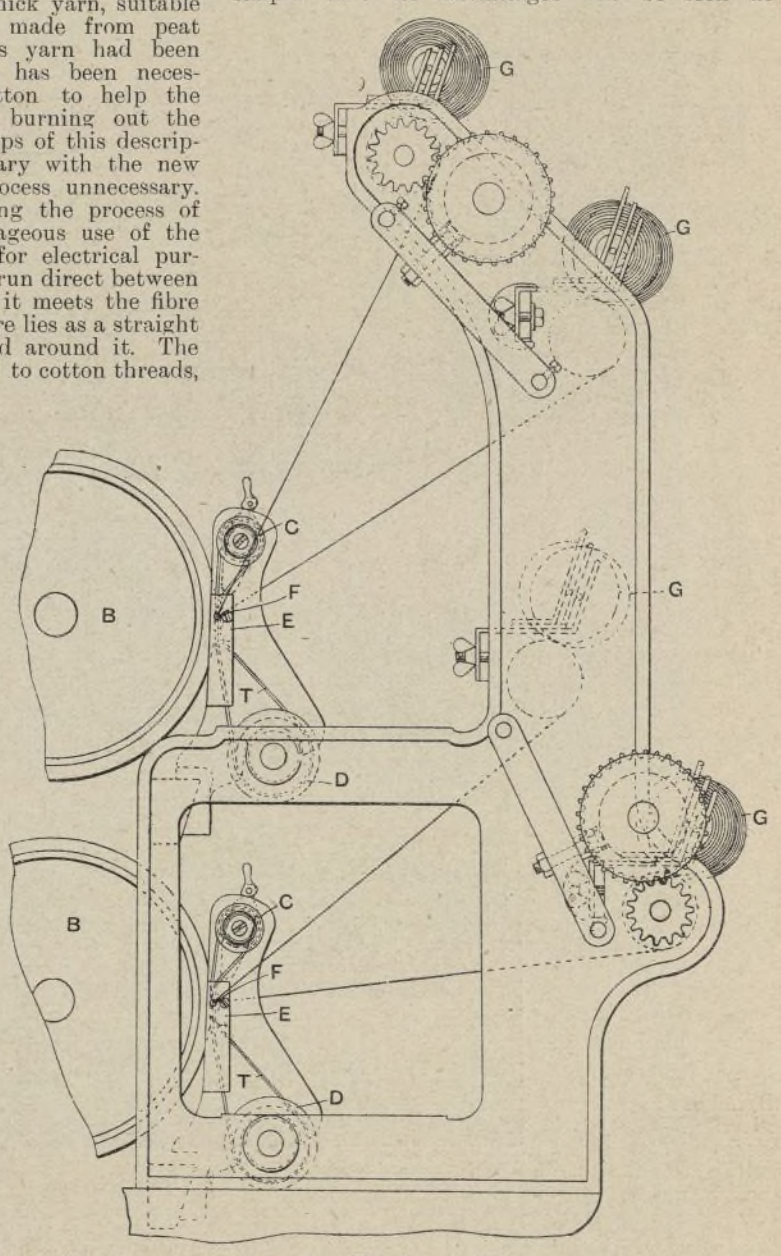


Fig. 4.

Adjustable Poker Foot for Ring Frames.

Messrs. Howard and Bullough Limited, Accrington.

A SMALL but most useful addition to ring frames will be found in the adjustable poker foot which is now being applied by the above firm. Its construction is so simple that its advantages will be seen at a glance, while this simplicity gives it the advantage of never getting out of order. The pokers, as shown in Fig. 1, have a tapered channel cut at their lower ends, and the tapered portion serves as an adjustable base on which the poker rests. The poker foot consists of the usual socket, but instead of the poker resting on the bottom of this socket, there is a screw, as shown in Fig. 2, on the end of which the tapered side of the poker slot rests. The screw is turned inwards until it touches the poker, this latter having previously been placed in its proper position, the screw requiring to go farther in as the poker is higher in position. When the proper position is found, the adjusting screw is locked by its lock-nut, thus remaining always in the same position. The pokers can be readily removed for cleaning purposes, and when returned to their places slip at once into the position in which they were originally adjusted. Not only is the adjustment much easier, but time is thus saved every time the frame is cleaned.

Machinery at the Paris Exhibition.—VIII.

A LARGE collection of textile machinery was shown by Messrs. Joh. Jacob Rieter and Co., of Winterthur, Switzerland, who also had other numerous exhibits of a mechanical or electrical nature. In the textile section they showed a complete set of cotton-spinning machinery, commencing at the opener, and finishing with a mule and doublers. We have not the space to illustrate all these machines, but a few will be described.

Fig. 36 is the cotton opener with pneumatic conveyer, intended to further open cotton which has been through the breaker, and prepare it for being conveyed pneumatically. The machine has a grid and feed roller, a beater with hardened steel teeth, riveted, and a pair of rollers with coarse flutings, pressed by helical springs. Under the toothed beater a strong grid is fixed, over which the

cotton passes. It then enters the pneumatic trunk to be sucked towards the next machine by means of a fan. The feed of the opener is regulated from the next machine by means of a clutch arranged on the opener, which acts simultaneously with a shut-off flap at the end of the trunk. The beater, the rollers, and all the gearing are protected by solid covers of hammered iron. The trunk for the pneumatic transport consists partly of round and smooth pipes 220mm. in diameter, and partly of special pipes containing grids or grid boxes. These serve for depositing heavy impurities, such as sand, seeds, etc. The bottoms of the grid boxes can be opened to permit the removal of these impurities.

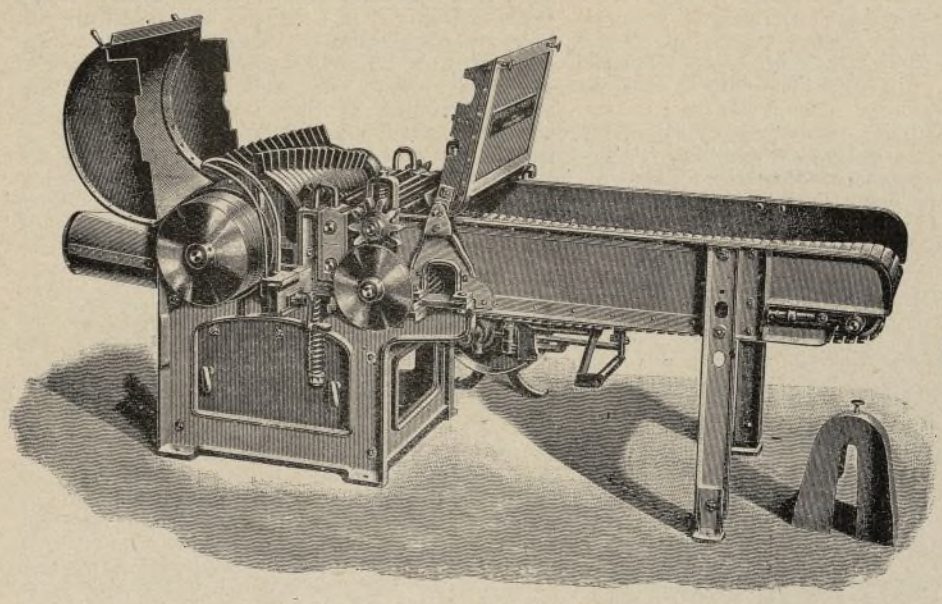


FIG. 36.

Fig. 37 shows the revolving flat carding engine which takes the lap from the scutcher. It is adapted for all qualities of cotton, provided suitable card clothing is selected for the large cylinder, the doffer, and licker-in. The machine has 104 flats, of which forty-two are working at the same time. The bends and bearings for the cylinder are made in one piece, which ensures the bends and flats being always concentric with the cylinder. The segments are turned concentrically with the cylinder, movable in a radial direction, and serving to guide the flats in a simple, light, and exact manner. These segments facilitate the sliding of the flats. The control of the distance of the flats from the cylinder is effected by means of small openings in the segments for the introduction of the gauge. The travelling flats can be placed concentrically with the cylinder, or, as with the old carding engines, eccentrically to the cylinder, so that the first flats above the licker-in are farthest from the cylinder, and the following flats approach it successively closer. The diameter of the cylinder is 1270mm., the doffer 610mm., and the licker-in 244mm., whilst the width across the teeth is 1140mm.

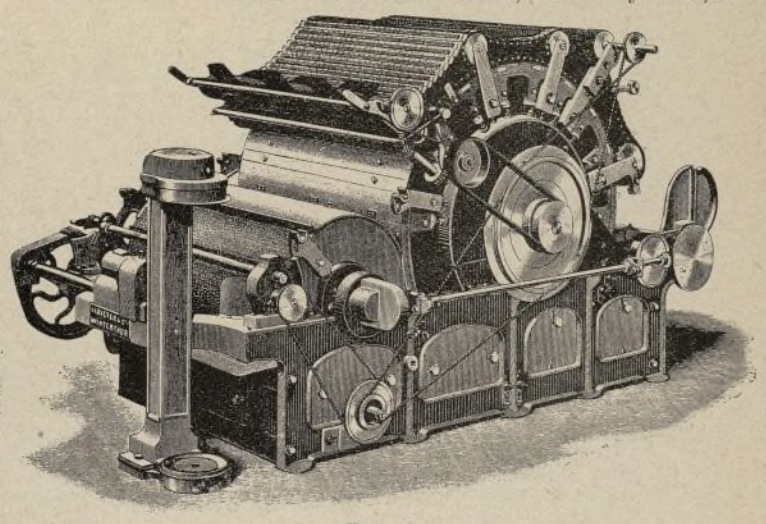


FIG. 37.

Fig. 38 shows the ring twisting frame, which in most of its features resembles the throstle frame, the ring being the greatest difference. It is built to treat fine or thick counts, wet or dry twist, and the winding may be arranged to take place either cylindrically on flanged tubes or conically on ordinary tubes. The thread guides can be lifted separately or all together, and for driving the spindles two tin rollers of large diameter are arranged, one of which is driven from the other. The cylinders and rollers are hardened at the bearings and the coupling pivots. For dry doubling they are bare and polished; for wet doubling they are covered with brass. The top rollers have at one side a groove, for preventing the thread falling when the machine is stopped. The water troughs for wet doubling are in several parts, with movable glass rods that can be taken out.

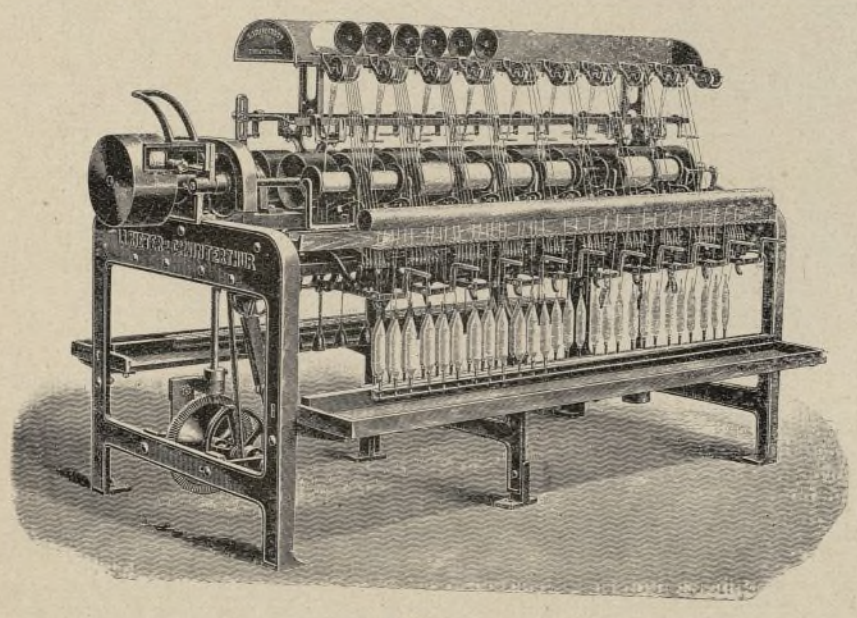


FIG. 39.

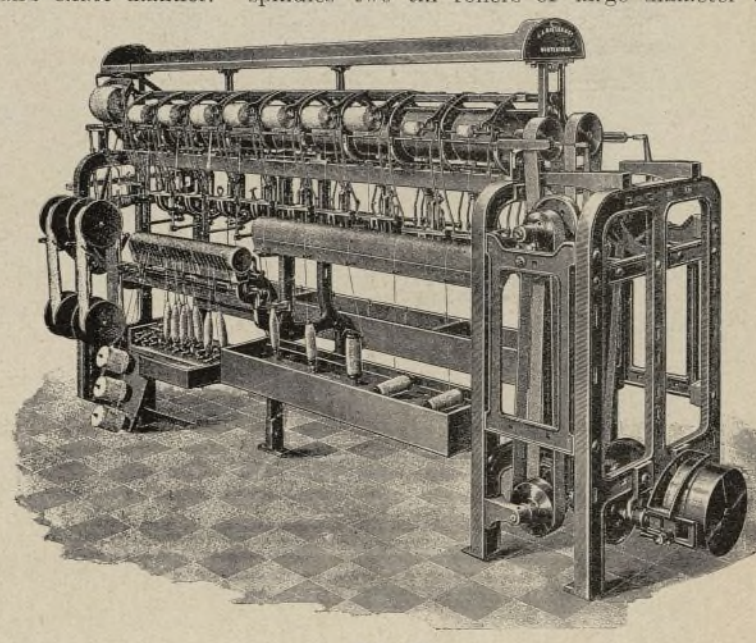


FIG. 40.

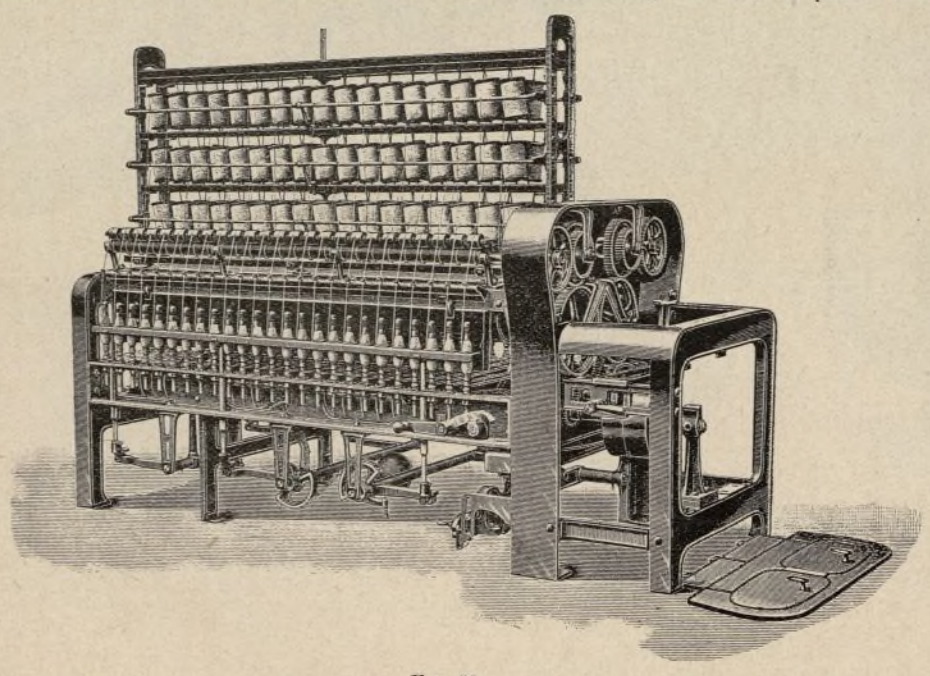


FIG. 38.

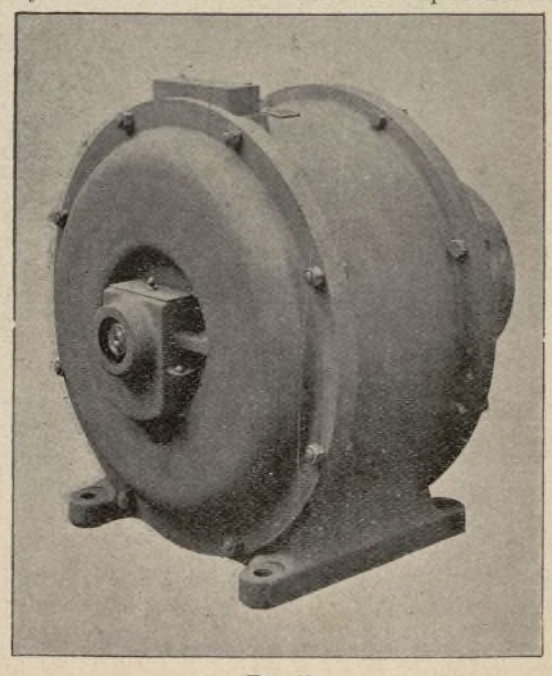
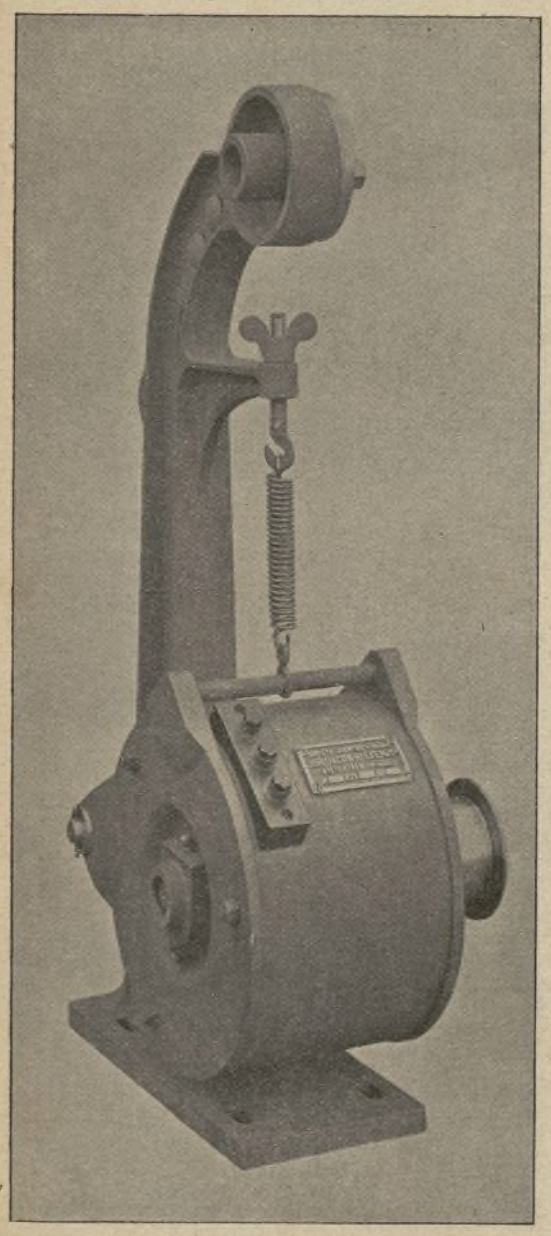


FIG. 41.

Fig. 39 shows the frame for winding flanged bobbins, the object being to wind or double in this machine previous to twisting, in order to have an equal tension in each thread, and afterwards obtain an equal and smooth twisting. This double process is particularly to be recommended for twists



Machinery at the Paris Exhibition.—Fig. 42.

containing several strands. The machine doubles the threads from 2 to 10-fold, and winds them upon flanged bobbins, which are then placed upon the twisting frame. It consists of a large number of doubling heads, each of which is provided with automatic stop mechanism, which acts when a thread breaks. The winding drums and the thread guides of all the heads are actuated by the same driving apparatus.

self-acting stop motions for overwinding or double ends, as also for the breakage of the threads.

Fig. 41 is an electric motor which was shown, and which is designed specially to meet the requirements of spinning machinery. It is a type used for separate driving—that is, one motor to each frame,—although the larger sizes would be suitable for group driving. The current used is triphase, and the motor is enclosed, so that its parts are not affected by moisture or dust. The motors require no commutators, and there is no sparking, with its accompanying risk of fire.

Fig. 42 is an electric motor of a type suitable for driving looms. It is built on the same principle and takes the same current as the motor previously described, simply being smaller and arranged for fixing to the end of a loom. Arrangements are also made for gearing down to meet the slower speed of the loom.

Although not definitely textile, the dynamometer is frequently used in testing textile machinery, and the geared dynamometer shown in Fig. 43 will not be without interest. A cast-iron frame A supports two shafts B, B^1, upon which the gear wheels E, E^1 and the pulleys D, D^1 are fixed. One of the pulleys receives the power from the principal lineshaft, and the other transmits it to the countershaft of the machine to be indicated. The shaft of the intermediate wheel C rests upon a beam F, which is pivoted at one end on the pin F^1 and connected at the other end to the suspension spring F^2. When the apparatus has been intercalated between the driving shaft and the machine to be indicated, the pressure of the teeth upon the intermediate wheel causes the latter, and with it the movable beam F, to descend and tighten the spiral spring proportionally to the force to be balanced. Each movement of the beam F is registered through the system of levers G, G^1 and the style G^2 tracing a curve upon a paper band, the ordinates of which are proportional to the power absorbed relatively to a base line traced by the fixed point G^4. By means of a specially-graduated scale the force in kilogrammes can be deduced from the curve obtained, either during the observations of the instrument or at any other time. The registering apparatus is actuated by the shaft B, and coupled by the handle H; by the same movement the revolution counter is put into or out of action, and marks the number of revolutions of the wheel C during the entire duration of the experiment. The wheel C measures exactly a circumferential metre on the pitch circle; the number of revolutions it makes thus corresponds with the lengths traversed by the force in metres; this number, multiplied with the number of kilogrammes read on the scale, gives the work in kilogrammetres; the product divided by 75 represents the horse-power absorbed. The apparatus is constructed for a maximum power of 35H.P. at a speed of 500 revolutions per minute. A sufficient number of change wheels for the registering apparatus and of graduated scales and springs of different resistances permits the application of the most varied forces and resistances. The loss of power in the apparatus itself is minute, reaching no more than 1·45 per cent. of the measured power.

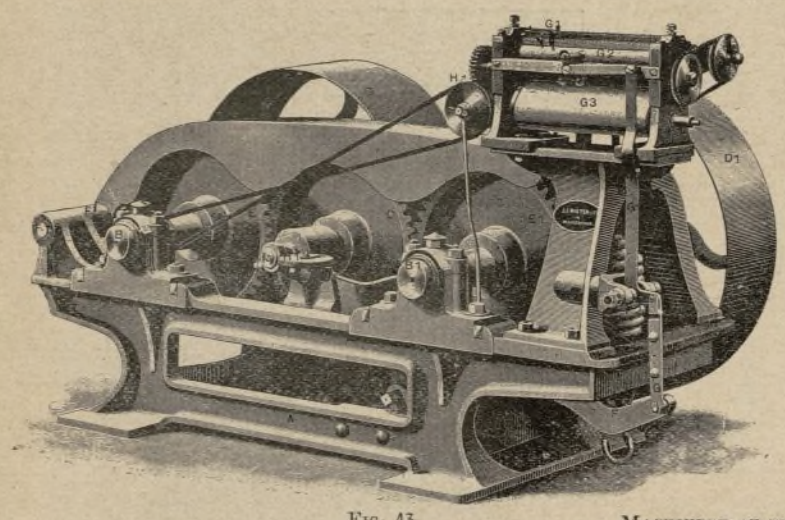


Fig. 43.

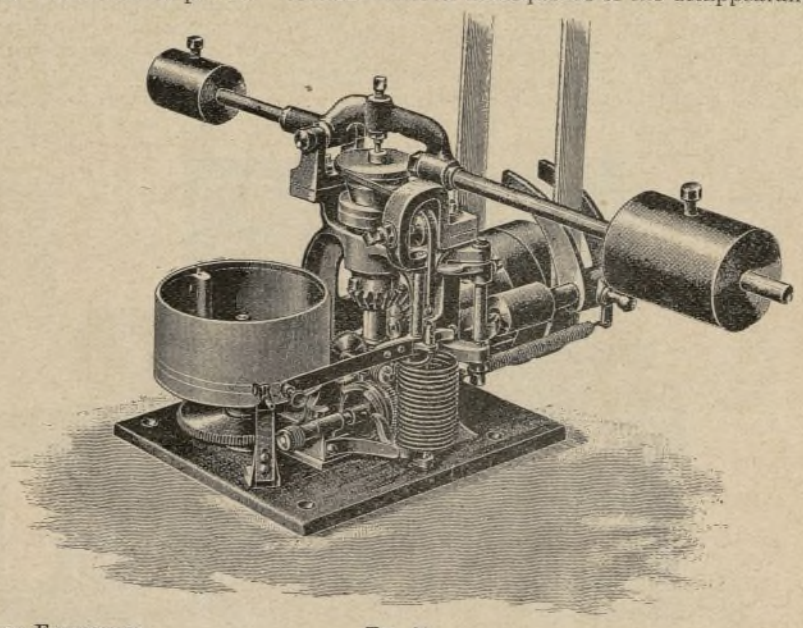


Fig. 44.

Machinery at the Paris Exhibition.

Fig. 40 shows the cross winding frame which serves for winding single or doubled yarns for weaving or embroidery, or which is used as a doubling winding frame. According to the purpose for which the bobbins with crossed threads are intended, it is necessary for them to have, not only a certain diameter, but also a certain length. The machine is designed to make bobbins of different diameters and of different lengths as required. It works each side separately, but the guides are operated from one cam. Each drum is provided with

Another auxiliary apparatus — an oil-testing machine—is shown in Fig. 44. Upon a solid iron base a horizontal shaft is mounted carrying a pair of fast and loose driving pulleys, which receive motion through a strap from the lineshaft. By means of a bevel wheel fixed on it, this drives a vertical shaft carrying a bevel pinion, the speed of the shaft thus depending on the greater or less number of teeth of the bevel wheel on the pulley shaft. The vertical shaft terminates at the top in a hollow friction cone, upon the inside of which a small quantity of the oil to be tested is poured. A solid cone fits accurately into the hollow cone, and the friction is regulated by a lever with adjustable weight. When the apparatus is started, the friction between the conical surfaces causes the solid cone to be carried round, but its rotation is limited by a leather band fixed at one end to the solid cone and at the other to a helical spring, which is elongated till the moments of resistance and force are equal, the extension of the spring being at that instant proportional to the friction of the cones. The movable end of the spring attached to the band also shifts a slide on a vertical square bar. To the slide a lever is connected, the end of which is furnished with an indicating pencil, which from time to time marks a point on the paper surrounding the metallic indicator drum. The distance of the different points marked from a baseline corresponding to the unextended position of the spring indicates the value of the coefficient of friction between the two cones. The baseline is marked by means of a fixed pencil at the bottom of the cylinder, which pencil is set at the beginning of a test according to the height of the movable end of the spring. The self-acting marking is effected in the following manner:—The square bar of the slide turns on a pivot, and is solid at its bottom end, with a curved lever which is actuated by a cam on a small shaft driven from the friction coneshaft by means of an endless screw and wheel gearing. This camshaft drives in its turn the paper drum in the same way. The cam is so arranged as to keep the indicating pointer connected to the spring off the paper during 500 turns of the vertical shaft, then at the 500th revolution the pointer is suddenly liberated, and makes a point on the paper surrounding the drum, the speed of which is so calculated that successive points are distant from each other by about 8mm., so as to form a curve. The ordinates of this will correspond with the frictions of the conical surfaces, and the abscissæ will be proportional to the number of the revolutions made by the friction coneshaft from the beginning of the test. A wooden scale accompanying the machine has six graduations. One of them gives the number of turns of the vertical shaft according to the length of the abscissæ, and consequently from the beginning of the test it indicates the duration of the lubricating power of the oil tested. Four other graduations measure the ordinates for four different loads on the solid cone; they are calculated to give, by simple reading-off, the coefficient of friction for each load; a sixth graduation indicates the pull on the small band, according to the extension of the spring. When the friction exceeds certain limits in consequence of the disappearance of the lubricating power of the oil, a special mechanical arrangement stops the machine automatically, which assures its durability.

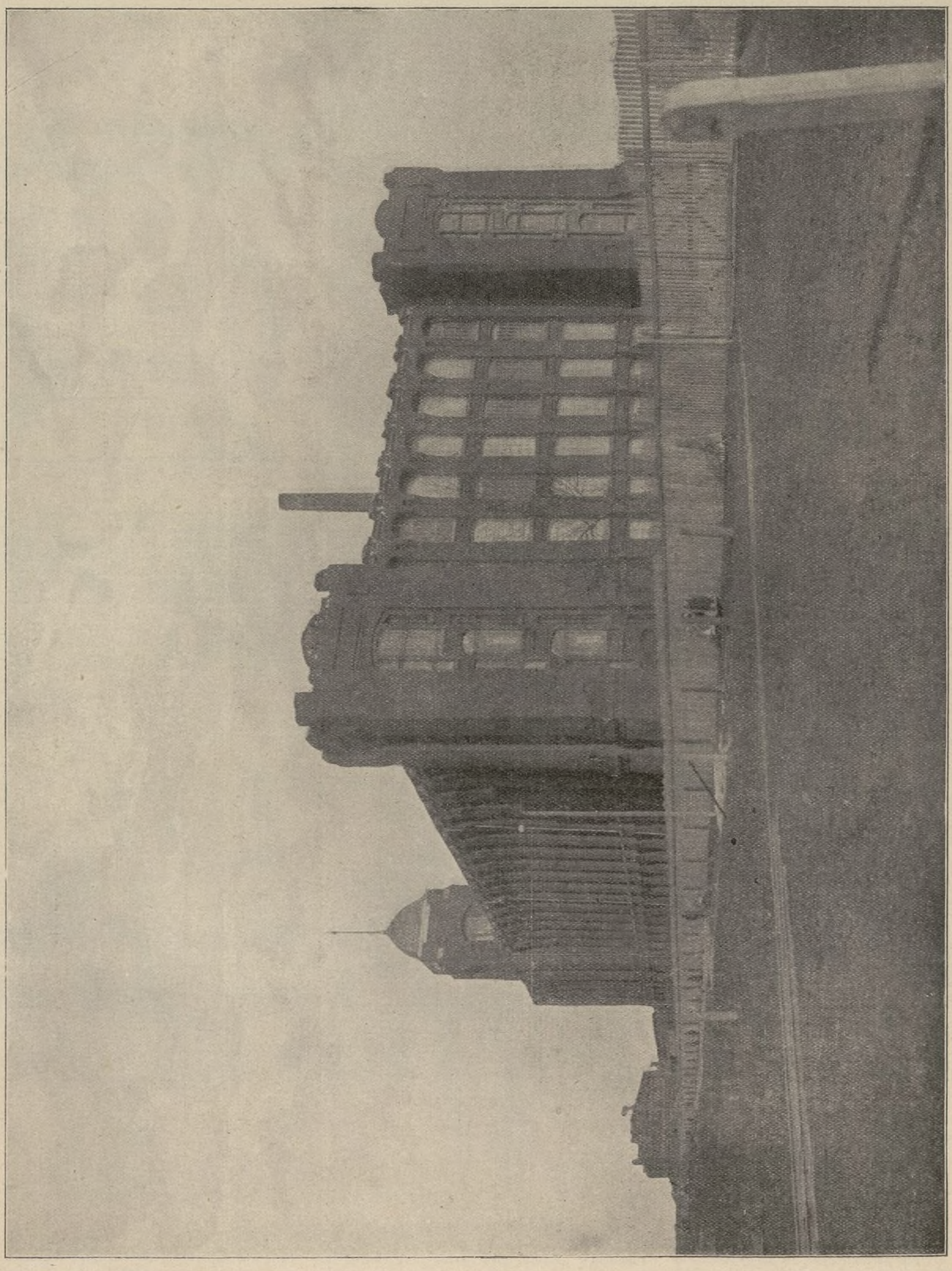
(To be continued.)

The directors of the Oldham Twist Company have decided to enlarge their No. 2 mill by the addition of another storey and a carding shed which will provide accommodation for about 25,000 mule spindles for the spinning of Egyptian yarns.

New Polish Cotton Mill.

THE growth of the cotton industry in Poland still continues with a rapidity which, if continued, will soon place the country amongst the more important textile manufacturers of the world. The latest mill of importance is that built for the Lodzer Nahgarn Mftr., at Lodz, which has been supplied with English machinery made by Messrs. Dobson and Barlow Limited, of Bolton. The plant consists of about 23,000 ring spinning spindles and 13,000 mule spindles, accompanied by the necessary preparing machinery.

These consist of a bale breaker with the latest improvements; lattices; large-size double cotton openers, with lap part attached; "Simple" automatic feeders for feeding the above openers, having cone feed regulators, pedal motions, and lap rollers bored for patent lap rods; single scutchers with beaters 16in. diameter, and extras similar to those of hopper feeders; revolving flat carding engines with anti-flexion grinding brackets and grinding rollers; sliver lap machines to feed the draw and lap machines, with loose bushes to the ends of all the drawbox top rollers, with the drawbox bottom rollers casehardened, and having indicators; draw and lap machines with loose boss top rollers to the front line. loose bushes to the ends of all three lines of top rollers, improved motion to stop the machine at the finish of each lap at the back, revolving clearers, the front line of bottom rollers casehardened all over, the three back lines casehardened in the necks and squares only, and with indicator; combing machines to make 80 nips per minute, with the drawbox bottom rollers casehardened, loose bushes to ends of all three lines of drawbox top rollers, can stop motion, waste shaft and tins, indicator, and doffer filleting; "Duplex" combing machines to make 120 nips per minute, with extras similar to those of the ordinary combers; drawing frames with loose boss top rollers to the front line, loose bushes to the ends of the three lines of top rollers. back roller motion to prevent single, weight-relieving motion, the front line of the bottom rollers casehardened all over, the three back lines casehardened in their necks and squares only, indicator,



New Polish Cotton Mill

middle traverse motion, and top clearer ; slubbing frames with loose boss top rollers to the front line, long collars, polished steel division plates, front line bottom rollers casehardened all over, the two back lines casehardened in the necks and squares only, differential motion, outside support to the driving shaft, round clearers, and heavy self-weighted back to the top rollers ; intermediate frames with loose boss top rollers to the front line, long collars, polished steel division plates, and otherwise similar to the slubbing frames ; jack frames with loose boss top rollers to the front line, long collars, polished steel division plates, the front line of bottom rollers casehardened all over, the three back lines casehardened in their necks and squares only, patent differential motion, outside support to the driving shaft, and single boss top rollers ; ring spinning frames with "Simplex"

The Perham Loom.

MR. C. F. PERHAM, RIVERSIDE-STREET, LOWELL, MASS., U.S.A.

THE origin and development of the automatic loom have been universally attributed to the United States, and as things go at present, everything points to this class of loom being a stay-at-home machine. This statement applies not only to its adaptation, but to the ingenuity which must necessarily accompany the introduction of new and improved forms of this interesting machine. Not only is the United States the place where inventors' minds are more than anywhere else at work on the subject, but it is the country where the only proved automatic loom has originated, and the only country, at least for many years, where these looms will be taken up by manufacturers to any appreciable extent.

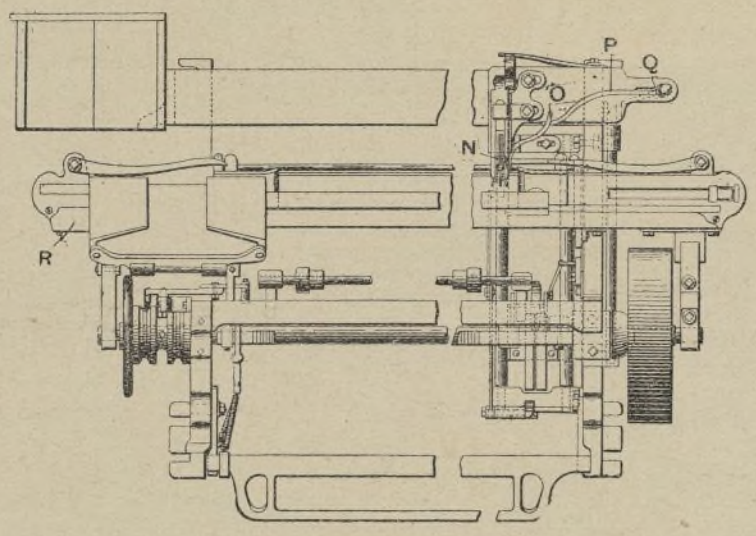


FIG. 1. THE PERHAM LOOM.

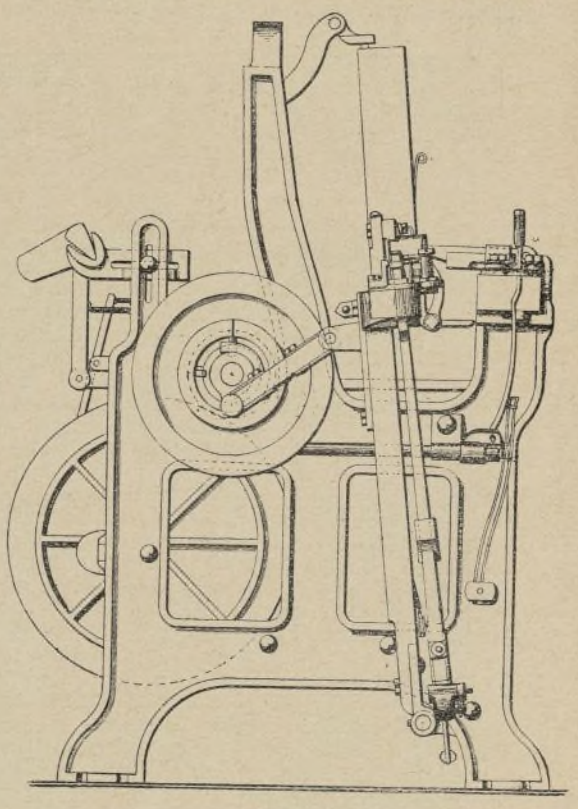


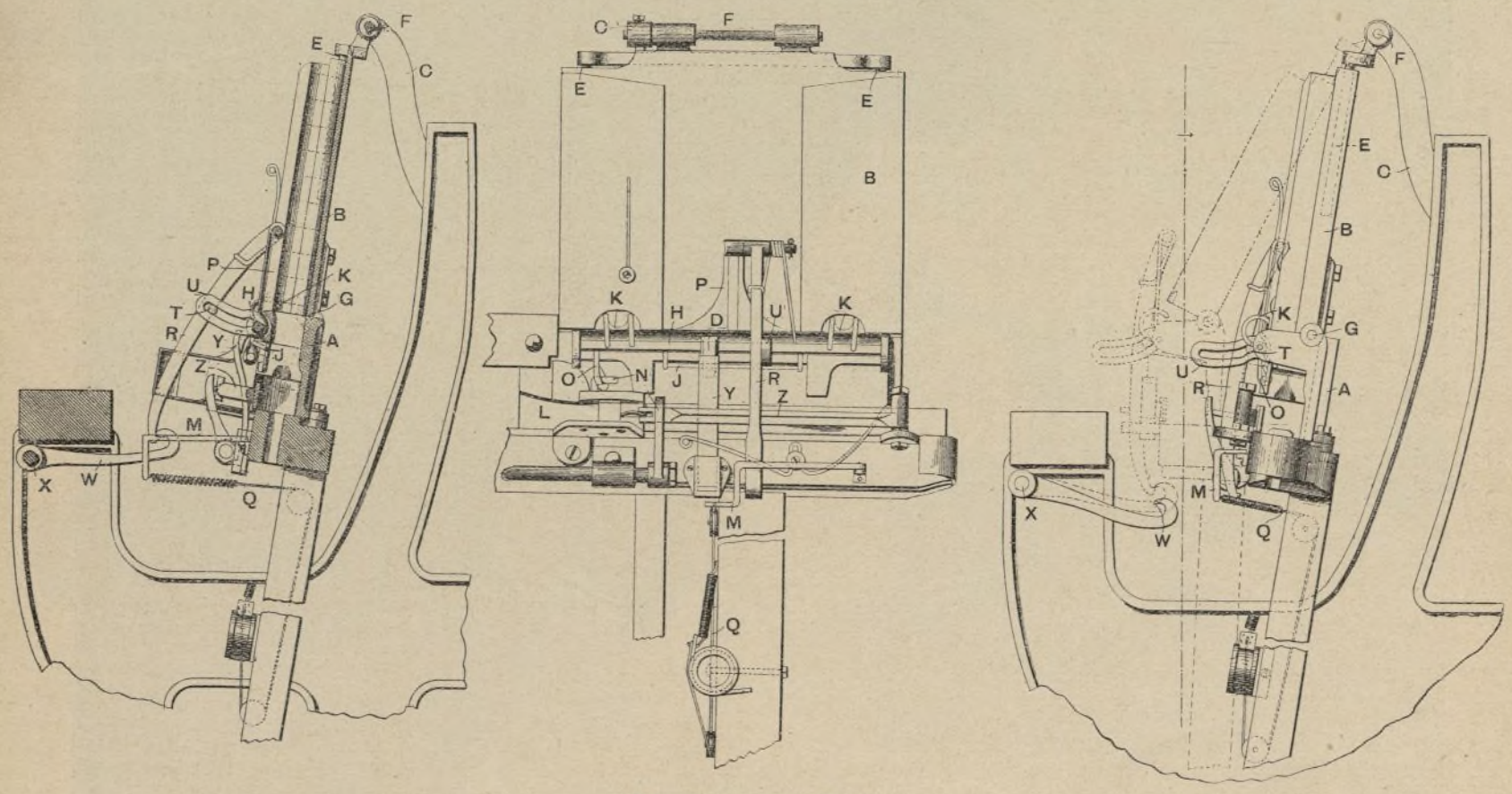
FIG. 2.

flexible spindle, the front line of bottom rollers casehardened all over, the two back lines casehardened in the necks and squares only, indicator, creels for double roving, and middle traverse guides ; self-acting mules with single-speed countershaft driving, governor motion, nosing motion, backing-off motion, roller motion whilst winding, carriages boarded underneath, iron creels, plate bolsters and footsteps, the front line of bottom rollers casehardened all over, the two back lines casehardened in the necks and squares only, duplex driving arrangement, treble-grooved rim-band arrangement, creels for double roving, middle traverse guides, single boss top rollers weighted by deadweights, cap bars with movable nebs for single-boss rollers, jacking motion, roller delivery motion whilst winding, patent faller lifting motion and anti-friction bowls, tin roller pulley in halves, dripping tins, travelling scavengers, and stop motion for when the cops are full.

Until two or three years ago English machinists and manufacturers dismissed the idea of an automatic shuttle-changing mechanism as impracticable, and the only English machine with this capacity—that is, the only one which is of the slightest practical value—has not proved a success. If, as is generally thought, the manufacture of low-class goods is gradually leaving England, there will be no place for the automatic loom amongst the remaining medium and better-class cloths, but there is no reason why we should not retain all our trade, and the automatic loom is the only hope for many classes of fabrics. However, it is doubtful whether the introduction of such looms would in any way be a success, for their advent would in all probability be disputed by the trade unions and harassed by absurd regulations, and the looms themselves would suffer at the hands of old-fashioned or bigoted tuners. Whatever the English version of the automatic loom may be, the interest in its success is gaining ground in the States. This is evidenced by the large number of Northrop looms now at work, and by the number of new machines which are constantly coming to the front. The more interesting of these have been from time to time described in these columns, and the present machine is another whose features have lately been made public.

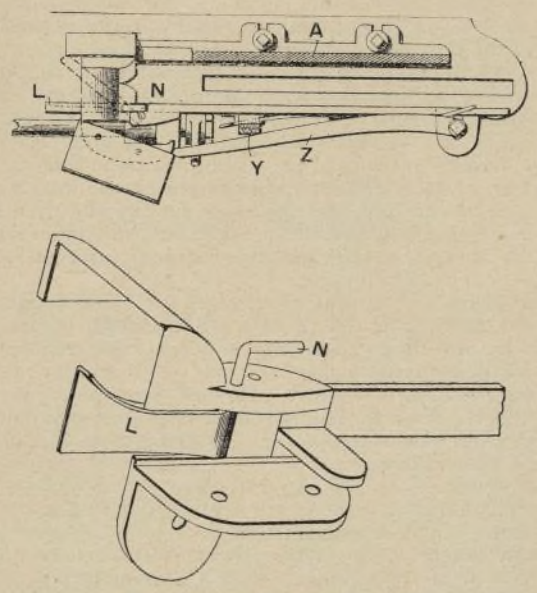
The loom in the main is not very different from those generally in use, and it has become recognised that the principle adopted is the only possible course to make a new machine a success. If a loom has new motions throughout, it requires a new class of tuner who has to re-learn his trade. If new attachments are added to the existing types, it is much easier—in fact, quite simple—for an intelligent tuner to fall into the changed methods. The new loom is shown in Figs. 1 and 2, which are plan and end elevation respectively, and it will be seen from these that most of the features are similar to, and others exactly like, the movements at present used.

Leaving the loom in general for a short time, the main alteration—that is, the shuttle-changing mechanism—is shown in Fig. 3. This drawing



THE PERHAM LOOM.—FIG. 3.

shows the parts of this apparatus in side elevation, front elevation, and sectional side elevation, the principal working parts being given in at least one of these illustrations. The height of the shuttle-box at one end of the lay is extended so that the upper portion A forms the lower magazine or reservoir for the shuttles. It is large enough to receive one shuttle, and to hold it in position ready for being dropped into the working shuttle-box. The upper part B of the reservoir is connected to the lower portion by a pin G, and the upper end has a sliding pivotal connection with the arm C, which is bolted to an extension of the loom frame. Guides receive the sliding rods E, which



THE PERHAM LOOM.—FIG. 4.

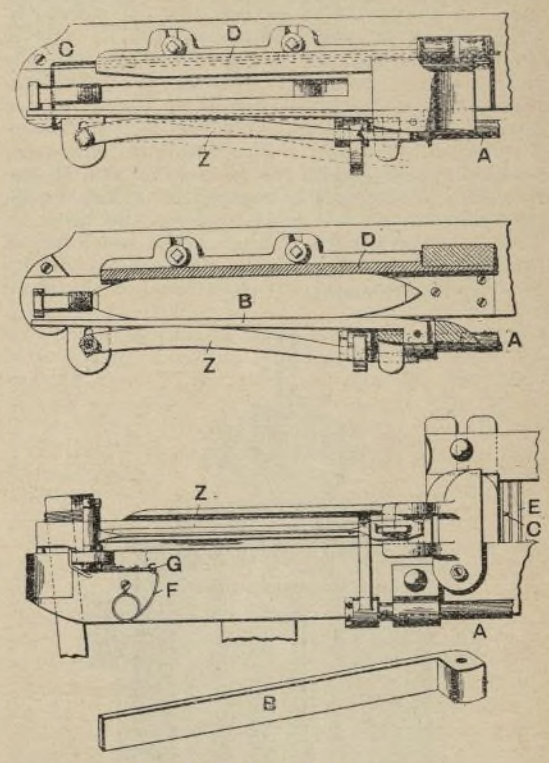
are attached by their top ends to a short connecting piece pivoted on the stud F. The drawing to the left of Fig. 3 shows the lay full back, but when it goes forward the upper part of the shuttle magazine swings back upon its pivot G, taking the position shown by the dotted lines.

In front of the lower part A of the magazine there is pivoted a rocking shaft H provided with curved fingers J and K, which project into the path of the shuttle as the latter passes through the magazine, and act as shuttle-feeding devices. The finger J is a piece of wire having its ends fastened to the shaft H, whilst its body portion is adapted to engage and hold a shuttle so as to prevent its dropping into the lower part of the shuttlebox; and when the finger J is moved outwards so as to allow the shuttle to fall, the fingers K move inwards and engage the next shuttle, holding it, and those above it, from falling. At the entrance of the shuttlebox there is a switch or deflecting plate L, which is better seen in Fig. 4, being pivoted so that it can move into the position shown by the dotted lines, when it deflects the exhausted shuttle from its usual course and prevents it entering the working shuttlebox. This deflecting plate L is mounted upon a rocking shaft, which is bent as shown in the lower part of Fig. 4, to provide the lever N at its end. This lever is engaged by a second lever O, which projects downwards from the rocking shaft H, so that when the shaft is rocked to allow the shuttle to drop into the working box the deflecting plate is thrown into its working position and turns the exhausted shuttle out of its course.

An arm P (Fig. 3) projects inwardly from the front of the shuttle magazine, and from the end of this arm is a stud on which is fulcrumed the lever R, which carries a hook on its lower end. On the lever is also a pin T, which works in the tappet-shaped slot of the lever U, which is secured to and projects out from the rocking shaft H. It will be seen that by swinging the lever R about its fulcrum the shaft H is rocked. The lever R is held in its normal position by a spring, which holds the finger J in position, projecting into the magazine, and engaging the lowest shuttle of the pile and preventing its dropping. Therefore, to move the lever outward so as to rock the shaft H allows the shuttle to drop. There is a catch W secured to the rocking shaft X, which is journalled under the breast beam. This catch is below the path of the end of the lever R when in its normal position, which place it holds as long as the weft remains intact in the working shuttle; but as soon as the weft breaks or exhausts the catch is swung up, and engages with the lever R, holding it stationary as the lay moves backward, and moving the deflecting plate into the position for turning the exhausted shuttle away from entering the shuttlebox. At the same time a new shuttle is dropped into the shuttlebox, instantly taking the place of the deflected one.

When the shuttle is approaching its box under ordinary circumstances, the binder is moving a false wall inward to check it, and mechanism has therefore been provided for holding the binder outward to allow the shuttle to drop into the box. On the rocking shaft H there is a finger D pressing against the spring lever Y, which is secured at its lower end to the front of the lay. This spring lever passes behind the binder Z, so that when the shaft is rocked, the binder is prevented from being moved inward by the rocking of the spindle A in Fig. 5. The false wall B (also Fig. 5) is normally held outward far enough by a spring so as to allow the shuttle to drop between it and the stationary wall of the box. A box, shown at R in Fig. 1, is provided for receiving the exhausted shuttle as it is thrown out by the deflector, the shuttle sliding down a guide arranged for the purpose. The shaft X in Fig. 3 is worked by the weft fork, which, operating in the usual manner, moves this shaft and elevates the hook-shaped lever W, in lieu of stopping the loom.

In order to prevent the shuttle-changing mechanism from being actuated, in case the power which drives the loom falls off a little, thereby occasioning slackness in the weft thread, a device is provided for engaging the weft fork and preventing the actuation of the rocking shaft X. This device is shown in Fig. 5, and consists of a sliding rod C movable in a guide in the rear of the walls D of the shuttlebox at the end of the lay, opposite the shuttle-changing mechanism, and it is adapted to be moved along across the upright pins E by a spring F, the wires being bent at their outer end to receive the spring. When the picking stick moves inward, the wire is moved across the wires E, and in case the shuttle does not come into the box with sufficient force to carry the picking stick to its limit of outward movement, the weft fork will engage the end of the wire C, and will be lifted to escape being caught by the notch in the oscillating weft lever. If the shuttle, however, moves with the usual speed and force, the picking stick is moved backward to its limit of movement, and the wire C is moved to its inoperative position.

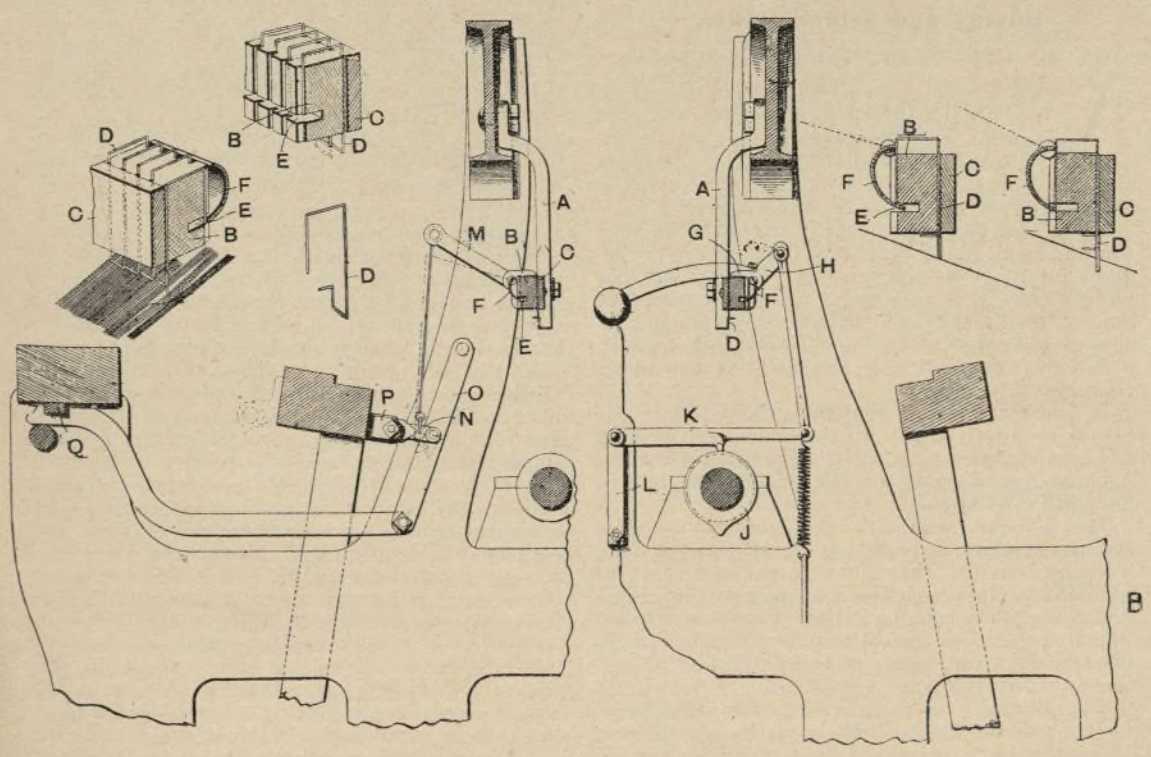


THE PERHAM LOOM.—FIG. 5.

The wire G is connected with the spring F, so that unless it is pressed back by the picking stick, the wire C projects across the upright pin E. The picking stick, when a shuttle is out of the box, rests midway between the ends of the slot in which it works. At this time the wire C will rest across the pin E, and will engage the weft fork in case the lay reaches the extreme of its forward movement, and prevent the actuation of the stop mechanism. When the incoming shuttle, however, strikes the picking stick, it forces it outward to the extreme of its movement, and the picking stick, engaging the wire C, carries it outward so that its end no longer projects across the pins E. Therefore, if the loom is not running with its usual power, and there is a slackness in the weft thread, by reason of the shuttle failing to pass into the box as far as it should, the weft fork will engage the wire C, and the loom will not be stopped as it otherwise would, or the weft-replenishing mechanism actuated.

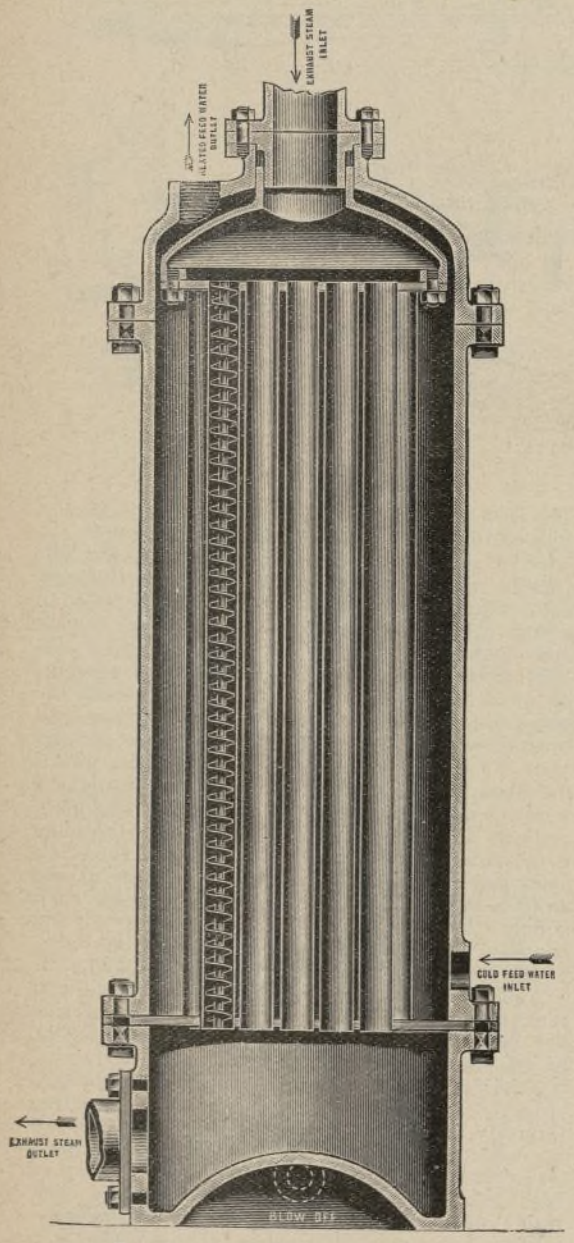
Another device is also provided for lifting the weft fork on the first reciprocation of the lay in starting the machine, to prevent any accidental actuation of the shuttle-changing mechanism. The starting lever is provided with a supplemental handle Q (Fig. 1), and having a curved arm P projecting laterally from it near its connection with the starting lever. The end of the arm P extends under a lever O pivoted in the guide for the weft fork, and having an arm N to extend under the weft fork. In moving the starting lever to its operative position, the arm P is raised to lift the weft fork and prevent a possible actuation of the shuttle-changing mechanism. In order to insert the new shuttle properly in the box when throwing out the shuttle from which the weft thread was broken or exhausted, it is necessary to permit the picking stick to move quickly back to its outer limit of movement. Therefore, on the picking stick at the end of the lay on which the shuttle-changing mechanism is mounted there is placed a pulley. A cord Q is passed around this pulley, and one end is connected to a spring. The other end is connected with the end of a lever M fulcrumed on the lay and projecting across the lever R. By this arrangement of parts, when the lever R is thrust outward to cause the insertion of a new shuttle in the box, the lever M is rocked about its fulcrum to draw upon the cord and loosen the friction strap around the band, so that the picking check is rendered inoperative and the picker stick returns quickly to the extreme limit of its outward movement, quite clear of the shuttlebox.

The loom is also provided with a warp stop motion which, although not instantaneous in its action, stops the loom as soon as the broken end begins feltering. This motion is shown in Fig. 6. Hanging from the cross framing of the loom are two hangers A, supporting two parallel guide bars B and C, which lie to the rear of the healds. The guide bar B is grooved on its front and back faces to receive drop wires D, one of which is shown



THE PERHAM LOOM.—FIG. 6.

alone in Fig. 6. The way in which these are grouped together and arranged across the warp is also shown in the same figure. In front of the guide bar B is a longitudinal groove E, across which the wires project when they are dropped to their lower position. A feeler F hangs from the brackets G at the end of the guide bars, and there is also connected the arm H. A cam J keyed to the crankshaft of the loom is adapted to engage and lift a lever K which projects outward from a bar L. The lever K is held against the cam by a spring at one end, and at the other is connected to the arm H. The formation of the cam J causes the lever K to rise once for each pick of the loom, and each time the feeler F is rocked so that its edge enters the groove E. At the opposite end of the feeler is an arm M, the free end of which is connected by a link to the pawl N, whose stud projects from the lever O. There is a projection P fixed on the inner side of the lay, which, when the pawl N is held in its raised position, engages with it to move the lever



THE "AIREDALE" FEED-WATER HEATER.

O backward. Connected to the lower end of this lever O is a rod which bears against the lever Q under the breast beam, and projecting through the loom frame so as to engage the starting lever.

When a warp thread breaks and becomes entangled with the adjacent ends a float is caused, and when the arm H is raised by the cam J and the lever K, the wire above the entangled threads will drop for lack of support, and its end will extend across the groove. Then the pawl N will be held in position for being engaged by the projection P when the lay goes back, which will cause the starting lever to be pushed out of its retaining notch and spring back, throwing the belt on to the loose pulley.

The "Airedale" Feed-water Heater.

MR. JOHN BARRETT, CROSSHILLS, KEIGHLEY.

THE increased cost of fuel for steam-boiler firing has not only had the effect of directing more attention to the possibilities of effecting economies in the generation of steam, but has also caused a lively interest to be taken in the various methods by which economy in its utilisation can be achieved.

In non-condensing engines the heating of the feed water by the exhaust steam is a well-understood source of economy, but it is obvious that the amount of heat which is thus turned to useful account must largely depend upon the efficacy of the feed-heating apparatus employed.

The illustration herewith shows an improved feed heater, known as the "Airedale," made by Mr. John Barrett, Crosshills, viâ Keighley, under the patent of Mr. G. Green. The special feature claimed is in the tubes of the heater, these consisting of ordinary straight solid-drawn brass tubes, each containing a patent spiral deflector, around which the steam circulates. It will be evident that with this arrangement the steam is brought into more intimate contact with the surface of the tube, and hence the length of heater tube required to transmit a definite amount of heat in a given time should be less than with the ordinary straight tube. This view is very fully borne out by the following results of an experiment, which have been furnished by the makers :—

The test was made upon an actual heater designed with sufficient heating surface to heat 200gals. per hour to about 200° F. when working with ordinary straight tubes.

The heater shell in both cases was filled with water at 70° F., then steam was supplied through a ½in. pipe at 212° F. and at equal velocity in each test. The temperature of the water in each case was as follows :—

Without Deflectors.		With Deflectors.	
Temperature at start	70° F.	Temperature at start	70° F.
In 18½ minutes	180 ,,	In 2¼ minutes	180 ,,
,, 21¼ ,, ...	190 ,,	,, 3 ,, ...	190 ,,
,, 23½ ,, ...	200 ,,	,, 5 ,, ...	200 ,,

The temperature in each case was taken at the surface of the water in the shell, and all the steam was condensed in the tubes when the deflectors were used, whereas when without a large portion of the steam simply passed through the tubes without in any way heating the water.

The above experiment renders it at once apparent why such an apparatus is more compact and relatively more efficient than is possible with a heater with plain tube surface. In point of fact, the makers state that the above apparatus, designed to heat at the rate of 200gals. per hour, is by the use of the patent spiral deflectors actually heating between 400 and 500gals. per hour to a temperature of 203° F. (after passing through about 30ft. of 1½in. pipe) at the works of Messrs. John White and Sons, curriers, of Bingley. Diagrams taken from the engine show that the back pressure is not in any way increased with this heater.

The apparatus is especially suited for heating by live steam for marine purposes, etc., owing to the extremely rapid heat-transmitting effect induced by the spiral deflectors, while the makers claim that on the other hand it is equally applicable to surface condensers or any other apparatus in which tubes are used for the transmission of heat.

Buying and Selling Power.

BY W. H. WAKEMAN.

A FEW months ago a certain manufacturing firm hired a vacant shop and proceeded to install a small steam plant. As they did not require all the available room, they induced another company to hire a portion of the space, and buy power to operate light machinery.

There were two points that it was rather difficult to agree upon, one of which was the power required, and the other was the price per horse-power per month. As this is a very common occurrence among small manufacturing concerns, some discussion of the subject may be of value and interest, although it may not fully settle all disputes along this line.

In some cases it is customary to estimate the power required to run all the machinery used by the prospective tenant, and charge him for the full amount, regardless of the fact that it is seldom or never all used at once.

This gives the tenant full permission to use all of the power that he is able to at all times during working hours, so that there is no chance for the landlord to claim that the machines are run more hours per week than he expected they would be ; but it is not always satisfactory to the tenant, because he soon begins to think that he is paying for more than he is getting.

The only fair way to do in such cases is to charge for the average load, which is a very easy plan to formulate, but a very hard one to put into successful operation.

I do not mean to say that it is difficult or impossible to find out just what the average load is, provided the proper instruments are used with due care and intelligence, but for one cause or another these do not seem to be available, usually because the necessary expense is considered excessive when the amount of power concerned is taken into consideration. Sometimes the two parties concerned—namely, the people who have power to sell and their prospective customers—agree upon an estimate of the power required, and then agree upon the price to be paid, which settles the matter so far as any dispute is concerned, but it is not always a just decision.

Frequently the power used by a tenant is transmitted by one belt to his part of the shop, and this belt does not transmit power for any other purpose

I have been called in on such a case and asked to compute the power transmitted by a belt, in order to settle a dispute, for the parties were quite sure that there was some way of telling exactly the amount of power transmitted.

I was not prepared to disprove their statements on the whole, but at the same time I was aware that it required instruments to determine necessary data, and neither one of the parties concerned, nor both of them together, would pay the expense of the test, hence the matter was dropped.

An impression lingers in my mind yet to the effect that they thought I did not understand the matter, or else I would have measured the belt, made some scientific calculations, and given them a definite answer. I am willing to admit that had I known the exact pull in pounds on the working part of the belt, also the same for the idle part, I could have ascertained the speed and calculated the power transmitted, but the required information was not easily secured.

There are several rules given us to determine the full power that a belt will transmit, but not only do these rules give different results when applied to the same case, but even if they did agree, this would not decide how much power was actually used, for it might have been only one-half, or even less, of the power that the belt was capable of transmitting.

While it is not my intention to describe a dynamometer and its application to the measurement of power transmitted, yet I wish to state for the benefit of the many power users who are not posted on this subject, that a dynamometer will determine the exact amount of power used, and the results are as easy to read as the steam pressure indicated by an ordinary gauge.

The dynamometer and the indicator agree when the results obtained by them are compared, but the former presents at least one advantage over the latter, for it is applied at a point closer to the work in hand, therefore there is less chance for errors to be made due to causes which lie between the prime mover and the machines operated by the tenant.

In further explanation of this point I would call attention to the fact that when a dynamometer is used it measures the power transmitted by the belt which runs to the department occupied by the tenant only, therefore it is entirely independent of whatever may be going on in other parts of the shop, so long as the speed of the belt remains constant. When the indicator is used it is necessary to take a diagram with the full load on that the tenant's machinery calls for, and then another must be taken with his load entirely off. The difference between the two shows the amount of power that the tenant should pay for, provided that the conditions in all other parts of the shop were exactly the same in both cases.

It is not impossible to secure uniform conditions; but the following incident shows that both care and accuracy are required in order to avoid mistakes.

Having been employed to do some work in a certain plant, which made it necessary to know the exact friction load, I asked the superintendent if it was convenient to get this information during working hours, and he replied in the affirmative. When I was ready to take diagrams, he sent one man into each room in the shop to order all the machines to be stopped when the whistle was blown. When I had taken several diagrams, and found that they were all different, it demonstrated the plan to be a failure, for it was evident that all the machines were not stopped. Calling another day at noon I hoped for better success, but was disappointed, for as some of the men were employed on contract or piece work, they took advantage of the available power, and used some of the machinery, thus causing a variation in the friction cards, and rendering them of no value.

Finally, I went there at night, after all the men had gone home but the watchmen. The engineer started up, and there was no trouble to secure several diagrams that were alike, thus showing that the results were reliable.

Afterwards diagrams were taken every fifteen minutes during an entire day, to determine the average load, and when the former was subtracted from the latter, the remainder showed the power required to operate the machinery.

In another case, where it was not practicable to apply an indicator, because the cylinder was not bored for it, and for other reasons, I tried the following plan with success :—It was a throttling engine, 10 by 10in., running 200 revolutions per minute, fitted with a valve that admitted steam during nearly the whole stroke. There was a hole bored into the steamchest and tapped for ¼in. pipe.

A steam gauge was attached here, with a double-ended pet cock in the pipe.

By partially closing this cock it was possible to prevent all vibration of the steam-gauge pointer, except a very small amount which was needed to demonstrate that the gauge was not entirely shut off.

After determining the horse-power constant for this engine, the power it was developing at any time could be determined by multiplying the pressure indicated by the gauge by the constant, which is 0·795. With a friction load the pointer indicated 9lb., and 9 × 0·795 = 7·155H.P. With a portion of the machinery in operation the pointer indicated 22lb., which means 22 × 0·795 = 17·49H.P., therefore it required 17·49 − 7·155 = 10·335H.P. to operate the machines. In this case the results were satisfactory, but I do not recommend the device for use in all cases; therefore, if any reader tries it under different conditions from those I have carefully mentioned, he must expect to be disappointed.—"The Engineer," N.Y.

Machinery Foundations.

(*Concluded from page* 20.)

A FOUNDATION, whether for an engine, pump, dynamo, or machine tool, should not be built into, or in any way be made a part of, an outer wall of a building, chimney or partition. It is rarely advisable to set two machines on the same foundation. For instance, in the case of a row of lathes, planers, shapers, milling machines or drill presses, when properly set, each machine should stand on its own (separate) foundation. It is a little more expensive at the outset to construct a separate foundation for each machine, but much more satisfactory results are obtained by so doing, especially in the case of a large and heavy machine, or machines intended for very accurate work.

It may be said that an engine foundation cannot be too substantially built. Especially is this true in the case of engines which are not self-contained—that is, the style of engines in which the outboard bearing is not supported by an extension of the frame or bedplate. The Corliss, Fitchburg, Wheelock, McIntosh-Seymour, and Brown engines come under this head, and are not self-contained. The cylinder and main bearing are provided with a foot and pedestal respectively, which rest upon the cap stone of the foundation, while the outboard bearing has a separate foundation. As stated in a former paper, much depends upon the nature of the earth under the foundation, which governs to a great extent the form, size, and cost of the structure. In but few instances are engine foundations placed upon rock, nor is it as necessary as it is for a chimney or other structure of equal weight. The foundation should in all cases be carried down to good, firm earth, and the footing stones laid upon the carefully-levelled bottom of the pit. Much of the success in managing an engine (the absence of hot boxes and of the necessity for frequent "lining-up") is dependent to a great extent upon the foundation.

We have seen foundations for a slow-speed engine built as illustrated in Fig. 11. The main bearing pedestal and the cylinder foot have separate foundations, and of course the outboard bearing also. The guides were supposed to have a support in the form of a small column or pedestal which was intended to rest on a pier forming an independent foundation, the bolts being leaded into the cap stone instead of being carried through to the bottom. The cap stone under the guide pedestal, instead of supporting the latter, and thus preventing the frame from springing, was actually suspended from the pedestal by the bolts as shown, so that in this case they were "holding-up" bolts instead of "holding-down" bolts as we usually understand this latter term. Such a foundation is cheap in every sense of the word, but it usually makes the expense of keeping an engine cool and in good running order very great. The foundation for an engine of the type referred to should be built in such a manner that when the cement mortar has become thoroughly hard, the whole structure will have become practically one piece or block. Such a foundation is illustrated in Fig. 12, and makes a thoroughly substantial structure. If it becomes necessary to run pipes through the foundation, an arch may be built in it as low down as practicable, as shown. Engine foundations should be given considerable batter, especially at the ends, for most of the sudden thrusts and pulls come upon the foundation in the direction of its length. It is seldom practicable to give the foundation for the outboard bearing much inside batter on account of the fly-wheel being in the way. Nor is it necessary, for, like the main structure, the tendency to move it is in the direction of its length—namely, parallel to the fly-wheel. This foundation should be made of ample length and as wide as the conditions will permit, having considerable batter at the ends, and supported by a liberally-proportioned footing stone. Such a structure is shown in Fig. 13, which represents a plan and side view. When the foundation is very shallow, as in Fig. 14, little or no batter will be required.

In many places it is customary to use hardwood plans instead of cap stones, as shown in Fig. 15. These are usually held down by the weight of the engine and the engine holding-down bolts, or foundation bolts, as they are called. This has proved to be a very unsatisfactory method in a

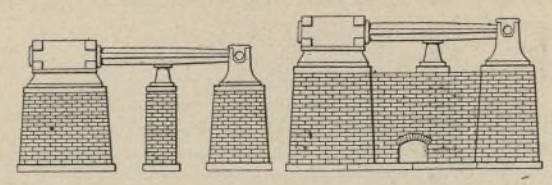
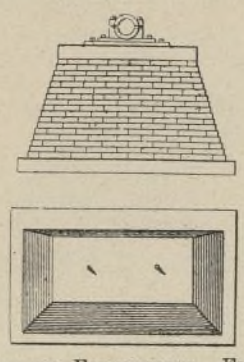


Fig. 11.—Machinery Foundations.—Fig. 12.

large number of cases. The better plan is to provide separate bolts for the plank, and locate them so that the nuts may be tightened as fast as the wood shrinks, which the best of it usually does in time. As soon as the slightest movement of the plank is discovered, and even before this occurs, the cap bolts should be tightened, and then the nuts holding the engine bedplate. Although the movement of the plank may be merely enough to cause the oil to ooze out at the joints, even this is too much, and should be stopped at once, for it has a detrimental effect upon the upper courses of brick, which are about as hard to get at to repair as those nearer the footing stone; and, further, it is much easier and cheaper to take care of a foundation than to rebuild it.



Machinery Foundations.—Fig. 13.

From what has been said concerning the form, size, batter, etc., of foundations, it will no doubt be apparent that an engineer must first have some conception of the form and size of the foundation he will need before he will be ready to begin the work of preparing an estimate of the cost.

When preparing an estimate of the cost of work and material it is not safe to assume minimum values, for the reason that in seven cases out of ten some unforeseen delay will occur, or some unthought-of condition will present itself after the work is begun which will be apt to change the total cost anywhere from 5 to 10 per cent. By minimum values is meant the smallest amount of material, for instance, which has been known to be required for, perhaps, a similar structure, and the minimum length of time which has been consumed on similar work by the same number of men. Of course, it is not wise to make the estimate too

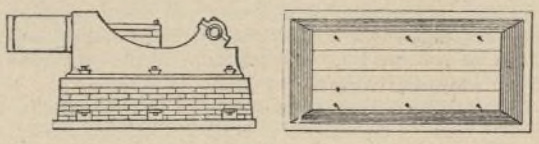


Fig. 14.—Machinery Foundations.—Fig. 15.

high, for while the amount given may be above the actual cost, and thus be on the safe side, it is very likely to appear to be "too expensive" to the proprietor, which in all probability will cause much delay and annoyance to the engineer. The first thing is to obtain the amount of material required, and the second, the length of time that will probably be required to prepare and put the material in its proper place. In order to be able to estimate the quantity of brick, for instance, for a foundation, the size and form of the structure must be determined, and this will depend not only upon the size of the engine, pump, or other machine, but upon the condition of the earth upon which the footing stone is to rest, the necessary depth at which firm earth may be found, and the batter of the sides of the foundation. The various items to be considered are: The necessary depth of the pit, the dimensions of the footing stone required, or block of concrete, as the case may be; this will depend upon the batter of the sides, and will determine the volume of earth to be removed. Then comes the number of bricks, amount of cement and sand, and of broken stone if concrete is employed; the size of the cap stone, and the length of time required to excavate, dress and set the footing stone, lay the brick, dress and set the cap stone, including the drilling of the holes for the foundation bolts. To this must be added the wages of a labourer to assist in handling the stone, and to supply the bricklayer with material.

The nature of the earth under the proposed foundation, from this depth of the pit, may very frequently be ascertained by the aid of an earth auger, such as is used for digging post holes. A labourer will excavate about 2½ cub. yds. of earth in a day of ten hours, when not more than 50 per cent. of the earth must be loosened with a pick, which includes the time required to level the bottom. A bricklayer will lay about 2000 bricks in a day of nine hours on this kind of work when kept well supplied with material. A stonemason will prepare a footing stone, rough dressed, at the rate of about 2½ sq. yds. of surface per hour, and square up and dress a cap stone at the rate of about 1¼ sq. yd. of surface per hour. He will drill a 2in. hole through a stone 6in. thick in about thirty minutes. In estimating brickwork of the nature of a foundation, a cubic foot may be considered equivalent to twenty-two bricks.

The cement mortar previously mentioned consists of one part of cement and two parts sand. One part of cement and one half-part of white lime (slaked) may be used with the two parts of sand with good results, and it is a trifle more economical, especially in the case of large foundations or other large work. The addition of 50 per cent. of lime does not materially affect the efficiency of the cement. When lime is employed, one barrel of lime and one of cement will be sufficient for 1000 bricks. A bricklayer cannot be counted upon to lay per day more than 1200 bricks in a wall. When using concrete instead of stone under the brickwork, a cement mortar consisting of one part cement and two parts sand, tamped solidly, requires about 36lb. of cement per cubic foot of concrete.

The directors of the Irwell Bank Spinning Company have decided to build another mill at Stoneclough, near Farnworth, adjoining their present mill, which contains over 130,000 spindles.

Good progress is being made with the erection of the new cotton spinning mill for the Bolton Textile Company Limited, at Farnworth, excavations and other preliminaries having been commenced. The building is to be erected on an eligible site fronting Cawdor-street, Moses Gate, nearly opposite the company's present factory, and Mr. J. Partington, of Middleton, has the building contract. The new premises will contain from 90,000 to 100,000 spindles.

Messrs. Mather and Platt Limited, Salford Ironworks, Manchester, have received orders for the supply of water-softening plants from—the Metropolitan Electric Supply Company, plant to deal with 240,000gals. per day of twenty-four hours: the Hayling Water Company, plant to deal with 120,000gals. per day of twenty-four hours; and Messrs. G. B. Kent and Son, plant to deal with 14,400gals. per day of twenty-four hours, for their new works at Hemel Hempstead.

Bank Top Mill, Blackburn, belonging to Sir Harry Hornby, M.P., has been let to a new company, after being stopped for some months. Formerly it was used for spinning and weaving, but during the last tenancy the spinning machinery was taken out and weaving substituted. Sir Harry Hornby recently decided upon taking out the old looms and preparation machinery and replacing it with new, containing all modern improvements. The order for this machinery has been given to Messrs. William Dickinson and Sons, of Blackburn, and is now in course of execution. There will be 250 new looms, and new winding and warping. The mill will then contain 700 looms.

The British Fire Prevention Committee are organising a novel demonstration in the form of a "fire-proofing" section in connection with the biennial Building Trades Exhibition, which falls due at the Agricultural Hall in April next. A large gallery has been retained for exhibits showing the progress made in combating fire by improved materials and systems of construction. This exhibition will not only be the first of its kind in any country, but will show that the reduction of fire risk by improved forms of building has now its own independent industrial position, claiming not only the attention of professional men, but the study of our local authorities. The British Fire Prevention Committee, over which Mr. Edwin O. Sachs, the architect, presides, is hence also issuing a number of invitations to the municipal, local, and other public authorities to attend this special demonstration of a modern industry, and a representative sub-committee of the society will attend to the general arrangements and the reception of the visitors, Mr. Hammond, the district surveyor for Hampstead, acting as chairman. An industrial demonstration of this kind in connection with the committee's scientific testing operations will, it is hoped, be of considerable benefit to the community at large, quite irrespective of its interest to the great technical professions.

RAW MATERIALS, PROCESSES, FABRICS, &c.

Weaving Geometrical Smallware.

THERE is a wide field for the manufacture of small woven articles, which at present are usually cut out of the ordinary cloth and worked into presentable form by the needle, in either hemming or embroidering. It is, however, an easy matter to make almost any shape suitable for fancy table mats, serviettes, handkerchiefs, and similar articles in the loom by an arrangement of the weave, and by such a method save considerably on the wasteful method of cutting out. The woven method, it is true, is not devoid of waste, but such only comes from the warp and not from the finished cloth, which means both weft and warp. Then, again, this waste is still further lessened by utilising a large portion of the warp threads which lie outside the pattern for the purpose of knots, or other forms of fringe.

The method consists in commencing weaving by first of all causing the weft to take a certain number of warp threads—for example, in proximity to the middle point of the width of the loom,—then to progressively increase or diminish the number of warp threads taken by each pick, in such a manner that the width of the woven portion constantly corresponds to the form which it is desired to give to the finished piece, continuing thus until the piece is completely woven. It then only remains to cut off all round the piece all the warp threads which have not been taken up in the weft, of course taking care to leave this latter intact. The variation in the number of warp threads taken in

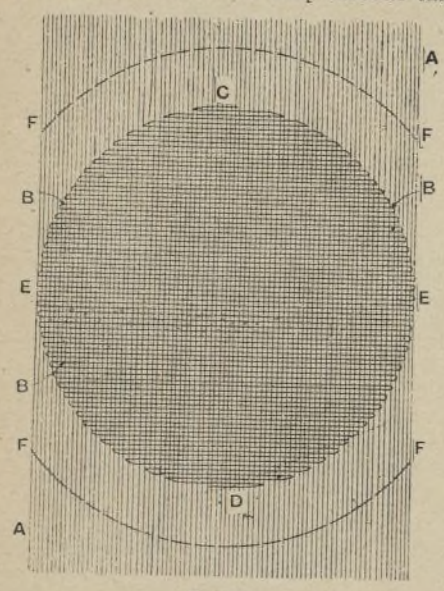


FIG. 1.

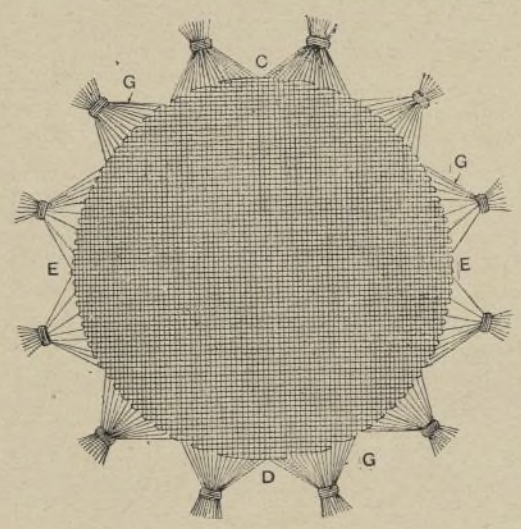


FIG. 2.

WEAVING GEOMETRICAL SMALLWARE.

the weft may be readily and automatically produced by means of a jacquard mechanism mounted in the ordinary way; it being only necessary to perforate the cards in a suitable manner, according to the form of the piece to be woven, in order to obtain the desired result, the formation of any kind of design, either figures, in colours or otherwise, being readily effected.

The shape of the pieces to be woven may vary greatly. The only condition which must be fulfilled is that no line parallel with a given direction—that of the weft—cuts the contour at more than two points. The continuity of the weft between the opposite selvages depends upon the observance of this condition. It is therefore possible to obtain not only convex forms, but also concave, undulating, polygonal, star-shaped, and other forms, provided that the condition above stated be observed. For economical reasons several distinct pieces of fabric cannot be formed simultaneously upon the width of the loom.

When the warp threads are severed around the piece of fabric they can be cut off quite close to the contour formed by the weft threads, or at a certain distance, in order to produce a fringe. In this latter case, the fringes can be drawn together so as to form a number of tassels distributed around the piece of fabric. An example to show one design of mat—namely, a circular one—is shown in the accompanying illustrations. Fig. 1 shows the piece of fabric before the warp threads have been severed, and Fig. 2 shows the finished cloth. In Fig. 1 A designates the warp threads, and B the weft thread, which is uninterrupted between the points C and D. It will be seen that the first pick C, of the thread B, embraces a small number of warp threads A, and that the following picks extend over a number of warp threads, and progressively increase towards the middle E E of the piece; from E to D, on the contrary, the weft B takes in fewer and fewer warp threads A. In Fig. 1 F indicates the line upon which the threads A can be severed in such a manner as to form a fringe; this fringe may then be made up into tassels G as shown in Fig. 2.

Cloth Stretching Devices.

IT is a disputed question as to what extent the extra length or width obtained by stretching woollen or worsted goods during the process of drying is permanent. Theoretically, the increase in length or width so obtained would be lost as soon as the goods are again dampened; practically this is not the case. A certain proportion of the increase in length or width is permanent. This proportion depends on a number of conditions, such as the quality of the stock, weight of the goods, degree of fulling, etc. In medium-weight fabrics which have received a fair amount of fulling most of the increase is preserved. Fabrics that have been fulled but little will frequently not only lose all of the increase of length obtained by stretching, but actually become shorter and narrower than they were before drying. This is due to the fact that their felting or shrinking capacity had not become exhausted. Heavy, strong fulled goods show a very strong tendency to return to their original dimensions. This tendency is diminished by gigging.

The fact that the length and width of goods can be permanently increased by stretching during the drying process affords a partial remedy for excessive shrinkage in fulling. If the goods have been fulled too much in their width or length, this fault can be remedied by stretching them out again. The extent to which they are stretched must, however, be much more than the actual increase desired, as much of the temporary increase of length is lost in the subsequent processes. In order, for instance, to make goods 2in. wider than the original dimension, it is necessary that the original width should be stretched at least 8 or 10in. Still more important than the widening of the pieces is the stretching lengthwise. Very frequently it happens that pieces come from the fulling room much shorter than they should be. This adds materially to the cost per yard of the cloth, and either wipes out the profit or causes an actual loss on the goods, especially at the present time, when prices are so low.

The builders of drying machinery have added various devices to their dryers by which the operator can regulate this stretching in length. One of these devices consist of a large faceplate, to which a friction cone is connected. Another method consists in running the cloth over two rollers, running at different speeds. The more recent German drying machines, says "Oesterreich's Wollen und Leinen Industrie," have a dial which indicates the amount of stretch applied to the goods.

In order to determine how much a piece should be stretched, it is necessary to know the clean weight, the length of the piece before drying, and the required weight per yard. Calculations are made for each piece before it is fulled, to determine what length it should have when finished, in order to get the desired weight per yard. When the wet pieces which have been fulled, scoured, and gigged are ready for the dryer, they are first carefully measured, and this length is compared with the length which they should have when finished. This comparison shows whether the goods should be stretched or not, and the stretching mechanism on the dryer is adjusted accordingly.

A piece must be stretched considerably more on the dryer than the desired increase in length. If, for instance, a cut 24yds. long is 1yd. short, the piece must be stretched at least 2 or 2½yds., in order to obtain this 1yd. increase. This means that the cloth is stretched from 8 to 10 per cent. If an increase of ½yd. is desired, the stretching of 4 or 5 per cent. will be sufficient. Where an increase of more than 1yd. is desired, the wet goods on the dryer will have to be stretched still more in proportion to the increase desired in the finished piece. For instance, the permanent increase of 1yd. in length necessitates the stretching of the piece from 2 to 2½ times this amount on the dryer, but if an increase of 1½yd. is desired, the stretch on the dryer must be at least three times this amount.

The process is rather simple, the difficulty being chiefly to ascertain how much the goods should be stretched on the dryer in order to give the desired increase in length. In this, as in other departments of textile manufacturing, experience is the best teacher, and it is only by experimenting that one can determine the best method of utilising this process. If medium and heavy weight goods are to be stretched to any considerable extent, it is a good plan not to extract the goods, but to dry them while saturated with water. The advantage arising from this method is probably due to the fact that the evaporation of a large amount of water in the goods has an effect similar to the process of sponging or crabbing goods, by which the fibre is fixed and loses the tendency to return to its original contracted condition. A greater proportion of increase of length obtained by stretching on the dryer is made permanent if the goods are immediately crabbed or steam blown after drying.

In cases where a large increase of length is desired, repeated drying and steam blowing will be found to give good results.

New Cleaning Process.

APART from the common and most generally known method of cleansing or scouring materials with soap and water, the so-called dry process has of late years received a large amount of attention. Generally, wool or woollen articles are the chief objects of the latter treatment, although it is adaptable and is also used on silk and cotton materials. By the usual system, the goods are treated with ether, benzol, or benzene in a closed vessel; but whether so treated or in an open bath, there is a great risk from the explosive nature of the gases given off, and the materials used are expensive. Often the processes are carried out in an atmosphere of carbonic-acid gas; but although this is a preventive against fire or explosions, it adds to the already heavy expenses of the process.

A further development has recently been made by a chemist in Belgium, who has succeeded in discovering a gas, or gas mixture, which, when used in the above manner in the treatment of wool or other fibrous material with volatile solvents, will not only act as a safeguard, but has a new chemical effect on the material thus treated and on the substances extracted by the solvents—viz., a bleaching action. This gas is the dioxide of sulphur (SO_2), either alone or in combination with trioxide of sulphur (SO_3) in a gaseous state. The treatment of the fibrous material being cleansed is achieved by means of these gases acting in combination with a solvent such as mentioned above, both as a mechanical means for imparting motion to the solution in the vessel and for driving out the solution when necessary, and as a chemical means for the purpose of purifying or bleaching the material. The following operations take place, the sequence of which may be varied according to the nature of the material to be treated, or the final results to be obtained.

The wool is soaked for a suitable period in a closed vessel from which the air has been removed, in a solvent—such as, for instance, benzene,—for the purpose of dissolving the fatty and resinous substances contained in the wool or material treated. The solvent, charged with the fats, is removed by admitting compressed sulphur dioxide gas (SO_2), previously liquefied under pressure either alone or in conjunction with sulphur trioxide (SO_3), the gas forcing out the solvent through an exit passage when the latter is opened. The action of the SO_3 consists in a slight carbonisation or singeing of the fibres. There are special apparati on the market for this purpose, and the SO_3 simply carries out a work which is otherwise effected by such apparati. These operations are repeated until the material is thoroughly purified from the fatty and resinous substances it originally contained. Then the wool

or other material, after the sulphur dioxide, or its mixture, has been removed, is treated in the autoclave with cold or warm water for the purpose of dissolving and removing the sulphite salts formed, in consequence of the reaction of the sulphurous oxide upon the potassium salts contained in the wool fat, and of removing any sulphurous oxide which may remain. The proportions of SO_2 and SO_3 employed vary according to the character of the material to be treated, but generally they may be employed in the ratio of 10 to 1 respectively.

The Progress of Cotton Manufacturing.

THE following tables, taken from Shepperson's "Cotton Facts," give the estimated number of spindles in the cotton mills of the United States, Europe, and India at the end of the seasons named, and their annual consumption of cotton :—

NUMBER OF SPINDLES IN COTTON MILLS IN THOUSANDS.

Season of	Great Britain.	Continental Europe.	Northern States of United States.	Southern States of United States.	Total in United States.	India.
1888—89.....	43,500	24,885	12,700	1360	14,060	2763
1889—90.....	43,750	25,460	12,800	1605	14,405	3274
1890—91.....	44,750	26,035	12,900	1740	14,640	3352
1891—92.....	45,350	26,405	13,250	1950	15,200	3402
1892—93.....	45,270	26,850	13,450	2100	15,550	3576
1893—94.....	45,190	27,350	13,500	2200	15,700	3650
1894—95.....	45,400	28,250	13,700	2400	16,100	3810
1895—96.....	44,900	29,350	13,800	2850	16,650	3933
1896—97.....	44,500	30,350	13,900	3250	17,150	4066
1897—98.....	44,900	31,350	13,900	3550	17,450	4260
1898—99.....	45,400	32,500	14,150	3950	18,100	4728
1899—00.....	45,400	33,000	14,400	4700	19,100	4945
Actual increase since 1889	1,900	8,115	1,700	3340	5,040	2182
Percentage of increase since 1889..	4⅜%	32⅝%	13 1/10%	245⅝%	35⅞%	79%

ANNUAL CONSUMPTION OF COTTON IN COTTON MILLS.

(IN THOUSANDS OF BALES EACH OF 500LB. NET.)

Season of	Great Britain.	Continental Europe.	Northern States of United States.	Southern States of United States.	Total in United States.	India.
1888—89.....	3016	3256	1721	445	2166	711
1889—90	3227	3432	1688	501	2189	806
1890—91.....	3384	3531	1701	550	2251	943
1891—92.....	3181	3640	1815	616	2431	933
1892—93.....	2866	3592	1762	660	2422	937
1893—94.....	3233	3848	1648	639	2287	978
1894—95.....	3250	4030	1813	805	2619	1074
1895—96.....	3276	4160	1630	840	2470	1127
1896—97.....	3224	4368	1771	946	2717	1041
1897—98.....	3432	4628	1771	1151	2922	1185
1898—99.....	3519	4784	2218	1364	3582	1340
1899—00.....	3334	4576	2163	1524	3687	1162
Actual increase since 1889	318	1320	442	1079	1521	451
Percentage of increase since 1889..	10½%	40½%	25¾%	242½%	70¼%	63½%

The figures do not include about 350,000 bales of cotton now grown annually in its Asiatic provinces and used in the mills of Russia, nor about 325,000 bales (500lb. net) spun by hand machines in India; nor the small quantity of Egyptian and Peruvian cotton used in the United States.

The chief significance of the increase in India is the fact that just as the consumption of the Indian mills increases, the quantity of the cotton crop of India left for export to Europe is diminished, thus making European spinners more dependent upon American cotton. Perhaps the most suggestive feature in the figures is the fact that the greatest *relative* increase in cotton manufacturing is in the countries where cotton is grown as a staple crop.

Agave Fibre.

AT Pawai, near Bombay, is a factory which has been established by the Agave Fibre Company, for producing and working the fibre whose name they bear. The Agave, commonly but erroneously called the aloe, is the plant from which this fibre is taken. It is placed in the nursery as a small sucker from a parent plant, in rows, for preference in marshy soil; for a year, or a year and a half, it is fostered and watered, and nursed if delicate, then during the following rains these year-old plants are pricked out, and put in the ground 6 or 8ft. apart, where they make their roots at home, and live their lives until they are about four years old. Then the sickle of the reaper or the "kukri" of the Mahratta coolie cuts off the outside leaves close to the crown. About thirty of these leaves represent a respectable year's harvest from each plant. The agave goes on growing these fibrous and thorny leaves for about ten years, when it proceeds to flower and sends up a tall flower stem, which bears a numerous branched candelabra of bell-like green blossoms. Then its life draws to a close, but beside it may be found its large family which have risen year after year at its feet, and which by the time the parent is fading away, are fit for the knife. Only one of these suckers is left, for it is found that a more numerous crop interferes with their individual excellence. The small suckers, when very young, are taken off to the nursery and there they develop and are farmed out eventually in the six-foot civil distances of the wilds. Some millions of these agaves are now flourishing in nurseries of different ages, on the Pawai estate. The young ones spread their leaves abroad unimpeded, but the older ones have felt the knife and only retain the centre leaves that stand up stiff and straight to guard the heart of the plant. The agave that is mostly grown is the Vivapara, but the Americana, which has been brought in wagon loads from Sholapur at great expense, is now largely planted out. It has thicker leaves, and produces more fibre than the indigenous sort. A still finer kind has been brought from Kew Gardens, but that is still in the experimental and solitary stage. Another, the Agave Sisalana, that makes the sisal hemp, is patronised by Mr. Chamberlain in his Bahama plantations, and the Government of India has done much to encourage its cultivation in other parts of India.

There are two different machines used, one for decorticating the pointed end of the leaf and one for finishing off the process at the thick end. For this purpose, a coolie, clothed from head to foot in woollen cloth, with woollen gloves takes a leaf by the thick end, lays it into the machine point down, holding it firmly, and the machine quickly scrapes off all the green, leaving a greenish white fibre behind smelling somewhat like the rhubarb stem. These leaves are quickly flung, when released, over an iron bar, from which they are taken for the next process. They are shaken well about in a large iron trough of fresh water until all the juice is washed out. They then go to the second machine, where the fibre is deftly twisted round a small brass handle, and the thick end delivered to the machine; and it, too, is scraped free of its green pulp. The fibre is now ready for the drying process, which the sun does cheerfully and easily. The next proceeding is to scutch or comb it, thus turning it into beautiful white silken threads nearly a yard long that look like glorified jute. It is then fit for pressing into bales, which are shipped to Europe, where the fibre is handed over to the manufacturers to be made into ropes, sacking, carpets, and various other articles. It is of a peculiarly elastic and tough nature, which should make it of considerable value for waterproof cloth or other durable stuffs.

In the preparation a profuse supply of water is needed, for the acid contained in the plant, if allowed to remain any time in contact with the fibre after the leaf is cut, turns it brown. So each machine is fed with water by a separate pipe. The water comes from Pawai, the company's pipes conveying it from the lake. In the decortication the acid is thoroughly washed away, thus preserving the snow-white colour of the fibre. The coolies are defended in their labour by their clothing from this same acid, which, if it falls on the skin, raises painful blisters lasting a few days. The company provides all this clothing for the men so employed. The machines have been made by Messrs. Richardson and Cruddas. Boilers burning English coal drive the machinery, but soon new ones will replace them, capable of burning wood and cutchra, English coal being now very costly. Indian coal is too dirty for use, as its thick smoke fills the pipes very rapidly with soot, and causes endless work and worry. The process for producing the agave fibre is so simple and so rapid that one cannot help wondering why it was not begun earlier. The benefits following such an industry—which is practicable everywhere that water is found in India—can be understood when we remember that the shores of the lake are jungle land, that the lake itself has been long a "quantité négligeable," being superseded by other and larger waterworks. The opportunity for cultivation of something adapted to man's use was there, only waiting for a pioneer. The "Bombay Gazette" understands that the Agave Fibre Company, of which Dr. Suter is the head, is in treaty with Government to rent 20,000 acres of land for the industry. At the Paris Exhibition of 1900 the company received the highest award allotted for agave fibre—a silver medal. Dr. Suter is assisted by his two sons and a Swiss overseer. The people of the neighbourhood supply the unskilled labour. About 250 workmen are employed daily at what appear to them good wages. The common or garden coolie gets fourpence per day, the guttermen fivepence, men working the machines sixpence to eightpence, women threepence, and children twopence each. In the planting-out time the men and women are employed by thousands; the work is then very heavy, for any agaves not planted in the rains must wait for the next year, and lose a whole season. The industry provides remunerative employment for the men and women of the locality, while developing the resources of the country. About a mile away from the factory the agaves stand on each side of the roadway three deep, with a band of grass carefully burnt on the side away from the road, lest a general conflagration of the dry jungle should dry up their sap and stunt their growth.

Exhibition of Paisley Shawls.

AN interesting collection of Paisley shawls was shown in the Halls of the Glasgow Weaving, Dyeing and Printing College, last month. No less than 314 articles had been collected, but those of most interest were a pair of shawls sent by Queen Victoria only a short time before her death. Both were Indian cashmere shawls: one was probably manufactured early in the nineteenth century, has a white centre, and is a beautiful example of combined needle and loom work. The other is of similar date, is also of Indian workmanship, but with a filled centre, and has exquisite border and edges. Though the use of these shawls has now gone entirely out of fashion, the fortunate possessors of them seem to look upon them as worth preserving. Some of the shawls shown date as far back as 1760, 1800, 1810, and a large number to the early part of the last century, and all are as fresh as if they had only just left the loom.

At the opening of the exhibition, Mr. John Ingram, the chairman of the governors, mentioned that the original home of the shawl was India. In the valleys of Cashmere, under a spreading tree, those strangely gifted needle artists might have been seen, centuries ago, evolving from brain and finger those exquisite creations of skill. Some shawls must have taken years of patient labour to complete. To imitate those shawls in the loom became the mission of the town of Paisley for two generations. The fame of the Paisley shawl spread to the most distant corners of the globe. Their manufacture became the chief industry of that town, numbering at that time 50,000 inhabitants. At one time the Paisley shawl was in universal wear by ladies of the highest degree and by all classes, especially on Sunday and holidays. Now they are only cherished heirlooms and relics of former fashions and former times. The shawl being an article of fashion, there were times of ebb and flow—periods of great prosperity, and seasons of terrible depression and consequent sufferings, when the nation extended a helping hand, as lately they did for India. He recalled an incident in the life of Her late Majesty in such a period of depression in the history of Paisley. Her Majesty, sharing as she ever did in the sorrows of her people, sent for some examples of Paisley shawls. A selection of 130, made by different manufacturers, was forwarded to Windsor. From these, eighteen were chosen and retained. This purchase and Royal patronage becoming known, seemed to have a helpful influence, for ere long the cloud of depression rolled past, and prosperity came again.

Tests for Artificial Silks.

WITH a view to testing the capabilities and qualities of artificial silk, experiments were recently made by a contributor to the "Oesterr.-Chem.-Zeit." Six materials were examined, three samples of which were Chardonnet silk made from collodion (1) from Pris de Vaux, near Besançon; (2) from Fismes, in North France; (3) from Walston, England; and (4) a collodion silk made by Lehner's process, at Glattbrugg, near Zurich; (5) a cellulose silk made by Pauly's ammoniacal copper oxide process at Oberbruch, near Aachen; and (6) gelatine silk.

As regards physical properties, Nos. 1, 2, and 4 are very similar in appearance; they are more lustrous than real silk, but are stiffer, and do not possess the feel which is characteristic to the natural material. No. 3 feels rough and appears hairy, being a better imitation of mohair than of silk. No. 5 has very much the same appearance as Nos. 1 and 2, but its lustre is better, and after it is made up its handle is almost like that of real silk. When swollen by immersion in water and examined under a microscope with a power of 150 diameters, Nos. 1, 2 and 3 are very similar, although No. 2 is more deeply grooved. Their dissimilarity is more evident when cross sections are

examined, for No. 1 gives the most symmetrical outlines, and No. 2 the least. No. 4 shows deep, longitudinal grooves, characterised by small air bubbles, while its cross section is very irregular. No. 5 has fine longitudinal grooves and minute traverse lines in the centre of the fibres ; its cross section is regular, being almost an exact circle or eclipse. No. 6 is also almost circular in cross section, and is free from grooves or bubbles. In polarised light No. 6 is singly, and the others double refracting. No. 5 shows uniform interference colours over long lengths of fibre, while in Nos. 1, 2, 3 and 4 the colours vary greatly owing to the irregular thickness of the fibres.

As collodion silks always contain some nitro-compound, they give a blue colour with diphenylamine and sulphuric acid. In water all kinds of artificial silk expands, and alcohol or glycerine will cause them to contract again. In strong sulphuric acid the collodion silks swell rapidly and dissolve ; cellulose silk gradually becomes thinner and dissolves ; gelatine silk only dissolves on strongly heating. Concentrated cold hydrochloric acid has little action, but on warming it rapidly dissolves gelatine silk. Acetic acid causes a slight swelling, but gelatine silk dissolves almost entirely if boiled in them. Chromic acid (a half-saturated solution) dissolves all artificial silks in the cold ; real silk dissolves more slowly ; cotton, flax, and other vegetable fibres are unaffected. Caustic potash (40 per cent.) dissolves gelatine silk rapidly ; collodion and cellulose silks swell, but do not dissolve even on boiling ; the liquid, however, becomes yellow. True (white) silk is dissolved on boiling, but the liquid remains colourless. Ammoniacal copper oxide (Schweitzer's reagent) causes collodion silk to swell quickly and then to dissolve ; cellulose silk swells less rapidly ; gelatine silk is insoluble, but stains the liquid a bright violet. Alkaline copper glycerine solution dissolves real silk immediately at 80° ; Tussah and gelatine silks dissolve when boiled for one minute ; the others are untouched. Solutions of iodine in potassium of iodide colour artificial silks an intense red or reddish brown. The colour vanishes on washing with water, leaving collodion silks a transient greyish-blue. Cellulose silk does not exhibit this blue. Iodine and sulphuric acid (von Höhnel's paper reagent) stains true silk yellow, gelatine silk yellowish to reddish brown, collodion silks deep blue (violet shade), cellulose silk pure blue. Solutions of zinc chloride and iodine colour collodion silk bluishviolet, cellulose silk greyish blue to greyish violet, gelatine silk and real silk become yellow and disintegrate. In burning, gelatine silk resembles true silk ; the other artificial silks suggest cotton.

Variety of Silk.	Moisture.		Specific Gravity.	Number of Fibres per 1 Sq. Mm.		Tensile Strength. Kilos. per Sq. Mm.		Extension.
	Air-dry.	Saturated		Wet.	Dry.	Wet.	Dry.	
	Per Cent.	Per Cent.						Per Cent.
Real Silk	8·71	20·11	1·36	9710	9710	37·0	37·0	21·6
Chardonnet (Besançon)	11·11	27·46	1·52	640	1135	2·2	12·0	8·0
,, (Fismes)	10·92	27·12	1·52	370	656	1·6	7·8	11·6
,, (Walston)	11·32	28·94	1·53	683	1620	1·0	22·3	7·9
Lehner	10·45	26·45	1·51	413	1180	1·5	16·9	7·5
Cellulose (Pauly)	9·20	23·08	1·50	742	1550	3·2	19·1	12·5
Gelatine	13·98	45·56	1·37	265	945	Nil.	6·6	3·8

As collodion silk suggest cotton.

The above table gives various mechanical and physical data respecting these products. The specific gravity was determined in benzene, removing air bubbles *in vacuô*. The fifth column gives the number of single fibres per square millimetre after soaking in water, as measured microscopically. The sixth column was obtained by calculation. The tensile strengths were determined by means of Tecla's machine.

Indian Jute.

THE growth of the Indian jute trade has been phenomenal. The use of this fibre was encouraged in the first instance by the Crimean War, which cut off the supplies of hemp, and threatened extinction to the manufacturers in Dundee. In 1828-29 the total exports from India were 364cwt. In 1872-73, when the trade had begun to assume considerable proportions, the export was about 7,000,000cwt. It rose to 10,000,000cwt. in 1882-83, and in 1897-98 to 15,000,000cwt. These figures alone account for only a portion of the increase. The exports of gunnies have for many years been swelling annually, and now add the value of fully £387,500 to the total of Indian exports. The advance in the jute industry may best be exhibited by stating that the estimated area under cultivation in 1872-73 was under one million acres ; it is now estimated in a normal year at about 2,150,000 acres.

So much interest is taken in the present jute crop that some figures published by the Calcutta "Capital" may be instructive. The following statement shows the clearances of jute, rejections and cuttings for the last eight years, classified thus :—

Season.	Up to December.	January to July.	Whole Season.
	Bales.	Bales.	Bales.
1892-93	2,068,655	1,014,368	3,083,023
1893-94	1,525,389	1,012,648	2,538 037
1894-95	2,045,963	1,544,193	3,590.156
1895-96	2,238.240	1,252,930	3,491,170
1896-97	2,070,441	1,223,150	3,293,591
1897-98	2,373,207	1,827,939	4,201,146
1898-99	1,435,170	1,325,655	2,760,825
1899-1900	1,577,490	1,018,447	2,595,937
Average	1,916,819	1,277,415	3,194,235

The clearances for the past year have been very large ; up to the end of November they were 1,771,427 bales. For December the figures are not yet made up ; but they are put down at from 450,000 to 500,000 bales. Therefore, taking the smaller figure the clearances for the first five months of last year were roughly 2,220,000 bales. It will be observed that during the past eight years these figures have only been exceeded on two occasions. We hear the usual cry that the season is getting exhausted and will come speedily to a close. This is no new cry, and it will be observed that during the last eight years the clearances from December to July have never been less than 1,000,000 bales. We see no reason to suppose that the latter end of the season will see the smallest shipments on record ; and even, taking the clearances at 1,000,000 bales, that would mean the clearance during the season of over 3,200,000 bales.

Gleanings from Consular Reports.

MEXICO.—The consumption of raw cotton in the Republic of Mexico in the year 1899 was 532,460cwt., an increase of more than 22,000cwt. over the previous year. Of this amount 127,398cwt. were imported. The amount imported in 1898 was 162,246cwt., showing a decrease in 1899 of 34,848cwt., due to an increase in the production of the country. The production of raw cotton in the Republic of Mexico is steadily increasing, owing to the attention it is receiving in the northern portion of the country, especially in the States of Coahuila and Durango. The latest returns published by the Department of Fomento (Ministry of Colonisation, Industries, etc.), in the Year Book for 1898, put the production of cotton in Mexico at 45,525,767kilos., or, say, nearly 900,000cwt. in round figures, of which the two States above mentioned produced respectively 189,464cwt. and 511,350cwt. The estimated production for the years 1892-98 is set down at a yearly average of 518,000cwt. This apparent discrepancy may be accounted for by the increased production of the years 1895-98 as compared with the period from 1892-94, as will be seen from the following table drawn up from the returns as published in the year book for 1898 :—

PRODUCTION OF COTTON IN MEXICO.

Year.	Quantity.	Increase.	Decrease.
	Cwt.	Cwt.	Cwt.
1892	314,390	—	—
1893	173,471	—	140,919
1894	325,553	152,082	—
1895	698,003	372,450	—
1896	575,173	—	122,830
1897	646,317	71,144	—
1898	896,126	249,809	—

This visible increase from the year 1895 is due to the operations of the Tlahualilo Company, and more especially to an extensive system of irrigation on the Nazas River, reclaiming and planting a large area of ground with cotton, which in that district grows very abundantly. The example given by this company serves as a stimulus for others of a similar character, whose chief object should be the cultivation of cotton in other districts or zones of the country. The principal cotton-growing districts of the Republic are situated in the States of Coahuila, Durango, Guerrero, Oaxaca, Tepic, and Vera Cruz ; though at one time nearly the whole belt on the Pacific Coast situated between the sea shore and the mountain range was considered as a very productive cotton-growing district. The State of Chihuahua was also in former times a large cotton producer, but it has ceased to be so on account of the difficulties for irrigation.

By referring to the production as set down in the Year Book of Mexico for 1898, and comparing it with the actual consumption of the raw material in the numerous factories as given in the returns sent in to the Government for fiscal purposes, there is no reason to suppose that a failure of the cotton crop in the United States would have any effect upon the factories in this country, as they would always be able to employ native grown cotton instead of what is imported, as the surplus of production is sufficiently large to keep the factories going, though it is quite possible that the quality of the fabrics may not be the same. This figure can be taken as the minimum, as the production of certain States is not specified, and it is probable that the returns for the other States are underestimated.

The imports of cotton piece goods show an increase in quantity as well as value. The total number of square yards imported into Mexico in the year 1899 was 49,029,863, as against 47,330,090 in 1898. The greatest increase is in cotton prints under 30 threads. The imports of this class of goods are steadily increasing, and it is here where the British manufacturers find the greatest competition. In cotton goods of other classes the imports from the United Kingdom are so far ahead of those of other countries that there is no need to think of their being troubled by other nations obtaining the monopoly. The number of yards of cotton prints under 30 threads imported into Mexico in 1898 amounted to 17,203,118 sq. yds., as against 21,459,474 sq. yds. imported in 1899, showing an increase of 4,256,000 sq. yds. The imports from the United Kingdom of coarse cotton prints, cretonnes, etc. (under 30 threads), in the fiscal year 1898-99 represented 63 per cent. of the total amount of yardage of this article, while the imports from the United States represented 23½ per cent. against 27 per cent. in the previous year.

The imports of cotton bleached or unbleached goods of smooth texture over 30 threads show an increase of 42,362 sq. yds. over the quantity imported in 1898. Cotton piece goods under 30 threads show an increase of but about 200yds. Piece goods of a texture that is not smooth show an increase of 1431 sq. yds., this class of goods not having such a large demand as other qualities.

The production of cotton piece goods in the Republic of Mexico in the year 1899 shows an increase of nearly 9 per cent. over the production of 1898, amounting to 10,782,349 pieces of unbleached or bleached cotton goods or prints, containing about 260,000,000 sq. yds. The greater quantity of this production was of cheap quality, made on purpose to meet the requirements of the lower classes.

In addition to piece goods, the factories produced yarn amounting to 4,028,236lb., most of which is used in the making of cotton "rebozos," or shawls, used by all classes, the prices of which vary, according to quality, from 1dol. 25c. to 50dol., and even 60dol. Mexican each.

The number of cotton factories in working order on December 31, 1899, was 127, as against 112 in the previous year. This figure only represents those that are working, the number of those closed for repairs or improvements being 10, making a total of 137. It is quite probable that the returns at the end of this year will show another increase in numbers, as several new factories are in course of construction. The number of workmen including women and children, employed in these various factories during the year 1899 was 25,761.

Tainan (Japan).—The import of foreign piece-goods, both cotton and woollen, into South Formosa is decreasing year by year. The trade is largely in the hands of Chinese, who, knowing the wants and tastes of their customers, are able to supply them at cheap rates by buying refuse goods, wholesale or at auction, in Hong-Kong or elsewhere, a kind of business that is not profitable for the foreign merchant to undertake.

China furnished during the year cotton piece-goods of native manufacture to the value of nearly £40,000, being a decrease of over £23,000.

Japanese imports of cheap fancy cotton prints and woollen and crêpe stuffs, favoured by the new tariff, are formidable competitors to both English and Chinese imports, and Japanese merchants hope with increased care to capture the whole market for these goods.

Somali Coast.—European white longcloth has maintained its popularity as a wearing apparel in the towns, but an increase in quantity and decrease in value would indicate a preference for the cheaper qualities. The Bulhar returns show an increase of

trade in this cloth with Harrar. This article is not much used in the interior, where the people find American grey shirtings preferable for every-day wear. The import trade in this commodity has risen from 1,21,420 rupees in value in 1897-98 to 1,53,997 rupees in 1899-1900.

American grey shirting retains its hold unchallenged as an everyday article of wear. In last year's report I drew attention to the large trade done in this article, to the prospects there were of its early further development, and to the fact that America had hit off in this shirting the exact requirements of the country.

Zaila shows an increase of 3,130,192yds. in quantity, and of 5,03,406 rupees in value, denoting increased demand in Harrar. At Berbera there is a falling-off, due to less demand locally, owing to disturbances in the interior in the eastern portion of the Protectorate. At Bulhar there is a decrease.

The value of the imports in American grey shirting has risen during the last three years from 16,61,424 to 24,05,403 rupees, which latter figure represents the imports in the article for the year under report. Country grey shirting is an imitation of what the Somalis locally call "Americani," made in Bombay. It has never taken a hold on the market. The cotton is inferior to the American ; the article is over-sized and does not wear. The importation has almost ceased.

Miscellaneous cotton goods include country pieces in pairs, other country goods manufactured in India, certain Manchester goods dyed in Bombay, and various hand-made and fancy stuffs from Arabia, varying considerably in price. The total value of the imports for the year was 5,77,461 rupees.

Berbera.—In European white longcloth there is an increase of quantity by 1959yds. and a decrease of 1903 rupees in value at Berbera, whilst at Bulhar there is an increase both in quantity and value by 70,084yds. and 12,100 rupees.

The increase in quantity and decrease in value at Berbera are due to a preference having been shown for the cheaper kinds. The increase at Bulhar must be ascribed to an increase of trade with Harrar.

In American grey shirting there is a decrease both at Berbera and Bulhar, as under :—

	Quantity. Yds.		Value. Rupees.
Berbera	524,274	....	87,942
Bulhar	286,699	....	52,526
Total	810,973	....	1,40,468

The decrease is due to the recent disturbances, which caused a temporary dislocation of the trade with the far interior. The decrease at Bulhar is also partly due to the preference shown by Harrar merchants for the European white longcloth, the increase of which has been noted above.

In country grey shirting there is a slight increase, both at Berbera and Bulhar, of 359 and 333 rupees respectively, giving a total increase of 692 rupees. This is due to the fact that during the past year the Somalis have shown a preference for the cheaper kinds of cloth. In country piece-goods in pairs there is a decrease of 11,766 rupees at Berbera, and an increase of 7139 rupees at Bulhar. These being fancy goods there has been little demand for them amongst the Somalis themselves. The increase at Bulhar is on account of the Harrar trade.

In other country piece goods there is an increase at Bulhar of 3261 rupees, and a decrease at Berbera of 2723 rupees, making a total increase of 538 rupees.

Zaila.—The value of imported American grey shirting shows an increase of 5,03,406 rupees. This cloth maintains its popularity without rival. It is cheap and durable and washes well. Bombay shirting made to imitate the above amounted in value to 2400 rupees. This cloth, imported as an experiment, has not proved a success. Cotton piece goods, miscellaneous, show an increased value of 95,110 rupees. These goods are chiefly for Harrar and other districts of Abyssinia. Turkey-red cloth imported has also increased in quantity, showing a gain in value of 1524 rupees. This is provided to meet local demand in the town of Zaila.

Khorassan (*Persia*). — Sheeting (British and Indian) increased to some extent. Traders bought sheeting with the capital which would otherwise have been laid out on indigo.

The demand for bleached and unbleached longcloth is decreasing in Khorassan ; other articles are more worn and more readily sold.

The amount of muslin imported has decreased, and it does not pay to export it to Transcaspia viâ Meshed

The cost of carriage in Khorassan has reduced the amount of Turkey-reds imported. The fact is important, as there was an increase in the import of miscellaneous piece goods, which are lighter, and consequently imported in preference.

The import of gold lace viâ Turkey has much increased, as the women in Meshed have taken to wearing it.

There was no import viâ Turkey and Tabriz of cotton yarn and twist. It came from India viâ Bandar Abbas.

Most of the wool exported to Russia is sent viâ Meshed, but some during the year under report went viâ Shaikh Junaid. There was consequently a slight decrease in the returns.

The Rating of Mills and Factories.

WHILE it is at all times a difficult matter to provide for the equitable rating of property for the relief of the poor, the question becomes particularly intricate when the assessment committee, or the valuer in its employment, is called upon to estimate the ratable value of a factory or engineering works.

With a view to explaining the cause of this evil, it is necessary to refer to certain Acts of Parliament. By a statute passed in the reign of Elizabeth (43 Eliz., c. 2, Sec. 1), machinery was made ratable as personal property, and it was no answer to an assessment under that Act to say that the machinery in question was annexed to the freehold. This statute was repealed in the letter, but, as we shall presently see, re-enacted in substance by later statutes. An Act which was passed in the year 1836 provided (by Sec. 1) that no rate shall be allowed which shall not be made upon an estimate of the net annual value of the several hereditaments rated thereunto—that is to say, "of the rent at which the same might reasonably be expected to let from year to year, free of all usual tenant's rates and taxes and tithe-commutation rent charge, if any, and deducting therefrom the probable average annual cost of the repairs, insurance, and other expenses, if any, necessary to maintain them in a state to command such rent."

This section refers only to hereditaments. Personal property (including machinery) was impliedly, if not expressly, put out of rating by the Poor Rate Exemption Act, 1840 (3 and 4 Vict., c. 89, Sec. 1), which enacted that "it shall not be lawful for the overseers of any parish . . . to tax any inhabitant thereof, as such inhabitant, in respect of his ability derived from the profits of stock-in-trade or any other property." Taking this in connection with Sec. 1 of the Parochial Assessment Act, 1836, which only contemplates the rating of corporeal hereditaments, it now appears that when it is sought to rate a person in respect of machinery, the question *ought to be* whether he is an occupier of lands, and whether the machinery in question is part of the land. If machinery is *not* part of the land, it should be out of rating. If it has become part of the land by annexation—*i.e.*, by being fastened to the land,—its value should be taken into consideration.

Such would appear to be the common-sense interpretation of these statutes, but the courts have decided otherwise. From certain decisions (to be considered later) it transpires that the question which the valuer has to ask himself, when determining the ratable value of a mill, is, "At what rent would this mill be reasonably expected to let from year to year as *a going concern?*" To arrive at this figure, the value of the machinery, plant, and fixtures must be taken into consideration. The result is that even after the statutable deductions have been made, the occupier of the mill is called upon to pay rates far in excess of those which he would be compelled to pay in respect of premises of equal magnitude which contained no valuable machinery.

At first sight the assessment of a factory as a going concern may appear to be equitable enough. The freehold is being used for the purpose of earning a large income, and it is not unjust that a certain proportion of that income should be diverted for public improvements or the relief of the poor.

As modified and expanded by various cases which have come before the courts, the application of the principle in practice has very little to commend it. Take the case of an occupier of a valuable mill, which, owing to depression in trade or the baneful influence of labour disputes, cannot be worked at a profit or at all. Decided cases go far enough to enable us to affirm that even under these conditions a rate based upon an enhanced value must still be paid. The existence of such an anomaly fully explains the hostile attitude which manufacturers generally adopt towards the indirect rating of machinery.

In a rate laid upon buildings to which machinery is attached for the purpose of manufacture, the real property ought to be assessed according to its actual value as combined with the machinery, without considering whether the machinery is real or personal property, and liable or not to distress or seizure under a *fieri facias*, or whether it would go to the heir or executor, or, at the expiration of a lease, to the landlord or tenant (R. *v.* Guest, 1838, 7 A. and E., 951 ; 7 L. J., M. C., 38). The principle above enunciated was adopted and confirmed in what is known as the "Tyne Boiler Case," which was decided in the Court of Appeal in 1886. A magic distinction was then drawn between machinery when regarded as personal property and machinery "fixed to the freehold," which enhances the value of the premises. The doctrine there laid down may be thus stated : "In estimating the ratable value of premises used as a manufactory, machinery and plant placed thereon for the purpose of making them fit as premises for such a manufactory are to be taken into account as enhancing the value of the hereditament, although such machinery and plant remain personal property, and are not physically attached to the premises. In course of his judgment in this case the late Lord Esher thus expressed himself : "I believe the rule really to be that things which are on the premises to be rated, and which are there for the purpose of making, and which make the premises fit, as premises for the particular purpose for which they are used, are to be taken into account in ascertaining the ratable value of such premises. . . . It seems to me that when things are brought into that category, they would pass by a demise of the premises as such, as between landlord and tenant." Lord Justice Lindley concurred with this decision, but he limited the scope of his judgment by saying, "Nothing is included, so far as I understand the nature of machinery, which would be mere loose machinery, and which would not pass to a tenant to whom the works were demised." No answer can be found in these judgments to the important question, How is machinery, which is not itself ratable, to be valued as enhancing the ratable value of a hereditament? [Tyne Boiler Works Company *v.* Longbenton Overseers or Tynemouth Union (1886), 56 L.J., M.C. 8 ; 18 Q.B.D. 81.] The doctrine of the Tyne boiler case also applies to mines, for it has been decided that the lessee and occupier of a coal mine is ratable for the full annual value of the mine, though increased by improvements, such as the erection of engines made at his own expense. [1829 R. *v.* Granville, 4 M. and Ry., 171.]

The Tyne boiler case practically decided that machinery is ratable whether fixed to the freehold or not. This point was made still clearer in Gifford v. Chard Union [63 L.T., 249]. Premises were used as a manufactory for the purpose of lace-making, upon which certain boilers, engines, etc., were placed for carrying on the said manufactory. These machines were essential to the use of the premises as a lace factory. The machines were each of them distinct, and could easily be removed for sale or repairs. Some were fastened to the floors by screws, others were not fastened, their own weight being sufficient to keep them steady, but further than this the machines were no part of the soil or hereditaments. It was decided by a Divisional Court that although some of the machinery and plant was capable of being removed without injury to itself or to the freehold, and although it remained personal property, yet, being essentially necessary and permanently attached to the appellant's business, it was all rightly taken into account in estimating the ratable value of the premises as enhancing the value of the hereditament. That the Assessment Committee must disregard the question whether the mill or factory is in use or not at the time of making the rate appears clear from the following cases :—

In Staley *v.* Castleton Overseers [1864, 5 B. and S. 505 ; 10 L.T. 606] a cotton mill, owing to depression in the cotton trade, was no longer worked, but was maintained at some expense as a factory, with machinery in a fit state for working when the trade should revive. A question arose as to whether the occupiers under these circumstances were ratable to the relief of the poor. It was decided that the occupiers were ratable for the mill. The same principle applies although the owners of a mill have ceased to use and have no intention of ever again using a mill. Thus in Harter v. Salford Overseers (6 B. and S. 591 ; 34 L.J., M.C. 206), the owner of a silk mill gave up his business, with the intention of never resuming it, and the mill had not since been worked, but, with the machinery and other articles and things in it had been advertised for sale. All the contents of the mill were essential articles and things for a tenant to have in working it for the manufacture of silk. The machinery, some of which was affixed to the floors and ceilings, was in the nature of tenants' fixtures. A man occasionally went to the mill in order to protect the property against trespass or depredation. It was decided that the owner of the mill was ratable for it.

Moreover, the rent actually paid for premises at the time of the rate is not always taken as an absolute criterion, inasmuch as the rule that premises shall be rated upon the basis of the rent for which it might rersonably be expected to let from year to year is applied with considerable strictness. Thus the ratable value is not always based upon the rent actually earned at the time of assessment. In one case three farms had been let at a certain

sum annually. They might, however, reasonably have been expected to let, and might have been let, at a larger sum. The overseers assessed the occupiers at the rent actually paid by them. It was decided that they should have adopted the larger sum—*i.e.*, the rent at which the farms might have been reasonably expected to let as the estimate of the net annual value. [Hayward *v.* Brinkworth Overseers, 1864, 10 L.T.N.S., 608.]

It has been decided that in estimating the probable rental of a concern, the profits of which vary in different years, the Assessment Committee must not point to a particularly good, nor must the owners point to a particularly bad, year for the purpose of arriving at the correct figure. This is upon the principle that in determining the rent for premises a landlord and tenant would mutually include all risks in the rent upon which they decide. Thus, in ascertaining the rent which a tenant could afford to pay, the possibility of strikes is one of the matters which he would be entitled to take into account, and therefore, when the strike came, he would not be entitled to a deduction. [Hoyle *v.* Oldham Union, 1894, 2 Q.B., 372.]

We are thus confronted with the fact that machinery is ratable. It remains to consider how the value of machinery is to be estimated for the purposes of rating. It is a general principle that the ratable value of machinery is based upon its value at the time of the rate, not upon what it once was, nor upon what it may hereafter become. [Met. Board of Works *v.* West Ham (1870), L.R., 6 Q.B., 193 at p. 198.]

The method by which an engineering works may be valued for assessment is as follows:—Assuming that the works have been valued and that rent is paid for them as a going concern, the net annual value may be ascertained by deducting from the gross rental the average annual cost of repairs, insurance, and other expenses necessary to keep the premises in the state to command the rent. In making a deduction for repairs, it is important to observe that the repairs for the particular year are not to be taken into account, as they might be below or above the average. The average amount in past years is to be ascertained. The courts have generally allowed an imaginary fund to be built up year by year to reproduce the property when it is worn out, and this is particularly beneficial in the case of machinery which, even if it does not wear out, is certain to become obsolete, and therefore less able to command the rent.

The "gross rental" above referred to is frequently calculated upon what is known as the "contractors' theory of rent." Upon that theory it is assumed that the occupier has employed a contractor to build the factory and equip it in such a manner as to place it in the hands of his employer as a "going concern." Assuming for the moment that the contractor becomes the landlord and the occupier becomes the tenant for the time being, the rent which would be payable under such circumstances is the gross rental.

A simple example will illustrate the hardship which may accrue to the occupier from the wide construction which the courts have put upon the statute of 1836 in allowing the value of machinery to enhance the rent at which it would have been reasonably supposed to let from year to year.

Suppose the proprietor of an empty mill or an ordinary house were to let it at an annual rental of £500 without making any stipulation as to the use to which his tenant should put it. Assume that the tenant hires machinery from an engineering firm for £500 a year. In due time the question must arise, What is the ratable value? The premises have been let at £500, and the landlord must be presumed to have demanded such a rent as was reasonable under the circumstances; and if the statute in question be construed strictly, that is the only figure which can be looked to. As a matter of practice, however, the Assessment Committee, under the existing order of things, would in all probability add the rent of machinery to the rent of the mill and make an assessment on that basis.

The greatest difficulty arises, however, when the occupier of a manufactory fills the rôle both of landlord and tenant—*i.e.*, where he is a freeholder in possession. In such cases the amount of hypothetical rent whereby the value of the premises is "enhanced" is generally fixed at 5 per cent. of the initial cost of the machinery and its erection. Even when annual allowances are made for depreciation—unless, indeed, such allowances are very substantial—it is clear that this rough-and-ready mode of assessment may in some cases give rise to hardship, while in cases where the producing capacity of the mill becomes increased, the ratable value may be greatly under-estimated. Thus there are certain classes of machinery or plant which, while their producing power may remain stationary, gradually become obsolete and wholly worthless. The most that can be said for the 5-per-cent. method is that it is simple and easy of practical application.

THE GAZETTE.

ENGLAND.

Partnerships Dissolved.

Louis Firth, Ann Firth, and John Holdsworth, worsted spinners, Scholes, near Cleckheaton.

Robert Walker, Joseph Mitchell, Herbert Widdop, and Fred Mitchell, makers of machine combs and gas engines, Victoria Works, Keighley; as regards Herbert Widdop.

Frederick Richardson Radford and John Cutts, lace manufacturers, Sherwood-street, Nottingham.

John Malcolm McLaren, William Malcolm McLaren, and James Lawrence McLaren, stuff and woollen merchants, 21, Canal-road, Bradford.

Wright and Johnson, lace manufacturers, Long Eaton.

James Dilworth Harrison and John Herbert Harrison, manufacturers and merchants, Burnley, and Princess-street, Manchester.

Jabez Iredale and Sam Hirst, cloth finishers and fullers, Dale-street Mills and Woodland Mills, Longwood, Huddersfield.

Arthur Young and John Carmichael Edgar, merchants, formerly at Dale-street, Manchester, latterly at Batley, Yorkshire.

John Wales Hirst and John Irving Mortimer, woollen manufacturers, Dewsbury.

Joseph Pogson and Samuel Haym Besso, grey cloth dealers, Princess-street, Manchester.

Voluntary Windings-up.

Premier Raising Machine Company (Seller's Patent) Limited; Mr. J. C. Wright, 32, Market-street, Bradford, liquidator.

Giggal and Clay Limited, Healey New Mills, Ossett, Yorkshire; Mr. W. H. Armitage, Market-place, Dewsbury, liquidator.

The White Carr Mill Company Limited; Mr. A. Walsh, 2, Lune-street, Preston, liquidator.

Lancashire Silk and Rhea Mills Limited; Mr. J. Feil, Dashwood House, New Broad-street, London, liquidator.

Banbury Woollen Tweed Company Limited; Mr. J. B. Childe, Market-street, Bradford, liquidator.

The Bankruptcy Acts, 1883 and 1890.

Adjudications.

Frank Howarth and Fred Crook (as Howarth and Crook), grey cloth agents, Cooper-street, Manchester.

John Shore, wool stapler, Butterworth-street, Rochdale.

Walter Briggs and Thomas Astley Cooper (as Briggs and Cooper), lately worsted spinners, Brook-street, Bradford.

Tatham and Clarke, lace curtain manufacturers, Ilkeston, Derbyshire.

John Robert Claypole (as A. Berrington and Co.), fancy hosiery manufacturer, Basinghouse Hall-street, London, and Gladstone-street, Leicester.

NEW COMPANIES.

B. Mellor and Son Limited.

Registered December 22, with a capital of £20,000, in £1 shares, to acquire the business of a cloth fuller, dyer, finisher, shrinker, bleacher, and printer, carried on at Albert Mills, Holmfirth, as B. Mellor and Son, and to carry on the business of dealers in textile fabrics generally. The number of directors is not to be less than two nor more than five; the first are J. R. Mellor, R. R. Mellor, T. M. Haigh, and A. P. Mellor; remuneration, as fixed by the company; qualification, 1000 shares. Registered office, Albert Mills, Holmfirth, Yorkshire.

Bottomley, Sons and Co. Limited.

Registered December 22, with a capital of £10,000, in £1 shares (4000 preference), to take over the business of worsted spinners, carried on by Bottomley Brothers at Thompson Mills, Tetley-street, Bradford. The number of directors is not to be less than two nor more than five; the first are S. P. W. Bottomley, F. T. Bottomley, E. H. Bottomley, and H. I. Bottomley. Registered by Jordan and Sons Limited, 120, Chancery lane, London, W.C.

Eagle Raising and Finishing Company Limited.

Registered December 22, with a capital of £30,000, in £5 shares, to acquire all or part of the business carried on by I. Hartley, at Eagle Mill, Heywood, and Spring Mill, Smallbridge, near Rochdale, and to carry on the business of bleachers, dyers, finishers, raisers, perchers, stiffeners, dressers, calico printers, textile manufacturers, etc. The number of directors is not to be less than three nor more than seven; the first are I. Hartley, J. W. Hartley, and G. E. Hartley; qualification, £500; remuneration, as fixed by the company. Registered office, Spring Mill, Smallbridge, Rochdale, Lancashire.

Henry Fisher and Co. Limited.

Registered December 15, with a capital of £30,000, in £1 shares (10,000 preference), to acquire the business of a cloth manufacturer carried on by H. Fisher, as Henry Fisher and Co., at Marsden Mills, Marsden, near Huddersfield, and at Huddersfield, Yorks, and elsewhere, and to carry on the business of textile manufacturers, etc. The number of directors is not to be less than two nor more than five; the first are Henry Fisher, Charles H. Fisher, and Allen Hall; qualification, 50 shares; remuneration, as fixed by agreement. Registered by Waterlow Brothers and Layton Limited, Birchin-lane, London, E.C.

Spring Mill Manufacturing Company Limited.

Registered December 21, with a capital of £6000, in £100 shares, to carry on at Rishton, Lancashire, or elsewhere in England, the business of spinning, weaving, and manufacturing raw cotton, wool, silk, flax, yarn, and other materials. No member may hold less than three shares. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Spring-street, Rishton, Lancashire.

Veronese Weaving and Printing Company Limited.

Registered December 22, with a capital of £5000, in £1 shares, to carry on the business of textile manufacturers, printers, warehousemen, merchants, agents, factors and brokers, and manufacturers of and dealers in goods dealt in by wholesale upholsterers, art furnishers, and drapers. Table "A" mainly applies. Registered office, 49, Bread-street, Cheapside, London, E.C.

B. F. Crompton Limited.

Registered December 28, with a capital of £4750, in £1 shares, to carry on the business of bleachers, dyers, calenderers, calico printers, textile manufacturers and merchants, chemical manufacturers, etc. The number of directors is not to be less than two nor more than three; the first are J. Mercer, B. F. Crompton, and R. Robinson; qualification, £250. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, 10, Church-street, Adlington, Lancashire.

Edward Lee Limited.

Registered December 27, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of R. Lee and J. L. Lee (trading as Edward Lee), and to carry on the same or any other business acquired or carried on by this company for the benefit and under the control of the British Cotton and Wool Dyers' Association Limited, who are the permanent managers. Registered office, 23, Cheapside, Bradford.

J. and J. McCallum Limited.

Registered December 27, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of J. McCallum and A. F. McCallum (trading as J. and J. McCallum), and to carry on the same and any other business acquired or carried on by this company for the benefit and under the control of the British Cotton and Wool Dyers' Association Limited, who are the permanent managers. Registered office, 23, Cheapside, Bradford.

John Turnbull and Sons Limited.

Registered December 27, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of J. Turnbull, sen., J. E. Turnbull, and J. Turnbull, jun. (trading as John Turnbull and Sons), and to carry on the same and any other business acquired or carried on by this company for the benefit and under the control of the British Cotton and Wool Dyers' Association Limited, who are the permanent managers. Registered office, 23, Cheapside, Bradford.

Joseph Cooper, Jun., and Co. Limited.

Registered December 22, with a capital of £30,000, in £1 shares, to take over the business of worsted spinners, wool combers, and top makers, carried on by J. Cooper, at Exchange Mills, Frederick-street, Bradford, as Joseph Cooper, jun. J. Cooper, jun., is the sole managing director for life; qualification, 500 shares. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Exchange Mills, Frederick-street, Bradford.

Marshfield Dyeing Company Limited.

Registered December 27, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of J. Emsley, P. Robinson, and A. S. Townend (trading as the Marshfield Dyeing Company). All other particulars are the same as in Edward Lee Limited (q.v.).

Royd Shed Weaving Company Limited.

Registered December 27, with a capital of £10,000, in £1 shares, to acquire the business carried on by J. Crowther, at Royd Shed, Hebden Bridge, and to carry on the business of fustian manufacturers, cotton spinners and manufacturers, woollen and worsted manufacturers and merchants, dyers, finishers, sizers, etc. The number of directors is not to be less than three nor more than five; the subscribers are to appoint the first; qualification, one share; remuneration, as fixed by the company. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Hangingroyd-lane, Hebden Bridge, Yorkshire.

Alexander McNab and Co. Limited.

Registered at Edinburgh, December 29, with a capital of £15,000, in £1 shares, to take over, acquire, carry on, and develop the business now carried on by Alexander McNab and Co., weavers, at Boden-street, Glasgow. The number of directors is not to be less than three nor more than seven; the subscribers are to appoint the first; qualification, 100 shares; remuneration, as fixed by the company; qualification, 100 shares. Registered office, 131, Boden-street, Glasgow.

Garde and Co. Limited.

Registered in Dublin, December 31, with a capital of £20,000, in £1 shares, to acquire and carry on the business of a woollen manufacturer, carried on by Johanna Garde at St. Joseph's Mills, Castlemartyr, co. Cork, under the style of Garde and Co. The number of directors is not to be less than two nor more than five; the first are T. Garde, sen., E. J. Julian, W. Bryson, and T. Garde, jun.; qualification, £200. Registered by M. J. Horgan, 13, Wellington-quay, Dublin.

Wm. Henry Hornby and Co. Limited.

Registered December 24, with a capital of £80,000, in £5 shares, to adopt an agreement with Sir W. H. Hornby, Bart., M.P., for the acquisition of the business now carried on at Brookhouse Mills, Blackburn, Lancashire, as "Wm. Hy. Hornby and Co.," to develop the same, and to carry on the business of cotton spinners, doublers, and manufacturers, flax, hemp, and jute spinners, linen manufacturers, cotton, flax, hemp, jute, and wool merchants, wool combers, yarn merchants, worsted stuff manufacturers, etc. Sir W. H. Hornby is governing director, with power to appoint others; special qualification, £25,000 for governing director; ordinary directors (of whom there shall not be less than two nor more than five), £500; remuneration, as fixed by the company. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Brookhouse Mills, Blackburn.

Bradford Patent Dyeing Company Limited.

Registered December 29, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of the Bradford Patent Dyeing Company Limited, and to carry on the same for the benefit and under the control of the British Cotton and Wool Dyers' Association Limited, who are the permanent managers. Registered office, 23, Cheapside, Bradford, Yorkshire.

Farrar Brothers Limited.

Registered December 28, with a capital of £20,000, in £1 shares, to acquire the business carried on at Globe and Well Lane Mills, Halifax, by Farrar Brothers Limited (registered September 3, 1894), and to carry on the business of worsted spinners, wool combers, and general

textile manufacturers and merchants. The number of directors is not to be less than two nor more than five. The first are E. Farrar (chairman) and C. Farrar; qualification, £50; remuneration, as fixed by the company. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C.

John Bentley and Sons (Radcliffe) Limited.

Registered December 28, with a capital of £30,000, in £10 shares, to acquire all or any of the businesses carried on at Wellington Mills, Radcliffe, and 37, Faulkner-street, Manchester, by J. W. Bentley and A. Bentley, as John Bentley and Sons, to adopt an agreement with J. W. Bentley and A. Bentley, and to carry on the business of cotton spinners and manufacturers, bleachers, dyers, packers, shippers, merchants, etc. The number of directors is not to be less than three nor more than five; the first are J. W. Bentley, A. Bentley, and J. A. Bentley; qualification, £500; remuneration, as fixed by the company. Registered office, 37, Faulkner-street, Manchester.

Mirfield Printing Company Limited.

Registered December 28, with a capital of £25,000, in £10 shares, to acquire the business of the Nun Brook Print Works, Mirfield, Yorkshire, and to carry on the business of calico printers and bleachers, dyers, paper makers and stainers, textile manufacturers, etc. Table A mainly applies. Registered office, 71, Faulkner-street, Manchester.

New Century Finance Company Limited.

Registered December 28, with a capital of £10,000, in £1 shares, to adopt an agreement with W. A. Phillips and C. E. Masterman, and to carry on the business of manufacturers of and dealers in spinning machinery, etc. The number of directors is not to be less than two nor more than seven; the subscribers are to appoint the first; qualification, £100. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C.

Cressy Brothers and Co. Limited.

Registered December 31, with a capital of £5000, in £1 shares, to acquire the business carried on by F. Cressy and R. Cressy at 14, Portland-street, Manchester, as Cressy Brothers, and to carry on the same and the business of manufacturers, merchants, spinners, agents, raisers, bleachers, dyers, finishers, textile manufacturers, etc. The number of directors is not to be less than three nor more than five; the first are F. Cressy, R. Cressy, and W. Bell (chairman); qualification, £100. Registered office, 14, Portland-street, Manchester.

Joseph Benn and Sons Limited.

Registered January 31, with a capital of £400,000, in £1 shares (100,000 preference). to acquire the business of alpaca, mohair, and worsted spinners, manufacturers and merchants, etc., carried on by Joseph Benn and Sons, at Beckside and Chapel-lane, Bradford, New York, Chicago, and elsewhere, to adopt an agreement with H. Benn and W. H. Benn, and to carry on the business of alpaca, mohair and worsted spinners, manufacturers and merchants, cotton spinners, flax, hemp, wool and jute spinners, linen manufacturers and merchants, yarn merchants, etc. The number of directors is not to be less than three nor more than seven; the first are H. Benn, W. H. Benn, S. Hainsworth, and P. Firth; qualification, £250; remuneration, as fixed by the company. Registered by Henry Tustin and Co., 4, Great James-street, Bedford-row, London, W.C.

Machen Woollen Mills Company Limited.

Registered December 31, with a capital of £2000, in £1 shares, to adopt an agreement with D. E. Jones, and to carry on the business of wool manufacturers and merchants, cloth manufacturers, dyers, cleaners, sheep farmers, etc. The number of directors is not to be less than three nor more than seven; the subscribers are to appoint the first; qualification, 10 shares. Registered office, Pandy Mills, Machen, Monmouth.

Electrical Bleaching Company Limited.

Registered December 31, with a capital of £15,000, in £1 shares, to acquire, own, and work English patents Nos. 20,214 of 1899 and 14,104 of 1900, for improvements in bleaching cotton yarns, and to carry on the business of bleachers, dyers, dressers, finishers, manufacturing chemists, etc. The number of directors is not to be less than three nor more than seven; the subscribers are to appoint the first; qualification, £250; remuneration, as fixed by the company. Registered by Johnstone and Williams, 1, Weekday Cross, Nottingham.

Fras. Hinde and Sons Limited.

Registered January 23, with a capital of £50,000, in £5 shares, to acquire the business carried on at St. Mary's Silk Mills, Norwich (with agencies in London and elsewhere) as Fras. Hinde and Sons, to adopt an agreement with F. P. Hinde and C. F. Hinde, and to carry on the business of silk, crape, and other fabric manufacturers and merchants, silk reelers, throwsters and weavers, bleachers, dyers, etc. The number of directors is not to be less than two nor more than five; the first are F. P. Hinde, C. F. Hinde, and F. C. Hinde; qualification, £500; remuneration, as fixed by the company. F. P. Hinde and C. F. Hinde may retain office so long as they hold £10,000 shares each. Registered by Hyland and Co., 81, Cannon-street, London, E.C.

Gem Spinning Company Limited.

Registered January 22, with a capital of £80,000, in £5 shares, to acquire land on lease or otherwise, to erect and equip a fireproof cotton mill (site not fixed) to hold about 80,000 mule spindles and preparation, and to carry on the business of spinners, doublers, weavers, bleachers, dyers, printers, and manufacturers of cotton, flax, wool, jute, silk, and other fibrous substances. The number of directors is not to be less than five nor more than seven; qualification, 200 shares; remuneration, £350 per annum, divisible. Registered by Jordan and Sons, 120, Chancery-lane, London, W.C. Registered office, 2, Waterloo-street, Oldham.

Henry Fisher and Co. Limited.

Registered December 15, with a capital of £30,000, in £1 shares (10,000 preference), to acquire and carry on the business of a cloth finisher carried on at Marsden Mills, near Huddersfield, as "Henry Fisher and Co." The first directors are H. Fisher, C. H. Fisher, and A. Hall. Registered office, Marsden Mill, Marsden, near Huddersfield.

Higson Brothers Limited.

Registered December 31, with a capital of £20,000, in £1 shares, to acquire and carry on the business of power loom cloth manufacturers now carried on by H. Higson and G. Higson, at Peel Mill and Canton Mill, both in Blackburn, as Higson Brothers. Registered without articles of association. The first directors are H. Higson and G Higson. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Peel Mill, Nab-lane, Blackburn.

John Hardman and Brothers (Dyers) Limited.

Registered December 31, with a capital of £30,000, in £10 shares, to acquire the business carried on at Radcliffe, Lancashire, and at Manchester, as John Hardman and Brothers, and to carry on the business of warp, hank, cotton, and slubbing dyers, bleachers, stovers, weavers, winders, beamers, reelers, printers, manufacturers, merchants, etc. The number of directors is not to be less than three nor more than five; the first are T. Hardman, J. Hardman, and J. H. Hardman; qualification, £500; remuneration, as fixed by the company. Registered office, Eton Hill Mill, Eton Hill, Radcliffe.

Universal Fibre Preparer Syndicate Limited.

Registered December 29, with a capital of £2000, in £1 shares, to acquire the interest of T. Burrows, G. S. Hunter, and H. A. Kribbe in an invention relating to improvements in machinery for treating hemp and other fibrous leaves, such as phormium tenax or agaves, or the like, and to carry on the business of patent owners, machine makers, rope, cable and twine makers, preparers, spinners and weavers of flax, hemp and other fibre, etc. The number of directors is not to be less than three nor more than seven; the first are G. S. Hunter, T. Burrows, J. Pugh, and H. A. Kribbe; qualification, £50. Registered office, 116, Wool Exchange, London, E.C.

JOTTINGS.

A COMPANY has just been established at Como under the title of "Unione Industrie Seriche," for the manufacture, dyeing, and sale of piece goods. The capital is £839,000, and the head offices are at Como, with branches at Milan, Cantù, and Civate.

THE directors of Messrs. Lister and Co., Manningham Mills, Bradford, have made the payment of a dividend at the rate of 4 per cent., less income tax, to ordinary shareholders, leaving a balance of £8299 to go forward to next account.

THE Board of the English Sewing Cotton Company has decided to recommend an interim dividend of 9d. per share, free of income tax, for the half-year's working of the company ended September 30 last—viz., at the rate of 7½ per cent. per annum, for the first half of the third financial year of the company's operations.

OWING to the laying down of a new engine and other alterations, we understand that Messrs. Irvin and Sellers, of Preston, will be compelled to close their works for three weeks—*i.e.*, from Easter Monday until April 29. It is hoped, however, to be able to execute business almost as usual if contemplated orders are sent in in good time.

THE French Minister of Agriculture has issued a decree fixing the amount of bounty payable to hemp and flax growers at 25s. per acre for 1900. A law, dated April 9, 1898, accords for a period of six years bounties to growers of hemp and flax, cultivating an area of not less than eight acres of these crops, to a total amount of not more than 2,500,000 francs, to be distributed in proportion to the area cultivated.

THE Board of Trade returns for the month ended January 31, 1901, give the declared value of goods imported during the month as amounting to £45,987,516, against £44,555,914 in 1900, and £41,216 606 in 1899. Of foreign and colonial merchandise exported in the month the value was £5,051,307, against £5,482,465 in 1900, and £5,120,260 in 1899; and of British and Irish produce and manufactures £24,753,531, against £23,583,682 in 1900 and £20,347,234 in 1899.

A FIRM intend to establish during the course of the year 1901 a large piece-goods factory at Warasdin. The Hungarian Minister of Commerce has accorded to the enterprise every facility allowed by law for the encouragement of national industry, and, in addition, a large sum of money. The Municipality of Warasdin has gratuitously conceded about fourteen acres of land and 500,000 bricks for building the factory, and has exempted the company from paying any municipal taxes for fifteen years.

AN exhibition of carpets made in Asia Minor will take place at Koniah from May 4 to June 13 next, under the direction of the Governor-General of the province. The exhibition will include carpets, "kilims," "sédjadés," "djidjims," fabrics for armchairs, and native-manufactured silk, wool, and cotton curtains. Prizes of 4000, 3000, and 2000 piastres will be awarded for the best carpets, "kilims," etc., and there are also prizes of 500, 300, and 200 piastres for other articles.

A METHOD of scouring wool and wool goods by means of ozone has been recently patented by a Frenchman. An atmospheric vacuum is first created in the vessel, and then ozone is introduced to the lower part, whence it ascends to the material under treatment, and eventually escapes at the upper part of the vessel. Owing to the vacuum, the ozone acts energetically and uniformly on every particle of the material contained in the vessel, freeing the material from every impurity. Washing, degreasing, and bleaching are thus said to be performed simultaneously.

A POLISH for machinery, which is found excellent for cleaning and keeping polished iron and steel machinery clean, consists of 5 parts of oil of turpentine, 25 parts of stearine oil, 25 parts of rotten stone, and 45 parts of bone charcoal. These ingredients are mixed with sufficient alcohol to produce a fluid mixture, which is applied with a brush to the parts to be cleaned. The alcohol evaporates, and the deposited matter is removed with the aid of a dry polish consisting of 45 parts of animal charcoal and 25 parts of rotten-stone. The surfaces thus treated are said to present a bright and polished appearance.

IT is officially announced that the Home Secretary, in consultation with the Vice-President of the Board of Education, has appointed a Committee to inquire into the question of the employment of children during school age, and to report what alterations are desirable in the laws relating to child labour and school attendance and in the administration of those laws. The Committee consists of Mr. H. H. S. Cunynghame, C.B. (chairman), and Mr. C. E. Troup, C.B., of the Home Office; Mr. H. M. Lindsell and Mr. H. E. B. Harrison, of the Board of Education; and Mr. H. Llewellyn Smith, of the Board of Trade; with Mr. A. J. Eagleston, of the Home Office, as secretary.

To come under the reduced rate of duty (1s. 4½d. per lb.) of the German Customs Union, silk tissues must be without pattern and of close taffeta, having fixed selvages on both sides. The reduced rate is only applicable to materials in a bleached or unbleached state, and not to tissues which have received further treatment by dressing, etc.; but calendering is not included under this latter head. The tissues must also be of pure silk, without any admixture of floss silk or of other spun material; and the raw silk out of which the tissues are made must be silk of the "Bombyx Mori" only, any tissues containing silk from the silkworms which live on oak trees being excluded from the benefit of the reduced duty.

THE cultivation of Indian cotton received its principal stimulus during the American war of 1860-66, and the cotton mill industry was greatly assisted by the opening of the Suez Canal. Prior to 1860 the exports of raw cotton from India used to average less than three millions sterling a year; but after that year they rose by leaps and bounds, until in 1866 they reached the enormous total of thirty-seven millions. They fell again after the restoration of peace in the United States, and sank to eight millions in 1879, recovering again to sixteen millions in 1882-83; but the average of the last ten years is probably under twelve millions. To this has to be added about six millions worth of cotton yarn, the product of Indian cotton mills, exported principally to China, and an increasing quantity of goods for local consumption manufactured by the mills at Cawnpore and in the Madras Presidency and gaols.

AT one time sericulture was largely carried on in Servia, the greater part of its territory enjoying a climate extremely favourable to this industry. Following on an attack of *pébrine* (an epidemic among silkworms) sericulture began to decline, and the majority of the cultivators abandoned it in order to direct their efforts towards more remunerative products. This decline fortunately was not of long duration, and with the assistance of the Government, who bought eggs in France and Italy to be distributed gratuitously, and who established nurseries for mulberry trees in order to distribute the young plants, the industry of silkworm raising developed so rapidly that the country is now able to furnish not only the silk required for the materials of the national dress, but even to export cocoons to other countries. It may be added that every year, in the State agricultural stations, practical classes and model methods of silkworm rearing are open to sericulturists in the neighbourhood. Also with a view to assuring the sale of the product, the State accords certain privileges to buyers of cocoons.

THE following table shows the position of sericulture in France for last year and the four preceding ones:—

——	1896.	1897.	1898.	1899.	1900.
Silk cultivators ... No.	145,310	133,253	123,288	128,114	136,214
Eggs used Oz.*	221,743	198,833	184,930	182,945	205,584
Cocoons Kilos.	9,318,765	7,760,131	6,893,033	6,993,339	9,180,404
Average yield from 1oz.* of eggs Kilos.	42·025	39·019	37·263	38·226	44·655

* Ounces of 25grms. Gramme = 0·0352739oz. avoirdupois.

The department containing the largest number of silk cultivators is Drôme with 29,032, followed by Gard with 27,400, Ardèche with 24,747, and Vaucluse with 17,839.

THE report of the directors of Messrs. A. and S. Henry and Co. Limited for the year ended November 30 states that the surplus profit for the year, together with the amount carried forward from the last account, is £79,690. Having paid the interest on the debenture issue for the year, and the fixed interim dividend on the preference shares at the rate of 5 per cent. per annum, also the interim dividend on the ordinary shares at the rate of 6 per cent. per annum (both for the half-year ended May 31, 1900), and after placing £10,000 to the reserve fund, there remains the sum of £32,190, out of which the fixed dividend on the preference shares for the remaining half-year was paid, on December 1, 1900, leaving the sum of £29,690, and it is now proposed to declare a dividend on the ordinary shares at the rate of 6 per cent. per annum for the half-year ended November 30, 1900, thus making 6 per cent. for the year. This will require £18,000, leaving a balance of £11,690 to be carried to the next account. The directors appointed Mr. Herbert Henry Brock a director, vice the late Mr. A. B. Macdonald. The members of the board retiring by rotation, in accordance with the articles of association, are Messrs. John Hamilton, William Henry Haigh, and Herbert Henry Brock, who, being eligible, offer themselves for re-election. The directors have nominated and recommend Mr. Thomas Longbottom, manager of the Continental department at Bradford, for election as a director of the Company. The directors have nominated Mr. Henry Mitchell, of Caley Hall, Pool, near Leeds, as a trustee for the debenture holders in the place of Mr. John Brigg, M.P., an original trustee, who, for reasons of health, wishes to retire.

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Practical Dyeing, Calico Printing, Bleaching, Finishing, Etc.

Sampling Heavy Bleaching Chemicals.

IN most works upon bleaching, the sampling and analysis of the chemicals receive but scant attention, not being stated in the full and elaborate manner that dyewares are in books devoted to dyeing. In most dyeing schools the time devoted to the subject is small when compared with that spent in dye trials, and frequently the methods given are not what may be termed standard tests as practised where such chemicals are manufactured. It is essential that considerable attention be paid to the process of sampling, as this may lead to serious discrepancies. The precaution to be adopted with each class of material will be noted in treating of that class. The commonest materials in use are soda compounds, consisting of soda ash, soda crystals, caustic ash, and caustic soda.

SODA ASH.—This may be either the refined ash of the old Leblanc process, or the modern ammonia soda, or 58 per cent. alkali, as it is termed. The difference between the two is marked, the former having a coarser feel, besides being denser. The Leblanc ash is more frequently packed into casks, while the ammonia ash is in bags. When the casks are received the lids should be removed, and the upper surface of the contents lifted with a spade, a sample being removed from some 15 to 18in. below the surface, and placed upon the floor, which should be well cleaned for the purpose. A sample is thus taken from each cask and placed in one heap on the floor, and the whole heap well mixed by means of a spade, being turned over completely four times. The heap is then flattened down with the spade, and divided into four parts, two of the diagonal portions of which are removed, and then the remainder well mixed as before, all lumps being broken down. If the sample is sufficiently small, it is removed to the laboratory, where all lumps are broken down fine, and a final sample taken and placed in a bottle for analysis.

Occasionally holes are bored in the heads of the casks, and by means of a gouge a sample is removed and taken to the laboratory. This method is objectionable if the ash contains lumps, as these are not brought out with the iron owing to the size of the bore hole; and as these lumps are of a different strength to the rest of the ash, the sample is not a representative one. If the casks are emptied on the floor, a sample should be taken over the whole of the heap, and treated as directed in the first instance.

When ammonia ash is used, the sampling is a less-elaborate process. A number of the bags are opened, and a sample taken from the centre either by means of the hand or a small spade, it being mixed with that from the rest of the bags. The sample of ash in the large bottle is placed on a sheet of paper, all lumps broken down, and a sample taken over the heap and then ground up fine in the mortar. From this, 20grms. are weighed out, and dissolved in hot water and filtered, the solution passing into a 500cc. flask. The residue on the paper is carefully dried and afterwards ignited, the residue multipled by five giving the percentage of insoluble matter. The filtrate is made up to 500cc., separate portions taken from it, and tested for the following bodies if Leblanc ash :—

Total Alkali.—This is expressed in terms of total soda (Na_2O), and is obtained as follows :—50cc. (which equals 2grms. of the ash) are placed in a beaker and titrated with either normal sulphuric or hydrochloric acids, these being standardised against pure sodium carbonate in the usual manner, either litmus or methyl orange being used as an indicator. The number of cubic centimetres of acid required multiplied by 0·031 and 100, then divided by 2, gives the percentage of available alkali.

Soda as Caustic Soda.—50cc. of the solution are taken, and a 10-per-cent. solution of barium chloride added to it in a 250cc. flask, sufficient being added to completely precipitate the whole of the carbonate. It is then made up to the mark, and 100cc. filtered. This filtrate is then titrated with normal acid. The number of cubic centimetres required multiplied by 2·5 gives the cubic centimetres required for the whole 50cc. of original solution, which multiplied by—

$$\frac{\text{Total number cubic centimetres} \times 0{\cdot}040 \times 100}{2}$$

gives the percentage caustic soda. This method is liable to give low results, and as an alternative the following may be used: To the 50cc. of solution used for total alkali phenolphthalein is added as an indicator; it is then titrated with normal acid until the coloration disappears. This point is noted, then methyl orange added, and the titration continued till finished. The decoloration of the phenolphthalein occurs when the whole of the caustic soda and half of the carbonate of soda has been neutralised. The second part of the operation effects the neutralisation of the remaining portion of the carbonate of soda. The difference between the first and the second of the two readings, doubled and then subtracted from the total number of cubic centimetres, gives the cubic centimetres of acid required by the caustic soda, an example being given under :—

First reading	17cc.
Total	32cc.
Cubic centimetres as Na_2CO_3	= 30
Cubic centimetres as NaOH	= 2

Thus

$$\frac{2 \times 040 \times 100}{2} = \text{percentage of caustic soda.}$$

Sulphide of Soda.—50cc. of the original soda solution are placed in a suitable test jar, and titrated with a solution of lead nitrate containing 42·5grms. of lead nitrate per litre, the value of 1cc. of this solution being 0·01grm. sodium sulphide. As an indicator a streak of the solution is run on a filter paper, and when the solution is added drop by drop, and well stirred, a drop is removed by a glass rod, and when, drawn across the above streak, no dark coloration is given the whole of the sulphide is precipitated, from the number of cubic centimetres taken, the percentage is readily calculated.

Sodium Chloride.—If normal sulphuric acid is used in the titration for total soda, the titration for the above may be done with that portion; if not, a fresh quantity is taken, and the carbonate decomposed with sulphuric or nitric acid, care being taken to leave the solution slightly alkaline. Chromate of potash is added as an indicator, and then titrated with a $\frac{N}{10}$ solution of silver nitrate, the number of cubic centimetres required multiplied by $\frac{0{\cdot}00585 \times 100}{2}$ = percentage of NaCl or sodium chloride.

Sulphate of Soda.—50cc. of the original solution, equal to 2grms. of ash, are placed in a beaker, and an excess of pure HCl (hydrochloric acid) added; the whole is raised to the boil, and to it a hot 10-per-cent. solution of barium chloride is added, and boiled for a short time. The beaker with its contents is covered, and allowed to stand until the precipitated barium sulphate settles out. It is then filtered through a tared or ashless filter, well washed, then the whole ignited in the usual manner. The weight of precipitate $\frac{\times\ 0{\cdot}61 \times 100}{2}$ = per-centage sulphate of soda. An alternative method is to take 50cc. as before, and carefully neutralise with hydrochloric acid, making up to a known volume. To this add a saturated solution of barium hydrate, filter off the precipitated barium sulphate, through the clear filtrate pass CO_2, until the precipitate first formed is dissolved, boil until the volume is one half, filter, titrate, filtrate with normal acid, and from the volume taken obtain the percentage from the following equation :

$$2NaOH + H_2SO_4 = Na_2SO_4 + 2H_2O.$$

Sulphur compounds other than the above are not common in well-made Leblanc ash. If the total sulphur compounds are required, they may be readily estimated by adding to 50cc. of the solution barium hypochlorite, and then dissolving the precipate of barium carbonate with hydrochloric acid, boiling well, filtering, and incinerating in the usual manner. The weight of barium sulphate multiplied by 0·61 will give the percentage when calculated as usual. When the percentage of free sulphate is deducted from this, it gives the total sulphur compounds other than sulphate of soda.

Iron and Alumina.—10grms. of the ash are dissolved in pure dilute hydrochloric acid, and to the solution ammonia is added in excess, the solution well boiled until less than half the original bulk, filtered, precipitate ignited and weighed, and the percentage calculated as oxides. The iron may be estimated separately by dissolving 10grms. in pure hydrochloric acid to which a few drops of nitric acid are added to oxidise the iron to the ferric state. This solution is poured into a 100cc. Nessler glass supported in a stand; into another tube 25cc. of acid and a few drops of nitric acid are made up to a volume equal to that of the soda solution. To these are added 2cc. of a 10-per-cent. solution of ammonium sulphocyanide; in the soda solution a red coloration is produced. To the colourless solution a solution of a ferric salt of known strength (preferably of a strength not exceeding 0·001grm. iron per cubic centimetre) is added from a burette until the intensity of the coloration produced is the same as that of the other tube. From this the iron can readily be calculated, and the percentage of iron as Fe may be calculated as Fe_2O_3 by multiplying by 2·85. This may be subtracted from the combined iron and alumina, giving the percentage of alumina.

Silica.—10grms. of the ash are dissolved in water, filtered, and hydrochloric acid added in excess to the filtrate. The solution is evaporated to dryness in a porcelain basin, the residue treated with water in which are a few drops of a hydrochloric acid, filtered, ignited in the usual manner, and the percentage of silica multiplied by 2·03 will give the percentage of sodium silicate, in which form it occurs. This is subtracted from the total carbonate, as it is estimated in that titration. The moisture is estimated by heating a sample in the water bath for from two to three hours, and re-weighing until constant.

In ordinary cases a determination of the total soda (Na_2O) and the insoluble matter only is done, as the rest is comparatively unimportant. When this is done, 2grms. are weighed out and titrated, using methyl orange as indicator. The insoluble parts may be estimated comparatively by dissolving up 20grms., and noting the residue, using an equal volume of water on each occasion.

Analysis of a good Leblanc soda ash :—

	Per Cent.
Na_2CO_3	86·42
NaOH	—
NaCl	7·40
Na_2SO_4	3·62
Al_2O_3	0·14
Fe_2O_3	0·028
Na_2SiO_3	0·51
Insoluble	0·05
H_2O	1·77

AMMONIA ASH.—The sample is spread on paper, and an average sample taken. 20grms. are weighed out and dissolved in water, and filtered into a 500cc. flask. The insoluble matter is much greater than the Leblanc ash, and is very voluminous, appearing much greater than it actually is. The filter paper with this insoluble portion is ignited and the percentage calculated, 0·5 per cent. insoluble occupying a large bulk.

Total Soda.—50cc. of the original solution are titrated with normal acid as usual and calculated as before.

Sodium Chloride is estimated as described under Leblanc ash, as are also the various other sodium compounds.

CAUSTIC SODA.—In this the sampling is not conducted in the same manner as the preceding tests. Uniformity of sampling in this product is important, as samples taken from different parts of the same drum give different tests. In taking a sample of a delivery at some works the small iron lid is removed, and the upper layer cut through with a long chisel, the pieces being removed with a pair of pincers. The second layer is cut and the sample taken from this. Another mode of sampling is to cut a triangular hole in the drum about half-way up, and take a sample from the side, then closing it up again. The first method is the one most frequently adopted in Lancashire, while the latter is done in some Scotch works. Whatever mode of taking the sample is adopted, the pieces, as they are removed from the drum, should be placed in a bottle, corked tightly, and if the sample is to be retained for some time the cork should be cut off close and sealed. When the analysis is undertaken, a sample is removed from the bottle and placed in a weighing bottle, and weighed by difference. It is dissolved in hot water, care being taken against loss by spurting. If any insoluble matter is present it is filtered off as in soda ash, the solution being made up to a definite volume, 500cc. being convenient.

Caustic Soda.—This is estimated by taking a portion of the solution and titrating with normal acid (using phenolphthalein as indicator) until it is decolorised, then methyl orange is added and titrated to the end. The difference between the two figures is doubled and subtracted from the total, the larger volume representing the NaOH,

while the smaller one is Na_2CO_3. By this means they can be both estimated in the same solution. Doubts have been raised as to the accuracy of this method, but with care it will yield good results. An alternative method is to add to the solution barium chloride, and proceed as under "Caustic Soda" in "Soda Ash." This method does not yield reliable results, as part of the caustic is retained. Another method is to place a large quantity in an apparatus for the estimation of CO_2, either by loss or by absorption of the liberated gas in caustic soda or soda lime. This method is not so convenient as the first method given.

Sodium Chloride is estimated in the same manner as described under "Soda Ash," but the process may be modified by using Volhard's method instead. This consists of neutralising with acid, then adding 5 to 10cc. of concentrated nitric acid, boiling, cooling, and then adding 15 to 20cc. of $\frac{N}{10}$ silver nitrate, when a white precipitate of silver chloride is formed. A solution of any ferric salt (free from chloride) is added, and then the solution is titrated with a $\frac{N}{10}$ solution of ammonium sulphocyanide. When the whole of the free nitrate of silver is neutralised a deep red coloration is formed. As the number of cubic centimetres run in is known, the number required to precipitate the sodium chloride is readily ascertained. The first method, however, is the one generally in use for caustic.

Sodium Sulphate, as in soda ash Fe_2O_3 and Al_2O_3, is also estimated in the manner described under "Ash," as is also silica.

Sulphide of Soda.—This is estimated by the same method as described under "Soda Ash."

Moisture.—This cannot be estimated by drying in a water oven, but is done by fusing 5 to 10grms. in a *silver* crucible; the loss represents the moisture.

The following are typical samples of caustic soda, known as 70, 72, and 78 per cent.:—

	70%	72%	78%
NaOH	86·70	87·94	99·22
Na_2CO_3	3·25	4·74	Nil
Na_2SO_4	2·90	4·88	0·13
NaCl	6·87	2·02	0·65
Al_2O_3	0·09	0·073	0·012
Fe_2O_3	0·03	0·035	0·003
Na_2SiO_3	0·10	0·15	0·03
Insoluble	Nil	Nil	Nil
Moist	0·20	Nil	Nil
Na_2S	Nil	Nil	Nil

The above 70 per cent. is an ordinary make, the 72 per cent. contains a higher percentage of carbonate, while the 78 per cent. is an electrolytic caustic soda of good quality.

(To be continued.)

Bleaching Vegetable Fibres.

By E. Tassel.

(Continued from page 31.)

BLEACHING LINEN YARN FOR WEAVING: *Degrees of Whiteness—Full White.*—It is only on very rare occasions that linen yarns for weaving are bleached fully. The reasons for this course have already been given, chief among them being that no yarn that has once been chemicked can be afterwards exposed to the action of lye without suffering attack in some degree, so that the bleaching of piece goods woven from bleached yarns is a very difficult operation. The bleaching of yarns for weaving is confined to such as are to form part of fabrics containing dyed portions which cannot withstand the action of bleaching agents; in this case it is desirable to have the fabric as white as possible before bleaching, in order to reduce the subsequent operations to a minimum after weaving.

Creaming.—Yarns intended for weaving into coarse fabrics, dusters, and common cloths which do not need to be very white, are usually creamed before weaving—*i.e.*, lightly boiled out and strongly chemicked. In fact, this is the only logical method to pursue: the common yarns must be bleached as much as possible before weaving, because in order to obtain uniform whiteness in the piece, the latter would have to be subjected to a stringent boiling-out treatment which would considerably attenuate it. On the other hand, lye-boiling would take too much weight out of these common goods; hence the necessity for mainly bleaching them with chlorine.

Although a possible explanation can be given why fabrics intended for medium white are woven from creamed yarns, we have already learned the reasons prescribing creaming for yarns intended for full-white goods; nevertheless, it seems advisable to recur to these once more, in view of the important nature of the case. If the object aimed at in creaming yarn to be woven into full-white goods be merely to facilitate the ultimate bleaching of the fabric by taking advantage of the divided state of the material in the yarn stage, we shall be defeating our own aim in doing so, since, far from assisting the operation, this process renders bleaching more difficult by causing a deposition of part of the colouring matter on the fibre. If, on the other hand, the end in view be to merely free the fibre from impurities so as to facilitate weaving, then the chemicking process is useless and injurious; a thorough boiling-out being of far greater service, and at the same getting rid of part of the pectic products that will have to be subsequently eliminated from the fabric.

It is therefore logical to conclude that the yarns employed for weaving fabrics to be bleached full white should be more thoroughly scoured in proportion as the cloth is to be more closely woven and of a better white when finished. The only limit, in fact, to the extent of the scouring process is that necessitated by the preservation of the strength of the fibre. Scouring under high pressure fulfils all the requirements of this important question, since by a single energetic operation it enables results to be obtained as regards the removal of a large part of the pectic substances in the fibre without injuring the strength, that cannot be secured by any number of scourings in the open air. However, though the weavers may desire to scour their yarns well, the case is different with spinners. All bundles of yarn have the same length (33,000 metres, or 36,000yds.), the weight consequently decreasing as the numbers ascend. The product of the weight per bundle, multiplied by the yarn number, is always 540. Thus, yarn No. 60 weighs 9kilos. per bundle—

$$60 \times 9 = 540.$$

Yarn No. 32 weighs 17kilos. (almost)—

$$32 \times 17 \text{ (almost)} = 540.$$

So that the weight of a bundle is a factor of the yarn number; and since the lower the number—*i.e.*, the coarser the yarn—the higher the price, it is evident that yarn merchants are strong on the preservation of weight. Yarns intended for weaving are often merely scoured, and are then known as "scoured yarns."

Full White on Yarns for Weaving.—When the final weight is fixed, the loss being restricted to 10 or 15 per cent., the English method is the best, since it furnishes the maximum whiteness compatible with the retention of strength; though unfortunately it is tedious and entails much trouble. Attempts have been made to replace some of the lye boilings by soapings or grassings after impregnation with suitable solutions. In the former case, however, the yarn rapidly becomes rough; the other has been abandoned on account of the multiplicity of handlings entailed by the grassing process, and the dangers of such operation. When no fixed limit of weight is laid down, it is far preferable to give the yarn two boilings with lye previous to the first chemicking, and to also separate the other chemickings by double lye boilings instead of one, only three chemickings then being given. The yarn treated in this way is a little lighter in weight, but the whiteness is always more considerable, and thanks to the reduced number and low concentration of the chemicking baths, the yarn is always much stronger.

Lye Boilings.—This operation is preferably carried on in cast-iron kiers holding about half-a-ton each. It is interesting to examine the appearance of the yarn after each operation; the shade acquired after the first lye boiling, in particular, affords a good idea of the difficulty that will be encountered in bleaching the yarn. For example, a yarn that has turned deep blackish grey in colour will generally bleach better than one that shows a reddish cast; not that the former bleaches more rapidly, but that it gives a better white, finally, with an equal number of operations. The shade of the yarn will be found to change in the first chemicking, becoming lighter, and usually turning pale yellow. After washing and scouring, the yarns are boiled again in lye, whereupon the shade changes—usually to brown. The alkalis modify the pectic substances oxidised by the chlorine, and convert them into coloured soluble metapectates.

Chemicking.—The yarns are chemicked for the first and second time in vessels known as "reels," wherein the hanks, which are suspended vertically, are rotated continuously to ensure regularity of treatment. A reel is formed of three rectangular brick tanks covered with cement, capable of resisting the action of chlorine or acids. These tanks are placed end for end, so that a single travelling crane serves for all three. Their principal dimensions are:—Length, 18ft.; breadth, 6ft.; depth in the middle, 25in.; height above floor level, 10in.; and their capacity is about half-a-ton of yarn apiece.

On the walls of each tank can be set a wooden frame of thick planks, 12 × 3in., intended to support twenty hank rollers fitted with trunnions at the ends, and rotating in bearings fixed on the planks. The frame, with the rollers and hanks in position, can be taken by the travelling crane and placed on any of the three tanks. The rollers are set in motion by twenty toothed wheels engaging one in the other, so that each adjoining pair turn in opposite directions; the trunnion of each wheel is provided with a spur plate which engages with the spurs of a similar plate on one of the trunnions of each roller. The frame is first set in position over one of the empty tanks, and is there laden with the hanks, twenty-five of which are hung on each roller. Meanwhile the chemicking bath is being got ready in one of the other two tanks. The strength of bath liquor usually employed when bleaching powder is used is as follows:—

Yarn No. 10 to No. 25	2·5°	Gay-Lussac.
,, 25 ,, 35	2·0	,,
,, 35 ,, 45	1·0	,,
,, 50 and over	0·5	,,

The frame is next lifted and placed over the bath tank, and the rollers are set in motion; they should, of course, be capable of turning in either direction. In this manner the yarn is alternately immersed in the bath and exposed to the air. We have seen that though, under these conditions, the hypochlorites exert their maximum bleaching effect, their power of injuring the yarn is also at a maximum, and therefore the operation should not be prolonged more than three hours. At the end of half-an-hour the effect is already considerable, the shade having changed from deep brown to pale yellow; the reaction is accompanied by a decided elevation of temperature when the bath is in a concentrated state. Afterwards the bleaching action is much more gradual.

At the end of three hours the movable frame is lifted, and the hanks are steeped in a current of water passing through the middle tank, where the yarn can be thoroughly washed, thanks to the revolving rollers. The frame is then lifted again, and the hanks are immersed in the third tank, which is charged with water acidified by 1 per cent. of sulphuric acid. The object of this operation has already been stated. After the yarn has remained about half-an-hour in the acid water, the frame is lifted and transferred back to the washing tank. The second chemicking treatment is performed in the same apparatus, but with weaker liquor.

The main advantage of the reel is that it gives a perfectly uniform bleaching. Its inconveniences we have already seen. It renders the yarn shaggy, and facilitates the injurious intervention of atmospheric carbonic acid; consequently it can only be employed for the first two chemickings, the frame method, or single immersion in stone tanks, being preferred for the succeeding baths. In the frame method the hanks, instead of being suspended from 4in rollers, are hung on pegs 1½in. thick, which in turn are mounted on a movable frame immersed entirely in the bath, and not placed on the top of the vat as in the former instance. Here, again, three vats are used, the method of handling the yarn and transferring it from vat to vat by a travelling crane being exactly as described for the reel. In the present case, however, the hanks are totally submerged in the liquor, the atmospheric carbonic acid no longer comes into play, and the fibre is bleached solely by the continuous evolution of hypochlorous acid resulting from the double decomposition going on between the hypochlorites of the bath and the colouring matters in the fibre. The final inorganic product of the reaction is calcium chloride.

To stir up the liquid as much as is necessary it is sufficient to lift the hanks from time to time and allow them to drop back sharply. Linen yarns are bleached with sufficient rapidity in this manner at a minimum expenditure of mechanical force; and as these constitute the most favourable conditions from a chemical aspect, the method is always used in bleaching fine yarns. Sometimes the hanks are merely thrown into stone tanks without providing any means of suspension; but there is no apparent advantage to be derived from this operation, the action of the bath liquor being irregular, the work of taking out the yarn long and tedious, and, finally, the washing process inevitably tangles the yarn; moreover, they have to be handled again in the same way when souring.

Some bleachers have tried piling the hanks up in large square wooden vats for bleaching, a circulation of bath liquor being forced through the heap by means of pumps of hardened lead. The method cannot, however, be recommended, and has never given good results, the circulation of the liquor through the yarn being very imperfect. The Jourdain apparatus has also been used. In this method from 2 to 3cwt. of yarn is piled up in a perforated circular wooden vat, which is fitted with a screwed lid and a perforated leaden pipe for supplying the bleaching liquor. The whole is placed in a leaden outer case, into which the excess of liquor is allowed to drain, and whence it is drawn off by a centrifugal pump, which returns it to the perforated feed pipe. Although regular penetration is obtained and uniform bleaching, the apparatus cannot be recommended, since, the liquor being in continued contact with air, the carbonic acid in the latter comes into play, and consequently the

bleaching is effected, not with hypochlorous acid, but with chlorine, which is dangerous.

Soaping.—It has already been stated that certain bleachers have thought to supersede some of the lye boiling, by soaping; later on we shall see which kinds of soap are employed, as also the types of hank-washing machines generally used for the operation. To the question: Is soaping capable of replacing lye boiling? an absolute negative must be returned. Except the resin soaps capable of acting on the colouring matter by combination, there are no soaps that have a chemical composition enabling them to decompose the pectic principles. Soap acts as a detergent, opens the fibre and renders it supple, but is not in itself a bleaching agent, and has no effective action in this respect except when mixed with alkaline lyes. After bleaching, the yarn is beaten to equalise and soften it, then pressed in a hydraulic press, drained, dressed, and dried.

Dressing Yarn.—Warp threads, as a rule, are not dressed at the bleacher's, but are sized by the weaver. On the other hand, weft yarns are sometimes dressed to give them strength and flexibility, as well as to gum the down. This operation may be performed by hand in a vat, or by the washing machine, or, finally, by immersion in a lye vat charged with the dressing preparation. The ingredients used are soap, starch, and glue, the proportions varying in accordance with the object to be attained. Very good results are furnished by the formula:—

Starch, 2 parts by weight,
Soap, 1½ part by weight,
Glue, 0·8 part,

per 100 parts of water, the materials being dissolved separately, mixed, and raised to 50° C. The hanks are steeped in the solutions, then drained by the aid of a wringing stick, and dried.

Creaming Yarn.—Yarns intended for creaming are first boiled in a weak lye to remove the grease, and then chemicked by reeling. For this work bleaching-powder solution alone is used, the strength varying from 1 to 3° of the chlorimeter, and the temperature is kept at about 25° C. The colour changes very quickly, and the operation is complete in three hours as a rule. After creaming the yarn is washed, soured again thoroughly, washed, and then dried. Of course, creaming may be pushed to a varying degree; but the results are obtained, not by increasing the strength of the chemicking, but by employing a stronger lye, and by repeating the lye boiling before chemicking.

Scouring.—We have seen that, with the object of rendering them more flexible and facilitating the operation of weaving, the yarns intended for weft are generally scoured by boiling along with carbonate of soda or soda crystals; and we have also shown that it is to the weaver's interest to thoroughly boil off the yarns intended for producing very white fabrics. It is now of interest to see what means can be adopted for securing a rapid, cheap, and powerful scouring, which shall not impair the strength of the fibre.

An opinion generally prevails that it is better to employ open vats, and that a large number of scourings in succession are more effective than one or two under high pressure. This is, however, erroneous, and a series of experiments just carried out by the author prove that a yarn boiled once in pure caustic-soda solution, under a pressure of 28½lb. per square inch, remains much stronger and more resistant, though better scoured, than one that has been treated three times under ordinary pressure. This is self-explanatory, it being known that pure caustic soda has no action on cellulose when air is excluded, and consequently there is no reason why it should impair the resistance of the fibre. In the ordinary treatment without pressure, though the fibre is not chemically attacked, it is mechanically weakened during the prolonged exposure and handling necessary to obtain an appreciable result, the fibre being opened and made fluffy: conditions that favour breakage. Consequently it is not surprising that in the presence of weak chemical reactions the yarn subjected to the smallest amount of strain remains the strongest. After scouring, the yarn is pressed, drained, and dried, and is usually delivered in this state to the cop-winding machine, though sometimes it is put through a process of soupling to complement the action of scouring.

Soupling—The object of soupling is to increase the flexibility of the hanks, and thus facilitate weaving, since soupled yarns are more easily moved into position under the influence of the reed. There are three ways of soupling yarn:—

1. By simple passage between two cylinders, without tension. The chief parts of the machine are two cast-iron cylinders mounted one above the other. The lower cylinder, which is 6in. in diameter, is arranged so that it can be heated, and can be rotated in both directions. The upper cylinder moves by friction against the lower one, and can be lifted 3 or 4in. by means of a treadle, so as to allow the hank of yarn to be put in. The yarn is soupled by the combined influence of heat and pressure.

2. By hot-pressing between two cylinders, the yarn being stretched. The only respect in which this machine differs from the foregoing is that it contains a third roller, placed in the lower part. By means of an endless screw this cylinder can be moved to a larger or smaller extent from the other two, thus stretching the yarn. The work is carried on at a quicker rate in this machine than in the former.

3. By combined stretching, friction, and steaming. The apparatus employed is the machine first mentioned, but fitted with an outer case of sheet iron, which enables steam to be employed. The steaming warms and moistens the yarn, thus preventing breakage; and under the conjoint influence of tension and friction the yarn becomes elastic and more flexible.

4. By steaming alone, the work in this case being done in a special form of autoclave.

(To be continued.)

The Physical Properties of Colours.

EVERY object we see, or, more strictly speaking, everything which calls our eyes into action, is dependent on colour, otherwise it would not be visible. This may seem a strong statement, but it is nevertheless true; for form alone appeals only to the sense of touch, and it is only when its contents, outline and boundaries, are distinguished by colours, however slight may be their difference, that we are aware of an external object. A perfect sphere of purest white marble would at first thought be pronounced an exception to the statement just made, but further thought reveals to us, says the "Dyers' Trade Journal," the fact that each small part of its surface presents to our eye a different shade varying from purest white to the shaded portion which the light does not strike, and which, if we had not the brighter side for comparison, would still be called purest white. Throughout this article I shall speak of white and black, as we see them, as colours, giving my reasons in a later paragraph.

The phenomena of colours are caused by the white light from the sun or any artificial light falling on the object under observation, and undergoing a change whereby certain components are reflected from the surface and others absorbed, while some white light is reflected without change and some directly absorbed, producing degrees of blackness. This change of white light into colours takes place in the fine particles of matter, but as it is not a point of vital interest we shall not discuss at length the open question as to whether the light is transformed by mass or by molecule. The evidence seems to favour the belief that colours are as deep-seated as the molecules themselves, and are changed with every change of the molecule. The characteristic colour of anything is altered by the light it receives. The sun is the prime source, but yet is not perfectly white, because the envelope of the sun has absorbed certain colours. A pure electric arc light, untinted with copper or carbon spectra, is nearly pure. The light from burning magnesium is next, then acetylene, Welsbach light, and such white lights. Incandescent and gas lights are too weak in blue and violet rays to give colours their true aspect.

We are forced to admit that no object has a constant colour, but depends on the degree of illumination and the quality of light furnished it. Colour, then, is a property of matter which depends for its existence on light. If this be true we would expect more colour from an illuminated point and less from a point in the darkness, which expectation is borne out by fact. It is because our eye associates such changes in shade as are found on the white marble sphere with form that we recognise flatness, rotundity, concavity, and other kinds of surfaces. The dim, hazy distance is distinguished from the foreground by its deeper shading. Even on a bright day there is a difference, so slight that it could hardly be appreciated were it not that our eyes have become so keen through unconscious comparisons that they cannot be easily mistaken. I do not mean to say that perspective and knowledge of facts have nothing to do with the effect, but merely wish to claim for colour a prominent place in our daily life. The skilful artist is the one who not only copies form to perfection, but gives pictured Nature its true colour values. Even the pen-and-ink artist must suggest his light values by shading. As night approaches, each colour takes a deeper shade, and soon all that we see are leaden greys, because the source of colour has been withdrawn.

There is a degree in the illumination of every object where the colour is most intense. Beyond that point more illumination dazzles us, and we lose the colour in the brightness. This is due, first, to the material itself, which reflects too much white light from its surface, and causes the colour to fade away on account of the comparison. It is also due to the eye getting tired, and losing its fine powers through partial paralysis of the nerves for the time being. I might mention here that the eye has a power in conjunction with the memory for distinguishing colours after a time has elapsed, but this power varies in individuals. A concrete example will better explain what I mean. Most men know reds, blues, yellows, etc., when they see them and have no difficulty in remembering them for an indefinite time. The majority can tell the difference between pink, scarlet, cardinal and magenta, if they see them alone. Men who are accustomed to colours can tell the most minute differences between a dyed colour of 1 per cent. and one of 1⅛ per cent., or between Scarlet 2 R and Scarlet 3 R; but I have never seen one who could tell whether a certain shade was Scarlet 2 R or 3 R if he had not the two side by side, or some other colour to compare them with. This power of "colour memory" is the measurement of a colourist's training, and it carries with it the abilty to match colours. This faculty of close measurement of colour by the eye is something which must be cultivated by anyone who wishes to match colours. Yet, after all, the best matcher depends on comparison, because the eye and mind are not accurate at their best.

A colour—on a piece of cloth, for example—varies from what it is in full, pure white light, according to several circumstances. First, the quantity of light which falls on it; then the quality of light, as altered by adjacent reflecting objects, or by the air and clouds, or by artificial sources of light. In short, red is only red when compared with every other colour under the very same conditions, and a colour has an individuality only by comparison. Suppose we were to try to describe what blue is to a man born blind. How would we start? He would know very little if we said that it was several hundred thousand vibrations less than violet, and more than green. If we could, by some means, actually show him blue, he would be no wiser if he saw no other colours to compare with it.

If we could cover the sun with a tremendous red glass so that no white light could reach the earth, but only pure red rays, we should perceive that everything was red or shades of red; but in a few hours we would find our eyes losing the impression of red, and all objects would be seen as in a black-and-white photograph. It is the multitude of colours presented to our eyes that keeps them in a healthy state and prevents the fatigue caused by too long impression of one colour. The reaction which would result when the imaginary red glass was removed from the sun would cause us all to see only green, because our eyes would have lost their power of perception for red, and the total of the remaining colours would produce green. In time this would cease, and we would again see the right colours. The green we thought we saw would be every bit as real to us as a true colour, and we would be in a true state of colour-blindness, which is an inability to see one or all colours. A person blind to red has every red ray subtracted from whatever he sees; and consequently, orange and yellow are alike to him, while red is a sombre grey. With a person having total colour-blindness, everything is white, black and grey. Such cases, however, are very rare.

Dyed colours are colours which have been imparted to an object by means of chemical processes. They impart to textile fibres a colour which is not natural, but which appears to come from the material itself. It may be either from a precipitate held between the cell walls or from a chemical combination between the colouring matter and the fibre itself. The latest theory is that the material holds the colouring matter in the same way that water holds substances in solution. This cannot be true of mordant colours, which are in the nature of precipitates and are held as foreign bodies in the cells of the fibre. Whatever changes then take place are in accord with the laws governing the colouring matter. The yarn or cloth is the body, and the colouring matter is the quickening spirit, as it were. The question may arise, "Why does benzo purpurine, for instance, dye a slightly bluer shade on wool and silk than it does on cotton?" We must find our explanation in the fact that the cell walls of wool, silk, and cotton have a different refractive power, and alter the light which passes through them in the same manner that an alcoholic solution gives a different colour from an aqueous solution. The colouring matter which penetrates farthest is more likely to change than the one which colours the surface only.

Colours are applied to paper by incorporating them throughout the entire mass; but after drying, the calender rolls, aided by the sizing, give a surface polish which heightens the colour. Glazed papers have a high colour; so have varnished objects, wet yarn, etc. This seems so natural and commonplace that no one inquires into the reason of it. Briefly it is this: Anything which will fill up the interstices and irregularities in the surface and remain transparent (water, varnish, and sizing, for instance) will prevent the reflection of white light from every minute surface, and

consequently more refraction and necessarily more colour will result. Paint consists of insoluble particles, generally opaque, held together by a liquid which will dry to a transparent glaze. The reflection takes place from the surfaces of the particles and forms a distinction from lacquers which contain colouring matter in solution, and modify the colour reflected from the surface to which they are applied. Stains partake of the nature of dyes, but there is little or no affinity between the colouring matter and the material coloured. Colour lakes are chemical compounds the colour of which is inherent in themselves, and is dependent on their composition. The colours of familiar objects, such as wood, earth, and vegetation, are all due to combinations of many colouring materials which might be isolated if necessary.

In course of time most colours fade or change. Some approach white and others grow darker. But after a time a colour results which resists further change. These changes are due to certain rays which accompany light. It is not due to X-rays, because a piece of paper will protect a colour from fading, although we know it offers no resistance to X-rays. Light itself is not responsible, but we have almost certainly placed the responsibility on the chemical or ultra-violet rays which accompany light and are subject to the same laws, and which differ from light in being more strongly refracted, so that they occur at the violet end of the spectrum and in the space beyond. These rays are not luminous, but as they are subject to the same laws as blue and violet rays of light, they are inseparably associated, although quite distinct in effects. Ultra-violet rays, as they have been called, are capable of destroying the molecules of many quite stable chemical compounds, only ceasing their work when the most stable compound possible results. In the case of silver chloride their work is not done until the element silver alone remains.

Such destructive rays find easy victims, so to speak, in organic colouring matters, and it is only a matter of time before the colour is gone. The method of their working is to cause a combination between water and air, which sets free hydrogen peroxide and ozone, which actually do the work. As there are few organic bodies which do not contain water and oxygen in themselves, there seems to be no way of preventing fading. "Fast" colours simply last longer. Changes in shades caused by heat are due to rearrangement of the molecules which, if not permanent, will cause the colour to come back on cooling. Others, notably the substantive colours, change their shades on heating because of a loss of water; but after the natural hygroscopic qualities of the material provide more water, the colour returns. A fast colour is a stable compound or one which resists the action of the ultra-violet rays. In the case of an inorganic compound, fast colours are possible; but every known organic colouring matter will succumb sooner or later.

So far we have considered colours as they exist, but of far more interest to the colourist is it to produce existing colours from the materials, in the shape of dyes and pigments, with which science has provided us. I have said very little about the solar spectrum, because from a practical standpoint it is unavailable and apt to mislead. In the first place, the colours are of absolute purity, such as are never found elsewhere; the shades of reddish violets and bluish reds are missing, although we know them to exist. There has been a determined effort made to classify them and wrangle over which are "primary" and which "secondary," whereas every portion of the spectrum represents a primary or elementary colour, which at the same time may be made with a combination of colours, thus placing it with the secondary colours, as they are called. A better classification would be:—

Colours representing only pure colour rays without any white light or any absorbed light are primary.

Colours consisting of pure colour rays mixed with white light are secondary.

Colours consisting of colour rays, white light and absorbed light or black, are tertiary, and are really the only ones to come under our notice.

Light passes from primary to secondary and to tertiary, and cannot go back to its original condition without loss. Its end is the quaternary state or total absorption. Under these three classes can be included all possible colours, even those which at the first thought seem to be exceptions or doubtful; for instance, fluorescent shades and dichroic solutions or minerals, black, grey, and white, and metallic shades. Fluorescence is easily explained if we notice the conditions under which it exists. It occurs only where the colour is in some transparent body; the colour which comes through is the normal shade, and the colour reflected is the fluorescent shade. The fluorescent shade is a secondary colour, with a great amount of white light broken up by many facets, producing a dazzling effect, as in the opal.

Dichroism, sometimes confused with fluorescence, is best observed in the gem Alexandrine, which is red in one direction and green in another. This phenomenon is due to the presence of very thin laminæ of colour, which, when looked through, give the stone a red colour; but being so very thin, they cannot be seen when viewed edgewise. The natural colour of the stone therefore predominates. Metallic lustre occurs in substances which combine great opacity with lustre, and yet do not absorb light. If jet did not absorb all rays it would be metallic in appearance, for it is very opaque and has a high lustre. Porcelain has lustre and does not absorb light, but it is not opaque. This lustre is not confined to metals, but it is found on insects, fishes, and crystals of organic dyestuffs.

Black, white, and grey have been classed as colours because they represent modifications of light just as other colours do. Furthermore, to exclude black, white, and grey as colours we would have to make very sharp distinctions; because in their pure state, without any coloured rays mixed with them, they are not to be found. As the transition from these "colourless colours" to true colours is so gradual, and as they are component parts of all compound shades, we retain them and place white as the starting point of the secondary colours, greys as the backbone of the tertiary, and black as the end of the system. The aim of artificial colouring is to reproduce the tertiary colours, which are, in fact, tinted greys. Pink, of course, contains very little black, but there is a little absorption of light nevertheless; and as for black, we might try for ever and we could not produce on any material a black which did not reflect a little white, together with some colour. Our raw materials are colouring matters of the tertiary class which we must combine so that the resultant shade will give just so much colour, so much white light, and so much light absorbed. This is what a colourist really does unconsciously. The following scheme may be of service:—The spectrum is bent into a circle, and the colours between red and violet filled in. (This is purely a theoretical chart.) The centre point of the circle represents white, and the space between white and any colour on the circumference represent tints or mixtures of white and colour in proportion to the distance from the centre. All secondary colours would be included in this circle. Red faces its complement green, blue faces orange, and yellow faces violet. The laws of this circle are that any line connecting two colours passes through the colours which result from their mixture, the distance from either being proportionate to percentage of that colour in the mixture. Mixtures of three colours or more are found by determining two at a time, and the resultant with the next colour. This circle may be drawn in black and white on a piece of paper, but it would be impossible to colour it properly.

The tertiary colours are built about a backbone of greys, as follows:—Suppose we had a pile of paper about 4in. square and 2in. thick, containing, say, 100 sheets, numbered from the bottom upwards. Sheet No. 1 contains the circle of primary and secondary colours. In the centre of sheet No. 100 is a dot of absolute black which we imagine to have no colour or to reflect no white light. Between this point and white we place shades of neutral grey made by mixtures of black and white, so that sheet No. 25 will have 25 per cent. black and 75 per cent. white; sheet No. 50 will have 50 per cent. black and 50 per cent. white; each sheet being tinted with a grey the shade of which is proportionate to its position. As a shade could not contain, say, 5 per cent. of black and still have its full amount of colour, the circle on sheet No. 5 would be smaller than on sheet No. 1 and so on. The circles of colours on each sheet would decrease in size as they approached black, and if the circles could be cut out we would have a hemisphere, including every possible colour, arranged symmetrically.

In our mind, if it is familiar with colours, we can place any particular colour. The properties of this hemisphere are very interesting. The rule holds throughout that a line connecting two colours anywhere throughout its volume will pass through all colours which would result from their mixture. A line from the centre (white) to the surface shows all shades caused by diluting the surface colour with white light. The circle on the base may be divided into degrees starting with red as 0°, orange 60°, yellow 120°, green 180°, blue 240°, violet 300°, for approximate measurement. This is merely a classification, and has no value beyond setting the mind right on the relative values of the colours. Some day colour photography may enable us to make a chart for reference. Then every colour could have a number, or formula rather, which would describe it accurately. Knowing the proper values of all colours, it still requires us to use all our wits to produce a given shade at times.

We should be careful not to mix colours of more than 120° distance apart on their respective circles if we wish bright shades. Indeed, 120° is too much in many cases. This is because a quantity of white light results from the combination, causing loss of colour and requiring more dyestuffs to make up the loss, whereby a greater portion of black is introduced, causing dulness. As an instance, take the two colouring matters rocceline and acid green. These are exact opposites in colour, and have a difference on the chart of 180°. When dyed together on the same skein of wool in the proper proportions they produce an excellent black, because the colours present combine to form white, and what black is present in each remains in evidence. The effect of black is produced when colours from opposite sides of the hemisphere are mixed, and this should be remembered in all mixtures.

There are endless possibilities of making the same shade, but it is usual to select such materials to make the combination as are characterised by fastness, cheapness, level dyeing, or whatever quality is of most importance, making shade itself a secondary consideration. Very often shades are matched in sunlight which turn to other shades in gaslight. Sometimes this is because the match is really not a match, but appears so to us, and a different coloured light magnifies the difference. Another reason is that some colours have dichroic or fluorescent properties which are brought to our attention by yellow rays. It is usually with blue and violet that we find these peculiarities. In matching shades where great care is necessary, it is convenient to have three-colour glasses, red, yellow and blue; and by observing the match through these in succession it can be ascertained whether the match will hold good for all kinds of illumination.

The dyer probably has purer coloured materials to work with than is the case with any other kind of colouring; and if it were not for the various classes of goods requiring different fastnesses, his work would be the simplest instead of the most complex. In the mixing of coloured powders and paints the general rules hold good, although allowances have to be made for the condition in which the pigment is wanted—whether wet or dry, in oil or in water. Any article with a metallic basis and lustre can be coloured with lacquers to imitate gold, bronze, brass, copper, etc.; but as the lustre is a necessity, there is no hope of obtaining such results by means of colouring matters. Solutions of colouring materials form a ready means of comparison of tinctorial powers, but only hold good when the substance is the same in both solutions, and the only difference is strength. It is very hard to detect slight differences in light absorption which would make a great difference in a dyed shade. It should also be borne in mind that dyestuffs which are of different composition, but which match in shade when dyed on wool, are not necessarily the same under all conditions, and must be tested before being used.

A word might be said about harmony of colours and the reverse, or discord. The greatest harmony of colour is found when the colours are of the same circle in the hemisphere, equal distances from the centre and 180° apart. As these conditions vary, the harmony lessens. It is purely a matter of personal preference which is the most harmonious pair of colours, and equally a personal matter as to which is the greatest discord. Two colours whose mixture produced violet would harmonise with another pair whose mixture produced yellow. A lesser harmony exists between the colours on a line from the centre of any circle to the circumference, because the line runs in the direction of the colour 180° away. Any colour, no matter how unattractive it may be by itself, can be made pleasing by proximity to a harmonious colour. The eye unconsciously craves for a combination of separate tints which would produce as nearly a neutral grey as possible, if they were mixed up. Unless this condition is fulfilled, the eye will not be pleased and we will call the combination discord.

Tragacanth Substitute.

GUM TRAGACANTH has the disadvantage of being somewhat difficult of solution, taking ten to twelve hours' boiling, and besides, it is anything but cheap to buy. A Continental firm, however, have put a substitute on the market (Tragantine T) which gives very good results in calico printing, and is considerably cheaper than tragacanth. It is a white powder insoluble in water, but readily soluble on boiling. A single hour's boiling is quite enough. Printing colours made with it have the same appearance as those made with tragacanth, and give the same results, except when the result is better, and the shades fresher and brighter. This happens strikingly with Alizarin Pink. The following recipes are recommended:—

Starch-tragantine Thickening. — 60kilos. wheat starch, 75kilos. water, 60kilos. acetic acid 6° Bé., 45kilos. tragantine solution (1 : 10), and 21kilos. turning oil. Boil for two hours.

Meal-tragantine Thickening. — 25kilos. wheat meal, 54kilos. water, 36kilos. tragantine solution (1 : 10), and 5·4kilos. acetic acid. Boil for two hours.

Alizarin Pink.—81kilos. starch-tragantine thickening, 10·2kilos. ricinoleic acid, 2·4kilos. Alizarin V2A 20 per cent., 1·2kilo. Alizarin SX 20 per cent., 1·68kilo. ammonium sulphocyanide 12° Bé., 13·2kilos. spirit, 1·32kilo. acetate of lime 16° Bé., 0·72kilo. tin solution 12° Bé., and 12kilos. water. The tin solution is made by slowly adding 1kilo. of tinsalt to 1kilo. of concentrated nitric acid. The ricinoleic acid is got by decomposing castor-oil soap with hydrochloric acid, and washing the fatty acid with solution of common salt.

Alizarin Blue. — 56kilos. starch-tragantine thickening, 12kilos. Alizarin Blue S R in paste, 3·4kilos. Gallamine Blue fourfold in paste, 4·4kilos. chromium acetate 20° Bé., 0·3kilo. acetic acid, and 6kilos. water.

Methylene Blue. — 15kilos. starch-tragacanth thickening, 0·225kilo. methylene blue, 1·5kilo. water, 6kilos. acetic acid, 1·29kilo. tannin in 1·29 kilo. acetic acid, and 0·09kilo. tartaric acid.

Starch tragacanth can also be used with aniline black. For ice colours the meal thickening is to be preferred. Make 140grms. of paranitraniline to a paste with water, then add 520grms of a solution of 29 of sodium nitrate in 200 of water, and then slowly 2kilos. of ice and water, and 220grms. of hydrochloric acid of 22° Bé. Allow to stand ten minutes, stir, and then mix into 4·8kilos. of meal-tragantine thickening. Finally add 300grms. of acetate of soda. This colour is printed on goods prepared with betanaphthol. These colours print quite evenly, and if the proportions given are strictly adhered to, no fault can be found with the result. Tragacanth can be replaced by Tragantine T in all printing colours. Perhaps a few basic colours come out a shade paler, but the greater cheapness of the tragantine much more than makes up for the necessity of using a little more dye in these isolated cases.

A further use, says the "Leipziger Färber Zeitung," is in dyeing Naphthylamine Bordeaux on piece goods to thicken the bath of sodium beta-naphtholate as well as that of diazotised alpha-naphthylamine. In this way, not only is the result quite as good as with tragacanth, but the clogging of the rollers is avoided, and they can be used very much longer than with tragacanth. The following recipes are recommended :—Make up to 100 litres a mixture of 2kilos. beta-naphthol, 2·6kilos. of soda lye of 26°, and 10 litres of solution (1 : 10) of Tragantine T. Make the developing bath with 2 : 31kilos. of alpha-naphthylamine salt S, 1·2kilo. of concentrated sulphuric acid, 12 litres of water, and 5kilos. of ice. When the temperature has fallen to the freezing point, or very nearly, add 15 litres of solution (1 : 10) of Tragantine T, and 3·97kilos. of acetate of soda, and make up with water to 150 litres.

Discharge Effects on Indigo Dyes.

WHEN the usual chromate discharging paste is printed upon indigo dyed wool, discharge effects of a very grey character are produced, effects which are far from satisfactory, and which are incapable of afterwards receiving light shades. To obviate this great disadvantage, experiments were made with the aim of obtaining a pure white discharge, and as regards silk goods, the trials made by the Badische Anilin and Soda Fabrik led a few months ago to a successful solution so far as silk goods were concerned. Further trials have now resulted in a process which produces *white* discharge effects upon indigo dyed wool, which is also capable of pure and brilliant *coloured* discharge effects on either wool or silk.

The old chromate process of discharging is utilised when coloured discharge effects are desired, but the discharge paste has a colouring matter added to it which will sufficiently resist the action of the various agents to which the printed material is subsequently submitted. Therefore, to produce a white discharge effect on indigo-dyed wool, the goods are printed with the usual chromate discharge paste, steamed, passed through a discharging bath, and treated with a suitable bleaching agent ; a suitable colouring matter is added to the discharge paste, and the material is printed with the mixture. All colouring matters are not suitable for this purpose, but Induline Scarlet, Azoflavine 3 G Extra, Azoflavine 3 R, Rhodamine Extra, and Methylene Blue B G N and B, give satisfactory results. By the combination of two or more of these dyes, green, olive, brown, violet, or other desired colour can be produced. The following examples will serve to illustrate the nature of the various methods, the parts mentioned being by weight.

White Discharge on Indigo-dyed Wool.—Print indigo-dyed woollen material with a discharge composed of 350 parts of tragacanth water (6 per cent.), 400 parts of gum water (1 : 1), 125 parts of water, and 300 parts of sodium bichromate (powder). Steam the goods for five minutes in a Mather-Platt apparatus, and pass them for about twenty seconds, at a temperature of from 55 to 57° C., through a bath containing 50grms. of oxalic acid, 50grms. of sulphuric acid (containing 95 per cent. H_2SO_4) in 1 litre of solution, and leave for several hours in a bleaching bath made up of 500 parts of hydrogen peroxide (containing from 2 to 3 per cent. of H_2O_2), 500 parts of water, and 15 parts of ammonia solution (containing about 20 per cent. NH_3). Wash and dry. In place of hydrogen peroxide, aqueous sulphurous acid, bisulphite of soda solution, gaseous sulphurous acid, or potassium percarbonate can be employed.

Red Discharge Effect on Indigo-dyed Silk.—Print indigo-dyed silk with a discharge made up as follows : — 600 parts of tragacanth water (6 per cent.), 610 parts of water, 60 parts of induline scarlet, and 300 parts of sodium bichromate (in powder). Steam the goods for five minutes in a Mather-Platt apparatus, and then pass them at a temperature of from 55 to 57° C. for about twenty seconds through a discharging bath of 50 parts of oxalic acid and 50 parts of sulphuric acid (containing 95 per cent. H_2SO_4) diluted with water up to 1000parts by volume. Bleach in an alkaline solution of hydrogen peroxide, as described in the foregoing example, or in aqueous sulphurous acid of 4° Bé., or in sodium bisulphite solution of 5° Bé., or in an atmosphere of gaseous sulphurous acid. By employing Azoflavine 3 G Extra instead of induline scarlet in this second example, a greenish yellow is obtained ; by employing Azoflavine 3 R a reddish yellow is obtained ; by employing Rhodamine Extra a red is obtained ; and by employing Methylene Blue B G N a blue is obtained.

Red Discharge Effect on Indigo-dyed Wool.—Print the indigo-dyed wool with a mixture of 300 parts of tragacanth water (6 per cent.), 300 parts of gum water (1 : 1), 610 parts of water, 60 parts of induline scarlet, and 300 parts of powdered sodium bichromate. Steam the goods and pass them through the discharging bath, and bleach as in the foregoing example. In place of induline scarlet, Methylene Blue B Extra can be used to produce blue effects, Azoflavine 3 G for greenish-yellow effects, Azoflavine 3 R for reddish-yellow effects, and Rhodamine Extra for carmine effects, whilst combination effects can, of course, be produced.

Indican.

RECENT researches, chiefly by Dutch chemists, have thrown much light on a very interesting question—that of the state in which the colouring matter of indigo exists in the cells of plants. Since 1855-56 very little attention had been paid to the subject, this being in a great measure due to the difficulties of the investigation. In the memoir of Hoogewerff and Ter Meulen, the authors describe their method of preparing a colourless crystalline glucoside in place of the amorphous indican, the only compound yielding indigo hitherto known. Though the existence of such a compound had been anticipated by Marchlewski and Ratcliffe, still its actual preparation was a meritorious achievement. Hazewinkel has also published a memoir in which he shows that indican, by decomposition with acids, enzyms, etc., yields indoxyl, which, by subsequent oxidisation, is converted into indigo blue. This might have been anticipated, since it was shown several years ago by Rœmer and Schunck that indican in watery solution does not yield indigo blue with acid, unless an oxidising agent, such as ferric chloride, is present at the same time. Hoogewerff, of Delft, forwarded to Schunck a small specimen of his indican, sufficient to enable him to confirm his account of its properties. The examination led to the conclusion either that Schunck's indican must have been very impure even for such a substance, or that there exists more than one substance to which the name has been applied. Assuming the last supposition to be correct, and giving the name alpha-indican to his original substance, and that of beta-indican to the substance of the Dutch chemists, the author indicates the distinguishing characteristics of the two as follows :—

1. Alpha-indican and beta-indican are soluble in water, alcohol, and ether.

2. The solutions of alpha-indican are coloured yellow on the addition of alkalies, and give yellow precipitates with lead acetate, while the solutions of beta-indican remain white with alkalies and give white precipitates with lead acetate.

3. By the action of strong acids and a mild oxidising agent alpha-indican yields indigo blue, indigo red, and a body which resembles but is not identical with glucose, inasmuch as it is not fermentable, while beta-indican with acid and ferric chloride is simply decomposed into indigo blue and glucose.

4. By the action of caustic alkalies at a boiling temperature, alpha-indican is changed and modified in some way, so as now to give with acids very little or no indigo blue, but in its place indigo red, whereas beta-indican is not affected by the action of caustic alkali.

Anyone conversant with this department of chemistry, and reading the description of the two bodies without prejudice, would probably come to the conclusion that they are distinct, not mere modifications of one substance. Of course, it is easy to say that beta-indican represents the pure substance deprived of the impurities accompanying it in the original substance ; this is possible, and even probable, but not proved. To have obtained a comparatively stable crystallised substance in place of what previously represented it, which was amorphous and ill-defined, is a very meritorious piece of work, but it does not exhaust the question.

Anyone reading Schunck's early memoirs on this subject would see how carefully he avoided, in the preparation of indican, the use of an elevated temperature, even that of boiling alcohol. The extraction of the material, and the subsequent evaporation of the extracts, were made in the cold, because at a higher than ordinary temperature, indican, especially in watery solution, is modified so as no longer to yield indigo blue on treatment. On the other hand, Hoogewerff and Ter Meulen employ boiling water, boiling alcohol, and even baryta water, in the preparation of their indican, all potent agents, very likely to lead to metamorphosis in any body liable to change. The indican of Hoogewerff and Ter Meulen is a derivative of alpha-indican or some similar substance, due to the action on it of agents apparently only employed for the purpose of purification. The author cannot offer any explanation how a stable body like beta-indican can be derived from a very unstable body by the action of potent agents. He can only point to analogous cases, and of these mentions that of chlorophyll. This body, when in solution, is very susceptible to the action of air and light, being rapidly bleached and decomposed thereby ; but when its solutions are treated for even a short time with sulphuric or hydrochloric acid, products of decomposition are formed which are remarkably stable, resisting the action of air and light, not for days only, but for weeks, and even months. The action of alkalies on chlorophyll leads, in a similar manner, to the formation of products of great stability. The author has met with similar instances in other departments, such as that of the glucoside of madder, which, as his experiments prove, does not pre-exist as such in the plant. These facts have been strenuously denied by observers who choose to shut their eyes, but there can be no doubt of their reality for all that. And so in the case of indican, as in that of chlorphyll, there may exist, before final decomposition takes place, intermediate products of which the final resultant products do not lead us to suspect the existence.

Beijerinck has thrown some doubt on the existence of indican in the leaves of *Isatis tinctoria*, and prefers to attribute the indigo-producing properties of woad to the presence of a body called by him isatase, which he has not isolated, and which, by the action of an enzym called isatase present along with it in the plant, yield indoxyl, and then by oxidation, indigo blue. Indican was first obtained by the author from woad leaves, and the properties of the substance subsequently obtained from *Polygonum tinctorium* seeming to be precisely the same, he concluded the two were identical. He had recently repeated Beijerinck's experiment of passing air through an extract of woad leaves with boiling water, but no indigo blue was precipitated until either a strong acid or an alkali was added, showing that if indoxyl was present in the extract it was certainly not in the free state. In confirmation of this view that woad leaves contain indoxyl either free or combined, Beijerinck states that if isatin be added to a watery extract of woad leaves, and the liquid be boiled, indirubin, or, at all events, a substance dissolving in alcohol with a bright red colour, is deposited. This does not, however, always take place. Sometimes the deposit does not consist of indirubin, but of a peculiar substance which the author discovered many years ago on adding isatin to a boiling extract of woad leaves, though he is not sure that he has anywhere described it. This substance, when pure, appears in microscopic crystals, and in mass is dark blue, almost black. It might be mistaken for indigo blue were it not for the peculiar bronze-like (not coppery) lustre which it exhibits when rubbed with a hard body. It may be kept for years in a dry state, but if its alcoholic solution, which is bright blue, be left to stand only a few minutes, the colour changes to yellow, and the substance is completely metamorphosed. In acting on indican with acids some indirubin is always formed, but much more when the indican has been previously acted on by a caustic alkali.

The discordant results obtained by Marchlewski in his examination of indirubin would almost lead one to infer that there are several substances of

similar properties comprised under the head of indirubin, from whatever source derived. The decomposition of indican, whether it be a glucoside or not, so as to yield indigo blue as one of its products, has been ascribed by some to the action of microbes, by others to that of a peculiar enzym. There is one process, however, which cannot be ascribed to either cause. It is as follows:—If a plant of *Polygonum* or of *Isatis* is immersed in a vessel of water, and the vessel is placed in a freezing mixture until the liquid has become one mass of ice, it will be found, after thawing, that the leaves that were thoroughly frozen will be found limp, flaccid, and discoloured, and, after treatment with boiling or even cold alcohol to remove the chlorophyll, those very parts will appear blue—sometimes a very dark blue,—while the leaves and parts of leaves not affected by the excessive cold will be almost colourless. That the indigo-producing body of leaves should be changed in the same way, by exposure to unusual cold, as by the action of acids, alkalies, or ferments, is indeed strange, and cannot be explained in any of the usual ways. Bacteria would seem in this case to be excluded, as it is difficult to conceive the possibility of their existing and acting within a block of ice. It may be surmised, too, that any plant enzym or enzyms would fare no better as agents of decomposition. No fermentation of any kind can take place at a temperature of 0°; this is conceded by all who have discussed the subject of fermentation. Some other cause must be found for the peculiar effect of cold, which takes place equally in the case of *Isatis* and *Polygonum*, and must in both cases be the same. The same effect as by cold is produced by dipping the leaves of either plant into moderately strong alcohol, which on standing removes the chlorophyll, the leaves remaining more or less deeply coloured blue. This reaction, says the "Chemical News," has already been described by Beijerinck, but he has not sufficiently explained it.

The Metallic Ornamentation of Textiles.

ALMOST as long as dyeing has been known, the practice of using metallic salts as mordants has been in vogue. These salts have been used to attract the dye and fix it on the fibres of the material being treated, but it has been left for the present age to adapt this old method to the more recently-developed process of electrolysis. The change is simple: instead of mordanting and afterwards dyeing yarns or fabrics, these are treated with some metallic salt, which is used as a medium on which to deposit a metallic surface. According to the process as tried by some New York manufacturers, nitrate of silver gives the best results. The material is treated with this, the salts being reduced to their conductive state by bringing them in contact with a reducing solution (preferably an alkaline solution), with the result that the fibrous material becomes an electrical conductor throughout its body. The fibrous material is then in a condition to receive a surface coating of metal, which may be deposited on it by electrolysis.

An alkaline reducing solution is employed for the purpose of reducing the salts to a conductive state, and the solution may be applied to the fibrous material either before or after the metallic salts. In the first case, the fibrous material is immersed in the reducing solution, which also contains a binding material, and the metallic salts are then applied to the fibrous material, by immersing the latter. In the second case the fibrous material is first dipped in the metallic salts, and then dipped in the reducing solution. In order to protect the fibrous material—lace, for instance—during the electroplating operations, and to hold the reduced metallic salts to the fabric until the surface coating of metal has been deposited, the fibrous material is treated with a dissolved binding material, such as dissolved gum shellac. This binding material is applied either alone (when the metallic salts are applied before the reducing agent) or with the reducing agent, when the fibrous material is treated with the reducing agent before the salts are applied to it.

Any suitable alkaline reducing solution is employed. Good results have been attained by using a solution made as follows:—First, dissolve 1oz. of pure metallic silver in a solution composed of 1½oz. of nitric acid and 1oz. of water; second, evaporate the fluid and crystallise the residuum; third, dissolve the crystals in 1 quart of distilled water; fourth, add common salt, precipitating the silver in the form of chloride of silver; fifth, thoroughly wash the chloride; sixth, add sufficient concentrated solution of cyanide of potassium to dissolve the chloride; seventh, filter the solution and add to the filtered liquid 3 quarts of distilled water. Another form of reducing solution consists of a solution of sulphuret of potassium, composed of 1oz. of sulphuret of potassium to each 6oz. of water.

For producing a flexible or semi-flexible metal-coated lace or fabric, it is best to adopt the following method:—First, saturate the lace or fabric with a solution consisting of an alkaline reducing solution (the first solution described above) to which has been added a quantity of gum shellac dissolved in alcohol. Then treat the lace or fabric with nitrate of silver, which is quickly decomposed on being brought in contact with the reducing solution. The three mixtures (gum shellac, alkaline reducing solution, and metallic salts) are also applied to the lace or other material in other ways. For instance, the lace or fabric can be first saturated with the gum shellac, then treated with nitrate of silver, and then treated with the alkaline reducing solution, which serves the purpose of not only decomposing the silver, but also of incorporating the three mixtures into one, and causing this mixture to permeate the entire body of the lace or fabric. The fibrous material, impregnated with the reduced metallic salts, is then immersed in the electro-depositing solution, and left in, or slowly carried through it, until a sufficient electrically-deposited metallic covering is secured.

When the surface of the article to be plated bears a pattern which is to be reproduced in the final product, care must be taken to prevent, or to remove, any excess of the metallic salts and sulphuretted solution from the openings or recesses in the pattern. In electro plating on woven, knitted, or knotted fabrics, the interstices or openings should be freed from the salts and sulphuretted solution, by washing with water, or by pressure between absorbent material or rollers. If desired, the article or body to be plated may first be treated to protect it from the action of the acid ingredients of the electro-depositing solution. This preliminary treatment will be especially advantageous when easily-destructible fibrous bases are to be coated with metal. The result is a product, metallic in surface coating and appearance, embodying the exact ornamentation of the original fibrous material, and reproducing in the metal-coated fabric the interstices or openings of the original fabric. These metallised fabrics or fibres are produced very cheaply and rapidly by the employment of the new process, and are said to be far more accurate in delineation of the minute details of the original fabric than is possible by the most expert die-cutting. When precious metals, as gold or silver, are to be deposited on the fibrous base, a coating of an inexpensive metal, as copper, should be deposited on the fabric by electrolysis before the final metal plating.

Dyeing Noils and Loose Wool.

NOILS are frequently mixed with loose, uncarded wool, in order to simplify and facilitate the dyeing of such mixtures, and it is often a question of dyeing comparatively small lots. By a shortened process, time and fuel are saved, of course, but then it is a speculation with the dyer whether or not the process will succeed. The better way is to dye the noils and the raw washed wool separately. If dyed together, the noils are almost always more felted than the wool, and the colour of noils will almost without exception appear different from that of the wool. This is a serious defect if the material is to be used for uni-coloured goods. Furthermore, the disadvantage arises, in the case of mixtures, that the noils, if strongly felted, mix badly in the carding process. To avoid the disagreeable consequences of this mixed dyeing, it is better to dye each material by itself. In the case of loose wool it is still possible to recognise the nature and source of the material, which cannot be accurately done in the case of noils. It frequently occurs that different kinds of wool are combed together, and thus it happens at times that a quite strong fibre will be combed in with defective goods in order to make the latter more fit for the manufacturing process. It hardly comes into consideration whether the inferior material be long or short, fine or coarse; the main question is to secure uniformity in the felting tendency. If this be the case, it is easy work for the dyer. He has only to be careful, when dealing with well-felting noils, that in mordanting the bath be kept near the boiling point without actually reaching it. If in this way the mordanting has lasted 1½ hour and the noils still remain loose and have the appearance of not being felted, a half-hour's boiling will do no harm. Nevertheless, strong boiling is to be avoided. In the case of noils that have but a slight tendency to felt, 1½ hour's boiling is permissible; but here, too, excessive boiling is to be guarded against, otherwise the weak felting tendency of the material will be still further weakened. As a rule, mohair noils felt most strongly in dyeing, so that in working with this material boiling must almost invariably be avoided and merely a seething temperature be maintained. In the dyeing out of the material the same cautious treatment must be observed.

If noils and wool are to be dyed according to one and the same sample, the best plan is to match each separately and not to mix the noils and wool until dyed. In that way it is possible to give each material its proper attention. Precaution is likewise necessary in the case of uncarded wool, on account of its non-uniformity. The various colonial wools possess such an endless variety of characteristics that dyers are almost compelled to treat each wool according to its origin. For instance, one kind of wool comes from sheep that rest at night in the sand on the open plain. Such wool is usually not so yellowed as the wool of sheep kept in stalls. Then comes the feeding of the sheep, the washing of the wool, the health of the sheep, and whether the wool be live or dead. All this asserts itself very frequently during dyeing, in the most unexpected ways and in difficulties that involve all kinds of inexplicable phenomena. In spite of all pains and effort, the result can never be guaranteed; it can only be approximated, even if we work according to the customary and well-compiled recipes.

If noils be matched in dyeing and then an effort made to bring the same shade upon loose, uncarded wool, the working of the mixture for one-coloured goods will present difficulties only if great non-uniformity exist in the felting tendency of the two materials. If one material felts strongly and the other not at all, a good smooth felt cannot be obtained. The so-called felt, after completion, will be stubby, or, as we may say, not fully closed. Loose and dense places will show, as if the object had been to produce rough, coarse goods. Whether noils and uncarded wool be dyed together or dyed separately, there is one point to be kept in view, says the "Deutsche Faerber Zeitung": both materials must have the greatest possible uniformity as to felting, and they should be alike in other respects as well, such as fineness, etc., in order to assure proper preparation for the manufacturing process.

NOTES ON DYEING, BLEACHING, FINISHING, &c.

Specially compiled for THE TEXTILE MANUFACTURER.

BENZO FAST RED L.—This is a new direct dyeing colour (Bayer), very fast to light, being claimed to be in this respect at least on a par with the fastest substantive reds on the market. The shade of many substantive reds is altered when the dyed goods are stored for a long time, becoming more or less dull or brownish, but Benzo Fast Red L is fast to storing. It is also said to be fast to heat (hot ironing), alkalies and organic acids such as acetic acid, etc. It is dyed on cotton in the usual manner with Glauber's salt and soda, and produces a more bluish shade than Benzo Purpurine 4 B. It is adapted for dyeing loose cotton, cotton pieces and hanks, as well as for mercerised goods. It appears, however, doubtful whether it is sufficiently soluble for machine dyeing. It is adapted for the dyeing of curtains, cretonnes, etc., and owing to its good level dyeing properties can also be employed in combinations for shades fast to light. In cotton printing it may be used for padding purposes, thus producing pink shades of very good fastness to light somewhat yellower than those of Geranine G. It is also suited for topping goods printed with Aniline Black as well as for mercerised articles; when printed on silk and half-silk the colour is fast to water.

FASHIONABLE SHADES ON WOOLLEN CLOTH.—A large and choice range of shades for the winter of 1901 has been issued by Messrs. Bayer and Co., particular attention being drawn to the blues and greys and other light fashionable shades produced with the combinations of Alizarin Sapphirole S E, Fast Light Yellow G, and Azo Crimson S or Azo Fuchsine G, which, on account of their extremely good fastness to light, even in light shades, are especially worthy of notice. All the patterns shown have been dyed for one hour at the boil with the addition of 10lb. Glauber's salt, and either from 2 to 5lb. sulphuric acid or 10lb. bisulphate of soda. Many of the shades are very brilliant, yet all have been dyed on unbleached material.

PLUTO BLACK C R.—This is a new dyestuff suitable for cotton, being a recent addition to the Pluto Black series (Bayer). Its properties are very closely allied to those of the older G quality, being possessed of the same fastness to light, alkalies and acids; but it produces a bluer shade of a more bloomy hue. When afterwards treated with bichromate of potash or copper sulphate the shade becomes redder. The direct-dyed shades are not quite so fast to washing as those produced in the same manner with the G brand, but when after-chromed are equally so. Pluto Black C R is not only adapted for dyeing cotton, but also for half-wool and half-silk. Attention is called to its fastness to light when dyed on half-woollen goods in which the cotton is exposed on the surface. Dyed on half-silk, particularly in light shades, very popular and fashionable greys can be produced. In cotton printing it can also be employed for padding purposes. The colour is discharged well with zinc powder and to a cream with tin, the direct-dyed shades being in this respect better than those after-chromed. When printed on half-silk in light shades, very fine, useful greys are obtained.

C

THE TEXTILE MANUFACTURER PATENT GAZETTE.

Manuscript Specifications of patents can be examined at the Patent Office, London, after the Complete Specification has been accepted, on payment of One Shilling. The printed Specifications are usually published in about one month after acceptance of the Complete Specification, and any single copy may be obtained by remitting 8d. in stamps (or by special postcards sold at the Post Offices at 8d. each) to the Comptroller General, Patent Office, 25, Southampton Buildings, Chancery-lane, London. When a number of specifications are required, remittances may be made by P.O.O.

Applications for Patents.

(Where complete specification accompanies application an asterisk is affixed.)

1901.

1st January.

1 D. G. BAKER, London. Thread-winding machinery.*
39 J. EHRLICH and O. KUHNEN, Manchester. Picking arrangements of looms.
43 W. A. S. SPARLING, Southampton. Hessian cloth fabric.
46 A. R. FERGUSON, Glasgow. Tapestry carpets.

2rd January.

176 J. ROTHWELL, Manchester. Means for driving the "laps" on carding engines.
181 J. B. BARTON, Manchester. Machines for plaiting or folding cloth.
195 W. LEE and R. J. BRAMLEY, London. Appliance for use in making rugs.
228 C. RIGAMONTI and G. TAGLIANI, London. Keirs for bleaching cotton fabrics.*

4th January.

273 W. A. E. CROMBIE, London. Artificial threads or fibres.
292 L. P. HEMMER, London. Stop-motion devices for fulling and like machines.*
295 A. G. GREEN and OTHERS, London. Colouring matters of the thiazol series.

5th January.

309 S. SCHWABE AND CO. LIMITED and J. GILBERTSON, Manchester. Printing metallic powders and colours on textile fabrics.
312 H. S. SMITH and A. THOMSON, Bradford. Machine for withdrawing press papers from cuttled fabrics.
330 C. D. ABEL, London. Black colouring matter directly dyeing cotton. (*Actiengesellschaft für Anilin Fabrikation, Germany.*)
342 R. FOULDS, Burnley. Reed motions of looms.
344 J. HENDERSON and E. G. GIBB, Dundee. Fabric-printing machines.

7th January.

381 B. ROSS, London. Mechanism for operating healds in looms.
392 O. IMRAY, London. Blue-grey dyestuff for cotton. (*Farbwerke vorm. Meister, Lucius and Brüning, Germany.*)

8th January.

438 H. W. WYMAN, London. Looms.*
441 O. LAUCKNER, London. Electrolytic bleaching of cotton and other textile materials. (*A Vogelsang, Germany.*)
445 R. N. PILKINGTON, Keighley. Spindles for ring and like spinning and twisting machines.
447 R. ALLEN and J. NIELD, Manchester. Securing paper and like reels or reel tubes to their spindles.
454 J. BOOTH, JUN., and T. HEATH, Manchester. Drawing, roving and like machines.
509 R. H. S. READE and OTHERS, Manchester. Hackling machines for flax and other long-staple fibres.
514 C. B. NEUKIRCHNER, London. Knitting machines.*
530 W. H. CALDWELL, London. Machines suitable for breaking or cutting up fibrous material, such as vegetable fibres, rags, rope, and the like.

9th January.

545 W. HOLDSWORTH, Halifax. Gill-drawing frames.

10th January.

609 W. BIRCH, Manchester. Clips for tentering machines.
613 J. C. RICHMOND, Nottingham. Card-punching machines.
618 R. WALLWORK, Manchester. Picker buffers and pickers for looms.
653 F. KILBURN, London. Scouring or washing machines.
656 F. CHIANTORE and R. CLAUDE, London. Machine for spinning and doubling cotton and other fibrous materials.

11th January.

726 J. S. HOLLINGS, Handsworth. Weavers' mails.
745 W. T. WATTS and W. STORRS, Manchester. Self-acting mules for spinning fibrous materials.
751 O. IMRAY, London. Manufacture of a dyestuff from 1:5 dinitronaphthalene. (*Farbwerke vormals Meister, Lucius and Brüning, Germany.*)

12th January.

792 J. A. SCHOFIELD, Keighley. Looms.
838 R. B. RANSFORD, London. Dyeing mixed fabrics. (*L. Cassella and Co., Germany.*)

14th January.

884 BURGON AND BALL LIMITED, Sheffield. Machines for shearing and clipping wool or hair. (*W. H. Eyres, New South Wales.*)
887 J. B. SYKES, London. Guard for mules
896 B. J. B. MILLS, London. Process for the decoration of folded or plaited fabrics. (*C. Dumoulin et Cie., France.*)
913 H. E. NEWTON, London. Dyestuffs capable of giving on fibre shades fast against washing. (*The Farbenfabriken vormals F. Bayer and Co., Germany.*)
922 H. ERDMANN, London. Manufacture of indigo.

15th January.

939 E. ASHWORTH and J. LINDLEY, Manchester. Apparatus used in the dyeing, bleaching, and treatment of cotton and other textile materials.
954 T. MORLEY, Leicester. Circular knitting machines.
999 J. IMRAY, London. Substantive black colouring matters. (*La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis, France.*)
1003 B. J. B. MILLS, London. Machine for manufacturing chenille. (*J. B. Bergeron, France.*)

16th January.

1037 F. WILD, Keighley. Bobbins for use in the production of yarns or threads of fibrous substances.
1041 J. H. GALE, Halifax. "Quadrant" winding motion of self-acting mules.
1042 J. E. PRESTWICH, Manchester. Apparatus for treating textile yarns and threads with liquids.
1081 E. KONIG, London. Treating or refining jute fibres.*

17th January.

1110 D. D. B. T. CATE, Manchester. Apparatus for use in the continuous spinning and doubling of cottons and other fibrous materials.
1159 J. Y. JOHNSON, London. Printing textile materials with indigo. (*The Badische Anilin and Soda Fabrik, Germany.*)
1160 J. E. BOUSEFIELD, London. Manufacture of sheets, waterproof fabrics, imitation linen goods, and the like from casein. (*F. Cantù, G. Miglioretti, and G. Maffei, Italy.*)
1162 J. P. FOX, London. Pneumatically-operated looms.

18th January.

1172 D. CROWTHER and OTHERS, Leeds. Combined cushion and stop for the pickers of looms.
1176 E. SMITH, Bradford. Winding machines.
1204 I. BRIGGS, JUN., Birmingham. Spinning machinery known as mule spinning machinery.*
1220 H. MACKINTOSH, Liverpool. Manufacture of repeat patterns applicable for textile fabrics.

19th January.

1278 T. BURGESS and OTHERS, Manchester. Machines for measuring lengths of textile fabrics, etc.
1285 C. D. ABEL, London. Dyeing. (*Actien-Gesellschaft für Anilin Fabrikation, Germany.*)
1289 W. PHILIPSON and OTHERS, London. The stripping and cleaning of carding engine flats
1295 J. G. LORRAIN, London. Stop motions for twisting or doubling frames. (*L Gaggero, Italy.*)

21st January.

1329 H. WILDT, London. Circular knitting machines. (*H Brinton, United States.*)
1332 S. ECROYD and E. E. MARSDEN, Manchester. Apparatus for unbaling raw cotton
1343 H SARAFIAN, London. Woven pile fabrics.
1357 J. Y. JOHNSON, London. Colouring matters of the anthraquinone series. (*The Badische Anilin and Soda Fabrik, Germany.*)
1358 J. Y. JOHNSON, London. Colouring matters of the anthracene series. (*The Badische Anilin and Soda Fabrik, Germany.*)
1374 P. HAHN, London. Apparatus for drying moist textile fabrics while stretched
1388 A. G. BLOXAM, London. Circular frame machines for lace making and braiding. (*The firm of A. and E. Henkels, Germany.*)

22nd January.

1436 C. H. GRAY, London. Woven fabrics.
1438 E. E. GAUNIER, London. Decorated lace.
1464 W. P. THOMPSON, Liverpool. Tooth-forming and inserting mechanism for card-setting machine. (*O. Arnold, United States.*)

23rd January.

1513 J. HETHERINGTON AND SONS LIMITED and F. MOSS, Manchester. Self-acting mules
1514 G. M. HOCKNELL and H. B. BARLOW, Manchester. Heald shafts for wire and metal healds.
1523 T. E. COUPE and M. J. MILLS, Manchester. Beam flanges.
1571 C. EDMESTON, Manchester. Mangles, and the mangling of textile piece goods.

24th January.

1614 C. C. COTTON, Glasgow. Machines for hackling flax.
1639 J. T. SHORT, London. Machines for washing, dyeing, or otherwise treating clothes, fabrics, and other fibrous materials.
1641 E. TILSTON, Manchester. Stripping the flats of revolving flat carding engines.
1644 T. R. SHILLITO, London. Sulphur dyestuffs. (*J. R. Geigy and Co., Switzerland.*)

25th January.

1717 J. FIELDEN, Rochdale. Apparatus for drying wool and other fibrous material.
1720 G. PARR, Nottingham. Twist lace machines.
1730 S. V. A. HUNTER, Manchester. Measuring devices for yarn and other materials.*
1779 A. MATITSCH, London. Lace-making machines.
1787 J. Y. JOHNSON, London. Production of colouring matters on the fibre, and products for use therein. (*The Badische Anilin and Soda Fabrik, Germany.*)
1797 H. BRIGGS, London. The manufacture of embroidery, and ribbon for use in connection with the same.

26th January.

1816 J. GRIME, Manchester. Clips used in stentering machines.
1834 J. SKOUPIL, Manchester. Apparatus for dyeing, bleaching, and finishing textiles and fibres.
1850 W. A. P. WERNER, London. Apparatus for use in the production of fibreless filaments

28th January.

1862 T. BOWLER, Keighley. Machinery of the continuous type for the treatment of fibrous substances.
1864 H. BROOKE, Liverpool. Hemp and other machinery guards.
1871 J. and H. WRIGHT, Keighley. Machinery for spinning, doubling, and twisting yarns or threads of fibrous substances.
1924 C. D. ABEL, London. Calendering rollers. (*The firm of Johann Kleinewefers Söhne Maschinen-fabrik, Germany.*)
1925 C. D. ABEL, London. Calendering machines. (*The firm of Johann Kleinewefers Söhne Maschinen-fabrik, Germany.*)

29th January.

1939 T. KAY and KAY BROTHERS LIMITED, Stockport. Utilisation of waste felt.
1959 E. HILL, Keighley. Dobbies for looms.
1961 W. B. MCGREGOR and R. COUSIN, Glasgow. Weaving of patterns on piece goods.
1966 H. ROSE and OTHERS, London. Positive rods for secondary electric batteries.*
1988 R. HUTCHISON and J. GAMBLE, Dunfermline, N.B. Twilling jacquard machines.
1989 M. SARFERT, London. The treatment of hosiery and other fabrics.*
1992 M. SARFERT, London. The treatment of hosiery.*
2000 M. SARFERT, London. Tubular knitted fabrics.*
2009 W. P. THOMPSON, Liverpool. Preparation of a soluble indigo paste.* (*The Firm of G. Flick, Germany.*)
2013 C. S. MCCONNAN, Liverpool. Flyers for spinning, twisting, winding, doubling, balling, and like operations.
2017 J. P. FOX, London. Figured woven fabrics and selvage fabrics.
2018 C. MULLERS, London. Driving mechanism of thread-winding or spooling machines, and stopping the same when a thread breaks.*
2028 R. W. JAMES, London. Clips or clamps for tentering machines.* (*The Windsor and Jerauld Manufacturing Company, United States.*)
2030 E. BURNOUF and A. RENARD, London. Differential gear.

30th January.

2048 J. HELLAWELL, Huddersfield. Milling and fulling machines.
2055 A. FIELDING, Manchester. Process of dyeing or filling textile fabrics or yarns.
2067 J. H. HAYWOOD, London. Surgical elastic hosiery.
2092 J. WILLIAMS and E. TILSTON, Manchester. Apparatus for spinning and doubling cotton and other fibrous materials.
2100 J. and F. SCHLENTER, London. Knives for cutting textile fabrics.*
2132 R. VOIGT, London. Thread-guiding mechanism for cross frames.*
2141 C. K. HARRISON, London. Weaving Royal Axminster carpets, rugs, and like fabrics.

31st January.

2129 J. SHAW, Bradford. Table for facilitating feeding piece goods and the like to dyeing or other machines.
2137 C. L. JACKSON, Manchester. Machines for embossing textile fabrics.
2143 J. A. SCHOFIELD and J. DEARDEN, Keighley. Woven fabrics.
2188 C. D. ABEL, London. Colouring matters directly dyeing cotton. (*Actien-Gesellschaft für Anilin-Fabrikation, Germany.*)

1st February.

2206 J. FAIRCLOUGH and OTHERS, Manchester. Mechanism for stripping the revolving flats of carding engines.
2212 H. A. FIELDING, Manchester. Jacquard and dobby machines.
2213 H. WOLSTENHOLME, Manchester. Picking motion for looms.
2273 E. FUES, London. Drying cylinders.
2283 R. WEISS, London. Apparatus for treating textile materials with circulating fluids.

Recent Textile Patents.

The following are abridgments of patents recently published. The date given at the beginning of each is that of application, whilst that at the end is the date of acceptance of the complete specification. The period of opposition expires within two months of the latter date:—

1899.

17,437. Hackling machines. Aug. 29. J. V. Eves, Forth River Mill, Belfast. The object is to economise labour in the manual attendance required to pass the flax through hackling machines, and also to make more efficient the mechanical devices already in use for that purpose.—Nov. 29, 1900.

19,633. Reproducing designs. Sept. 29. A. E. Jacobs, 29, Kirk-street, Cleveland, O. Relates to an improved pantographic apparatus for reproducing designs on different scales or distorted whereby designs can be directly copied from a model upon paper or metal with such variations of size or proportions as may suit the taste or convenience of the draughtsman.—Dec. 29, 1900.

22,899. Jacquards. Nov. 16. J. Charpenel, 31, Rue de l'Hotel-de-Ville, Lyon. Relates to looms, and comprises improvements in jacquard, Vincenzi, and other similar mechanisms which may be applied to hand or power looms in which use is made of cards or endless paper bands. In lieu of the square prism—generally called the cylinder or barrel—heretofore in use, a cylinder of octagonal shape and of special construction is used, which, owing to the number of sides or faces, causes the mechanism to work at every ⅛th of a revolution instead of at a ¼ revolution as heretofore. This improved cylinder is formed with an external casing divided into three parts, of which the two end ones are capable of sliding, while the middle part is stationary. These three portions are mounted upon an internal boss furnished at each end with gudgeons or trunnions. The arrangement in sections of this casing is of the highest importance, because it permits of completely counteracting the hygrometric effect of the paper and cardboard, which effect has hitherto always prevented the employment of paper and in many cases the employment of cardboard for the design, owing to them becoming frequently deteriorated by the humidity of the atmosphere, thus presenting a serious inconvenience in weaving when it is desired to obtain a perfect cloth.—Dec. 15, 1900.

23,499. Winding. Nov. 24. W. L. Wise, London (communicated by the firms J. Salzmann-Däniker and Nufer and Co., St Gallen, Switzerland). Relates to apparatus suitable for use in connection with bobbin, spool, reel, or ball-winding machines, in which a holder for a bobbin, spool, reel, or ball, and a device for holding its thread ends, can be rotated relatively to each other. Its object, is to free thread-ends of the ball, and to arrange them in such a manner that they will be ready to hand in the subsequent use or treatment of the ball.—Nov. 24, 1900.

23,761. Cotton gins. Nov. 28. T. H. Pearse, 89, State-street, Boston, U.S.A. In ginning cotton it has been ascertained that the so-called "roller" gin is preferable to the so-called "saw" gin, for the reason that the latter damages the staple to an almost ruinous extent, while the former does not injure it to an appreciable degree. The principal reason why the roller gin has not been universally adopted has been its relative uncertainty and slowness of action; this and other objections have resulted for the most part, if not entirely, from the imperfections of the roller which carries the fibre into the machine to have the seeds and substances foreign to the fibre separated therefrom. It is essential to a perfectly-operating roller that it shall possess structural characteristics in virtue of which it will readily and with certainty catch or take hold of the fibres when the latter come into contact with the roller, but without injury to the staple, so that the roller may carry the stock into the machine to be acted upon by the seed-removing means. A roller for the purpose is made, comprising in its construction round discs or layers of suitable substance, compressed to render them compact or solid, provided at intervals with substantially radially-arranged fibre-catching means, and means for maintaining the layers in compressed condition.—Nov. 28, 1900.

24,234. Improved fabric. Dec. 5. E. Goldschmidt, 2, Rabenplatz, Vienna. Relates to the manufacture of a new fabric, chiefly designed for use for the linings of clothes. The fabric is a woven material, the weft threads of which are of horsehair, whilst the warp threads are of cotton or other suitable material. Good results are obtained by weaving the fabric with horsehair weft and by employing for the warp a material known as "weft yarn," which is made from crossbred wool. The warp and weft threads are woven together in such a manner that the horsehair is visible upon one face of the finished material and practically not at all upon the other face, where it is covered by the warp threads.—Dec. 5, 1900.

24,335. Spinning and doubling. Dec. 7. G. H. Milward, 19, Agnes-street, Meadows, Nottingham. Relates to improvements in machinery for spinning and doubling cotton, wool, and other fibrous substances, more especially in what is known as ring spinning, and in which the traveller or ring is driven, the yarn carrying round the spindle to which the drag is applied, the ring rail being stationary, and the copping motion given to the spindle rail. It consists principally in forming the bearings for the spindle in such a manner as to cause the spindle to run so lightly and the drag to be applied so delicately as to allow of the finest fibres being spun or doubled thereon.—Dec. 1, 1900.

24,525. Card punching. Dec. 9. H. Hill, 63A, Mansfield-road, Nottingham. Relates to improved mechanism for reading, selecting the punches, and perforating pattern cards for the jacquards of multiple embroidering machines or the like.—Dec. 1, 1900.

24,882. Metallic hollow frames for looms. Dec. 14. J. C. Fell, London (communicated by La Société Chaize Frères, 19, Rue Cambon, Paris). Relates to the manufacture of metallic frames for looms, and has for its object the substitution for the usual heavy frames of cast iron or timber, of light tubular metallic frames, adapted to be of cheap, strong, and durable construction, and easily to be put together and mounted, from stock materials, for any size or arrangement of frame. Metal tubes, such as are known as steam or gas tubes, are employed, of any suitable metal and of any desired thickness and dimensions, to form the longitudinal and transverse frames and ties of the framing for any description of loom, the vertical pillars being completed by suitable cast-iron rests or feet attached to the said tubes.—Dec. 14, 1900.

25,180 Reeling or winding slivers Dec. 19. R. Haddan, London (communicated by J. Niqui and J. E. Harrison, Rue Obispo 2, Barcelona, Spain). Relates to the reels on which slivers, slubbings, or rovings are wound in spinning mills. Formerly such slivers, slubbings, or rovings have been rolled up simultaneously on one long reel, which will hold twenty or even more slivers, slubbings, or rovings. Each of these reels is put in rotary movement by a cylinder known as a taking-up cylinder. This system has one great disadvantage, owing to the frequent breaking of the slivers, slubbings, or rovings, so that some are longer or shorter than others, which difference in the length means a considerable loss when these slivers, slubbings, or rovings are further dealt with in the spinning machines. In order to avoid this inconvenience the present invention is intended to take up and wind the slivers, slubbings, or rovings independently from each other on separate reels. Each reel is driven by a corresponding take-up cylinder, the width of which (parallel to its axis) is a little less than the distance between the flanges or end-plates of the reel in order to allow the take-up cylinder to be introduced into the hollow or channel of each corresponding reel. The flanges or end-plates of the reels may be of star shape, but can be in any other form; the star shape is only adopted for obtaining lighter weight in the reel. Each of the reels comprises a central cylindrical boss or nave and two flanges or end-plates; each reel is provided with an axle or trunnions. These axles are lodged in supports of fork-like form; each of these supports carries two grooves or slots, one

for the axle end of one reel and the other for the axle end of the next reel; the other end of each of these axles is lodged in the next similar support. The take-up cylinders lie between the end-plates or flanges, and come in contact with the central bosses or naves of the reels. In proportion as the slivers, slubbings, or rovings are wound up on the naves of the reels in consequence of the action of the take-up cylinders, which turn the reels by surface friction, and in proportion as the roving or the like fills each reel, the axles of the latter rise in the grooves or slots, and the reels, when entirely filled, are taken away from the upper and open ends of the said grooves or slots.—Dec. 19, 1900.

25,257. Twist lace machine carriages. Dec 20. E. Jardine, Deering-street, Nottingham, and H. Lambert. Relates to the manufacture of twist lace machine carriages, and more particularly to the bevelling, or what is more commonly termed the chamfering, of the edges of such carriages, so that they will pass through the threads without injuring them, and it has for its object means of effecting this operation in a more expeditious, economical, and perfect manner than heretofore Heretofore in the manufacture of lace machine carriages their edges have been chamfered, partially by milling or other suitable machines, and the remaining parts by hand by means of files, emery paper, or the like. Owing, however, to the irregular outline of such carriages, and especially those provided with teeth or projections to engage with toothed rollers or locker bars, the amount of chamfering that it has hitherto been possible to effect by machinery has been extremely limited, and an excessive amount of hand work has therefore been entailed in this process. According to the invention, any part of the edge of a carriage is bevelled on either one or both sides by means of suitably-formed dies, placed in a press or drop-stamping machine, and thus squeeze or stamp a bevel edge thereon.—Dec. 20, 1900.

25,533. Coating fabrics. Dec. 27. J. W. Hargreaves, 29, Booth-avenue, Mauldeth-road, Withington. Relates to spreading machines for treating fabrics in order to produce that class of goods known as leather-cloth and the like, and the improvements have for their object to prevent the jerk hitherto occurring in machines in which the fabrics are treated in an endless band, and whereby serious defects are caused to the material under treatment; also to produce a more uniform tension in the fabric while being coated, and to prevent the fabric when charged with electricity from adhering to the rollers through which it has to pass, and thereby becoming creased or torn.—Dec. 15, 1900.

1900.

228. Self-acting mules and twiners. Jan. 4. J. Moorhouse, 201, Belgrave-road, Oldham. In self-acting mules as at present operated there is a great strain upon the winding mechanism at the moment the operation of backing-off is completed and winding commences, due to the momentum set up in the driving or twist band in backing-off. The object of this invention is to effect the backing-off without setting up the said momentum, or to reduce it to a minimum compatible with the proper operation of the band in backing-off and spinning, and to this end consists essentially in retarding the movements of the band by a brake or drag.—Jan. 4, 1901.

237. Circular knitting machines. Jan. 4, H. Clarke, 132, Robin Hood's Chase, Nottingham. Is designed to enable a fabric, similar to that hitherto made on the Terrot machine, to be manufactured on a circular knitting machine at a greater speed and less cost than heretofore. A circular latch needle frame, or frame having other suitable needles, is used, having the needle cylinder, needles, and sinkers arranged to revolve, the cam ring being stationary. Upon the cam ring or table are arranged a suitable number of feeders or thread guides, and an extra fixed guide is attached to each of the thread guides for the purpose of plaiting. The sinkers are movable and are revolved with the needle cylinder, so that they come under the action of fixed cams at the proper periods in the revolution of the needle cylinder. The usual weights for drawing the fabric from the machine are dispensed with, and the fabric is received in a revolving box or basket, or its equivalent, whereby, notwithstanding the great speed at which the machine works, the breakage of needles is considerably reduced and more perfect fabric obtained.—Dec. 31, 1900.

273. Weighting warp beams. Jan. 5. J. Longton, Brinscall, near Chorley. Instead of levers and weights there is fixed on the loom end casting a cast-iron bracket. Working against this bracket is a spiral tension spring, the spring being actuated by a hand wheel or lever which is attached to a screw-threaded iron box. One end of the rod being bent or hooked to receive the rope as at present used, the rod is passed through the centre of the bracket, and held in position by the hand wheel coming in contact with the spring.—Dec. 8, 1900.

382. Cutting cloth. Jan. 6. W. A. McWilliam, 15, Rudall-crescent, Hampstead. Relates to an improved machine for cutting cloth and other materials having a vertically operating knife adjustable so that its cutting edge can be placed in more than one direction.—Dec. 31, 1900.

379. Suites of colours upon threads. Jan. 6. O. Hoffmann, Neugersdorf, Saxony. The purpose is to dye a thread of great length in different colours, and to repeat this suite of colours along the whole length of the thread, either in the same manner, inversely, partially or with small variations. The yarn to be dyed is warped in the form of a hank, the length of which corresponds to the length of the suite of colours. The so-obtained yarn hank then is dyed in different colours and afterwards is cut, according to the necessity, into threads of different lengths. In order to have a suite of colours repeated in similar manner over the whole length of the thread, the yarn hank is not cut at its extremities, but both are connected to another, or, more precisely, the one forms the continuation of the other, thus a continuous thread being formed. The connection of the extremities easily can be obtained by the warping mill generally employed in the art. A part of the yarn hank is warped in zigzag as often as the suite of colours shall be repeated.—Dec. 22, 1900.

509. Treating cops. Jan. 9. J. Major and T. J. Wood, 30, Cannon-street, Eccles. Relates principally to improvements on the apparatus for which Patent 25,525, 1898, was granted; but the improvements are also equally applicable to other similar apparatus for treating cops of spun yarn wherein each cop is individually mounted on a cop-carrier fixed at the lower end of a vertically-situated revolving spindle, and is immersed in a tank containing the dye or other liquor with which the cops are to be treated. The object of the present invention is to double the production of each machine. For this purpose the spindles are made somewhat shorter than before, so that their lower ends do not reach the level of the dye contained in the tank, and to the lower end of each spindle is affixed a perforated tube of such a diameter as to contain a cop without its touching the inside of the tube, and of such a length that the whole of the cop is carried therein well below the level of the dye or other liquor. At the lower end of this perforated tube is attached a tubular enlargement provided with a suitable number of radial openings, the interior of such enlargement being made slightly conical so as to receive a conical plug fitting closely therein, but capable of being removed and replaced in a vertical or endwise direction. This plug is made with a hollow chamber inside, in the centre of which are fixed two conical nipples, one projecting upwards and the other downwards from the plug, and from the inside of the chamber to the outside are a suitable number of passages in a tangential direction corresponding with the openings through the outside of the plug, so that when the spindle is caused to revolve rapidly this attachment at the bottom of the perforated tube acts as a centripetal pump, drawing the dye or liquid into the centre and forcing it both upwards and downwards through the two central nipples above mentioned.—Dec. 22, 1900.

670. Looms. Jan. 11. F. Zapata, 31, Homefield-road, Chiswick, London. The object is a rolling shuttle propelled by positive motion in combination or not with a weft-beating comb. The rolling shuttle is merely a cylindrical shell with a conical end for casing the pirn or cop of weft. The weft may be unwound from the centre of the cop or from the outside in the usual manner. When the cop is to be unwound from its centre it is placed within lateral springs projecting on the rim of the conical part and slid into the cylindrical shell. When the cop is to be unwound from the outside the shuttle is fitted at the other end with a disc, carrying in the centre a peg or tongue to support the cop. The disc fits into the cylindrical shell, and is kept in position by expanding springs. On the apex of the cone there is a small tube and windholes to help the sucking up of the end of weft through the tube. This shuttle does not cross the shed lengthwise like the common shuttle. As it travels by rolling, its length is parallel to the warp threads. The delivering tube approaches the fell of the fabric, allowing the thread of weft to be beaten by the teeth of a vibrating comb.—Jan. 5, 1901.

1252. Textile fabrics. Jan. 20. G. Townsend, 23, Wilton-road, Handsworth. Relates to an apparatus to be used in connection with the washing of textile fabrics, and has for its object the simplifying and expediting of the process, and consists in the employment of a frame or carrier having mounted within it a series of corrugated or other free-running rollers, upon which clothes or fabrics to be washed are rubbed backwards and forwards when in a soaped and wet condition.—Dec. 31, 1900.

1577. Stretching fabrics. Jan. 25. O. Isherwood, 6, Hardy-street, Peel Green, Patricroft. Relates to improvements in circular machines for stretching, straightening, drying or finishing woven fabrics, the object being to produce means whereby such machines are rendered more effective in action, and the fabric can be passed through and operated upon in various forms.—Jan. 5, 1901.

1595. Driving spindles. Jan. 25. J. Haslam, 327, Bury-road, Tonge, Bolton. Relates to improvements in tinned iron and other rollers, and means for coupling, supporting, and strengthening the same, and consists in providing cast-iron or other metallic bosses with circular ends with a rim to fit into the end of the tinned or other rollers to facilitate fastening by means of solder or otherwise in any convenient manner.—Dec. 8, 1900.

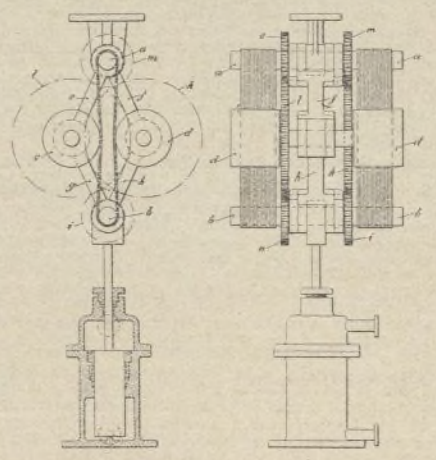
1609. Coverings for drawing rolls. Jan. 25. W. F. Reid and The Velvril Company Limited, 139, Queen Victoria-street, London. The drawing rolls used in spinning cotton and other fibres are usually covered with tubes of leather, but such tubes are expensive, and have the disadvantage of having a longitudinal seam. The leather, also, soon polishes, and is grooved by the fibres, causing alterations in the tension of the thread. Indiarubber and like compounds have been suggested, but are unsuitable, being acted upon by the grease in the cotton or other fibre. According to this invention a tube is used, preferably a seamless tube, of a mixture of nitro-cellulose with nitro-linolein or nitro-ricinolein, prepared as described in Specification No. 21,995 of 1895. A suitable mixture consists of one part by weight of nitro-celloluse to two parts of nitro-ricinolein. The tubes may be made in a variety of ways, such as by applying a solution of the mixture (in any of the usual solvents of nitro-cellulose) to a revolving mandrel, or by forcing the mixture under pressure through dies, or by cementing together the edges of a sheet.—Dec. 22, 1900.

1736. Mercerising yarns Jan. 27. W. Macconel, jun., Redholm, Netherlee, Renfrewshire. Relates to an improved apparatus for mercerising, scouring, or dyeing yarns. The apparatus consists of the usual alkali, washing, and acid tanks, which may be arranged in any suitable manner, but preferably in a line. Suspended from overhead rails above the tanks is a travelling frame, which may be travelled by means of a long screwed spindle-and-nut arrangement, or by means of an arrangement of belts and pulleys. The screwed spindle, when used, actuates a worm-wheel carried on a shaft, which latter is geared with a friction roller carried by the frame near its lower end. Pivoted to one side of the frame, preferably by means of a pin-and-eye-joint arrangement, so as to swing out horizontally, is a shaft upon which the "head" or stretching frame is carried. This frame consists of two side bars hinged at or about their mid-length so as to fold up after the manner of a foot-rule. At the lower end of the "head" frame is a cross roller, and at the upper end is a second roller. The yarn to be treated is placed on these rollers. For the purpose of holding the "head" frame rigid when straightened out, telescopic sleeves or their equivalent are provided on the side bars, and these sleeves can be moved so as to lock the joints.—Dec. 1, 1900.

1760. Coal-tar colours. Jan. 27. O. Imray, London (communicated by The Farbwerke vormals Meister, Lucius and Brüning, Hoechst a/Main). Relates to the manufacture of transformation products of dyestuffs of groups containing primary or secondary amido or hydroxy groups, by treating these dyestuffs in original form or on the fibre with salts of aromatic bases containing in the molecule one or more $(-CH_2-NH-)$ or $(-CH_2-Nalkyl-)$ groups, such salts being soluble in water.—Dec. 22, 1900.

2019. Folding cloth. Feb. 1. J. B Barton, Palace-street, Market-street, Manchester; A. Barlow, and J. Y. Ricketts. Relates to apparatus for folding layers of cloth, to effect such folding by automatic means.—Dec. 1, 1900.

2157. Mercerising yarn. Feb. 2. L. Schreiner, 75, Berlinerstrasse, Barmen-Rittershausen, Germany. Relates to a machine for acting upon yarn in hanks under tension. Fig. 1 is a side view, and Fig. 2 a transverse vertical section; *a* and *b* are two double yarn rollers, *c* and *d* two double pressing rollers. The rollers are arranged on a frame the parts of which *e*, *f*, *g*, *h* are united by suitable joints and pivots. The journal or bearing of the upper yarn roller is fixed. The displacement or motion of the lower yarn roller *b* can be effected, for example, by means of the plunger piston indicated on the drawing. The frame, by reason of its pivoted joints, communicates this movement to the pressing rollers. The latter and the lower yarn roller are driven by the



upper yarn roller *a* by means of toothed wheels *i*, *k*, *l*, *m*, *n*, *o*. The diameter and arrangement of the pressing rollers are such that the contact surfaces between the yarn and the pressing rollers are approximately the same as those between the yarn and the yarn rollers. It will be seen that when the yarn roller *b* is moved upwards, the pressing rollers *c*, *d* are moved away from the yarn, owing to the toggle-joint action of the frame; similarly, when the yarn roller *b* is moved downwards, the pressing rollers are pressed against the yarn.—Jan. 5, 1901.

2189. Weaving neckties. Feb. 3. The Bury Quilting Manufacturing Company Limited, Fern Grove Mills, Bury, and J. Redfern. The object is to weave a number of strips of tubular or double cloth of the same or various widths at one time and in one piece in a loom, with narrow strips of plain cloth (or two cloths bound together in one) in between them, so that the same can be cut or divided along the plain strips into a number of tubular widths suitable for manufacturing neckties, belts, braces, bands, tapes, and other narrow tubular articles.—Jan. 5, 1901.

2465. Drying. Feb. 7. S. C. Davidson, Sirocco Engineering Works, Belfast. Has reference more particularly to apparatus for drying yarns, but is also applicable to the drying of cloths or other fabrics, or vegetable or other substances, by subjecting them to a current of heated air propelled or drawn through or amongst same.—Jan. 5, 1901.

2522 Thread guides and snarl catchers. Feb. 8. E. Appleby, Tower-road, Aston, Warwick. Consists of improvements relating to thread guides and snarl catchers for cotton-spinning and like machinery, to provide in a simple and economical manner a more effective cutting notch upon the said articles. In the application to a combined thread guide and snarl catcher made from a properly coiled or twisted wire in the ordinary manner a chisel-shaped tool is used, so that the tool shall cut into the wire at the required position in a slanting direction. But instead of cutting a piece right away from the metal as in the ordinary method of cutting the notch or compressing the metal, and so displacing a portion of it laterally, as in another existing notch-forming method, a portion of the metal of a pointed or conical form is left.—Dec. 22, 1900.

2531. Black colouring matter. Feb. 8. C. D. Abel, London (communicated by The Actien Gesellschaft für Anilin Fabrikation, Berlin). Relates to the production of a new black colouring matter, and is based on the observation that when dinitrochloro-oxy-diphenylamine is melted with sulphur and sulphides of alkali metals, it is transformed into a sulphurised dyestuff which dyes unmordanted cotton green-black shades of great intensity.—Dec. 1, 1900.

2569. Blanketing for printing machines. Feb. 9. J. W. Hargreaves, 29, Booth-avenue, Mauldeth-road, Withington. Relates to the manufacture of a new or improved woven fabric primarily intended for use as blanketing on printing and other machines, but applicable also for other analogous purposes. The cloth is woven with a cotton warp of suitable thickness and strength according to the required strength of blanketing, and two wefts, one cotton and the other woollen, preferably employing two picks of cotton for each pick of wool, although this proportion may be varied or modified as desired. The cotton weft is interwoven to form the back, and the woollen weft the top surface or right side of the cloth. The cloth, woven of the materials described, is then subjected to any suitable known process in order to render it non-absorbent and impervious to the action of ink and colour mixtures and the like.—Dec. 15, 1900.

2383. Azo dyestuffs. Feb. 10. H. E. Newton, London (communicated by The Farbenfabriken vormals Friedrich Bayer and Co., Elberfeld). It is found that the monazo dyestuffs which can be obtained by combining diazo compounds with beta$_1$-amido-alpha$_2$-naphthol-beta$_4$-sulphonic acid, or beta$_1$-amido-alpha$_2$-naphthol-alpha$_1$-beta$_4$-disulphonic acid, or with certain derivatives of these acids, and those secondary disazo dyestuffs which contain the amidonaphtholsulphonic acids, are capable of dyeing cotton directly without the aid of mordants.—Dec. 22, 1900.

3000. Softening hemp, jute, or other fibre. Feb. 14. H. H. Benn, South Kensington (partly communicated by Mr. V. Heinik, Prerau, Moravia, Austria). Relates to a machine for softening hemp, jute, or other fibre. This machine consists of a drum in which the fibre to be softened is placed, and a freely rolling heavy body within this drum which, when the drum is caused to rotate, rolls on the, for the time being, lower side of the drum, and thus presses and softens the fibre lying on that side.—Dec. 22 1900.

3208. Dyestuffs. Feb. 17. R. B. Ransford, Upper Norwood (communicated by Leopold Cassella and Co., Frankfort-on-Main). The amidonaphtholsulpho acid R can easily and almost quantitatively be transformed into a homogeneous disulpho acid. It is found that the diazo compound of the latter reacts most energetically with amines and phenols, and that the resulting easily soluble azo dyestuffs—notwithstanding the presence of the two sulpho groups—can by the aid of chromates be fixed fast to milling.—Dec. 22, 1900.

3227. Humidifiers. Feb. 19. G. B. Pye, 63, Dewhurst-street, Blackburn. Relates to improvements in humidifiers designed for supplying warm or cold, humid or moist or dry air to the interior of weaving sheds, the object being to construct an efficient and inexpensive apparatus and one which is complete in itself, or the whole or part can be used in combination with any of the well-known "distributors." The invention consists of a trough or series of troughs filled with water, which by capillary attraction is distributed over a fabric through which the air is drawn by means of a fan and deflected by deflecting plates or distributed by means of pipes over the shed or building. The troughs are provided with steampipes or a coil so that the water may be heated and the humid air consequently warmed, and also to prevent the water in the troughs freezing in frosty weather.—Dec. 22, 1900.

3466. Dress goods. Feb. 22. R. Turner, 111, Horton-lane, Bradford. Relates to a new means of obtaining a plush effect in crepons and similar mercerised dress goods. The mohair or other fibre floats are cut across the middle or other suitable part, so that when mercerised the cut ends project more or less in plush-like form.—Dec. 22, 1900.

3467. Winding yarn. Feb. 22. J. Fraser, P. Fraser, and N. Fraser, Westburn Foundry, Arbroath. Relates to winding machinery in which yarn or thread passes from a bobbin to a spindle on which it is to be wound, the yarn on the bobbin being acted on by a drag lever as it unwinds, and the object is to provide improved mechanism whereby variation in pressure of the drag lever as the quantity of yarn on the bobbin diminishes is obtained in a satisfactory and reliable manner. The drag lever is centred on the framing of the machine so that one end or arm bears as usual on the circumference of the yarn on the bobbin. The other arm of this lever extends out and is acted on by what may be called a rolling weight, the weight being circular and centred in the forked lower end of a lever which is pivoted at its upper end to the framing. When the bobbin is full of yarn the arm of the drag lever on which the weight acts will be in such position that the lever carrying the weight will be turned to its outermost position so that it will act on the outer part of the drag lever and exert the greatest leverage. As the diameter of the yarn on the bobbin decreases, the arm of the drag lever on which the weight acts will become gradually depressed, and the weight will roll along the lever towards the fulcrum, so as to act with a leverage gradually diminishing until the bobbin becomes empty.—Dec. 22, 1900.

3301. Improved cloth. Feb. 23. J. A. Penny, 66, Royal Exchange, Manchester. Cotton and linen cloths with a strong, closely-woven twill or other face, such as are known as drills or serges, have hitherto been made with a hard, harsh, and practically non-absorbent back. The invention is designed to provide a cloth suitable for soldiers' clothes, overcoats, and other garments. It consists essentially of a cotton or linen drill or serge cloth with a strong, hard, and closely-woven twill or other face with a soft absorbent back made from worsted or other soft woollen yarn. The cotton or linen threads are woven into the cloth so as to greatly predominate on the face, and present the ordinary close appearance of drill or serge suitable for chemically waterproofing, and the back presents a more loose, soft, and absorbent appearance.—Dec. 8, 1900.

3315. Azo colouring matters Feb. 23. H. E. Newton, London (communicated by The Farbenfabriken vormals F. Bayer and Co., Elberfeld). Relates to the preparation of a new group of urea, or thio-urea, derivatives. In order to produce the urea derivatives, phosgene ($COCl_2$) is caused to act, with or without suitable condensing agents, or such amidonaphthols, amidonaphtholsulphonic acids, amidonaphtholcarbonic acids, or the like, which do not contain the amido and the hydroxy group, either in the so-called ortho position or in the so-called peri-position. The corresponding thio-urea derivatives can be obtained either by acting in an analogous manner with thio-phosgene ($CSCl_2$) on the amidonaphthol compounds, or by subjecting these bodies to the action of carbon bisulphide (CS_2) in an alkaline solution.—Dec. 22, 1900.

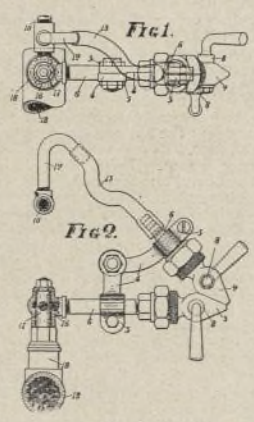
3373. Trisazo colouring matters. Feb. 24. H. E. Newton, London (communicated by The Farbenfabriken vormals F. Bayer and Co., Elberfeld). Relates to a new and useful process for the production of valuable trisazo colouring matters. The new process consists in first combining a diazo derivative, such as diazobenzene, paradiazophenol, paradiazosalicylic acid, monoacidylamidoparadiazobenzene, or the like, with one molecule of Clève's alphanaphthylaminebetasulphonic acids alpha$_1$-beta$_2$, or alpha$_1$-beta$_4$; secondly, re-diazotising the resulting amidoazo compound, and combining the diazo derivatives thus obtained with a second molecule of one of Clève's acids; finally, again diazotising the resulting amidodiazo dyestuffs, and coupling the diazo compounds thus produced with beta$_1$-amido-alpha$_2$-naphthol-beta$_4$-sulphonic acid, or with alkyl or acidyl derivatives thereof. In case the first or the last component causes a sufficient solubility of the dyestuff, the two molecules of Clève's acids can also be replaced once or twice by alphanaphthylamine.—Dec. 22, 1900.

3971. Tension devices for shuttles. March 1. F. S. Hamel, Bole Hall, Tamworth, and J. R. Vellacott. Relates to shuttles for looms, and provides such shuttles with devices whereby tension is exerted upon the supply of thread or weft carried by and supplied from the bobbin or spool, in such manner that cylindrical and long bobbins or spools carrying a large supply of thread or weft can be used with the shuttles, and the proper tension be maintained throughout the whole of the unwinding of the bobbin or spool, and in such a manner that the liability of breaking of the thread or weft is greatly lessened.—Jan. 5, 1901.

4023. Picking motion. March 2. E. Chadwick, Bolton (communicated by G. Baines, Daneelovka, Moscow). Refers to improvements in the picking motion of underpick looms, and is designed to produce a certain and positive action for each pick. On each frame side of the loom is a suitable fixing carrying or supporting a rocking or oscillating shaft, to which is attached a stand for supporting and carrying the picking wing which is operated by the picking lever of the loom. To the picking wing is attached the picking shaft or peg employed for throwing the shuttle through the shed. To the stand is secured a bush on which the picking wing works when operated by the picking lever. The stand employed for supporting or carrying the picking wing is provided with an arm or projection to which is secured a bracket provided with a boss in which is disposed a centre with a buffer end, against which the picking shaft or peg operates when the picking wing is disengaged from the picking lever. Between the bossed end of the bracket and the centre with the buffer end is disposed a spiral spring, the tension of which may be regulated by an adjustable washer and set screw.—Dec. 22, 1900.

4024. Guiding yarn. March 2. M. Musgrave and G. A. Barnes, 583, Chorley Old-road, Smithills, Bolton. Refers to improvements in the transverse motion for guiding yarn or other fibrous materials to the rollers employed in self-acting mules, twiners, and similar machines employed in the preparation, spinning, and doubling of cotton and other fibrous materials, and is designed to prevent the cutting of the covered rollers, by which the production of uneven yarn will be reduced to a minimum, at the same time prolonging the life of covered rollers. This is carried into effect by mounting on the roller beam, or other convenient part of the machine, a stand to which is secured a shaft on which is mounted a boss provided with a worm-wheel, which is operated by a worm from the roller shaft. The opposite end of the boss is provided with a stud or centre, on which is mounted a slotted guide in which operates a pin secured to a disc on the end of the boss On the stud is disposed a spur pinion gearing with a spur wheel mounted on a pin secured to the stand on the roller beam. On the face of the spur wheel is attached a slotted plate, in which slot is disposed an adjustable pin or centre attached to a rod or arm connecting the same with the sliding yarn-guide bar. The adjustable pin in the slot may be set to travel the yarn guides to suit any length of covered roller, and its action is to produce a variable transverse motion to prevent an undue pause or dwell during the reversible actions of the yarn guides.—Dec. 15, 1900.

4721. Air humidifying. March 13. J. V. Musgrave, 33, Legrams-terrace, Listerhills, Bradford. Relates to improvements in apparatus for humidifying the air in factories, and its object is to provide simple and efficient apparatus. A combined air jet and water jet is used, with the water jet above the air jet, and fed with water by static pressure. The air jet is fed with air under considerable pressure, and opens close to the water jet, and lies at such an angle thereto that the water passing from the water jet is reduced to an imponderable spray and widely diffused by the force of the current. The two jets or nozzles may be made in one piece or be separately made and preferably united in any convenient way, and they may be each fitted with a stop valve. Fig. 1 is a plan, and Fig. 2 is a side view of the same partly in section. The water nozzle 2 is connected to the air nozzle 3 by the connecting piece 4, the ends 5 of which are clipped round the shank 6 of the nozzles. The nozzles are both fitted with stop taps 8. The water pipe 10 is fed with water under sufficient pressure to cause it to flow up



the branch pipe 12 and down the indiarubber tube or flexible pipe 13, connecting 12 to the shank 6 of the nozzle 2. The branch pipe 12 is passed up in a vertical direction for a little way as shown, in order to reduce the possibility of particles of solid matter reaching and choking the nozzle2. The shank 6 of the air nozzle 3 is connected to the swivel socket 16 fitting the hollow conical plug 17, secured to the air pipe 18, fed with air under suitable pressure. The swivel socket 16 and the flexible connection 13 permit of the nozzles being swung round so as to spray in any direction. For convenience of illustration the pipe 12 is not shown immediately over the air supply plug 17, but the water can be supplied by a plug and socket similar to 17 and 16 if the two plugs are fixed axially in line.—Jan. 5, 1901.

4792. Colouring matters. March 13. A. G. Green, 13, King's Drive, Heaton Moor, near Stockport; A. Meyenberg, and The Clayton Aniline Company Limited. No process has been known by which it has been possible to prepare the mono or dithiosulphonic acids of aromatic monamines or meta-diamines. Such a process, which is capable of very wide general application, forms the subject matter of the present invention.—Dec. 31, 1900.

5113. Reading-in the cards for jacquard looms. March 17. C. Vorwerk, 23, Mühlenweg, Barmen. Relates to a process of reading-in jacquard cards, wherein the lifting wires or hooks of the jacquard machine actuate the punches of the perforating machine.—Dec. 22, 1900.

5409. Scouring or otherwise treating piece goods. March 22. C. L. Jackson, Wharf Foundry, Bolton, and E. W. Hunt. Relates to improvements in the method of scouring, bleaching, dyeing, mercerising, or otherwise treating piece goods in the open state, such as drills, sateens, velvets, pile goods, and other woven fabrics, in an open or expanded condition, and by a simple and economical process which obviates the creases caused by running fabrics in the rope form, and prevents the selvages from curling up and creasing, such creases subsequently showing and marking the goods when dyed in light and delicate shades.—Jan. 5, 1901.

10,005. Clips for tentering machines. May 31. W. Birtwistle, 27, Barnfield-street, Accrington. Relates to improvements in clips or chains for gripping and holding the selvages of piece goods when passing through tentering machines, the object of the invention being to reduce the cost of manufacture of the clips, and at the same time to increase their efficiency and durability. The invention consists of a swinging jaw or clip provided with a wheel or runner, which effectually prevents the clip holding the cloth or piece until such time as it has been delivered from the clip, whereon the latter grips and tightly holds the edge or selvage. The swinging jaw or clip may be opened by a cam or inclined face acting either on the jaw or on a tail piece attached thereto.—Dec. 15, 1900.

10,015. Humidifying and ventilating apparatus. May 31. T. Walton and J. H. Walton, 25, Talbot-street, Rochdale. Relates to improved apparatus for producing pure steam from pure water for the purpose of humidifying the air in weaving sheds and like places with the object of avoiding the injurious effects on the workers resulting from the air being tainted when humidified by steam arising from water that is obtained in the ordinary way from boilers which may have been supplied with water from impure sources.—Jan. 5, 1901.

11,055. Washing wool. June 18. E Maertens, Providence, Rhode Island, U.S.A. Relates to improvements in machines for washing, rinsing, or chemically treating wool and other animal fibres, having superposed chutes or troughs through which the wool is carried by means which is supplied to them by a pump, and also to improvements in the means employed for carrying or lifting the wool from the chutes or troughs or from a wash bowl into the squeezing or pressing rollers of wool-washing machines.—Dec. 22, 1900.

11,172. Ticket for textiles June 20. L. T. Edminson, G. B. Blair, and J. T. Blair, 18, Aytoun-street, Manchester, and W. M. Reekie Is an arrangement whereby the "drop" or "tag" ticket that is attached to textiles may also serve as a "style" ticket. For use on textile goods the lower half of the ticket which becomes the face may bear any design or trade mark it is permissible to use. The upper half (which becomes the back when fastened down) will be cut, leaving an open square, circle, oval, oblong, diamond, or other shape that enables the fabric to be seen to the best advantage.—Dec. 1, 1900.

13,664. New azo colouring matters. July 30. J. Y. Johnson, London (communicated by The Badische Anilin and Soda Fabrik, of Ludwigshafen-on-Rhine). When aromatic amines are suitably treated with sulphites, sulphurous acid esters of phenols can be obtained. In the same way, if diamines be subjected to treatment with sulphites, sulphurous acid esters of amidophenols are obtained, and these possess the property of yielding diazo compounds upon treatment with nitrite. By the combination of these new diazo compounds with suitable components an entirely new class of azo colouring matters is obtained. The members of this new class of azo dyes are characterised by possessing a sulphurous acid phenol ester group. The presence of this group is of importance in that, among other things, it renders the colouring matters more readily soluble in water as compared with the corresponding products obtained from the amidophenol itself, and further, the sulphurous acid residue can be split off after the dyeing operation has been completed, so that, after the dye is on the fibre, it is rendered less soluble, and it is possible, by suitably choosing the components, to obtain dyes possessing ready solubility, which, after dyeing, can be rendered less soluble, so that the shades obtained are characterised by a high degree of fastness against milling, and against the action of soap The sulphurous acid residue can be split off from the azo colouring matters in their solutions similar to the manner in which it is split off from the phenols and amidophenols themselves—namely, by treatment with alkalies, or with acids, or with a suitable oxidising agent, such as certain cupric salts, especially sodium-cupric-glycerate; but if it be desired to split off the sulphurous acid residue after the dye has been taken up by the fibre, then it has been found that neither sodium-cupric-glycerate, cupric sulphate, ferric chloride, nor bichromates, in acetic or mineral acid solution, produce a satisfactory effect, for these reagents hardly affect the colourations at all, or the effect is not sufficiently complete. Excellent results are obtained by the use of cupric acetate, which appears not only to split off the sulphurous acid residue, but also, in some cases, to lead to further lake formation, or other change. Jan. 5, 1901.

13,713. Knitting machines. July 31. H. H. Lake, London (communicated by the Standard Machine Company, 508, Ludlow-street, Philadelphia, U.S.A.). Relates to an improvement in that class of knitting machines known as straight knitting machines of the class generally known as the Lamb or double-bank type, and among other things to cause it to automatically widen the goods in a particular manner.—Jan. 5, 1901.

14,076. Automatic loom. Aug. 7. W. H. Baker, Central Falls, Providence, U.S.A., and F. E. Kip. Relates to weft or filling changing or supplying mechanism for looms, and comprehends improvements in the magazine, and in mechanical means, controlled by the presence or absence of weft or filling in the weft carrier, and including a feeler and indicator, for setting in motion at proper times the weft supplying mechanism.—Jan. 5, 1901.

14,079. Automatic loom. Aug. 7. W. H. Baker and F. E. Kip, Montclair, New Jersey. Relates to double-shuttle looms, and has for its object to provide means for supplying weft to the shuttles or weft-carriers of the loom as required through mechanism automatically controlled by exhaustion-indicating devices made inoperative and operative respectively by the presence or absence of weft or filling in the active shuttles.—Dec. 22, 1900.

15,732. Automatically changing shuttles April 5. H. I. Harriman, Brooklyn, New York, U.S.A. The main object is to produce an automatic weft-replenishing loom in which the operations that are incident to replenishment shall be performed without the suddenness and shock that are characteristic of many of the forms of weft-replenishing looms heretofore devised, and also without arrest of the loom or modification of the driving thereof When the weft-indicator mechanism acts to indicate that the working weft supply is in the predetermined condition calling for replenishment thereof, the picking is arrested, the letting-off of the warps and the taking-up of the woven cloth are arrested, and then, while the loom continues to run at normal unabated speed, the operations essential to weft replenishment are caused to be performed in the required order, these operations being divided up among a considerable number of revolutions of the crankshaft of the loom and reciprocations of the lay; that is to say, through more than two revolutions of the crankshaft and reciprocations of the lay, in order that precipitate and harsh action with all its attendant liability to disarrangement, breakage, etc., may be avoided.—Jan. 5, 1901.

16,243. Winding cops. Sept. 12 H. Bourry, Cham, Elsass, Germany. Relates to a winding system for ring spinners and ring twisters, and effects the winding in such a manner that cops capable of resistance without central tubes can be spun on them. In the methods of winding hitherto known all the layers of the body of the cop are of equal length, and approximately parallel to each other. In order to make cops formed in this manner resistant, they must be spun on a tube, as otherwise they would yield and break at the slightest strain. In order to obviate this drawback, at regular intervals, or repeated as desired, longer layers are arranged in the cop in which the parallels overlap and prevent the cop from breaking up, even when it is wound on the bare spindle.—Dec 31, 1900

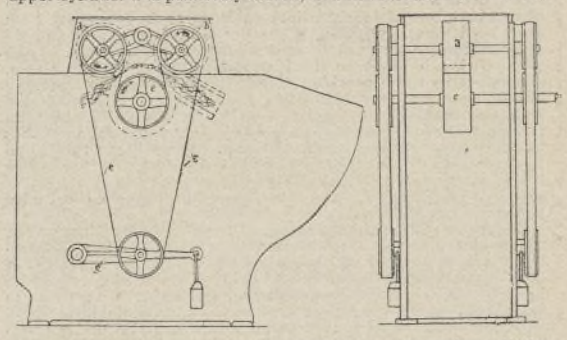
17,060. Drawing. Sept. 25. J. A. A. Imbs, 20, Rue Greuze, Paris. Relates to improvements in drawing mechanism for use in the preparation of cotton and other fibres. When it is desired to unite in one drawing head a number of slivers coming from a corresponding number of cans the ground space occupied by these cans is very considerable, and a corresponding distance has to be traversed by the slivers in tension before they can reach the first part of the apparatus which will hold them, and this results in frequent breaks, loss in production, and serious interference in regularity of work, even if the machine be provided with a stop motion brought into action by the breaking of a sliver To avoid these objections there is provided behind the drawing head a polished drawing table, which is made of a breadth and length according to the number of slivers and cans employed.—Dec. 31, 1900.

17,134. Roving cans. Sept. 26. G. S. Perkins, 12, Gove-street, Medford, Massachusetts, U.S.A. Relates to improvements in roving cans or like receptacles, and consists of an improved metal re-enforcing band secured to the upper or open end of such roving can.—Jan. 5, 1901.

17,480. Treating fibrous materials. Oct. 2. J. F. Lester, 7, Whitehall-street, Atlanta, U.S.A. Relates to an apparatus for treating fibrous materials: and it consists generally of the novel construction and arrangement of the various parts as will be hereinafter more fully described and particularly set out in the claims. The prime object is to produce an apparatus by means of which various cleaning fluids may be successfully applied to the material being treated, while under pressure, and, at the same time, under agitation or circulation, if desired, whereby the fluids are more rapidly and evenly forced into the tissues or textures of the material. Another object is to so construct the apparatus that the process of cleaning may be accomplished without handling or removing the materials being treated from the chamber into which they are placed.—Dec. 1, 1900.

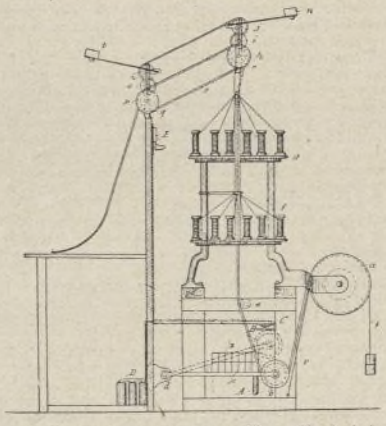
17,863. Cotton harvesting machine. Oct. 8. N. Bowditch, 297, New York-street, Aurora, Illinois. Relates to cotton harvesting machines, and has for its object to provide a new and improved machine particularly adapted to gather cotton and similar material.—Dec. 22, 1900.

18,763. Fulling machines. Oct. 20. L. P. Hemmer, Aix-la-Chapelle, Germany. In fulling machines constructed according to the Lacroix system, in which two or three upper cylinders press on a cylinder below, only the rear upper cylinder, which forwards the material under treatment into the exit conduit, is driven by the under cylinder, usually by means of toothed gearing. The upper cylinder in front acts as a friction roller on the work, and its rotatory motion is effected solely by the friction generated between it and the material. This cylinder chiefly serves the purpose of spreading out the material on the under cylinder, with a view of forwarding the work more easily than could be done by means of one upper cylinder only. According to the present invention, which is illustrated in the accompanying drawings, the front upper cylinder *a* is positively driven, in a similar manner as in the



case of the rear upper cylinder *b*, directly from the under cylinder *c* by means of a belt *e*, which drives the cylinder simultaneously. The upper cylinders *a* and *b* are also preferably given a slightly different angular speed relatively to that of the under cylinder *c*, by making a slight difference in the dimensions of the belt pulleys, or of the diameter of the upper cylinder, as compared with the belt pulley or of the diameter of the under cylinder. By this arrangement the following advantages are obtained:—(1.) A regular and perfectly reliable forward movement of the material between the cylinders and in the machine. (2.) A considerably increased fulling effect as regards quantity. (3.) A superior quality as regards the work—*i.e.*, a denser felting produced by the increased friction in consequence of the difference in speed of the upper cylinders *a* and *b* and the lower cylinder *c*. The belt *e* passes from the belt pulley of the under cylinder *c* over similar belt pulleys of each of the upper cylinders *a* and *b*, as well as round a tension roller *f*, carried on a lever *g*, drawn down at one end by a weight or spring, which lever and tension roller rise or sink according as the material treated passes in a thicker or thinner layer between the upper and lower cylinders, so that the upper cylinders rise or fall correspondingly. The effect of this arrangement is that the belt always works under even tension.—Dec. 22, 1900.

19,096. Braiding machines. Oct. 25. M. B. Ryan, 12, Erfst-street, Cologne. Relates to improvements in braiding machines, especially such machines as serve for braiding cotton, wool, or the like around rubber strings. *a* is the drum upon which the elastic rubber strings are rolled. From this drum the rubber goes around the roll *b*, which is fixed to a lever *c* fulcrumed at *d*. From there the rubber runs over a roll *e* and then passes into the braiding machines proper *f* and *g*. After leaving these machines the rubber passes around rollers *h*, *i*, *j*. After leaving the roll *j* the elastic cord passes around the rolls *n*, *o*, *p*, which are driven by the



pulleys *q* and *r* and a leather belt *s*. The rolls *h*, *i*, *j*, *n*, *o*, *p* are pressed together by means of weights *t* and *u*. In order to regulate the revolutions of the drum *a*—that is to say, to regulate the expansion of the rubber strings at the time when they enter into the braiding machine,—two round leather belts *v* are provided, which are fixed to the bottom of the machine and pass around grooves *w* provided in the discs *x* fixed to both sides of the drum *a*. The leather belts *v* are provided with counterweights *y*, so that by augmenting these weights the friction between the leather belts and the grooves *w* can be augmented, whereby a greater power is needed for driving the drum *a*. The roll *b* fixed to the lever *c* is for the purpose of controlling the movement of the drum *a*. For this purpose the lever *c* is provided with weights *z*. In case the drum *a* rotates too quickly on account of the friction of the belts *v* being too small, the lever *c* will sink until the rod A touches the bottom, when the downward pull of the weights *z* will cease, so that the pull will diminish, and the drum *a* will rotate more slowly. In case the friction of the belts *v* is excessive, so that there is danger of the rubber being torn or ruptured, the lever *c* will rise to the position shown by the dotted lines in the drawing In this position the roll *b* touches the small board B, which is pressed against an electrical button C, by means of which the circuit of an electrical battery D is closed and conveyed to and operates the bell E. The ringing of the bell E immediately shows to the workman in charge of the machine that there is danger of tearing or rupturing of the rubber strings, and that the weights *y* are too heavy. By this arrangement the pull of the rubber is always the same, and accordingly the thickness of the elastic band to be manufactured always remains uniform.—Dec. 15, 1900.

19,808. Spindles for plaiting. Nov. 5 B. White, 44, Dacre Hill, Rock Ferry, Liverpool. Relates to improvements in spindles used in plaiting machines, and has particular reference to spindles used in three-plait plaiting machines used for the manufacture of wicks for candles and for other purposes.—Dec. 8, 1900.

20,620. Cloth-measuring machines. Nov. 15. B. Anderson, 5, Michigan-street, Boardman, North Carolina, U.S.A. Relates to cloth winding and measuring machines, the object of the invention being to provide a compact machine that will take up little room and which may be quickly and easily adjusted and operated; to provide a machine wherein the parts will automatically adjust themselves to correspond to varying thicknesses of cloth to be wound and measured and in which the first wrap of cloth on the bolt board will be straight and evenly made; to provide for quickly adjusting the parts to secure the proper strain upon different cloths and to maintain such strain constant during operation to produce a tight and evenly-wound bolt, an additional object being to so construct and arrange the counting mechanism that the dial thereof will be in plain view of the operator, and may be readily returned to zero after each bolt has been wound.—Dec. 22, 1900.