THE

TEXTILE MANUFACTURER:

WITH WHICH IS INCORPORATED

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

No. 313.—Vol. XXVII. JANUARY 15, 1901. Price One Shilling.

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NOTES OF THE MONTH.

The Textile Industries in 1900.

THE most noticeable feature of the past year, as regards raw cotton, was the uncertainty of an adequate supply. Fears of a shortage drove prices up in an unwarrantable degree, accelerated by rumours of frosts and of small crop estimates. The crisis was met by the Federation of Cotton Spinners' Associations, who agreed to stop all purchases for a short time. This brought prices to a reasonable level, although it necessitated all spinners without a stock of raw cotton closing their works for periods varying between two and four weeks. The yarn trade was unsettled throughout the year by the fluctuations and uncertain price of raw material, and most buyers took only enough to cover themselves. Generally speaking, the piece trade was satisfactory throughout; at any rate, it began the year well, and closed it with most manufacturers well supplied with orders and contracts. The wool trade was in a very depressed condition, prices declining throughout the year. This was the result of over-speculation and production during the preceding year, markets being gutted and fashions changing owing to the prohibitive prices. The decline took place in the face of a phenomenal shortage from almost all sources of supply, a fact which throws some light upon the feverish speculation during 1899. The fall of prices necessarily affected the yarn trade, which was very quiet in every branch with the exception of fine mohairs. The exports of yarn also showed greatly reduced quantities. Manufacturers of worsted coatings suffered greatly during the year, but dress-goods manufacturers had a steady run, chiefly on cloths containing mercerised cotton, and on other bright cloths. The woollen trade was in a similar condition to the worsted, but shoddies and cheap goods were in good demand. The prices were cut, but makers kept busy, and in some cases worked overtime. The blanket trade of Heckmondwike was busy in its shipping branches, but quiet as regards the home trade. There was also a steady demand for Brussels and Kidderminster carpets in that district. The making of Axminster carpets progressed throughout the year, not only in Worcestershire, but in the West of Scotland. There was a slight falling-off in the early part of the year, chiefly owing to the war in South Africa, but the Canadian inquiry was larger. All makers are now busy, and substantial orders from South America gave a year-end spurt to the industry. The lace trade of Nottingham was fairly busy throughout, and in some branches goods were in very fair demand. The cotton laces were, however, in greater requisition than those made of silk yarns. The jute trade of Dundee was specially profitable throughout the year, but the linen trade was unsettled, owing to the violent fluctuations of prices. The silk trade of Macclesfield saw many fluctuations during the year, but still her manufacturers persevere, if not in a very energetic manner. The ribbon trade continued on its downward course, and the number of manufacturers are again fewer than at the beginning of the year. The hosiery trade of Leicester derived advantages from the great demand for articles of clothing for the South African troops. The extra work on these goods kept a large section of machinery running for more than half the year, thus preventing ordinary goods being put into stock. This was fortunate, for notwithstanding the mild weather at the opening of winter there was a steady demand for lamb's-wool underclothing, cardigan jackets, and similar articles. The black hosiery trade was dull, being seriously affected by wool values. Cotton hosiery decreased in amount, especially during the time that cotton was dear and wool cheap.

Mill Engine Fly-wheel Accidents.

ALTHOUGH we occasionally have to record a bad case of fly-wheel failure, millowners in this country may congratulate themselves on the comparative immunity from such accidents which they enjoy, for, compared with the experiences of American millowners, their lot in this respect is indeed a happy one. At startlingly frequent intervals American engine fly-wheels go to pieces, and invariably with disastrous results, wrecking the buildings and machinery and killing or maiming the operatives. A recent occurrence of the kind, which is described as much less serious than was expected, took place at the Atlantic Cotton Mills, the failure being of the belt-driving fly-wheel of a 350 I.H.P. Corliss engine. The wheel was 22ft. in diameter with a 38in. face, and formed of eight segments bolted together in the usual manner. The wheel failed early in the morning, the pieces flying in all directions, part going into the engine-room, destroying the condensing apparatus. Pieces of rim and spokes tore up through the ceiling of the engine-room, opened a gap 6ft. high and half as broad in a 12in. brick wall, and flew along the creel and warp room for a distance of 100ft. or more. The flying brick and mortar caused considerable damage, and was probably responsible for many of the minor injuries sustained. Eight creels were demolished, and one girl, a creel tenter, was killed. Two others were badly injured by jumping or falling from a fire escape. A large piece of one of the spokes, with a small section of rim attached, lay near the spot where the girl was killed, some 50ft. from the engine; a large dent in the beam above shows where the piece struck and was deflected downward from its course. Other large pieces of various shapes, and upwards of 200lb. in weight, were strewn the entire length of the creel and warp room, while many smaller pieces were scattered about promiscuously. A square section of rim, of full width, showed one of the bolted flanges to be intact, the break having occurred on either side, some distance from the flange. Another piece, comprising nearly an entire spoke, and certainly not less than 600lb. in weight, struck a 10 by 14in. beam in the ceiling of the engine-room and dropped into the pit. The beam was cracked, but not broken, the flooring above preventing a complete fracture. The damage in the lower weave-room was caused chiefly by the broken belt, which probably slapped about freely for a time. A number of looms were more or less dislodged from their usual positions; one stood on end, as if placed carefully in that position. As but few pieces of the wheel, and of no considerable size, flew in this direction, it seems probable that the broken belt did the damage before it came to rest. Finally, to complete the disaster, the sprinkler pipes in the engine and lower weave rooms were broken, and a large quantity of water thoroughly soaked the débris before the supply was cut off. In this, as in many similar instances, the cause of rupture cannot be ascertained; certainly the speed of the rim—4146ft. per minute—was by no means excessive. Against the probability of the failure being due to defective construction, it is urged that the wheel had been so long in service that any such cause would have long since resulted in rupture. Those who have followed the reports of engine breakdowns in this country, and thus have some notion of the experiences of Mr. Michael Longridge, will, however, not attach much weight to such a contention. The fatigue which the various elements of a mill engine will endure before failure occurs is in some cases remarkable, and it is by no means inconceivable that a slight initial defect in the wheel rim in question has, during years of service, gradually extended until failure occurred as described.

The Operative of the Future.

THE present is a period when everybody is looking back and complimenting himself upon what his forefathers achieved in the earlier part of the last century. The work was theirs, the benefit is ours, and hence there is a tendency to forget the future in the glorification of the past. In the earlier part of the nineteenth century the English workman was the finest in the world. The birth of the steam engine, the power-loom, spinning machinery, and other mechanical devices had given our countrymen a knowledge of things almost unknown in other countries. Contact with the various machines gave a certain amount of knowledge, and the freedom from monopolies gave everyone the opportunity to rise. Now, however, every country knows what we know; details of our latest inventions are immediately mailed, if not telegraphed, to the farthest parts of the earth, and almost every improvement is used for the advantage of our competitors. In the textile industries we still hold a certain position. Our operatives, brought up near the mill, in close contact with mill life, acquire an early knowledge of the routine of a factory. The art of weaving (for it is an art, if properly studied) comes naturally to a child born of generations of weavers; the deftness in tenting and piecing requires little training in a young person whose ancestors have successively followed that work, and in the course of both nature and surroundings English operatives have a great advantage over their foreign competitors. This advantage, however, can scarcely be claimed over the United States, for the people of that country are the same as our own, having the same ancestors, the same temperament, and having in many cases been born on this side of the Atlantic. The advantage over other countries may be slight, but it is decidedly evident at the present time, although a couple of generations will probably wipe that out and place us on the same footing as those who are now rapidly developing their textile industries. Our supremacy depends very largely upon the operative. A few years ago it was said that our coalfields were our chief support, but that theory has been swept away by the discovery of immense coalfields in other countries, the harnessing of waterfalls for cheap power, and the growing use of mineral oils. In the way of natural conditions, humidity of atmosphere, evenness of temperature, and other advantages, science and mechanics have provided means for ready substitutes. In every way are our old advantages being supplanted, and we can only depend upon the main factors of every industry—the workpeople. Unfortunately these are being sadly neglected, and what is far worse, are learning to neglect themselves. We have technical schools for the managers and designers, and even for the book-keepers and clerks, but nothing of value for the operative. Good managers are necessary, and good designers are essential, but they are small in number compared with the hundreds of thousands who tend our machines. It is true that the various technical schools open their doors to them in the evenings; if they have aspirations towards a managership or of eventually being a designer, they go, acquire a few rudimentary details of what is of little use to them, get what is sufficient to make them dissatisfied for the rest of their lives, and ignorantly critical of what goes on around them. It is a pity some preparatory course cannot be taken by the youth of our operative population. The extension of the time of attendance at school might readily be taken as an opportunity for an introduction, for a year or so, of subjects treating on the machinery and materials used in the district, giving the children an insight into the great industrial scheme of which they will soon become a part. Bad work is often the cause of carelessness and laziness, but a great amount is caused by ignorance, and this might, in large part, be avoided. The suggestion is more in place at the present time than at any during the past century. Never was the textile industry of England so threatened as now. The storm-cloud has not burst, but the large mills being rapidly pushed forward in every part of the world, fitted with the best machinery obtainable, must affect us sooner or later. Then, again, it is the rising generation of operatives upon whom we depend. These are likely to become spoiled. They spend, or rather waste, as much time studying trade-union questions as would make them intelligent citizens and workpeople, and they cripple the millowner not a little by opposition which a little more knowledge would show to be frivolous. If the trade unions could obtain powers to convert their energy to the elevating and manual training of the operatives, life would eventually run much easier both for themselves and the masters. Trade unions arose of necessity; their existence will be requisite as long as man is human; but they should be an elevating, not a degrading, power, and undoubtedly they have great opportunities for the elevation of the operative in other ways than through his pocket.

Electric Driving.

SO immense are the advances which have been made during the last few years in the practical application of electricity, and especially in its adaptation to the transmission of power, that there is a risk of the capabilities of the newer agency being over-estimated. Particularly is this so in the suggested substitution of electric transmission for ropes or wheel gear in existing cotton and other mills. As readers who are interested will know, we have consistently advocated the retention of the older methods of driving as best suited to the present requirements of the average millowner in this country. We are glad to see our opinion is shared even by engineers who are interested in the application of electric driving. Thus Mr. R. O. Ritchie, of Messrs. Greenwood and Batley, Leeds, in a recent address on the subject to the Yorkshire College Textile Society, stated that in this country "electrical driving for textile factories was not of any value at the present moment unless the electricity was brought from a considerable distance, and the nearer machinery approached the class of that used in textile factories the less was the economy obtained from using electric energy. In many works the loss on steam power was 60 or 70 per cent., and in most it was 50 per cent. That was where the value of electricity came in; but in textile machinery there was exceedingly little waste of energy, and consequently very little scope for the introduction of electric machinery at the present time." Again, in the course of his lecture at the Bradford Textile Society on "Economics in Relation to the Textile Industry," Mr. D. D. Marshall, referring to the careful comparison he had made of the cost of various methods of transmitting power, stated that under present conditions steam power was about 20 per cent. cheaper than electric power. It will be understood, however, that these remarks pertain to *existing* conditions, and will doubtless require considerable modification in the face of twentieth-century progress. The question will be particularly affected by the carrying out of the various schemes for distributing electric power over large manufacturing areas, and notwithstanding the strenuous opposition of the municipal authorities interested we believe the next few years will witness great advances in this direction. With current at a cheap rate brought to his own door, the millowner will require to reconsider his position, more especially as that while the constant advances which are being made in the electrical generation and transmission of power will tend to cheapen the supply, the economies possible to effect in isolated steam plants seem to have almost reached their limit. Freedom from costly breakdowns and their attendant losses will also be a factor to be considered. Electric power in cotton mills offers many other incidental advantages, but, as we have said, its adoption can only be justified when power can be purchased at a sufficiently cheap rate to warrant millowners in abandoning their existing steam plant. There is little doubt that this position of affairs will be reached sooner or later, but the time is not by any means as near at hand as some electrical enthusiasts proclaim.

The Outlook in the Cotton Trade.

A FEW years ago those who had the temerity to suggest that we were losing our hold upon the cotton trade were viewed as pessimists, easily alarmed at a temporary trade depression, while those who ventured the opinion that the leading American and Continental builders of engines and machinery had little to learn from makers in this country were charged with want of patriotism. But just as a visit to the Paris Exhibition has changed the opinion of most of the quidnuncs on the latter topic, so also have many of the leading manufacturers in the cotton trade altered their tone, and now evidently regard the future of the industry with a considerable degree of concern. As a case in point we need only refer to the recent speech of Mr. Alderman T. Thornber, the president of the Burnley Employers' Association, who, commenting upon the gradually-lessening proportion of the American cotton crop which found its way into this country, referred to the great exportation of spinning and weaving machinery which had taken place during recent years, and which was now apparently having an effect upon Lancashire trade. Mr. Thornber's view was that the trade in the plainest makes would gradually depart from us, or at all events these sorts would probably be the first to go, and the question was, How were they going to meet this? They were endeavouring to establish a good system of technical training in Burnley and that would be a very useful thing; but the teaching of weavers was in a very primitive stage. He did not know whether learners ought to be called upon to pay a premium, but the teaching ought to be invested in certain expert weavers who had the knowledge and the knack of teaching weavers. But seeing that the plain makes of cloth would doubtless be the first taken from this country, it behoved them to give every attention to technical training and the teaching of weavers, and in general to put their house in order. Mr. Thornber also questioned whether operatives and managers took the same interest in their work as they did ten or fifteen years ago, commented upon the tendency of the times in fostering the belief that the less work a man did the better wages he could get, and finally stated that as we had obtained our position in trade by hard work and continuous effort, so also we could only retain it by working on the same lines. Another sign of the times is the increasing tendency to invest capital in mills abroad—a prominent instance of which is the mill to be shortly opened at Boulac, Egypt, by the Egyptian Cotton Mills Company Limited. For this, the first cotton mill in the country, the spinning machinery has been supplied by Messrs. Asa Lees and Co., Oldham, the looms by Messrs. Hattersley and Sons Limited, Keighley, and the engines by Messrs. J. and E. Wood, of Bolton.

ARTICLES.

Cotton Fibres in Spinning and Manufacturing.—I.

By W. I. Hannan.

INTRODUCTORY.—The fruit borne by the cotton plants of all countries is the capsule, or pod. The size of the capsule, the number of segments it is divided into, and the quantity of seed cotton contained in a capsule, have a marked influence on the crop of cotton produced by a single plant during its life. On a much larger scale, the general cotton crop of different countries is increased by the quantity of plants cultivated, and the healthiness and physical character of the plants when the picking of seed cotton from the ripe capsules is commenced. As a rule, the cotton-plants of America have their bottom, or first, crop gathered during the time that the leaves of the plant are green; but the second crop, from the upper part of the plant, is liable to attacks of frost, which interferes with the picking harvest.

In the economy of the plant the fibres are plumose coverings, serving as winged appendages — structurally they are one, — celled, and composed of nearly pure cellulose; the outer wall of which is spiral and covered with a fine, delicate coating of vegetable wax. The waxy coating known by the name of cerosine gives a glossiness to the fibres, and enables them to float upon water; but if spirits of wine are added to the water they readily sink, owing to the waxy coating having been dissolved. Other fibres of commerce are structurally different to those of cotton; amongst these are flax, hemp, jute, china-grass, sisal hemp, and New Zealand flax. The fibres of all the above-mentioned plants (excepting sisal) are stem structures, made up of a tissue of cells which serve as a mechanical support to the softer tissues of the plant.

Commercially, cotton fibres are regarded under three or four groups, which are indicative of their properties for spinning and weaving purposes—viz., long-stapled cottons, moderately long, medium, and short. In the longest group of fibres, Sea Island stands out prominently as being the best adapted for the finest and most silky of cotton yarns. Egyptian fibres will spin a much stronger yarn for either twists or wefts, of a brown colour, and these are distinguished in the trade as brown yarns of twist or weft spinnings. Brazilian fibres when spun into yarns are capable of taking up the size mucilage so essential for the strengthening of cotton in weaving; and during the recent cotton shortage an extra run on Brazilian cottons was necessitated by spinners who had large contract orders for American yarns. The natural difficulty in using Brazilian and American was in the blending of smooth Peruvian with Orleans, or with Uplands, for weft mixing. In order to keep up the tension, rotundity, and ooziness of the yarn, it was found that when the two classes of staples were nearly similar in length the want of pliability and cohesion was well marked in the Brazilian, while the American showed a minimum amount of harshness, and in mixing had to be used largely in excess of that of the Peruvian staple.

American cotton fibres are exceedingly well adapted for spinning the white twists and weft yarns of medium and medium fine counts, such as are often included in specialities for manufacturers and in the spinning of 32's to 34's twist, and wefts varying from 36's to 40's, and sometimes up to 54's, for fabrics such as jeans, printers, and some other classes of goods. East Indian cottons are short in staple, and often dull in colour, owing to the broad leafy fragments of bracts and sand which accompany the different classes. Cocoanada cotton has a buff or yellow colour, nearly similar to brown Egyptian; but other classes, such as Broach, Hingunghat, Tinnevelly and Madras, have a good white colour which almost equals that of Orleans, Texas, Mobile, and Maceio.

In times of scarcity of American cotton, East Indian has had a run. Perhaps the greatest run that was ever made was in the 'sixties, in what was then styled the "Cotton Panic." At that time Orleans cotton reached 2s. 9d. per pound. At a conference held in London, Mr. H. Mason, speaking on behalf of the Cotton Supply Association, said that in Lancashire a great many factories were stopped, very many working short time, and a great number of workpeople suffering severe privations, from the scarcity of cotton. He had seen Indian cotton selling at 1s. 6d. per pound. At the time referred to there were 40,000 bales of cotton locked up in America owing to the blockade.

The average diameter of East Indian cotton fibres is $\frac{1}{1200}$in., of American $\frac{1}{1300}$in., Egyptian $\frac{1}{1480}$in., and of Sea Island $\frac{1}{1500}$in. The broader diameter of East Indian is a sign of greater strength, and some individual fibres of Dhollerah cotton when tested were found to break at 48 to 286 grains, while those of Uplands (American) broke at 43 to 212 grains. The strength of East Indian fibres lies in their broad diameter. In this respect they contrast with the Sea Islands, which have a uniform diameter in the width of the cell fibre, which, along with the spiral wall, renders them adaptable for spinning a sound, level, and silky yarn.

The East Indian fibre, although strong in the middle, declines in strength towards both ends; consequently it does not take the twist so readily as other more uniform fibres of nearly similar length. Hence in mixing East Indian with American cotton some skill is required in the blending, otherwise the American will tend to lie in the core of the yarn, while the East Indian fibres will merge to the outer side and give a woolly appearance to the yarn.

(To be continued.)

Lined Cloths.

By S. B. H.

LINED CLOTHS, as the name implies, consist of cloths to which is woven a backing, another cloth, or a lining. One side of the cloth is usually made plain or with some very simple figuring or colouring, whilst the other side has in many cases stripes, checks, or other figures developed upon it. Such cloths are very suitable for ladies' cloakings, overcoatings, travelling rugs, etc. They are made

Lined Cloths.—Fig. 1.

with the figured side upwards in the loom, and the plain side underneath, so that the weaver may more readily see that the cloth is woven perfectly. The cheaper goods are made with weft-backed weaves, but others of a more expensive and elaborate character are made with special weaves. The pattern shown in Fig. 1 is a very common style of cloth made for dressing gowns and ladies' cloakings. One side of the cloth is usually a darker shade than the other, so as to appear as a lining or reversible cloth. The warp is made entirely of cotton, and the weft a good quality of woollen, the price of the cloth depending to a very large extent upon the quality of woollen yarn used. The particulars of the cloth given are as follows:—

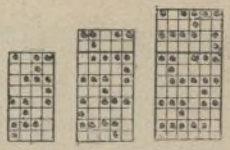
Warp.

All 2/40's white cotton.

Weft.

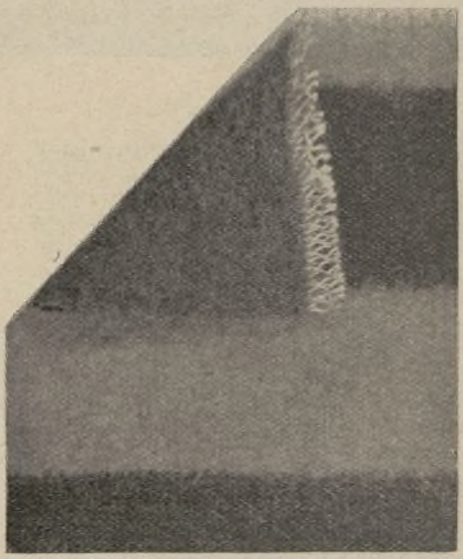
1 pick 2/28-skeins woollen (No. 1 shade).
1 „ „ „ „ 2 „
24's reed 2's, 64 picks per inch.

The cloth must be heavily raised in finishing on both sides, so that no trace of the cotton will appear on the surface, and a full and lofty-handling fabric will be obtained. The design is a very important factor in the structure of these cloths, and therefore such weaves are selected which tend to hide the warp and bring up the weft to the surface. The weaves are then



Lined Cloths.—Fig. 2.

backed so as to present a similar appearance on both sides. Three very common and suitable weaves are shown in Fig. 2, which are very largely used in the manufacture of shawls, the weft being interchanged to produce the desired figure. The one to the left was used for the production of the pattern in Fig. 1. Very little variety can be produced with this class of weave alone, the only variety offered being a number of small stripes if it is desired to retain one surface perfectly plain. An example is shown in Fig. 3. One side is perfectly plain, and the other is alternate stripes of two other shades. There are 48 picks per inch, all other particulars



Lined Cloths.—Fig. 3.

being the same as the pattern in Fig. 1. To obtain more variety in weft-backed weaves requires some special construction of the cloth. It is possible to make a cloth with a cotton warp so that the back will be solid in colour, and any desired figure produced on the other side in two shades. It gives a much larger field for figuring and obtaining variety, and also involves a little extra expense. A portion of a design for such a weave is shown in Fig. 4, the face, middle, and backing picks being indicated by different marks. It will be noticed that the picks marked solid run regularly throughout the design, the other picks being interchanged and working either on the face or middle of the

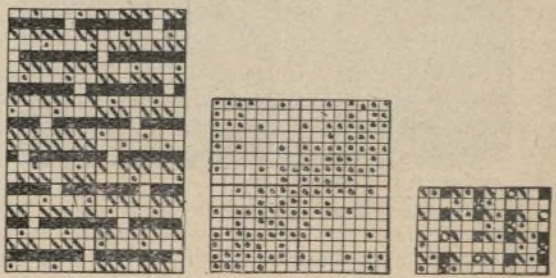


Fig. 4. Lined Cloths.—Fig. 5. Fig. 8.

cloth. Thus one side is obtained solid and the other figured. The weaving particulars are:—

Warp.

All 2/24's cotton.

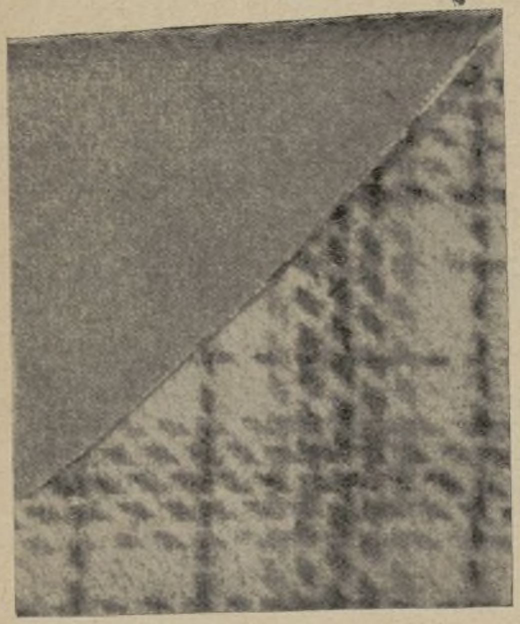
Weft.

1 pick 12-skeins woollen (No. 1 shade).
1 „ „ „ „ 2 „
1 „ „ „ „ 3 „
18's reed 2's, 54 picks per inch.

Another method of producing lined cloths is by double weaves, when different checks or stripes can be obtained on the different sides, as desired.

A2

Fig. 5 is a double 4-by-4 twill, a design suitable for such work. Fig. 6 is a pattern woven in this design, one side of the cloth being plain, and the other a checked pattern of different shades. This style of cloth structure admits of more elaborate colourings than weft-backed weaves, and



Lined Cloths.—Fig. 6.

results in a somewhat more expensive cloth. The particulars for the foregoing cloth are:—

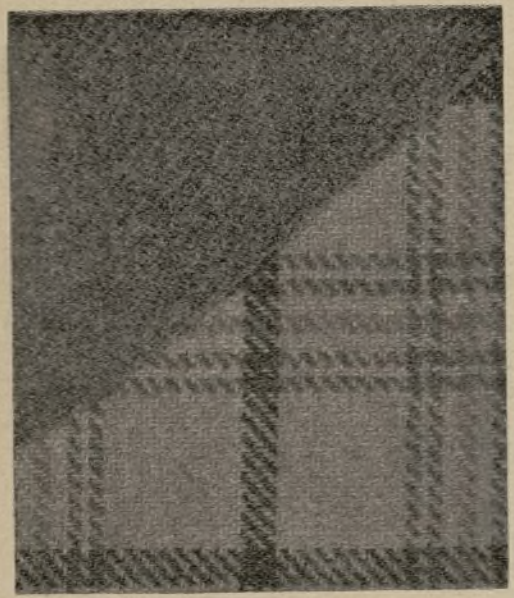
Warp and Weft.

2/26's woollen.

12's reed 4's, 44 picks per inch.

These particulars are very suitable for travelling rugs, mauds, etc.

It is often necessary to make cloths firmer in structure and build than the example given, and to obtain perfect cloths with colourings equally elaborate, so the ordinary double-cloth structure cannot be used alone. The fault in an ordinary double cloth lies in the stitching, and to overcome this difficulty we must look for some method of binding the two cloths together without interlacing the

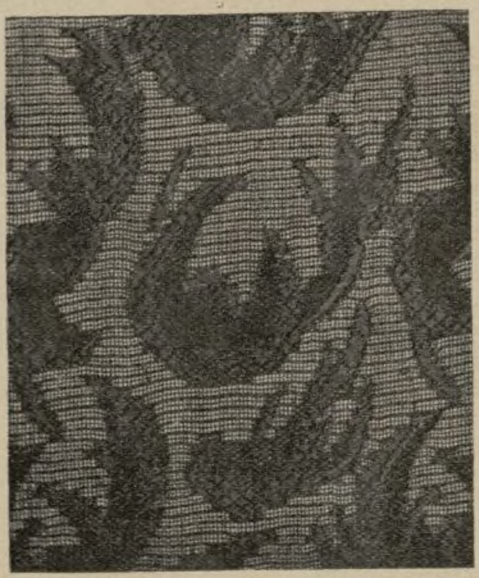


Lined Cloths.—Fig. 7.

threads of one cloth with the threads of the other, thus avoiding any possibility of the stitching showing. The pattern shown in Fig. 7 is made with a 2-and-2 twill weave for both surfaces. The upper surface is made of woollen, and the under surface of crossbred worsted. With the ordinary double-cloth structure this pattern would have been imperfect, but on careful examination the cloth is found to be perfect, no trace of the stitching being visible. The pattern consists of two cloths, one woollen and the other serge. An extra warp is worked in between the two, and is used to stitch them together. It is lifted over a weft thread when on the under surface of the top cloth, and dropped under a weft thread when working on the upper surface of the bottom cloth, and when neither stitching to top or bottom cloths it is worked in the middle between the two, and therefore it neither shows on the face nor back. The design is given in Fig. 8.

Figured Gauze With One Doup.

THE method of weaving figured gauze patterns upon ordinary single-action jacquards with a doup placed in front of the harness is so simple that it can be readily and usefully applied, especially for making fancy black dress goods of a bright lustrous description. A 2/60's cotton warp set with 50 threads per inch and 20's mohair weft, 48 picks per inch, would produce a cloth lustrous in appearance and highly suitable for developing designs in which the figure is a combination of plain weave and weft float, and the ground some interesting gauze weave which will show to advantage when placed over a bright coloured satin lining. Many designs which are produced at great expense on special douped



Figured Gauze.—Fig. 1.

harnesses might be imitated very closely and cheaply by this method of working, if the principle of forming new ground weaves which combine openness with novelty were only thoroughly understood. Though the effects produced by this method of working in cloths (where the threads are arranged in pairs, one thread crossing one thread, and where the doup lifts every alternate pick for producing a plain weave in the figured portions of the design) cannot be so open in character as those formed with special douped harness; they may be so varied in character, and so open in appearance, as to produce novel and attractive cloths which will meet with a ready market.

A style of design in which an opaque figure of decided character is formed by a combination of plain weave and weft float upon a ground weave of a simple but open character is shown in Fig 1. It is produced by arranging the interlacing of the warp and weft in such a way that the first three picks are drawn together, and the fourth pick separated from them by the threads making a

Marks lift. Doup lifts on odd picks.

Fig. 2.

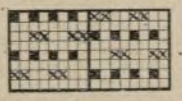


Fig. 5.—Figured Gauze.—

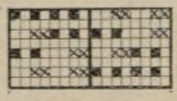


Fig. 8.

perfect crossing on each side. This is accomplished by using the lifting plan shown in Fig. 2, which makes the threads interlace as shown in Fig. 3. From an examination of Figs 2 and 3 it is found that the cause of the three picks running together is the method of flushing adopted on picks Nos. 2 and 6. It will be seen that these two picks are put in loosely, and in such a way as to cause no crossing of the threads, thus allowing the picks which are put in before and after them to be pushed against them when the crossing takes place on the fourth and eighth picks.

Fig. 4 shows a design in which the opaque figure is developed on the same principle as in Fig. 1, but the ground is of a more intricate character, though quite as open in appearance. The effect in this case is on sixteen threads, and is produced by arranging the weave shown in Fig. 2 in stripe form, in such a way that the second and sixth picks

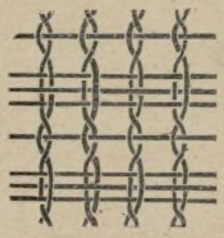
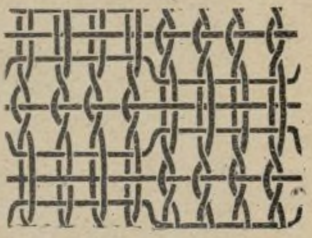
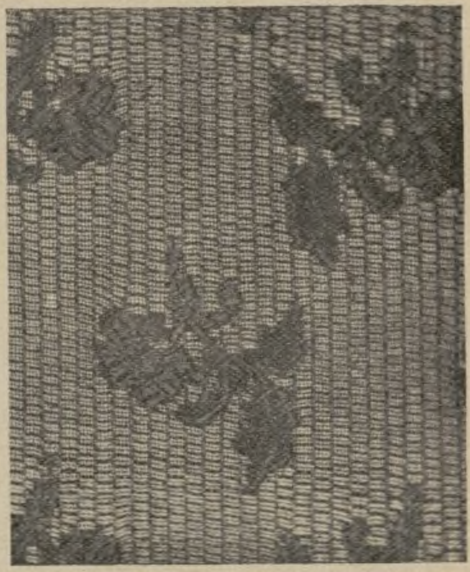


Fig. 3.



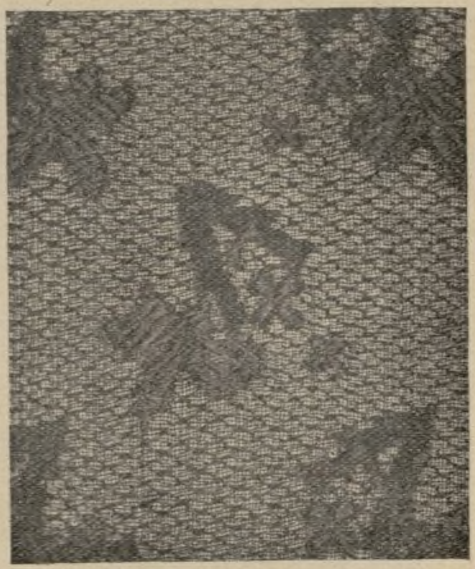
Figured Gauze.—Fig. 6.

which float in loosely for the first half of the ground weave form the crossing picks in the second half, and the fourth and eighth picks which form the crossing picks in the first half of the ground weave float in loosely for the second half. This causes the rib effect which is produced by the three picks falling together in one stripe to be opposite the single pick which forms the open effect in the other stripe. The lifting plan is shown in Fig. 5, and the method of interlacing in Fig. 6.



Figured Gauze.—Fig. 4.

Fig. 7 is shown upon a ground of a still more intricate character, but one which is quite as open in appearance as the others. This effect is produced by arranging the interlacing shown on the sixth pick of Fig. 5 in four-end broken satin



Figured Gauze.—Fig. 7.

order, as will be seen by a reference to Fig. 8, which is the lifting plan for this ground weave. This method of construction causes two places in the weave to have five picks pressed closely together, and three picks following them forming full crossing, thus producing a spotted effect in the ground weave. By following this principle of allowing the pick to float in loosely for a given number of threads, and following it with picks which produce a full crossing of the warp, a large variety of novel and attractive open-gauze weaves may be produced highly suitable for the groundwork of figured gauze cloths.

Jute and Linen Weaving.—XIII.

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

Dobby Shedding.—Dobby machines are utilised as a shedding mechanism for patterns of a character (generally symmetrical) beyond the scope of an ordinary tappet, and which may be more economically produced by the dobby than by a jacquard machine. Although positive tappets may be built to weave cloth the design of which occupies as many as 32 picks to the round, it is generally advisable to utilise the dobby when the picks in one repeat of the pattern exceed the limit of an ordinary negative tappet (which is about eight), although the number of shafts required may be as few as four, the principal benefit of the dobby being that there is practically no limit to the number of picks in a repeat. Dobbies are built variously to actuate from 8 to 48 shafts, and also according to the weight or class of work required. Rarely this maximum number of shafts is used, and for jute and linen dobbies of 12 and 20 shafts respectively, give a fairly extensive field of design, and are as large as may be conveniently worked.

Figs. 77, 78, and 79 show respectively side, front, and sectional elevation of a bottom shedding dobby as usually applied to hand looms. The griffe or block A is actuated by means of a foot treadle through the cord B, lever C, and pendant arm D, the vertical movement being ensured by the spindles E, which pass through the lugs F cast on each end of A. The lifting knife G is rigidly fixed in, and therefore moves with the block A, taking with it the selected hooks H. The catch I, in the upward movement of the block A to which it is attached, takes hold of the projecting pins J fixed in the star wheel K on the head of the lag barrel L, and causes it to rotate one-eighth of a revolution each time. The lags M, which pass round and take into the grooves of the barrel L, are thus brought successively into position. As shown in Fig. 79, the normal position of the hook H is off the knife—*i.e.*, not in the same vertical plane,—and therefore, if allowed to remain in this position, will not be affected by the upward movement of G. By means of a cross-wire or needle N the hook H is attached to a vertical flat spring O, against which the pegs in the lags M press. One lag is necessary for each pick of the design, and each lag is pegged according to the order of lifting necessary for that pick. It is obvious that a peg pressing against the spring O will, through needle N, cause the hook H to occupy a position over the knife G, which in its upward movement will lift the hook H and the camb shaft attached below. When the knife G descends the hook H is released, and the spring O returns it to its normal position, unless required to rise again for the following pick. P, P, P are horizontal grates for the guidance of the hooks H and springs O, and the tension or spring of the latter may be adjusted by screws in the bars Q and R. Any vibration or rocking of the barrel L when not turning is prevented by the spring S, the end of which is shaped to coincide with the star wheel K. Lagging back or reversing is accomplished by the catch T and cord U, while the spiral spring V and the lever W, with their connections, keep the catch T clear of the pins J when working in the forward direction. When the lags M form a chain of any considerable length they are passed round and kept taut by means of a roller in the adjustable carrier X.

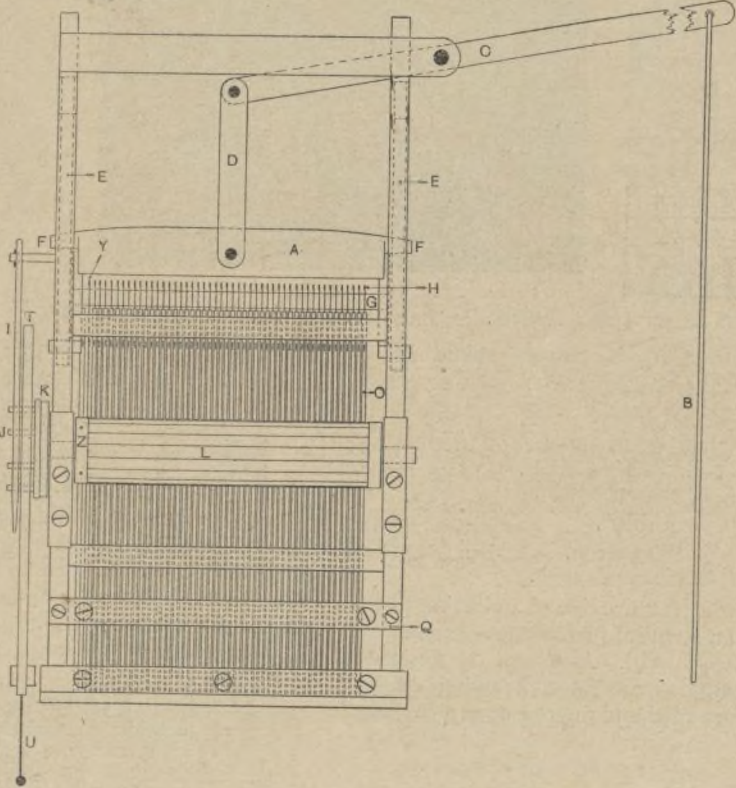
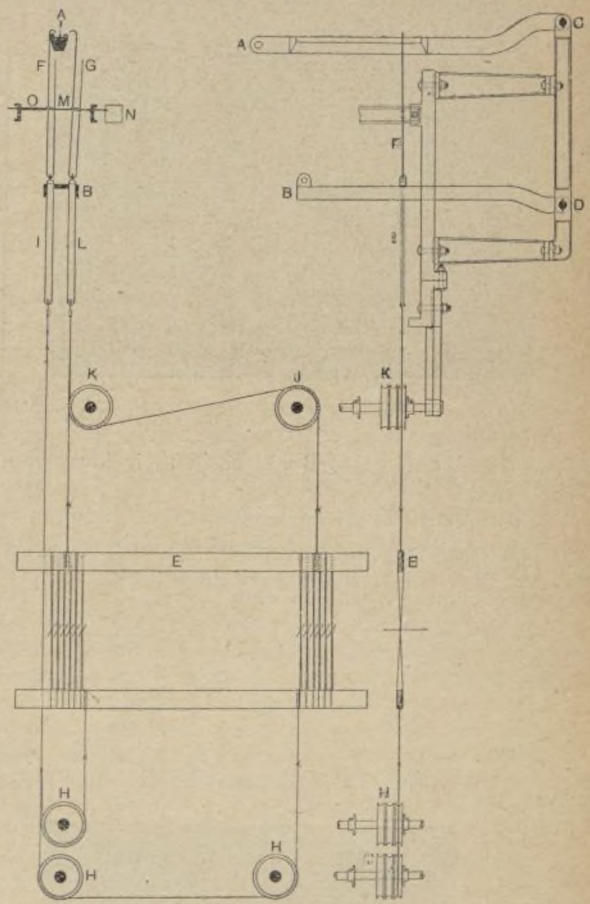


Fig. 77. Jute and Linen Weaving.



Figs. 80 and 81.

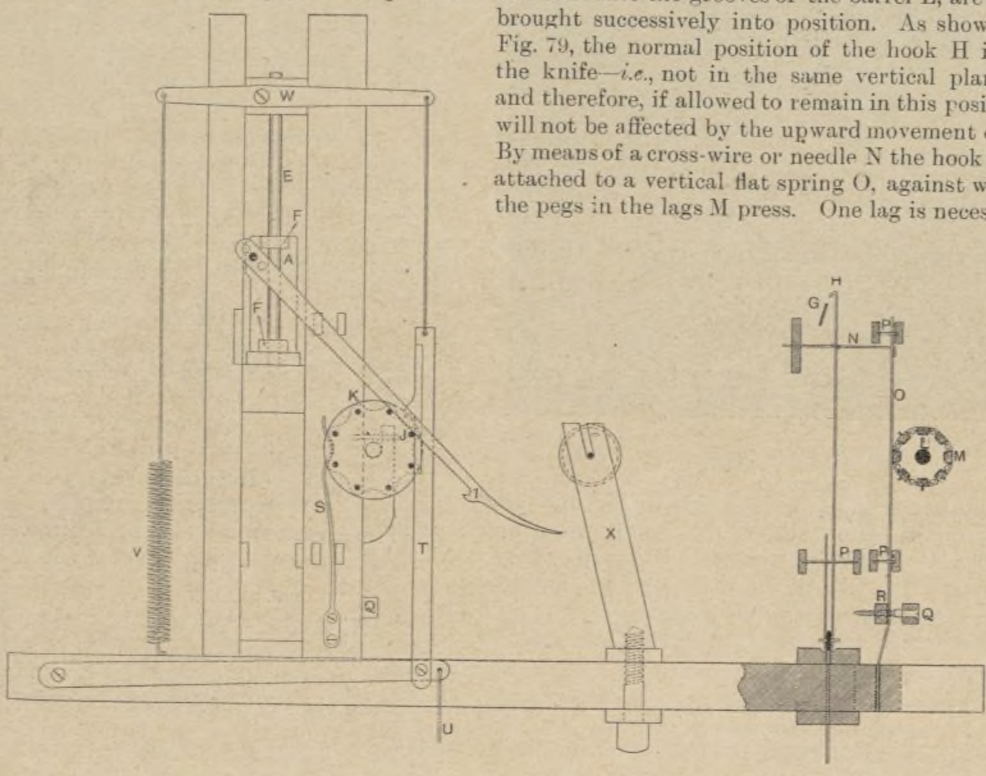


Fig. 78. Jute and Linen Weaving. Fig. 79.

The first hook Y in the machine is arranged to work a "catch-band" or selvage thread at each side of the cloth by means of pegs Z fixed in the end of the barrel L. Under certain circumstances, such as picking twice in succession from the same end, this arrangement of selvaging ceases to be effective; but the objection could be overcome by making the pegs movable instead of fixed, so that different arrangements of lifting this thread might be obtainable. A further improvement would be the addition of a second hook for this purpose, so that a proper plain or other selvage could be woven without it being necessary to peg and arrange for the same on the lags.

Positive Centre Shedding Dobby.—For the heavier fabrics it is advisable that the shedding be positive. A dobby of this type constructed by Messrs. Charles Parker, Sons and Co., Dundee, specially for heavy cloths, is that illustrated herewith. Figs. 80 and 81 show in front and side elevation a general view of the knives, hooks, and connections to the camb shafts. The lifting knife A and reciprocating grate B (fulcrumed at C and D respectively) are so connected that they continually move in opposite directions—*i.e.*, as A rises, B falls, and *vice versâ*. Each camb shaft E is connected to two hooks F and G—to F from the underside by cords passing round the guide pulleys H and attached to a flat bar I, which in turn is hooked on the lower end of F; and to the hook G from the upper side by cords passing over J and under K to a similar bar L hooked to G. The bars I and L slide freely in corresponding slots in the grate B, and are provided with a shoulder at their upper end which keeps in touch with B when falling, and by which B lifts them when rising. The hooks F and G are controlled by one needle M in such a manner that both cannot be over the lifting knife A at one time; they are thus free to move in opposite directions. If, therefore, as in the figure, F be over the knife and be taken up with it, the shaft E and hook G are pulled down in a corresponding degree, the latter being permitted to fall by the downward movement of the grate B. It is apparent that as hooks F and G are level, the knife A and grate B will be in their lowest and highest positions respectively. The respective positions of the hooks F and G are determined by means of cards passing round the cylinder N. A hole in the card opposite the point of the needle M permits the needle to enter the cylinder as the latter advances, and the hook F will be lifted. If, on the other hand, a blank card be presented, the needle M will be pressed back by the advancing cylinder, thus placing hook G over the knife, and forcing F clear. The spring O always tends to place the hook F over the knife, unless prevented by the card on the cylinder, as stated. It will thus be seen that a hole in the card means a falling shaft. Being a centre shedding dobby, all hooks, and therefore all shafts, are brought level after each pick. Guide pulleys J and K revolve freely on studs carried by brackets bolted to the top girder rail of the loom; while pulleys H revolve on similar studs carried in special frames usually batted to the floor.

(To be continued.)

Fig. 128.

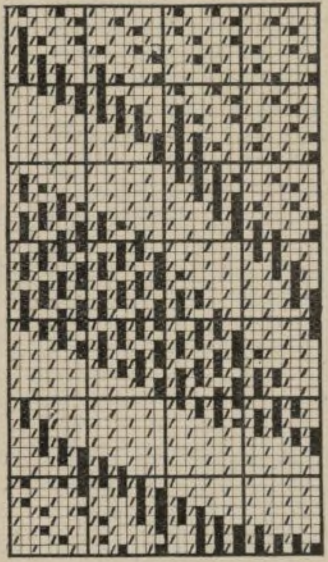


Fig. 129.—Fancy Dress Fabrics.

Fig. 132.

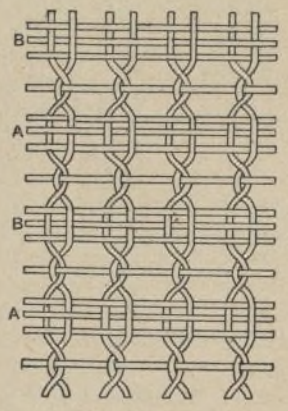


Fig. 133.

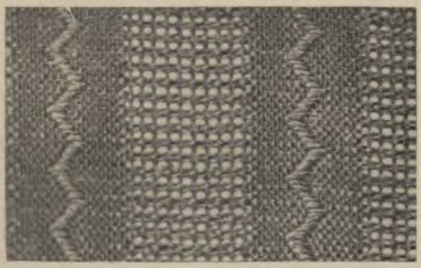
Fancy Dress Fabrics.—XIII.

By G. Washington.

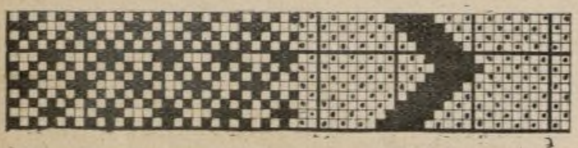
In the mohair fabric illustrated in Figs. 128 and 129 the cotton warp and weft form a perfectly plain and firm foundation fabric, the mohair warp passing from face to back of this ground texture as required for ornamental purposes. The long floats on the face allow it to stand in bold relief above the surface. In order to keep down the plain, and thus increase the contrast between it and the solid mohair warp figures, the mohair is very firmly bound every fourth pick to the back of the cotton fabric in these portions of the design. This has the further advantage of adding to the firmness of the plain and preventing it from appearing loose and flimsy. An effect intermediate between these two is produced by bringing the mohair warp on to the surface for five picks in sateen order, where the warp does not stand up so prominently or present such an unbroken reflecting surface as the solid warp figures, and yet forms a pleasing contrast to the cotton ground fabric which separates it from them :—

Warp.
1 end 2/40's cotton.
1 „ 2/28's mohair.
72 ends per inch.

Weft.
20's cotton.
52 picks per inch.



Fancy Dress Fabrics.—Fig. 130.



Fancy Dress Fabrics.—Fig. 131.

In Figs. 130 and 131 a stripe of imitation gauze alternates with a stripe of plain fabric ornamented with a zig-zag weft twill. Although the design is so simple it contains several contrasting effects. The close texture of the plain, the open character of the imitation gauze; the smooth reflecting surface of the weft twills, the dispersion of light by the remainder of the fabric; the diagonal direction of the zig-zag twills, and the perpendicular lines of the stripe, all contribute to produce a satisfactory design. The imitation gauze effect is caused by every third thread and pick weaving three-and-three, alternately over and under, thus drawing the threads and picks into groups of three. The remaining threads and picks weave plain and make a distinct cut between each group; this also tends to send them farther apart :—

Fancy Dress Fabrics.—Fig. 134.

Warp.
40's cotton.
66 ends per inch.

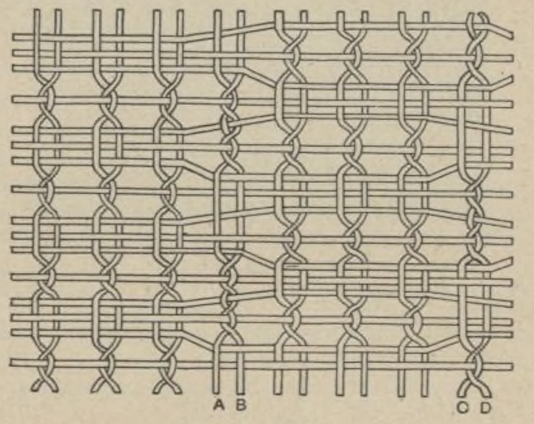
Weft.
24's worsted.
52 picks per inch.

Fig. 132 represents the appearance of a fabric containing figures composed of weft flushes and plain weave on a gauze ground. Fig. 133 is a sketch of the interlacing of the ground weave, which is complete on 4 threads and 8 picks. The threads work in pairs crossing round each other between one and three picks alternately. This weave gives a similar result on both sides of the fabric, the centre pick A in the group of three passing over and under alternate pairs of warp threads, the corresponding pick B in the next group (7) working exactly opposite to it :—

Warp.
2/60's cotton.
52 threads per inch.

Weft.
18's worsted.
36 picks per inch.

Another fabric of a similar character is shown in Fig. 134. The gauze weave sketched in Fig. 135 is a modification of the gauze in the last pattern, and produces a honeycomb appearance. The most noteworthy feature is the gradual manner in which the transition of the even picks is made from one group of three to the other. This is accomplished by threads A and B, also C and D, which, while different from the remaining threads, yet combine the principal features of those on both sides of them :—



Fancy Dress Fabrics.—Fig. 135.

Warp.
2/80's cotton.
52 threads per inch.

Weft.
16's worsted.
32 picks per inch.

(To be continued.)

The Mechanism of Spinning.—IX.

By H. R. Carter.

The Mule.—The principle of mule spinning is that of the distaff, the most primitive of all spinning implements. The spindle takes the place of the distaff, and the rollers that of the retaining and regulating motion of the fingers of the spinner, while, as with the distaff, the yarn is alternately spun and wound upon the spindle. The spindles are rapidly rotated by means of bands from a tin cylinder in a similar manner as in the ring frame, just described. Their motion, from the source of supply or the front line of rollers, is in a horizontal and not in a vertical direction, while instead of the thread being attached by any mechanical means to the top of the spindle, it is kept from winding off while twisting, by the fact that the twist is put in in the same direction as the winding-on takes place, while winding-on is avoided during twisting by the position of the top of the spindles below the plane of the rollers, and by the inclination of the spindles to the vertical. A thread being wound upon a spindle always tries to reach a point on the spindle which is the base of the perpendicular which passes through the point of delivery. In the case of the mule spindle, owing to its inclination and height, such a point would be considerably above the top of the spindle; hence in endeavouring to reach it during spinning, the yarn slips over the top of the spindle putting in the required twist, while during winding-on the effective delivery point is so lowered by the faller wire as to wind the thread upon any desired portion of the spindle. A rove creel and three lines of rollers, similar to those of the ring frame, are employed. The rollers revolve in fixed stands and bearings, and extend the whole length of the frame, the drive being in the centre. Parallel with the rollers, and also extending the whole length of the machine, is the carriage containing the spindles, shown in Fig. 23, which is a side view in section. The carriage is run backward and forward upon the rails A by means of bands wrapped upon scrolls, the free ends being attached to the framework of the carriage, which brings the spindles to within a couple of inches of the rollers, and then carries them out again to a distance of 60in. or more. We will first suppose the carriage to be in, the fallers changed, and the ends or threads extending rather slackly from the point of delivery to the part of the spindle upon which the thread is being wound. The machine being started, the spindles begin to revolve at once, and the thread is wound round the spindle up to the top, taking up the position shown by the dotted line in Fig. 23, where it remains, for a reason already explained. The rollers begin to deliver and the carriage to move outwards almost instantaneously, the speed of the latter being usually about 5 per cent. faster than the surface speed of the delivery rollers, giving what is known as "gain" to the carriage. The actual speed of the carriage during the outward run is about 25ft. per minute. When it has reached the extremity of its travel, both the carriage and the rollers automatically stop, and the twisting of the yarn, if not already fully accomplished, is completed usually at an increased speed. The spindles are then brought to rest by specially-arranged mechanism. At this moment the ends remain twisted spirally round the spindle from its top down to the nose of the cop, lying as a rule more closely just at the extremity of the spindle. Were the faller wires to change while the threads are in this position, the ends would be broken. To avoid such a catastrophe, a movement known as "backing off" is introduced, which consists in turning the spindles backward by a number of turns which is sufficient to clear the spindle entirely down to the nose of the cop, permitting the faller wire C to descend at the same time to this point (B, Fig. 23) without straining the yarn. The winding-off of the yarn from around the spindle would naturally leave the ends slack, did not the counter faller D rise as the tension of the yarn permits, and, its wire being under the ends, all slackness is taken up, leaving them, as shown by the black line, under an easy tension, in position to commence the winding-on of the 60 or more inches of yarn which has just been spun.

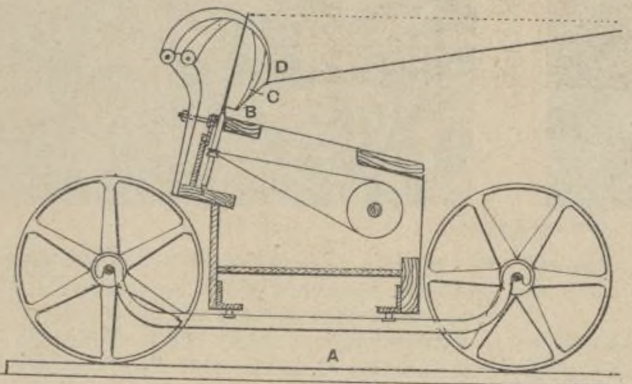


Fig. 23. The Mechanism of Spinning.

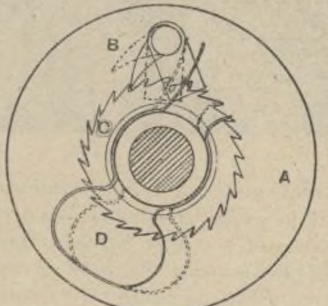


Fig. 24.

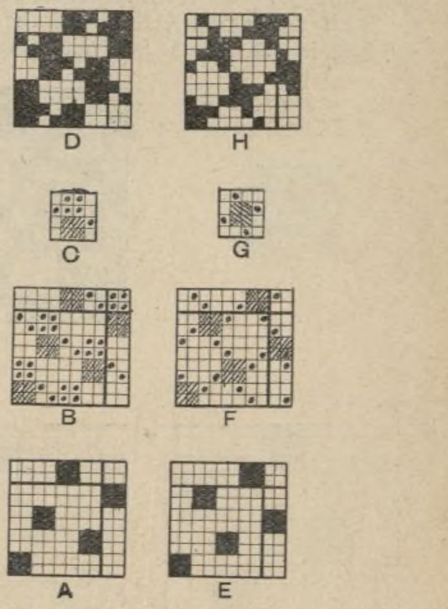
The cycle of operations is as follows:—The belt being upon the fast pulley, and the pulling-out catch box in gear, the carriage starts on its outward run, the tin cylinder and spindles which it carries revolving at the same time. The drawing rollers also revolve, drafting the rove and delivering it at approximately the same speed at which the carriage recedes. Next, the carriage reaches the end of its run, the camshaft changes, disengaging the roller, and the drawing-out scroll clutches. A "holding-out catch" maintains the carriage in position, while the belt, remaining on the fast pulley, puts in the supplementary twist. Then the belt passes on to the loose pulley, and the backing-off friction comes into gear, effecting the backing off, and indirectly the change of the fallers, the engagement of the cone friction, and the run-in of the carriage, which, with the aid of the quadrant, causes the winding-on of the yarn. On the near approach of the carriage to the rollers the fallers and camshaft change, the pulling-in friction is raised, the pulling-out clutch box comes into gear, and the belt shifts on to the fast pulley, all the parts, in fact, resuming their original positions.

Between the sides of the headstock, and loose upon the tin cylinder shaft, is a metal disc A, Fig. 24. Compounded with this disc is a pinion which gears with a large wheel on the winding drum. A cord fixed at the back and front end of the headstock passes round this winding drum, causing it to rotate as the carriage runs out, and while thus rotating to wind on a chain, one end of which is attached to the "quadrant," a lever fulcrumed at its lower extremity. When the carriage commences to run inward, the forward motion of the quadrant upon its working centre is governed by the engagement of a pinion on a short shaft placed in the front of the headstock and carrying a scroll around which one of the mule bands passes, with the circular quadrant rack attached to the straight lever. The winding drum is thus caused to revolve by the pulling-off of the chain, and passes on the motion to the circular disc A, on the face of which a detent B is centred, which, when the disc becomes a driver, engages with the ratchet wheel C, and the latter, together with the boss upon which the clip spring D works, is fast upon the tin cylinder shaft, the latter, together with the spindles, being revolved. When the tin cylinder is driven by the mule band, as it is when the carriage is running out, the tail of the spring clip D keeps the detent B out of contact with the ratchet wheel, as shown by the dotted lines, in which case the disc is merely turned as the running-out of the carriage causes the cord wound around the winding drum to give the latter motion, winding up the chain again. Then the quadrant rises to its place, being acted upon by the pinion referred to, and the same operation is repeated. The power of the quadrant to give more or less turns to the spindles while they run in is due to the fact that the point of attachment of the chain with the quadrant is variable, being a block or nut working upon a screw which extends down the lever leg of the quadrant. The point of attachment can thus be gradually raised until the cop attains its full diameter, when, if the ratchet wheel which actuates the shaper be of proper pitch, no further change should be required until the point of attachment is wound down again to commence a fresh set. The quadrant moves through an angle of about 90°. When the chain is attached to a point near the working centre of the quadrant the forward movement of that point is naturally small, and consequently more chain has to be wound off the winding drum than when the chain is attached to a point higher up on the quadrant, when the point of attachment has a much greater forward motion. The more chain pulled off the winding drum the more revolutions will the spindles make when running in, and *vice versâ*. The natural form of the quadrant motion automatically accomplishes what would otherwise be a difficult task—namely, the production of a motion for the spindles, slow while the yarn is being built on the large diameter of the cop, and gradually increasing in speed as the winding-on diameter decreases towards the point of the cop. It will be seen that when the quadrant starts from its vertical position to turn radially through a quarter circle, the point of attachment of the chain has its maximum forward motion at that time, while this forward motion gradually decreases until the quadrant has turned through 90°, when it is absolutely nil. While the camshaft mule is still in general use, one known as the "long lever" mule is being introduced. In this mule the changes are brought about by the travelling carriage acting upon a long lever centred on a stud fixed in the side of the headstock. In America a novel mule is being tried, in which the spindles are stationary while the rollers and creel traverse backwards and forwards.

(To be continued.)

The Design and Construction of Worsted and Union Coatings.—IX.

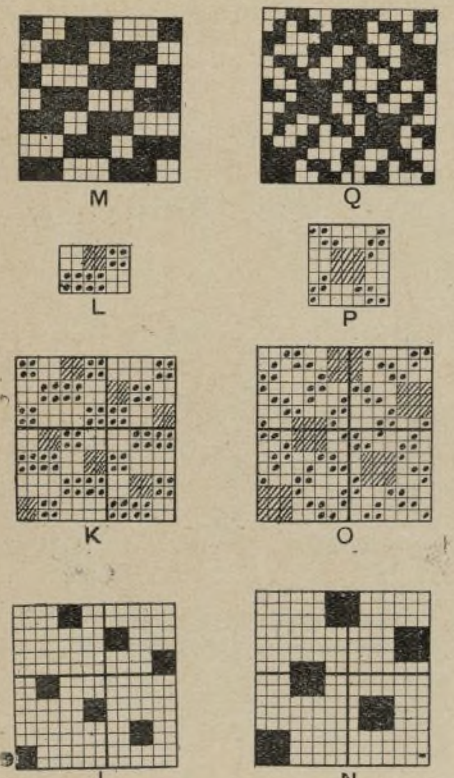
GROUND WEAVES (*Continued*).—The formation or building-up of weaves upon a satin base has now been explained in its simplest form, but this form is open to a number of variations. By the method shown a large number of small designs may be obtained; but large as this number is, it only covers a portion of the infinite variety of weaves which may be obtained in a systematic manner. So far the satin base has been the satin usually known under that name, and expressed by a single lift of each end or of each pick in the complete satin. But the satins may be enlarged, and then taken in their enlarged form as a base upon which to work.



Worsted and Union Coatings.—Fig. 33.

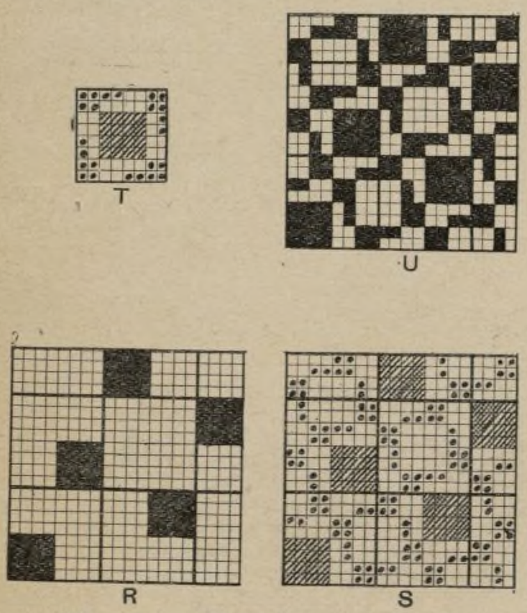
The usual 5 shaft satin weaves one up and four down, or *vice versâ*, but in enlarging the satin base this may be doubled, trebled, or quadrupled. For instance, the design paper may be fancied as having twice the number of squares required each way, when, instead of one dot, a square of four small squares will be required. Fig. 33 shows a 5-satin worked out in this way at A, where the original satin is doubled in size in each direction. If every alternate weft and warp line on the paper were removed, a simple 5 (4-and-1) satin would remain.

Taking these enlarged satins as a basis, it is possible to commence again with the smallest satin weaves, and build upon them other varieties of small effects. The doubled 5-satin at A (Fig. 33) is used at B as the base upon which the lifts, as shown at C, are built. In B the satin base is shown by diagonal shading lines and the additions by dots, C being a complete portion, or one-fifth of the total design, which is shown completed at D. This weave is one of the best known in the coating and overcoating trade, and in addition to being used alone, is very frequently found in stripe form alternating with a 10-shaft Venetian or similar warp face weave.



Worsted and Union Coatings.—Fig. 34.

The double 5-satin ground is used in the next illustration, but as shown at E is running in a contrary direction. In precisely the same manner as that just explained, the spot given at G is worked on to the base at F, and the resultant weave H is obtained. In Fig. 34 an example is taken where the ordinary 7-shaft satin is doubled, as shown at J. With this as base, K shows the method of working in the spot L and obtaining the effect



Worsted and Union Coatings.—Fig. 35.

shown at M. This weave is more adapted to goods with weft preponderating on the face, as it stands at M, but when turned on its side makes a very useful warp-faced coating weave, specially suitable for heavy goods made in a medium sett with thick yarns. It will be recognised that the way in which a design is developed may produce a weave the wrong way up for the purpose for which it is wanted. This is, of course, an immaterial incident, for a design once obtained can quickly be recognised as of possible use or otherwise, and quickly adapted, or even varied, to suit the conditions prevailing.

Extending the system on a larger scale, N in Fig. 34 shows a 5-shaft satin tripled in size each way. This gives a larger design, as concerns the number of threads in the repeat, without using a larger satin base. The way in which the base is built upon is shown at O, the spot P, which is of a somewhat fancy shape, being used. The design Q, which is obtained in this way, is not of the loose weave which the size of its base would lead one to suppose, and serves to illustrate that

Fig. 1. Cotton Designs. Fig. 2.

weaves suitable for light cloths may be obtained from a multiplied satin base, quite as easily as designs of a coarse hopsack type.

Before leaving this type of base, an example is given in Fig. 35, taking the 5-satin in a quadrupled form. This base is shown at R, whilst at S it is used as base for the spot T. The resultant design at U is a reversible weave, showing satin hopsack spots of both warp and weft in equal proportion. It is suitable for heavy all-wool coating goods, and although other branches do not come under the

Fig. 3. Cotton Designs. Fig. 4.

head of these articles, it may be said that this design is very effective in fine shot-silk goods.

(To be continued.)

Designs for Cotton Fabrics.

Specially Contributed.

Pattern 169 is a rather showy stripe, having a pretty honeycomb effect in the centre. This is worked by douping, the douped threads being mercerised cotton arranged in pairs. On examination of the back of the fabric it will be seen that a cord effect is worked in the white cotton behind the douped threads, and the floats of weft are arranged so as to overlap, and draw together, the spaces which would otherwise be made by the reed. The broad portion of the stripe is a fine satin warp face, which is separated from the honeycomb stripe by cord and plain weaves.

Pattern 170 is a dobby effect obtainable on a small number of shafts. One doup is required, the crossing taking place over one and three picks alternately. The diamond design is worked by the dobby in mercerised cotton, two ends in a mail, requiring five shafts in addition to those taken for the plain edges and centre of the design.

Fig. 1 is a design for a cotton brocade with 100 ends of 2/100's for warp, and shot with about 120 picks of 80's weft. The black portion of the figure should be weft, the large object being floated as much as possible. The smaller effects should be bound with 4-and-1 satin with the exception of the spots on the ground, which should be floated. The grey portions should be 7-and-1 warp satin, except the spots, which again must be float. The ground must be a 2-and-1 or 3-and-1 warp twill.

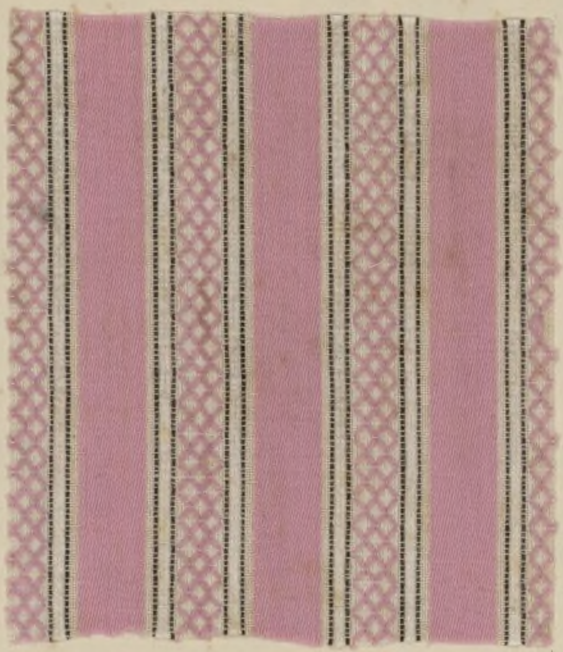
Fig. 2 is a good design for printing in one or two colours, or would also come up well as a jacquard figure on a fine cloth with a 4-and-1 warp satin ground. The black portions must be worked with the weft, the grey effect being a 7-and-1 warp satin.

Fig. 3 is a nice design for a cotton damask stripe with about 80 threads of warp and from 90 to 96 shots per inch. The figure should be worked up chiefly from the weft, getting plenty of effect with the bindings. Where warp is used, it should be either 4 and-1 or 7-and-1 satin. The ground in the body of the design is tabby, and the lines should be 7-and-1 warp satin. These are improved if crammed in the reed, and the ground between may be 2-and-1 or 3-and-1 warp twill.

Fig. 4 is a design which is worked up from the weft, no warp showing in the figure. The black portion

PATTERN SHEET No. 90.

Samples of Cotton Cloths.



PATTERN No. 169.

PATTERN No. 170.

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. 91.

Samples of Silk Fabrics.

PATTERN No. 171.

PATTERN No. 172.

is made from well-floated weft, the grey should be a bold weft twill with a tabby thread between, and all the white (ground and figure) must be plain. The twill should be kept from the spots and figure by tabby threads, so that the figure will stand up well.

Fig. 5 is a good all-over design suitable for a variety of cloths requiring an all-over pattern. It would come up well on a plain ground with black as weft, the floral part being well floated, and the ornamental portion bound firmer with twills The grey should be warp bound with satin, and the grey shading on the ground should be run into the plain ground.

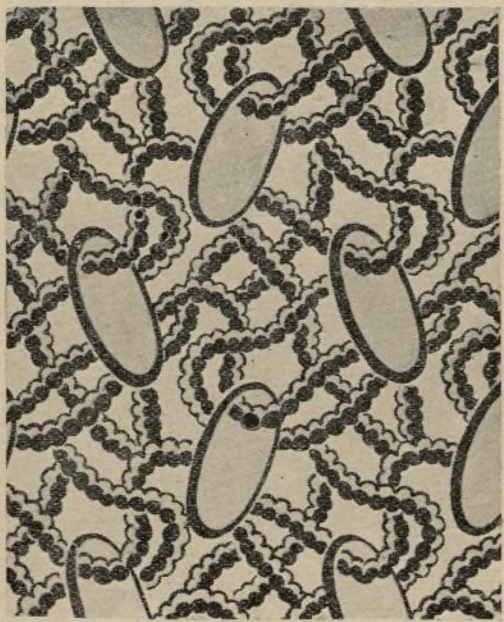
COTTON DESIGNS.—FIG. 5.

Fig. 6 is a design suitable for a cotton zephyr. The warp should be about 2/80's of some light colour, in an 80 reed, and shot with from 90 to 96 picks of 80's weft. The black should be weft, the grey warp, and inside the object may be bound with 7-and-1 diamond or 4-and-1 satin, but the warp on the ground pattern should be firmer; a 3-and-1 twill would be suitable. The ground is plain.

Designs for Silk Fabrics.

SPECIALLY CONTRIBUTED.

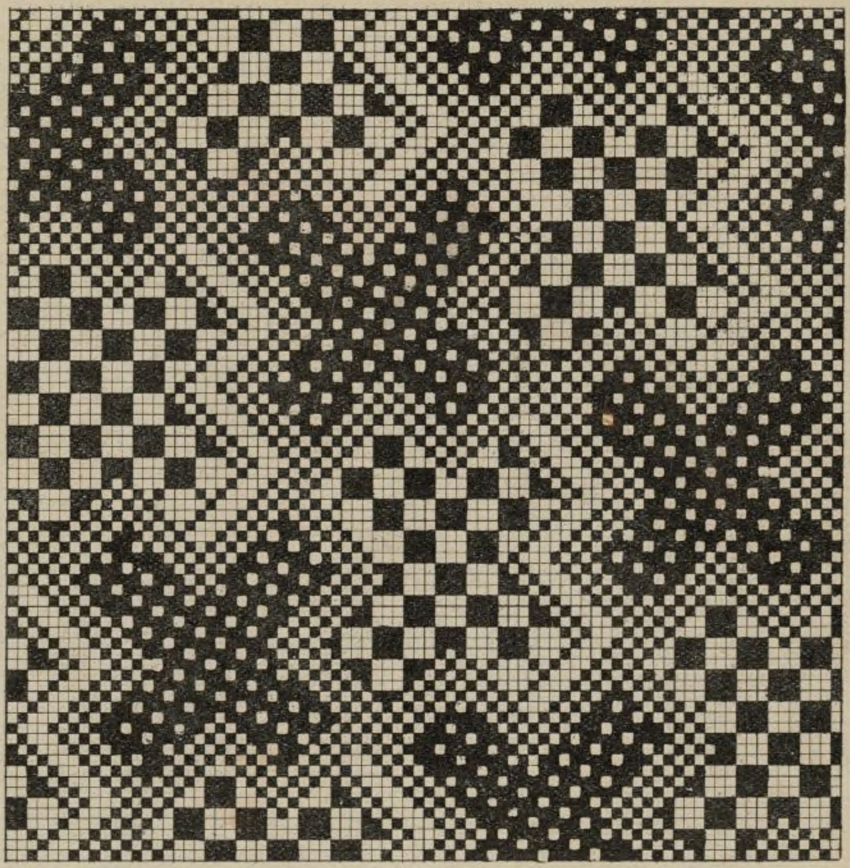
PATTERN No. 171 is a pretty net pattern of a style which is very fashionable, and is likely to be more so in the coming spring. These net effects upon coloured backgrounds are very showy and effective, especially if the net is light



COTTON DESIGNS.—FIG. 6.

and hangs easily, as in the pattern given. This is woven with a fine discharged organzine warp arranged with twelve pairs of ends weaving leno, and a coloured stripe of 18 ends. The reed has 48 dents per inch, the leno being slayed two in a reed and every alternate dent missed, while the coloured stripe is set three in a reed. The weft is discharged tram, and over the gauze stripe four ends of white mercerised cotton work a honeycomb design by means of doups placed in front of the reed.

Pattern 172 is a plain silk pongee embossed after dyeing. These goods are scarcely suitable for use in the form of wearing apparel, being of too flimsy and unreliable a nature, but make very pretty and tasteful hangings, and are useful for

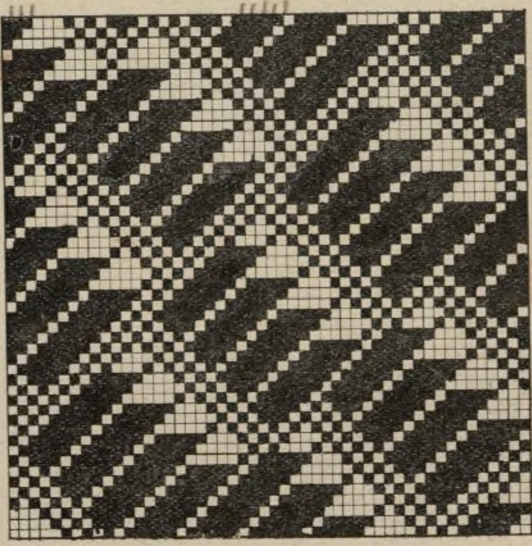


SILK DESIGNS.—FIG. 1.

other decorative purposes. They are cheaply made, being woven in the gum, and the embosser has no limit to the diversity of designs which may be applied.

Fig. 1 is a good all-over weave very suitable for tie-cloths. The weave is very firm, there being no float above five. The design repeats on 80 ends and 80 picks.

Fig. 2 is suitable for the same purpose, but is a smaller all-over design repeating on 50 ends and 50



SILK DESIG S.—FIG. 2.

picks. The fabric may be woven in the gum and boiled off, but better effect might be obtained in a shot, using net silk or spun warp, and tram for weft.

Figs. 3 and 4 are designs for handkerchiefs with a net-silk warp, about 2000/2 double Macclesfield counts, and shot with 100 picks to the inch of tram. The light effects in the figure should be warp, and the dark ones of weft on a 3-and-1 twill or 4-and-1 warp satin ground. The designs for this class of goods should be worked with plenty of tabby and bound fairly firm to give a good feel to the fabric. A fancy border, worked with from 16 to 24 hooks, would be a nice finish to a handkerchief having a ground of either of these designs.

Fig. 5 is a sketch suitable for piece goods, to be made with 100 ends net-silk warp to the inch, and shot with 90 picks per inch of tram. The figures should be 8-shaft warp satin, surrounded by floating weft. The figured groundwork should be composed of both warp and weft, floated in some places and in others bound with 3-and-1 twill. The ground should be tabby. This design should be made as a shot, for with self-coloured warp and weft much of the effect is lost.

Fig. 6 is a pretty design for brocade, with a fine silk warp about 240 ends to the inch, and shot with from 90 to 100 picks of tram. The black should be floated weft, the grey should be tabby or two pick,

SILK DESIGNS.—FIG. 3.

and the two should be worked on an 8-shaft warp satin ground.

Worsted Spinning.

BY M. M. BUCKLEY

(Lecturer on Worsted Spinning at Halifax Technical School).

(Continued from page 413, vol. xxvi.)

THREE forms of cap are in general use—the ordinary straight type, suitable for double-headed bobbins, the conical, and the bell caps, specially adapted for spools or tubes. The efficiency of the cap frame is very largely determined by the suitability of the caps and the condition in which they are kept. The constant vibration of the spindle in the running tube has a tendency to cause the apex to wear and the cap to descend, which necessitates frequent readjustment. The position of the bobbins is determined by the lifter plate, and the caps must be set to them by either raising or lowering the spindles. When changing from one kind of bobbin to another, the spindles should be examined to see that the caps are properly set, or otherwise bad bottoms will result. If the tops are badly worn, the spindles should be removed and good ones substituted, as the position of the cap with regard to the spindle has some influence on the yarn. To facilitate the removal of the caps during doffing, the tips of the spindles should be occasionally oiled; if this is neglected they have a tendency to work fast, and in forcing them off, the edge is very liable to get snipped. A fall or a knock may produce the same result, and when it occurs it necessitates the grinding of the edge to remove the irregularity. Otherwise it is impossible to keep the ends up. The cap edge must not be too thick, and should be kept perfectly smooth, which is easily accomplished by polishing regularly with fine emery paper. The friction of the end on the edge of the cap causes grease and dye to collect there, and unless this is removed results in numerous breakages of the end. A cloth should be used for cleaning, and the edge should be well polished, especially in the case of some of the woaded shades, which are very bad in this respect, and require the caps to be cleaned every doffing.

The conditions which exist in a cap frame are to a certain extent somewhat similar to those previously considered when dealing with cone drawing. Here we have a bobbin lead pulling the yarn on under the edge of the cap. As previously shown, a large bobbin diameter has a greater capacity per revolution than a small one, but in cap spinning no provision is made to give the requisite differential speed. Its equivalent is necessary, and is obtained by the relations which exist between the different parts of the spindle. The delivery of the rollers and the velocity of the bobbins are both fixed factors; after leaving the nip of the front rollers the yarn passes through the eye in the top board under the cap edge, and on to the bobbin, which, when revolving, carries the end around the cap. Now, if both have the same velocity, no winding can take place. The rotation of the end must therefore be retarded sufficiently to ensure correct winding without excessive tension. This is a most important feature in cap spinning, and requires to be carefully adapted and regulated to the counts of the thread. In this connection the size of the cap, speed and diameter of the bobbin, and position of the spindle, all exercise some influence. Much has been learnt by experiment and observation in this direction, and since these observations are easily performed upon the cap frame, we shall endeavour to explain them. The cap performs a somewhat complex function; it enables the bobbin to put the twist in the yarn, and also guides the end during the traverse of the lifter, as well as contributing towards the necessary resistance to ensure winding. These features may be best shown by an example. Assuming the front rollers of the frame to be 4in. diameter, and making 40 revolutions, they will deliver 500in. per minute. If the bobbins are 1in. diameter, and running at 8000 revolutions, they will be capable of taking up 25,132in., and at 2in. double that quantity; but only 500in. are available in each instance. The yarn will receive 16 turns per inch, and if the diameter of the cap be taken at 2¼in., it will have to pass through practically 56,000in. of space. Here, then, we have three factors—viz., 500in. of yarn traversing 56,00in. to be wound on a bobbin capable of taking up 25,132in. It will be clear that some compensating arrangement is essential. Much has been made of the loss of twist in the cap frame, but numerous tests by independent observers show that this is more apparent than real. The conditions require that the yarn shall lag behind the bobbin sufficiently to secure winding; hence we can readily ascertain their relative speeds, for that of the bobbin is 25,132, that of the end will be 25,132 − 500 = 24,632in., or 7842 revolutions, and at 2in. 7921 revolutions, showing that the yarn has a greater velocity when the bobbin is full than when empty. This is one reason why many prefer spools to ordinary bobbins. Still, the change is so gradual, and distributed over such a great length, that the difference in this respect is very slight. The most favourable conditions are undoubtedly those where there is least difference between the extreme diameters. We may get the bobbin too small, as will afterwards be apparent, but their relations are easily found.

Uniformity in the appearance of yarns is what is sought by the spinner; but unless they are made under suitable conditions it cannot be obtained. It frequently happens that while certain counts are all that can be desired, others are just the opposite, and often the blame is laid upon the drawing overlooker, whereas it really lies in the principles of spinning being ignored. This frequently comes under notice. For instance, we cannot expect a fine yarn to withstand the same strain as another half as thick again, and yet present the same full appearance. Still, this is the course which is often pursued. In many cases we find that all counts, say between 30's and 64's, are spun at the same speed, with the same size of cap and bobbin, to the detriment of the finer counts. Some have adopted a more rational method, and have frames fitted with short spindles, small caps, and thick-barrelled bobbins, for fine yarns, so as to reduce the strain. In most mills a very wide range of counts is spun with the same size of cap; and as it would be undesirable, and almost impracticable, to keep several changes of caps for each frame, the requisite alterations must be made by changing the speed of the spindles. Generally speaking, small ranges are spun at the same speed, but great care requires to be exercised in this direction, because its application is limited, and very often through ignorance is neglected, resulting in a bad spin when other conditions are favourable. Yarn will only stand a certain strain in spinning, and the nearer we approach to its maximum the leaner and more wiry the thread becomes. In other words, if we spin a yarn at the highest speed and with the greatest strain it can bear, it will be very different from those spun at a high speed with a minimum tension. This is most important, since the two, tension and speed, are so intimately related. We can run a cap frame at such a speed that it is absolutely impossible to keep the ends up; on the other hand, we can so arrange it that although it spins well the yarn is so soft that it can scarcely be pulled off the bobbin. These are extremes. Still, they show that if properly adjusted the cap frame is capable of infinite variation.

(To be continued.)

Fig. 4.

Silk Designs.—Fig. 5.

Fig. 6.

REVIEWS OF BOOKS.

Lacemaking in the Midlands. By C. C. Channer and M. E. Roberts. London: Methuen and Co. 2s. 6d.

This work commences by stating that the history of lacemaking is that of an art, and it describes a piece of lace as an artistic composition expressed in twisted thread. This ideal is upheld throughout the book, a perusal of which raises the ideal of lacemaking to a higher level in the reader's mind. A historical survey of the art in Europe and in England is followed by a description of lacemaking in the Midlands during the eighteenth and nineteenth centuries. A chapter describing the old lace schools is very vividly written, and in a manner which leaves no doubt as to the sex of the writers. The decline of the trade after the introduction of machinery is followed by the attempts which have been made to revive it by the energetic perseverance of a few ladies in the Northampton district. The book is not only instructive, but most interesting reading, and is illustrated profusely by art examples of the various styles of lace.

Woollen and Worsted Finishing Machinery. Messrs. William Whiteley and Sons Limited, Lockwood, Huddersfield.

This is a catalogue of the machinery made by the above firm for the various processes in finishing woollen and worsted cloths. The list includes many kinds of boiling apparatus; brushing and steaming machines; carbonisers; cutting, shearing, crabbing, dewing and dyeing machines; fulling stocks; drying, grinding, milling, napping, shrinking and soaping machines. The machines are fully illustrated, as are also the various hydro-extractors, pumps, presses, etc. Part of the catalogue is devoted to electric motors and other electrical apparatus which Messrs. Whiteley and Co. make. Electrical terms and other useful information are also included.

MODERN TEXTILE DECORATION. By R. BEAUCLAIR. Nottingham: I. Howitt and Son. Stuttgart: Julius Hoffmann. £3; or in two parts, 35s. each.

THIS collection of designs has been executed in a lavish manner, and nothing has been omitted which was required to show up the colours in their exact shades. The designs are of special interest to designers of fancy coloured textiles, for the tints used are all of a subdued nature, serving to illustrate the beautiful effects which can be got without resorting to glaring shades. The designs vary in style, those illustrated in Figs. 1 to 6 being taken promiscuously from different parts of the collection. The colouring is, however, the chief point, and unfortunately it is impossible for us to reproduce the actual shades. The designs are arranged in plates of four or six, the whole being carried in a convenient portfolio.


FIG. 1.


FIG. 2.


FIG. 3.


FIG. 4


MODERN TEXTILE DECORATION.—FIG. 5.


FIG. 6.

WE have also received: Messrs. Lupton and Place's Pocket-Book and Diary, which, in addition to illustrated descriptions of the firm's well-known dobbies and under-motions, contains much useful information, the centre of the book being devoted to blank ruled pages for daily notes.—Messrs. John McNicoll and Co.'s Dundee Jute Price Report gives in tabular form the present prices, exchange, and freight of jute, in comparison with those of the preceding nine years.—Two further instalments have been issued of the "New English Dictionary" (London: Henry Froude), of which the first, covering the interval Invalid—Jew, is edited by Dr. Murray. The second section, embracing Green—Gyzzain, is by Mr. H. Bradley, and concludes the letter G. It is supererogatory at this time to comment upon the merits of this work, which is in every way distinctly in advance of all previously published dictionaries. — The January part of "Cassell's Magazine" (London: Cassell and Co. Limited) contains a number of well-written articles and more than the usual proportion of fiction. A contribution on "Harnessing Niagara" is, though somewhat belated, interestingly written and well illustrated.—The recently issued sections of C. F. Grieb's "Englisch-Deutsches und Deutsch-Englisches Wörterbuch" (Stuttgart: Paul Neff) carry this work well into its second half. The book, when completed, will be of very material assistance to technical readers in both languages, pending the appearance of that much-to-be-desired publication, a reliable and complete technical dictionary for the English, French, and German languages.—We have to thank Messrs. John Oldfield and Co., City Tannery, Bradford, for an effective calendar, and also Messrs. Neale and Wilkinson, foreign carriers, London, for a similar favour.

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.

H. P. (Aberarth).—We should advise you to get Professor J. J. Hummel's "Dyeing of Textile Fabrics" (5s.).

A. Z. AND A. K. (Moscow).—We have made inquiries, but are unable to trace the makers of "Paragon" emery wheels.

E. A. C. (Belfast).—Messrs. Robert Hall and Sons (Bury) Limited, Bury; and Messrs. William Smith and Sons Limited, Heywood.

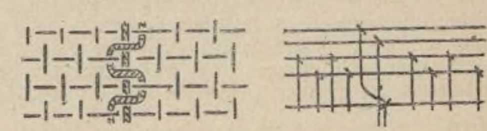
L. LINT CO. (Liverpool).—Messrs. J. H. Riley and Co., Bury; Sir James Farmer and Sons Limited, Salford; and Entwistle and Gass Limited, Bolton.

C. S. S. (Chicago).—There are no books devoted to sisal and manila cordage, but you should gain some useful information from "Flax, Tow and Jute Spinning," by Peter Sharp (5s. 3d.).

W. AND J. K. (Hawick).—There is no book published on the "Carbonisation of Wool." An article appeared on page 107 in the March, 1900, issue of THE TEXTILE MANUFACTURER, which covers the subject. Anything omitted we shall be glad to explain.

J. W. (Walkden).—In the sample sent no special take-up device has been used, the loose weave of the checking being the cause of more picks slipping in. You will notice a corresponding bareness in the ground at either side of the checking. In larger checking effects, where it is necessary to have a number of picks more than in the ground, it is customary to use an arrangement similar to what you surmise.

FABRIK TRUMAN.—The effect is simply a gauze stripe, with the douping end woven in very loosely. The accompanying drawing gives the working of the ends, in this



case a batch of ends being represented by one thick one, to prevent confusion. The draft is also given, the doup requiring to lift every other pick.

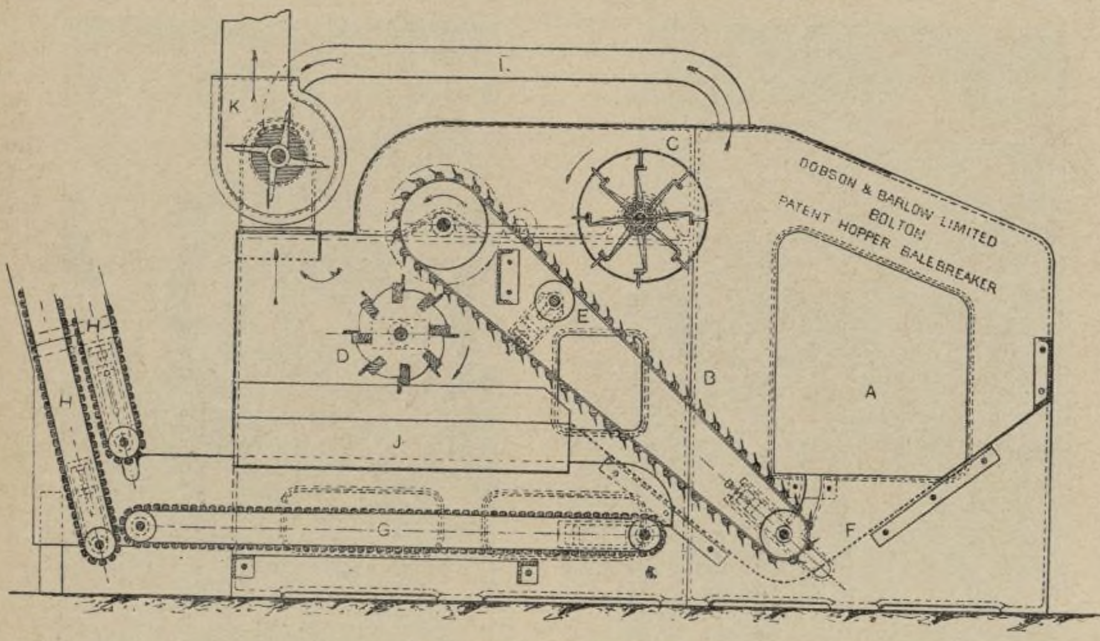
THE TEXTILE MACHINIST:

Devoted to Machinery, Apparatus, Tools, Etc.

Improved Hopper Bale Breaker.

MESSRS. DOBSON AND BARLOW LIMITED, BOLTON.

AN improved type of hopper bale breaker has recently been introduced by the above makers, which has a few features which are great improvements upon the firm's older machine, although that has given, and is still giving, general satisfaction. The new machine has been built with the aim of producing a



IMPROVED HOPPER BALE BREAKER.

maximum output of cotton, a minimum amount of dust, and it is built specially strong, so as to be able to meet every emergency without strain or risk of breakage.

The principal features of the machine are shown in the accompanying illustration, which is a side view in section. The cotton is fed into the hopper A by hand, direct from the bale, and the feed lattice, with its aptitude to clog or get out of order, is avoided. The bottom of the hopper consists of a grid F, which allows all dust and loose dirt on the surface of the lumps of cotton to fall through into the dust chamber below. The cotton is taken from the hopper by the spiked lattice B, which travels at the rate of 200ft. per minute, the amount being regulated by an evener roller C having eight rows of teeth, made of hardened steel, and mounted eccentrically on the evener roller shaft in the usual way.

The evener roller makes from 60 to 70 revolutions per minute, and the cotton which it allows to pass is thrown off by the leather flap roller D, which has a speed of from 400 to 500 revolutions per minute. All the driving is arranged from one shaft, the bearings are all either cast iron or hardened steel into cast iron, and special arrangements are made for easily adjusting the rollers and lattices in relation to each other. The cotton, when thrown off the spiked lattice by the flap roller, may be arranged so as to fall through the floor into the room below; if required in the same room, it falls on to a travelling lattice H, which carries it to its destination.

One very important feature is the arrangement for carrying away the dust. A fan K is placed on the top of the machine, and by pipes placed just over the flap roller and over the evener roller, draws away the particles of dust and fluff which are always present in large quantities in this class of machine. The entrance to each pipe is protected by a grid, or perforated box chamber, which prevents the fibre being drawn away with the dust. It is needless to remark that this arrangement makes a wonderful difference to the breaker-room. The air is purer, the machinery is kept cleaner, and the cotton is in a much cleaner state when passed on to the opener or scutcher. The output is very satisfactory. An American bale can be put through in from six to twelve minutes when fed by one attendant. An Egyptian bale can be opened in from three to five minutes, but requires two feeders to keep pace with the machine.

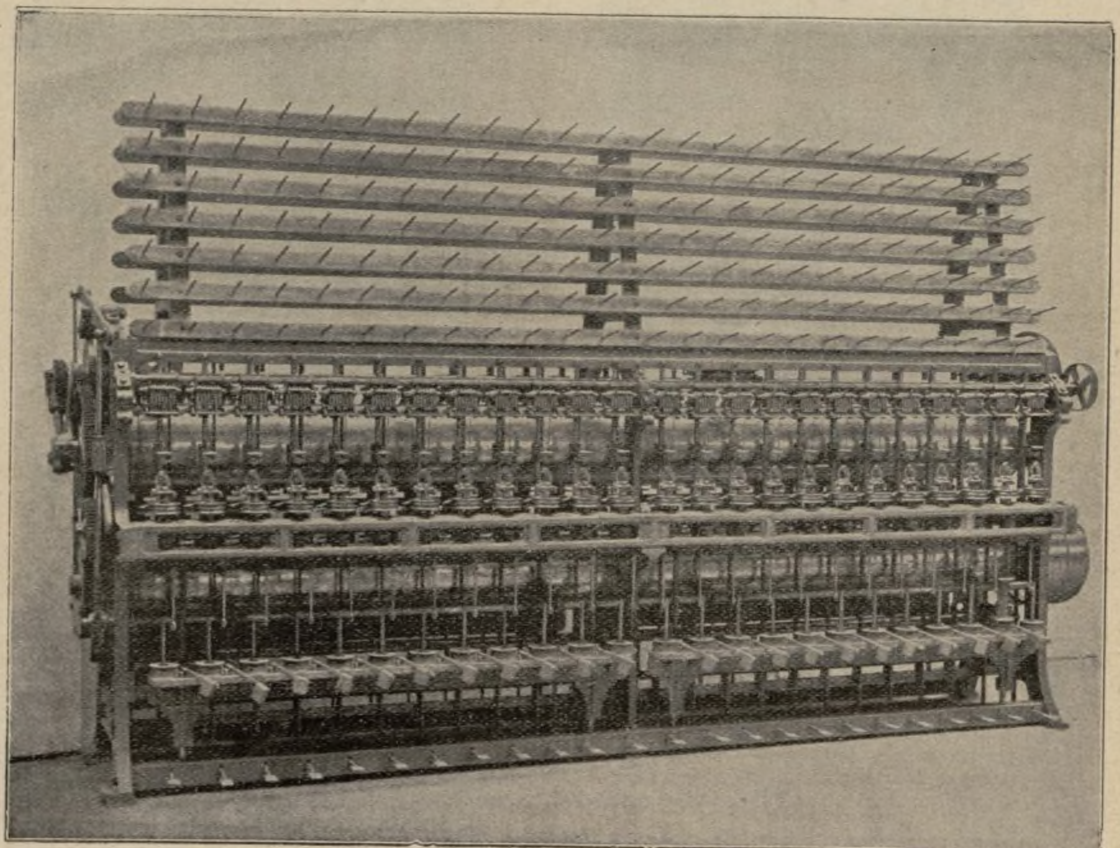
MESSRS. DOHERTY AND DOUAT, engineers, Manchester, inform us that owing to the increase in their business they have removed to larger premises, situated at 82 and 83, Deansgate Arcade, Deansgate, Manchester, where all correspondence should in future be addressed.

Improved Twisting Machine.

MESSRS. DOUGLAS FRASER AND SONS, ARBROATH, N.B.

THE new features of the stop-motion tube twisting machine shown in Fig. 1 make it of considerable interest to spinners of flax, jute, or hemp yarns. The spindles, which take from two to five-ply yarn, are quite independent of one another, and are provided with separate stop motions. The independent driving makes it possible to either piece the ends or doff the bobbins without interfering with the other spindles, or without stopping the machine. The stoppage of the flyers, bobbins, and haul pulleys is effected by brakes, in order that sufficient length of the single yarn may be left for piecing before entering the eye.

The general arrangement of the machine is given in Fig. 2; the stop-motion mechanism is shown at A, and B is the eye or tube through



IMPROVED TWISTING MACHINE.—FIG. 1.

which the untwisted strands are drawn. The point where these threads touch the top of the spindle is marked at C, the spindle being in one piece with the flyer. The haul pulley, which takes the place of the draw rollers in an ordinary twisting frame, is shown at D, and this pulley runs loosely on the spindle, which is hollow, and through which the threads pass, being twisted together in the passage. The twisted yarn then passes over pulleys at the head of the flyer and then on to the bobbin. E is the driving pulley fixed to the flyer, and F is the drag for retarding the bobbin.

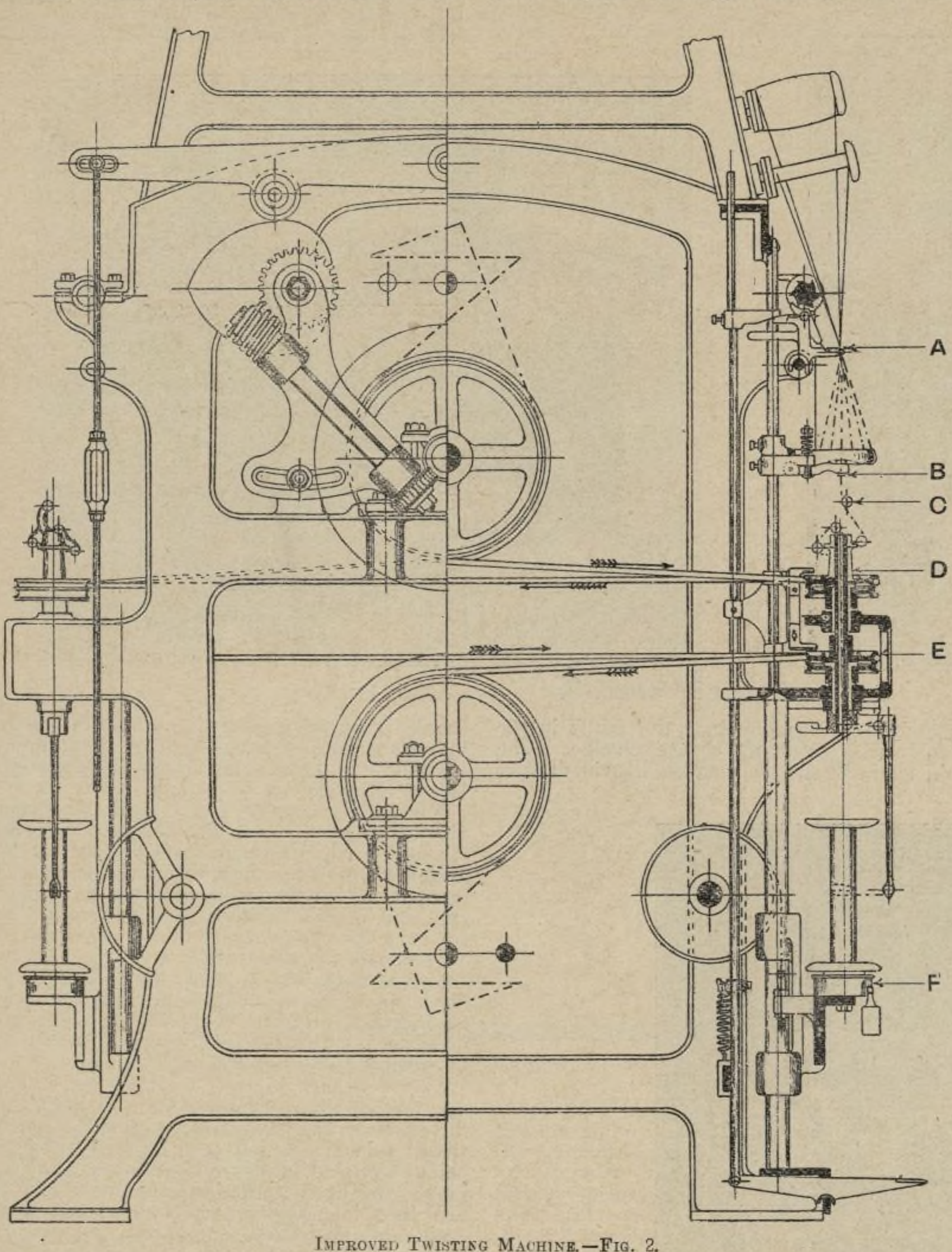
The flyer and haul pulleys are driven separately by two sets of pulleys, the bands being shifted by a belt fork from the fast to the loose pulleys. Fixed to this belt fork are the friction brakes, which, at the moment the driving bands are shifted, stop both the flyer and the delivery of thread to the bobbin. The single-yarn stop motion is also connected to the belt fork by its rod, as is also the polishing tube. If a break occurs in either the single or twisted yarns, or if a choke takes place in the hollow spindle, the parts are stopped in time to piece up or to remove the obstruction.

The spindles are arranged compactly, but enough space is allowed for doffing whilst the adjacent bobbins are running. There is very little toothed gearing in the machine, all being belt or band, with the exception of three change wheels at the end of the frame. This system allows of high running speeds. The drag of the twisting bobbin shown at F in Fig. 2 is run in oil, which is contained in a cup cast in the lifter rail, this arrangement giving a regular drag, which gives no trouble when twisting fine or weak yarns.

The actual twisting is done between the polishing tube B and the top of the spindle C. The space between these is only about an inch, so that regularity of twist is ensured when treating irregular or rough material. The machine puts a high finish on the twist, the loose fibres are laid during the process of twisting, and the polish given makes it very suitable for shoe threads, seaming, shop, rope and other twines.

Machinery at the Paris Exhibition.—VII.

THE Maschinenfabrik Rüti, formerly Caspar Honegger, Rüti, Canton Zurich, exhibited ten different power looms and some preparing machines for weaving, and proved, not only by the number of their exhibits, but also by the working of the principal types of looms engaged in producing various fabrics, and the elegant and accurate construction of the same, that they occupy a leading position in this special branch. For more than fifty years the firm of Honegger has built specialities in power looms and preparing machines for silk, cotton, woollen, and linen weaving, and at present, with about 1200



IMPROVED TWISTING MACHINE.—FIG. 2.

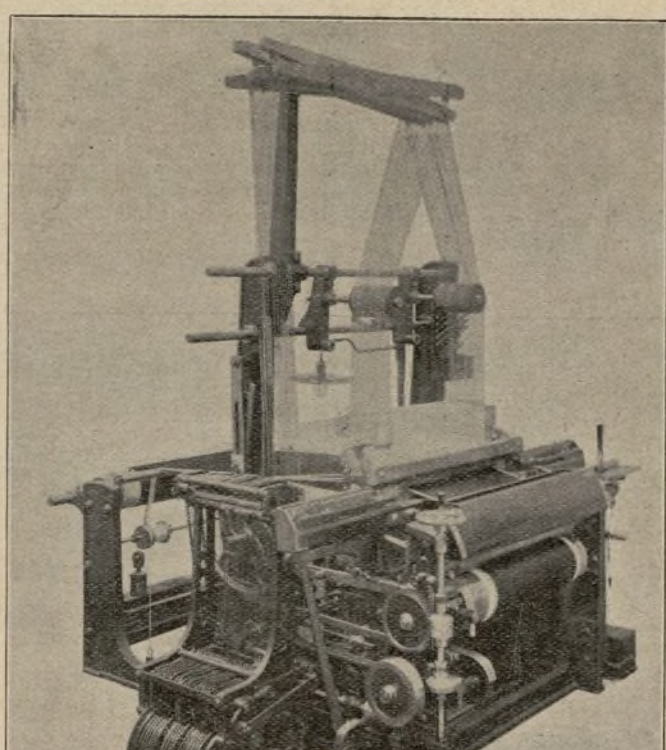


FIG. 29.

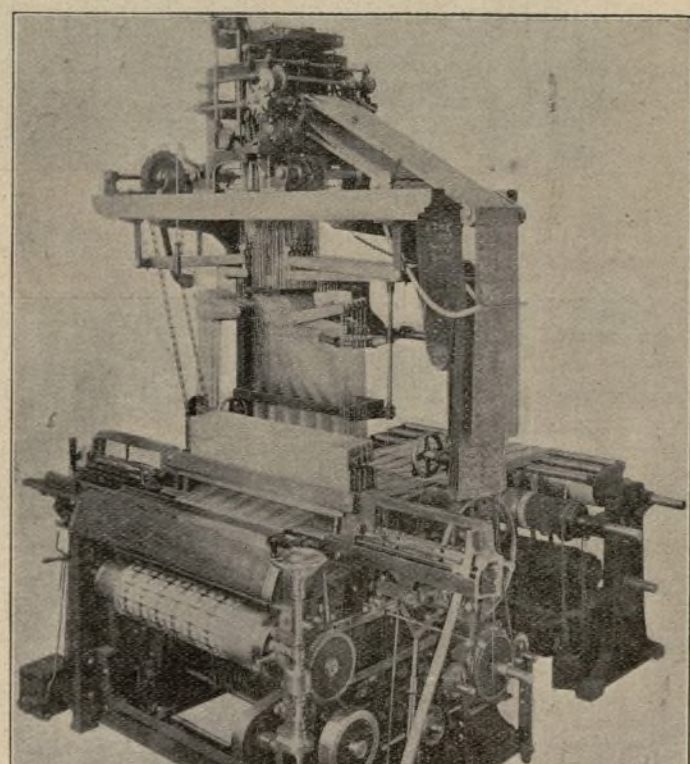


FIG. 31.

MACHINERY AT THE PARIS EXHIBITION

workmen, produces annually 6000 looms and a corresponding number of preparing machines, which are sold in all Continental and also in transoceanic countries.

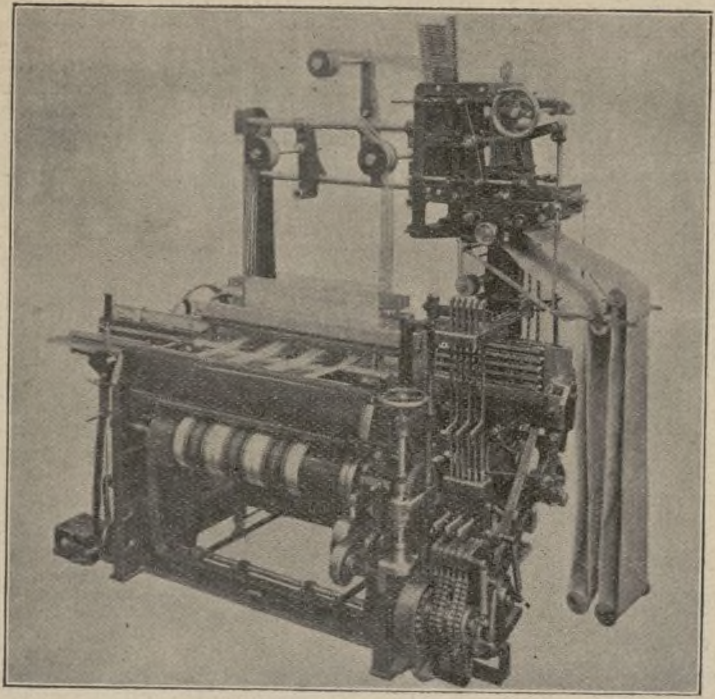
One half of the looms form a tolerably complete collection of the types mostly used for silk manufacture. They are all constructed according to the original "Honegger" loom pattern, which is used largely in Continental silk factories, and has been adopted by other loom makers; while in England and America a type of loom is used for silk weaving resembling the cotton loom, and apparently developed from this latter by suitable modifications.

The Exhibition loom shown in Fig. 29 serves for weaving certain heavy silk goods, and has a working width of 30in. The shafts are lifted by a dobby of twenty shafts on the double-lift system, which is arranged on the floor at the side of the loom. The latter makes 120 picks per minute, and by the action of the jointed crankarms—which effect a very energetic beat-up—produces a fine, very heavy quality of peau de soie. This loom, as well as the others, possesses a very convenient arrangement for turning back the cards by means of a handwheel and chain.

The loom in Fig. 30 is provided with a one-sided shuttle change motion for six shuttles, and is combined with a double-lift shaft machine, which controls the weave and also the shuttle-box motion by means of an endless paper card. This arrangement allows of long weft repeats without occupying much space, and without much additional cost. As the shaft machine is in direct connection with the loom-driving shaft, a complete agreement between the motion of the shafts and the pattern exists at all times.

The loom in Fig. 31 has four change boxes on each side, and thus permits the use of seven shuttles in optional sequence. A small jacquard machine is used, which is built on the double-lift system, and by means of a suitable arrangement of levers actuates a number of heald shafts, produces small jacquard effects, and controls the shuttle changing and the disengagement of the take-up motion. The shuttle-box motion is effected by turning cranks by means of partially-toothed wheels. It acts very smoothly, and while the loom is standing, the weaver, by a simple turning of a crank, can lift any one of the shuttle boxes to the level of the shuttle race. Another loom had a double-lift jacquard machine with 896 pairs of hooks on Verdol's system and a special patented apparatus for saving the paper cards combined. When the card is turned, it at first drops or moves farther away from the wires, and is then turned by means of a star wheel. The loom is further provided with jacks placed above and underneath the machine, which can be actuated independently of it. The fabric made at the Exhibition was a large patterned damask, and was woven at the high speed of from 150 to 160 picks per minute. On the last of the five silk looms two pictures representing William Tell were woven at the same time. The loom was provided with two change boxes on each side, by means of which the weft might be changed to pick-and-pick. The changing can be effected by the jacquard machine or by a dobby, or in regular sequence self-actingly. The jacquard used was also built on Verdol's system, with 1344 hooks, high and low, open and closed shed.

Of the five other looms, the Northrop loom, shown in Fig. 32, with its automatic cop-changing motion and warp stop motion, attracted the attention of most visitors. The Maschinenfabrick Rüti has the manufacturing rights in most Continental countries for this novelty, which has been already introduced in America on a large scale, and the combination of the improvements mentioned with their well-tried cotton loom appears to be successful



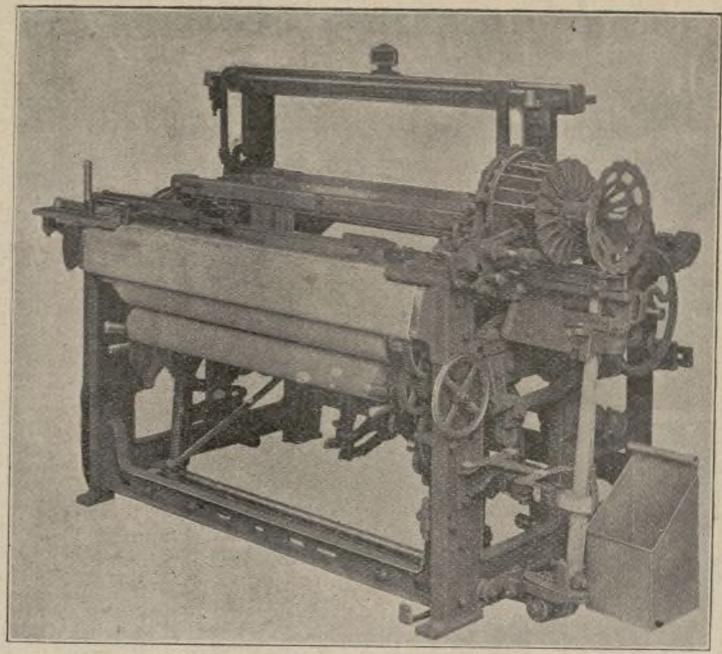
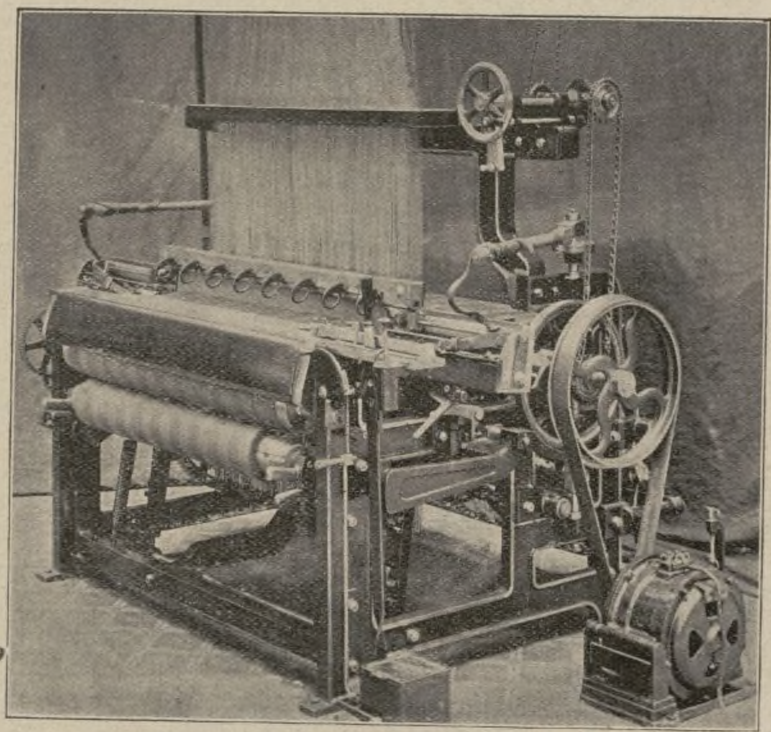


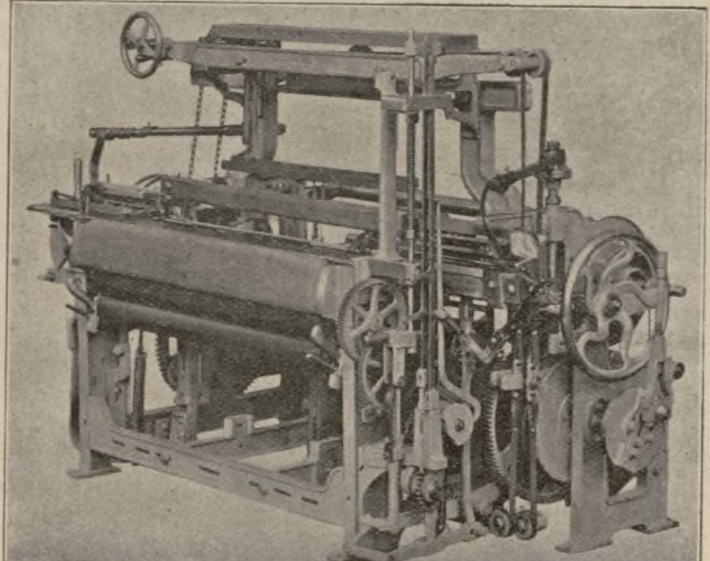
FIG. 30. MACHINERY AT THE PARIS EXHIBITION. FIG. 32.

and likely to introduce the loom into many cotton weaving sheds in the Old World. Assuming the general arrangement of the automatic cop-changing



MACHINERY AT THE PARIS EXHIBITION.—FIG. 34.

motion as built by the Northrop Company to be generally known, we need only mention that the



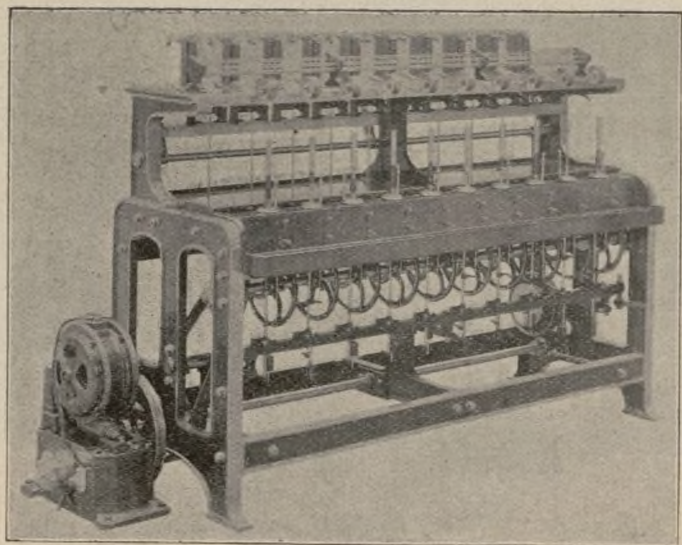


FIG. 33. MACHINERY AT THE PARIS EXHIBITION. FIG. 35.

"feeler" motion on the exhibited loom is novel, and patented by the Maschinenfabrik Rüti. This apparatus, which causes the weft cop to be changed *before* the weft is completely used up, prevents completely, and with certainty, the faults in the weft otherwise occurring at the change. The certain action of the loom makes it evident that where fabrics with single coloured weft, and warp and weft of good material, are manufactured, it would win a place for itself, even if the American practice of giving from 16 to 20 or more looms to one weaver to overlook was not completely carried through under European conditions. The introduction of the loom under certain circumstances, and for a large part of the simpler fabrics, should be of the greatest importance. The loom may be safely asserted to be one of the greatest inventions in the weaving branch made during the last twenty years.

For a speciality in piqué goods with double warp, the loom given in Fig. 33 was shown with a jacquard machine for high and low, open and closed shed, which remains open during three picks. The motions for the jacquard machine, the drum for the front shafts, the shuttle change, etc., all start from the same point, which is very convenient.

The single-shuttle cotton loom shown in Fig. 34, of 40in. reed space, was provided with a double-cylinder jacquard machine with double lift, and served for weaving cotton dress goods. It works at 180 picks per minute. As will be seen, this loom may be arranged for direct electrical driving.

Two weft pirn winding machines were shown, one for winding cotton, woollen, or linen yarns directly from the hank, and the other for winding single or double silk weft work correctly (this latter being shown in Fig. 35); and there was also a combined warping and beaming machine for silk. This firm have long held a name as loom makers, and their exhibits at Paris showed that they were not surpassed by any other firm. They received the grand prix, and three of the collaborators received gold medals.

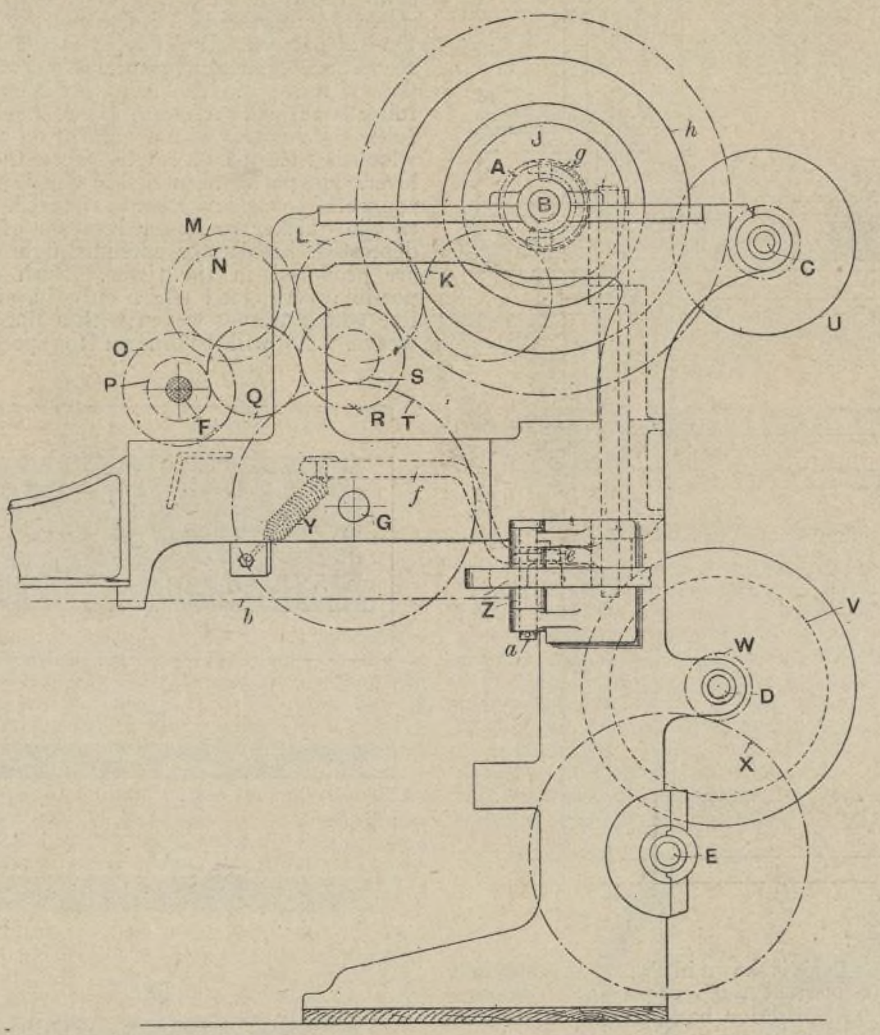
(To be continued.)

Improved Self-acting Mule.

MESSRS. JOHN HETHERINGTON AND SONS LIMITED, VULCAN WORKS, MANCHESTER.

VERY good results have been obtained from the new method of driving the carriage of woollen and waste mules recently adopted on some of the machines made by Messrs. John Hetherington and Sons Limited. The carriage is driven independently of the spindles by rope gearing from the overhead countershaft, which also drives the backing-off and taking-in motions. The way of doing this is shown in the accompanying drawings, where Fig. 1 is a side view, and Fig. 2 a plan of the headstock of the mule.

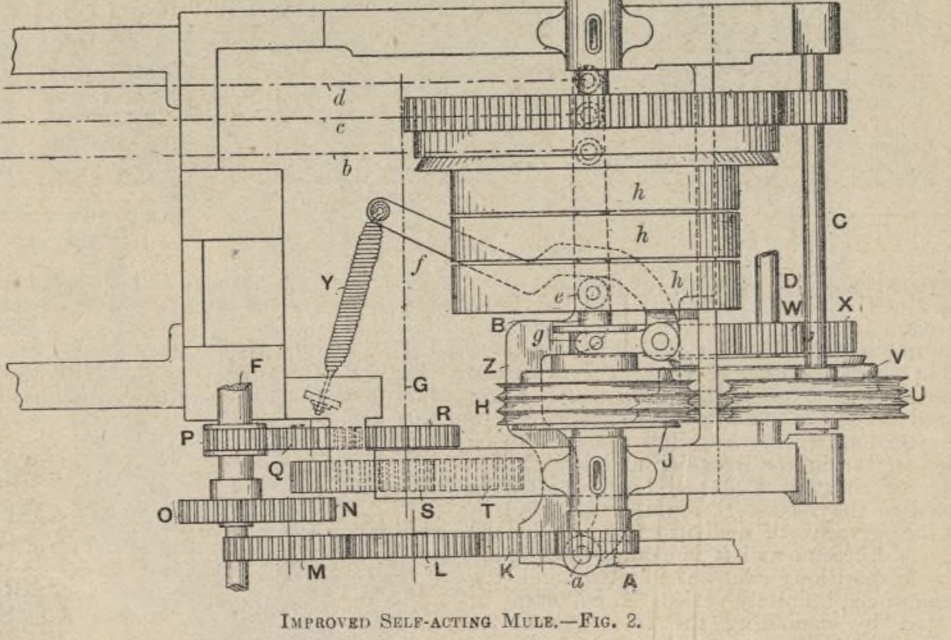
The backing-off shaft is shown at C, the taking-in friction shaft at D, the drawing-in scroll shaft at E, the front roller shaft at F, and the drawing-out scroll shaft at G. The new method consists of



IMPROVED SELF-ACTING MULE.—FIG. 1.

loosely mounting the friction pulley H, and the friction plate J upon the rimshaft B, whilst to the boss of the friction plate J a pinion A is keyed, driving the train of toothed wheels K, L, M, N, and O, from which, by another train of toothed wheels P, Q, R, S, and T, the drawing-out scroll shaft G is driven when the friction plate A and the friction-rope pulley H are in contact with each other. The rope—which derives motion from the overhead countershaft—is not shown in either drawing, but passes round the friction rope pulley H which is on the rimshaft B, and then round the other rope pulleys U and V on the backing-off shaft C, also taking-in shaft D, and thus driving both motions in addition to the drawing-in scroll shaft E, which is geared to the taking-in shaft by a clutch and the toothed wheels W and X.

Normally the friction rope pulley H is held in gear with the friction plate J by means of the coiled spring Y. Below the friction clutch is fulcrumed at *a* the usual horizontal elbow lever Z which is connected to the three change motion rods *b*, *c*, and *d*, by which the position of the lever Z is regulated and the usual changes effected. Upon the lever Z is mounted a bowl *e*, which, when the lever is moved in one direction and a change is made, bears against the curved surface of the lever *f*, and, pushing it back against the resistance of the spring Y, causes the clutch fork *g* to move the friction rope pulley H out of contact with the friction plate J, and so stops the rotation of the front roller shaft F and the drawing-out scroll G, thereby stopping the front rollers and the mule carriage. By driving the carriage in the manner described, it can be run at a regular speed independently of the ordinary two speeds given to the rimshaft by means of the driving belt and the usual pulleys *h* on the rimshaft, and hence the speed of the spindles can be varied without affecting the speed of the carriage.



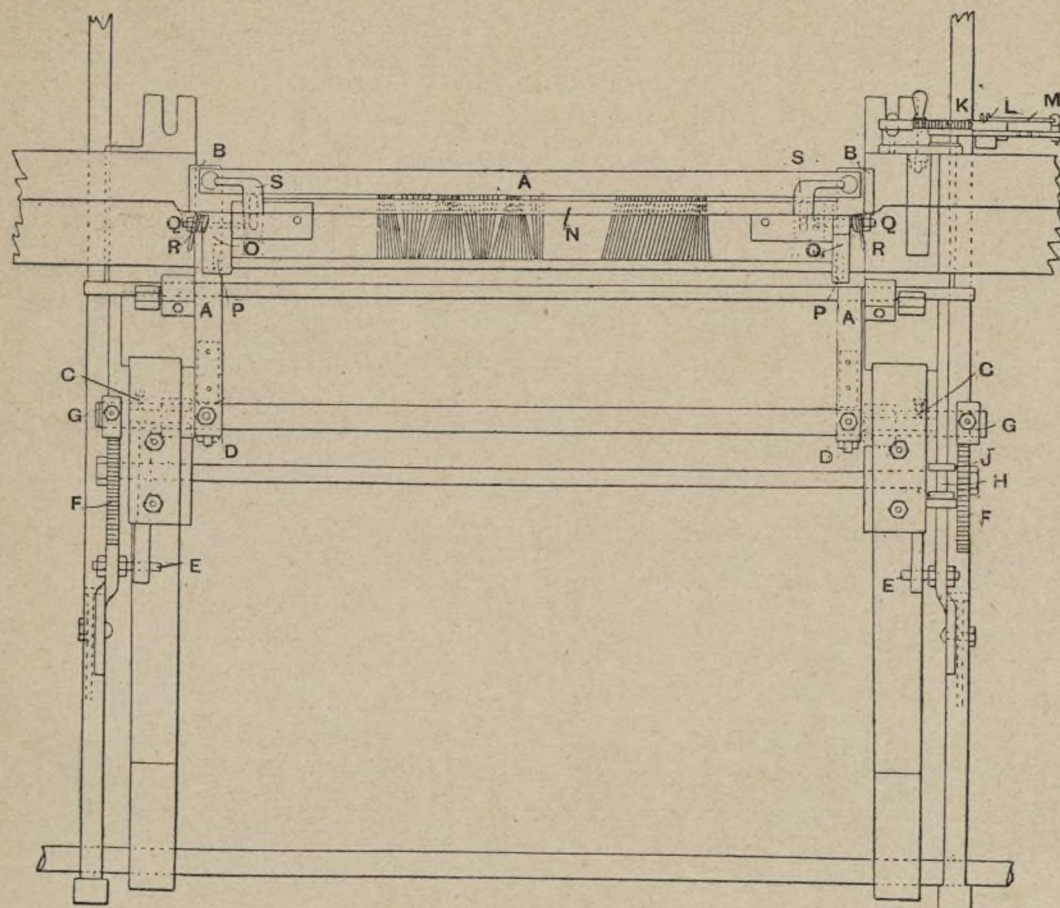
IMPROVED SELF-ACTING MULE.—FIG. 2.

Reeds for Ondule Effects.

ONE of the most fashionable types of design of the past season was the ondulé effect, which will probably be still more in vogue during the coming season. Ondulé designs are obtained in various ways, but perhaps the most ingenious is the method devised by Mr. Patrone, of Corino, who uses reeds with movable dents, which by changing their distance vary the distance between the warp threads of the tissue and weave them in sinuous lines. This, however, according to "L'Industria Tessite e Tintoria," has not proved generally practicable, as it was found that a large reduction in the number of warp threads, or great openness, was required. To obtain somewhat closer tissues, recourse has been had to reeds with inclined dents, which, being raised and lowered, spread apart or gather together the warp threads and dispose them in the fabric in sinuous lines. A Mr. Greffert has brought out a loom attachment and reed for displacing the warp threads in the manner mentioned. He employs a reed with alternating fans, as Fig. 1, or fans with intermediate parallel inclined dents, according to the effect to be obtained, and the warp threads are drawn through the reed in the same way as for plain fabrics. These reeds are mounted in a frame A, which is movable upwards and downwards, and guided by slotted guides B and C, fixed to the slay swords. This frame rests at each side upon one arm of a bell crank lever D, the shaft for which is guided in an opening in the slay swords; the other arms of the bell cranks engage by means of slots with studs E fixed on the loom frame sides. The slay in its to-and-fro motion carries the bell-crank shaft forward and backward; and the stud E, passing through the slotted arm, will cause the bell crank to oscillate and the frame carrying the reed to be raised and lowered. The reed in this way would always rise by the same amount, and would not produce an undulated pattern, and it is necessary to vary the point of contact of the weft on the reed at the time of beating up. For this purpose there is fixed upon the slay swords below the bar or shaft carrying the bell cranks, a shaft carrying at its ends two eccentrics F, upon which the bar G reposes. The shaft, mounted in two bearings, receives its rotary motion by means of a worm wheel H, which is fixed thereon and engages with a worm J fixed upon a vertical shaft, the upper end of which carries a ratchet wheel K actuated by means of a lever and pawl L. This shaft turns in bearings attached to the upper part of the slay swords. For turning it and the two eccentrics, the to-and-fro motion of the slay is utilised. To the frame of the loom an iron rod M is attached, which is connected with the lever of the ratchet wheel K, and, retaining the same while the slay makes its motion, causes the lever to describe an arc, and its pawl to turn the wheel K by a certain angle that can be varied by changing the point of attachment of the rod M on the lever. With this arrangement more or less elongated but always regular undulations of the warp can be obtained. If it is desired to have irregular undulations, the eccentrics can be made of irregular shape, according to the pattern desired.

In order to utilise for the undulations all the variations in the position of the reed of which the entire height of the same admits, the weft is beaten up in such a manner that the fabric rests upon the lower rail of the slay at the moment of beating up, by means of a rod N resting upon the fabric close to the reed. The rod is carried at its ends by the longer arms of the bell cranks O, and the shorter arm with an inclined face is brought into contact with a roller P fixed to the front of the slay. The bell cranks turn on pins Q fixed on the front of the loom, and are provided with springs R, which tend to lift the bell cranks and the rod N. A stop S prevents its lifting higher than the position occupied by the tissue in its normal position at the moment when the shed is opened. The bell cranks are lifted by the springs R against the stops S, and hold the rod up above the cloth while the shed is opened and the shuttle passes through it. When the slay moves forward again to beat up the weft, the roller P encounters the inclined face of the short arm of the bell crank O, forces it downwards, lowers the rod N, and the cloth upon which it now bears, in such a way that at the moment when the reed touches the cloth and the weft is beaten up, the warp rests upon the bottom rail of the slay; and as the position of the reed is at that moment regulated by the position of the eccentrics, it is evident that at each change in the position of the reed, the warp threads will occupy different positions, and consequently form undulating lines in the tissue.

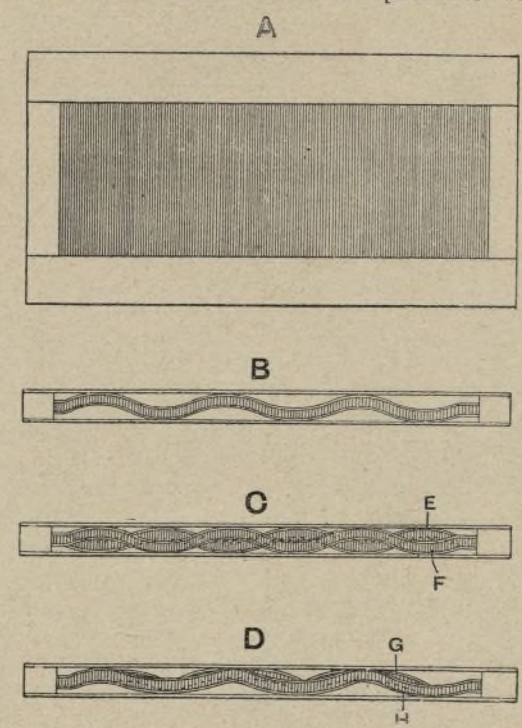
A Mr. Erdmann has devised a reed for placing the weft in undulating lines in the tissue. This is a solid reed, with the difference that instead of the dents being arranged in a straight line, they are placed in an undulating line, so that when the weft is beaten up it is placed in the cloth in the same undulating lines as those of the reed. With this reed Mr. Erdmann proposes to weave tissues that are to be watered or moiréd. The watering of tissues rests upon the principle of crossing the weft threads by folding the fabric upon itself, so that the threads in one layer cross those of the other at certain points, and then pass the folds between two rolls subjected to strong pressure, so that the tissue is flattened and the impression of the lower threads remains marked on the upper ones, and *vice versâ*. This is the principle on which watered fabrics are mostly produced, and it is evident that much care is required to obtain such a crossing of the weft threads as will give a good result. Many systems have been proposed for facilitating the process, and adopted with more or less success. The latest novelty in this line is the Erdmann reed, which, as explained, causes the weft to assume undulating lines in the fabric, which, when



REEDS FOR ONDULE EFFECTS.—FIG. 1.

submitted to the watering process, will produce a corresponding design on the fabric.

The slay consists of an ordinary reed, the wires of which are soldered so as to present a regularly or irregularly undulating line. Fig. 2 shows a front view at A, and plan views at B, C, and D,



REEDS FOR ONDULE EFFECTS.—FIG. 2.

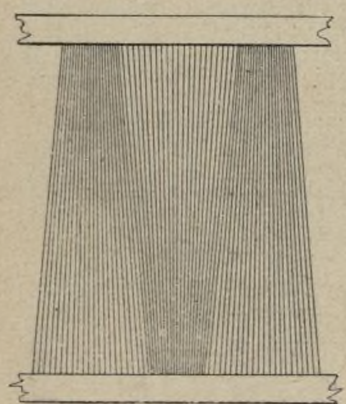
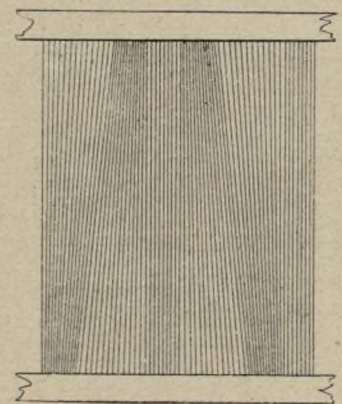


FIG. 3.



REEDS FOR ONDULE EFFECTS.—FIG. 4.

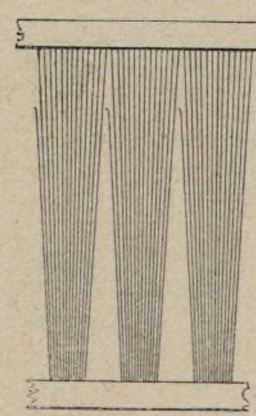


FIG 5.

which show the different forms the reed can take. In Fig. 2, at B, the upper curvature is equal to the lower one, so that the weft threads will always be beaten up parallel with each other. C represents a reed in which the upper and lower curves are not parallel with each other, the lower one E being displaced as regards the upper one F, as shown in the illustration, which will allow the weft to be inserted in varying or irregular undulations if a regular or irregular up-and-down motion is imparted to the reed. D represents a reed in which the curvature of the bottom and top bars G and H are different, and it is evident that many various dispositions can be adopted, and the patterns woven infinitely varied. It will easily be seen that by combining the two systems for obtaining undulating warp and weft threads, and arranging suitable change motions, entirely novel fabrics can be obtained.

Another, and perhaps the simplest, method of obtaining ondulé effects is by using the double fan reed, one of which is shown in Fig. 3. The disadvantage attending this class of reed is that it requires a great height, so as to allow of its use at different levels, for beating up the weft. These double fan reeds are almost always made with their two parts in duplicate, although it should be possible to make numerous variations. The "Leipziger Monatschrift für Textil Industrie" suggests that alternate vertical and inclined sections be used, as shown in Fig. 4, where a varied width of each pattern would give differing ondulé effects.

A peculiar reed for weaving ondulé goods is shown in Fig. 5. It is made with one-sided fans only, and with one dent open. Naturally, such reeds not bound in on one side must be broad and strong, and very firmly bound in at the other side, in order to stand the beating up. A peculiar reed exhibited at Paris is shown in Fig. 6. It is specially suitable for crossed warp goods and trimmings which are still made on hand-looms. A twisting of the thread can be easily effected by it. Naturally the warp threads which are to be crossed in this peculiar manner have to be conducted over or under the loom harness, and the heald mails holding the respective threads have to be connected to the healds when the crossing is to be effected from below, by means of a revolver hook connection. But if the crossing is made above, the thread is laid over, and the respective heald has only to be lifted over.

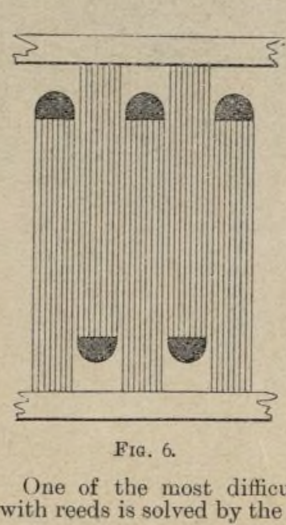
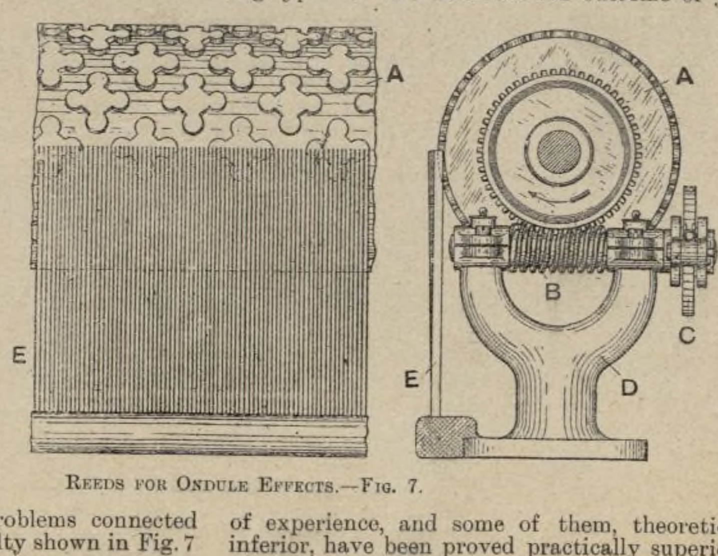


FIG. 6.



REEDS FOR ONDULE EFFECTS.—FIG. 7.

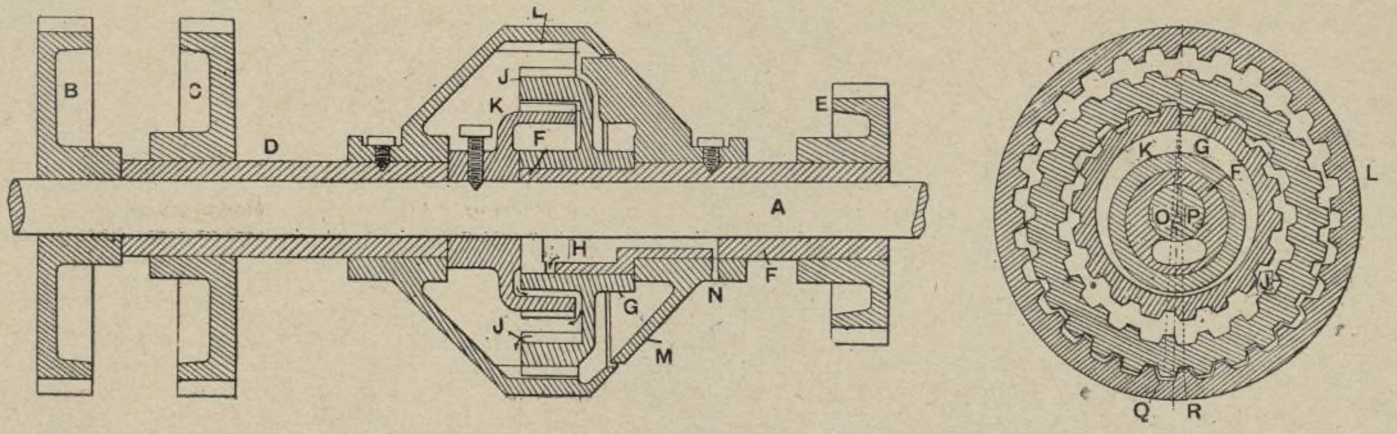
One of the most difficult problems connected with reeds is solved by the novelty shown in Fig. 7—viz., that of producing patterns in the cloth by means of the reed. E is a portion of a reed, the dents of which are bound or soldered in fast at the bottom into a frame, and are free at the top. The dents must be tolerably strong, but also elastic, to enable them to stand the beat-up on the fell of the cloth, and at the same time to yield to the pattern roller. A represents a roller engraved with any kind of pattern. It is placed at the back of the reed at such a height that the lifted warp threads do not touch it. The side view shows how the roller is turned. A worm-wheel fixed upon the roller end engages with a worm B on a cross-shaft which is turned by a ratchet wheel C and a pawl lever. The parts are carried by a pedestal D, firmly connected to the lower bar of the reed. According to the quicker or lower rotation of the roller, depressed, regular, or extended figures or effects are produced in the tissue. Such figures are possible with good effect only in silk or very fine cotton tissues woven with a linen or taffeta weave. As will be known to specialists who thoroughly understand silk taffetas, all irregularities in the reed are at once visible on these goods. By the simple shifting of a dent a more or less large opening is made, and the weft thread protrudes more and causes a corresponding effect, which is at once more or less distinctly visible according to the position of the spectator. Many readers will think that it will certainly not be possible to obtain regular patterns in this way. This is actually the case, for in the whole piece of tissue the same pattern effect is not exactly produced twice over, which, however, must not be taken to mean that there is no similarity in the figures. The pattern effects produced in this manner are both attractive and novel. How the novelty will be used in practice, time only can show.

New Differential Motion.

MR. A. C. CUNHAMORAES, RUE CAMBON, PARIS.

THE differential motion is one of the mechanisms employed in spinning machinery upon which much labour has been spent and great ingenuity displayed. The existing types of the motion are the outcome of years of experience, and some of them, theoretically inferior, have been proved practically superior to seemingly more ingenious contrivances. It is not only essential that the mechanism should be simple and easily made, but it should take up little room and be of a form which can be easily and efficiently lubricated.

One form of differential gearing has recently been greatly improved, and in its present condition is very compact, and possesses arrangements for a regular system of lubrication. It is shown in section in the accompanying illustration, the two drawings being longitudinal and transverse sections respectively. The main spindle is shown at A, and is driven by the gearing usual to a slubbing or roving frame. It transmits power to the spindles by the toothed wheel B which is keyed upon it. Motion to the bobbins is transmitted by the wheel C fastened on the sleeve D, which receives its motion from the differential gearing. This gearing receives motion from the cones through the toothed wheel E which is fixed on the sleeve F.



New Differential Motion.

This sleeve rides loosely upon the spindle A, and at its inner end H is shaped in eccentric form. A collar G fits upon this eccentric, carrying, fixed to it, the ring wheel J, which is toothed both internally and externally. Upon the spindle A is fixed a toothed ring wheel K, which is concentric with the spindle, and which gears with the internal teeth of the wheel J. Then outside all there is fixed on another sleeve D an internally-toothed ring L capable of gearing with the external teeth of the ring J. The wheel C is fixed upon the sleeve D and communicates motion to the bobbins. The several toothed rings are so proportioned that J is always engaged internally by K, and externally by L. The ring L forms part of a casing which encloses the gearing, the other part of the casing being formed by the coned part M fixed to the sleeve F.

Lubrication is provided for through the oil hole N, which is ordinarily closed by a screw, and which communicates with a cavity in the eccentric part H, whence it flows (as indicated in the figure by arrows) over the toothed surfaces. If the wheel E be driven at the same speed as the shaft A, the assemblage also will rotate at the same speed. But if the wheel E be rotated faster or slower, it will move the eccentric H around A, and displace the toothed ring J, thus causing the motion of L to be accelerated or retarded, as the case may be, relatively to the motion of A. If, for example, the eccentric H be moved from O to P, the ring L will at the same time be displaced from the position at Q to that at R.

Tentering and Drying Machinery.

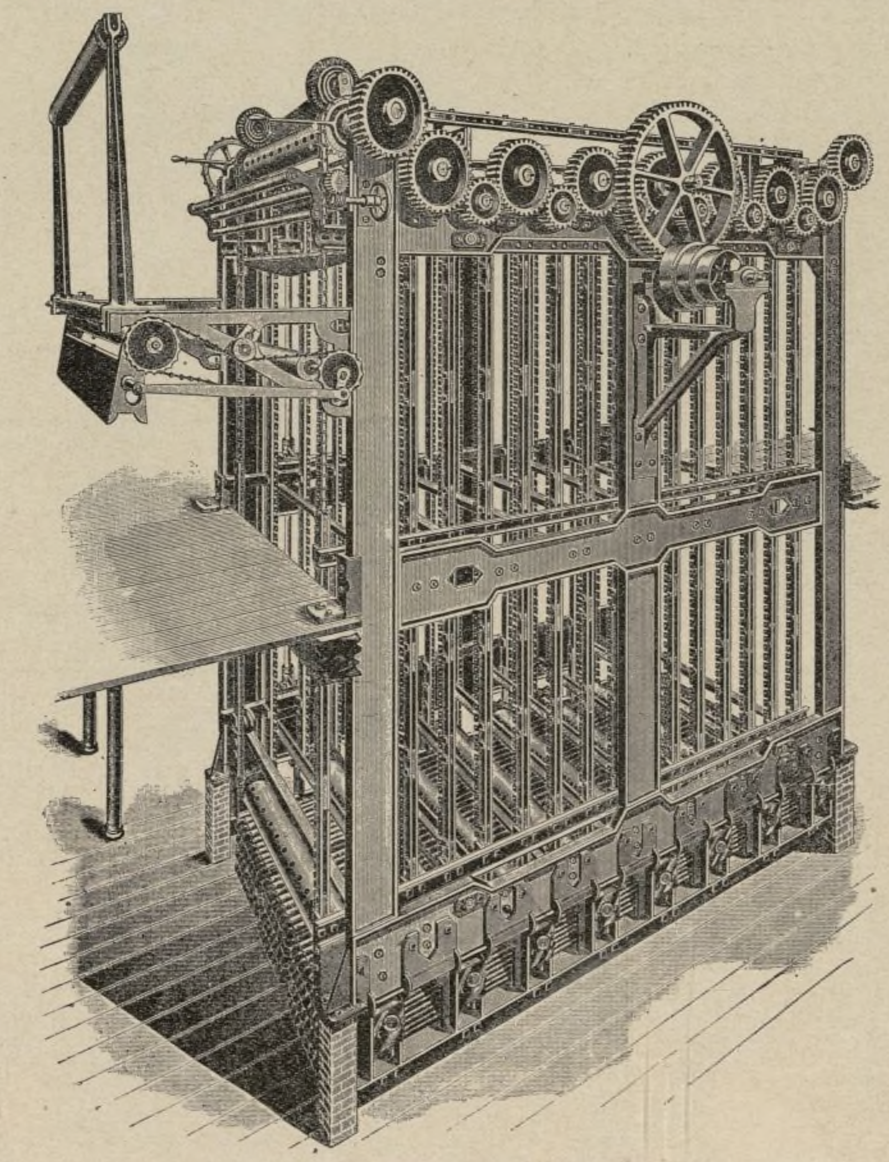
MR. JOHN HEATHCOTE, PROVIDENCE, R.I., U.S.A.

AMERICAN machinists have given of late a great deal of attention to finishing machinery. If their enterprise is not emulated in this country, there is every probability of some distinctly new feature being eventually introduced by them, and their holding, with some finishing machine, a position similar to that which they now enjoy in regard to automatic looms. Old countries may often learn from new ones, for there is the risk of a routine of experience making men and countries antagonistic to any change out of the ordinary rut of business procedure.

A strongly-built, heavily-braced tentering and drying machine is shown in the accompanying illustration, designed for stretching and drying woollen and worsted goods. The machine is built with the aim of taking up less floor space than the usual type of tenter and dryer, and also to require less power than is generally necessary. This latter feature is achieved by arranging the chain to go up one side and down the other each time it traverses the machine, its different lengths acting as a counterbalance to each other. This chain is made of malleable iron, with brass plates, in which the tenter pins are set closely together. The chains work in sprocket wheels at both the top and bottom of the machine, and an automatic take-up arrangement keeps the chain always taut.

Heat is derived from steampiping, which is placed at the base of the apparatus, in a position where it does not come too closely in contact with the goods. In operation, the wet cloth passes over the roll in front of the machine, and passing across the top turns and goes down into the machine and then up again, and so on, according to the number of folds. It then passes out dry over the delivery roll in front, and then up to the folder. The operator, standing on the platform in front, has complete control of the machine, as well as of the tenter wings on the top, which gradually stretch the goods to the width desired. These tenter wings are adjustable, and will stay wherever they are set.

The same makers have recently made a new type of dryer, which is built to meet the requirements of small firms, or to act as a supplementary machine to a larger one. A fan is placed between an inner chamber and an annular chamber. One side of the annular chamber is formed by the cloth circumscribing the machine, the other side being of sheet



Tentering and Drying Machinery.

metal in telescopic form. Opposite the fan is a pyramidal deflector for the purpose of minimising the back pressure of air. Within the annular chamber is a layer of steam coils a few inches away from the cloth. These are supplied with direct steam. The fan keeps the air travelling at a great speed, and prevents the intense heat from baking the cloth. Every inch of cloth is subjected to this heat and direct air blast, during its entire travel around the machine. The blast of air is thus perfectly dry and of unvarying temperature. All the moisture in the cloth is forced outward, and escapes into the surrounding atmosphere. By other systems the air blast in a drying machine frequently reduces the temperature, or contains so much moisture as to impair the efficiency of the heat supplied, while in this machine the entire efficiency of both heat and air blast is utilised.

The blast of air moves at about the rate of 30,000 cub. ft. per minute, through an area of 13 sq. ft., and is capable of drying about 1500yds. of cloth 54in. wide per working day. The machine takes up 105 sq. ft. of floor space, and is 9ft. high.

A New Loom.

MR. O. HALLENSLEBEN, HILDEN, GERMANY.

THERE have been many attempts to find some method of laying the weft in the shed without the employment of a passing shuttle. The objection to the usual system is that the shuttle, being a passing container, is entirely out of control from the time it leaves one shuttle box to the point of its reaching the other. This objection does not apply to swivel shuttles, but their use is impracticable except for auxiliary ornamentation, or for ribbons and other smallware goods. The ordinary shuttle is a constant source of anxiety; it is the one dangerous part of a loom, if part it can be called, and it is the mechanism connected with its transmission which absorbs the greater part of the power employed to drive the loom, and which entails the greatest expense attendant upon wear and tear.

The new loom is only practicable for coarse fabrics, a feature which it shares in common with all the recent types of loom which have varied to any ordinary degree from usual lines. One special feature, however, is the simplicity of all its mechanisms, a simplicity which contrasts very strongly with the intricate, delicate, and almost impracticable mechanisms which are continually being invented, tested, and forgotten. It is not entirely free from a semblance of a shuttle, for carriers at either end of the lay traverse the shed, half way at either end, and it is by gripping tongs at the inner extremities of these carriers that the weft is carried through and laid in the shed.

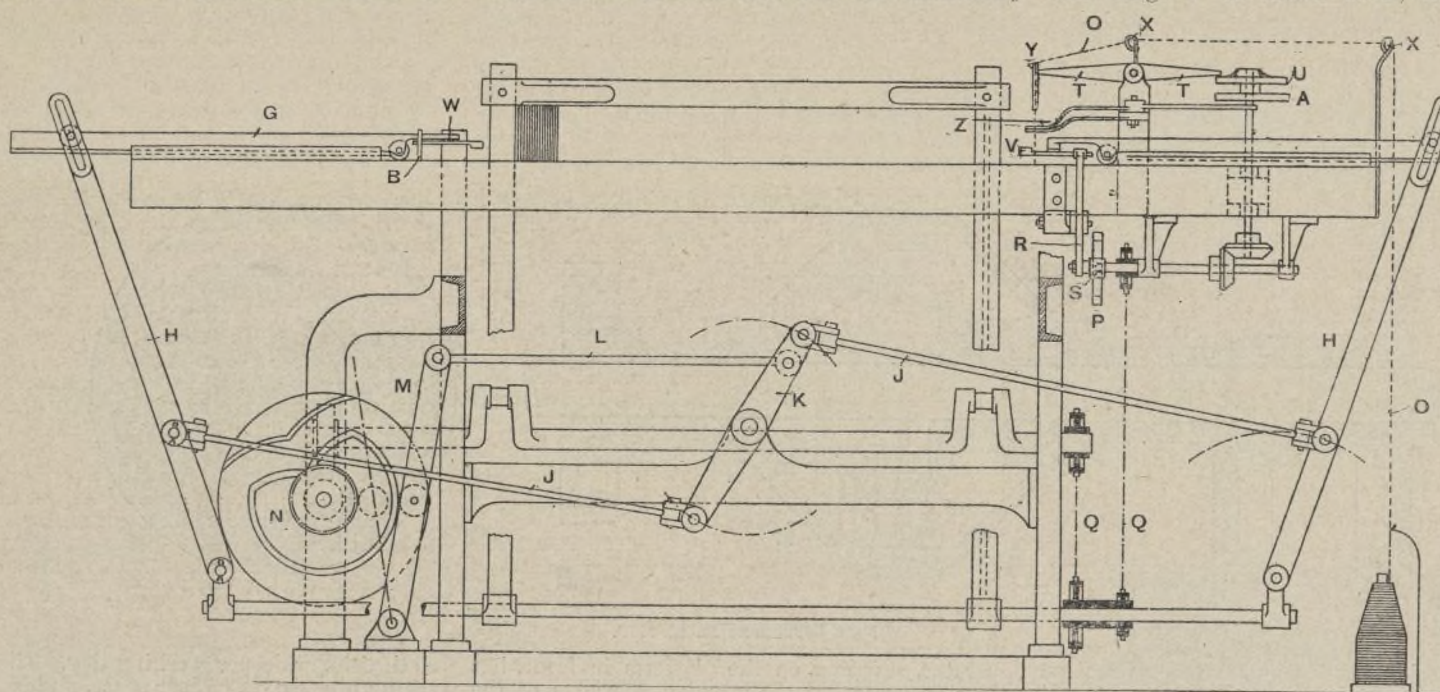


Fig. 1.

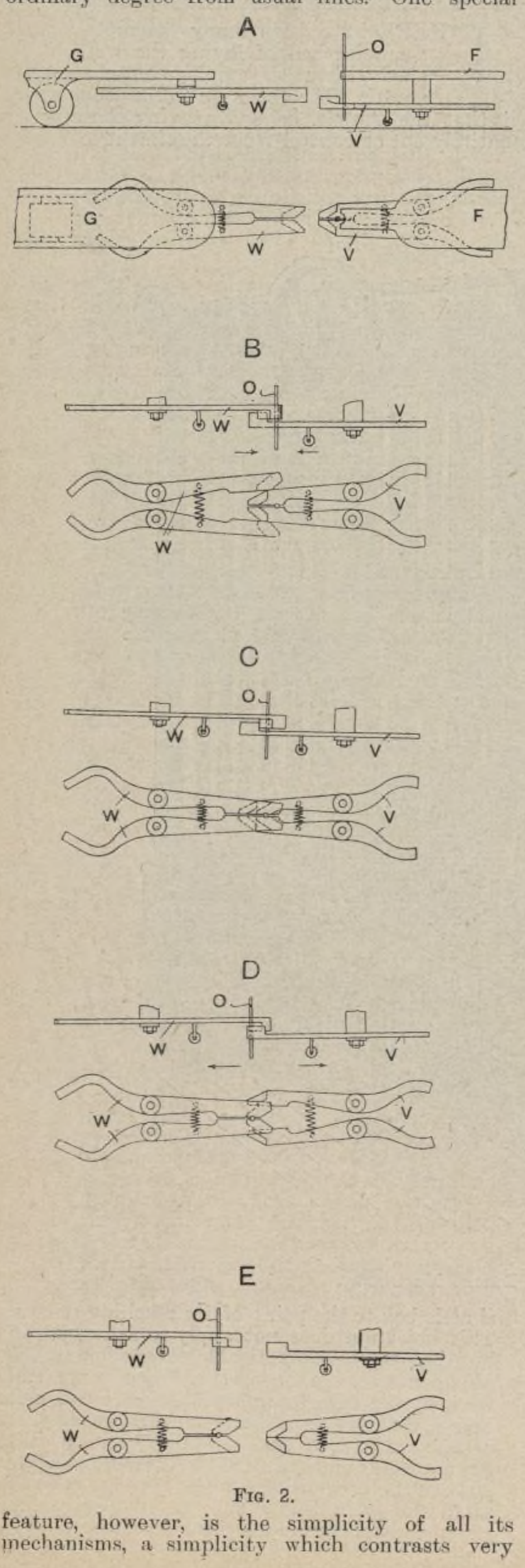


Fig. 2.

A front view of the loom is given in Fig. 1, which shows all the motions connected with the wefting. F and G are two horizontal slides reciprocating in suitable guides provided in lateral prolongations of the frame, and removed from the shed by the levers H, connecting rods J, lever K, connecting rod L, lever M, and all actuated by the cam N. The removal of the horizontal slides from the shed takes place at the moment when the weft threads O are to be laid, and the inner extremities of the slides F, G are provided with gripping tongs the jaws of which can be closed and opened. A cam P, to which rotation is imparted from the main crankshaft by means of chains Q, influences the levers R carrying the rollers S, and capable of turning round a pivot. The pair of tongs fixed to the right-hand horizontal slide F is opened by means of the levers R, when the latter are caused to turn round, and their upper extremities close and press the right-hand extremities of the pair of tongs together. A balancing arm T is influenced by a cam U, to which rotation is imparted from the crankshaft by bevel wheels and the chains Q. Simultaneously with the opening of the pair of tongs V the arm T is lowered, so that the thread O, coming from the spool, and guided through the eyes X and a narrow tube Y attached to the arm T, can be inserted between the tongs V. As soon as the pressure of the cam P upon the lower extremities of the levers R ceases, the latter free the tongs when turning back into their normal position, owing to the helical spring arranged between them. When released, the tongs V close again and grip the thread, which is then carried to the middle of the fabric. At the same time the horizontal slide G, together with its pair of tongs W, is moved into the shed from the opposite side, and takes the weft threads from the pair of tongs V, and, on the withdrawal of the slides F, G, draws the weft completely across the shed.

In order to facilitate the gripping and the freeing of the weft threads by the tongs W and V, both tongs are provided with wedge-shaped projections or cams, as shown in Fig. 2. The position at A shows the tongs approaching one another. B shows the manner in which the gripping fingers of the pair of tongs V open those of the pair of tongs W, whereupon during the further inward movement of the slides, both pairs of gripping fingers close again as shown at C, the tongs W gripping the weft thread O above the tongs V. When the tongs are removed from each other by the outward movement of the slides, the projections on the gripping fingers of the tongs W open the mouth of the tongs V as shown at D, the latter thus liberating the weft thread, which is then drawn across the shed by the tongs W, as shown at E.

The extremity of the weft thread O is cut at the right moment by means of a pair of scissors Z, which are operated by a cam A (Fig. 1) arranged upon the same shaft as the cam U, whilst the tongs W are caused to liberate the extremity of the weft thread, when leaving the shed, by two stops B (Fig. 3), which are fixed upon the lay, and force open the nippers.

The tongs are actuated by the apparatus shown in Fig. 4. At each side of the frame are arranged guides which practically take the place of the usual shuttle box. In these run the slides F and G operated by the lever H, as shown in Fig. 1. A dovetailed recess is cut in the slide G, in which

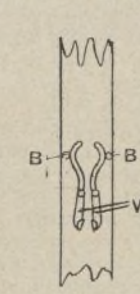


Fig. 3.

recess a correspondingly formed rack E is adapted to move. A roller D lends support to the rack which forms the bearing for the pair of tongs W. The left-hand extremity of the piece G carries a frame A in which are bearings for the spindle of a toothed wheel K and a chain wheel J. The toothed wheel K engages with a rack B fixed to the frame of the loom, whilst the chain wheel J is connected by a chain C with the second chain wheel L, the spindle of which is mounted in bearings in a frame fixed to the right hand extremity of the slide G. The chain wheel L is rigidly connected with a toothed

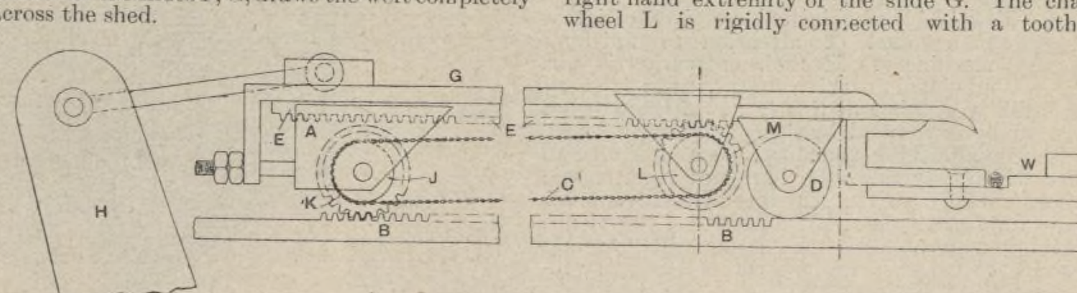


Fig. 4.

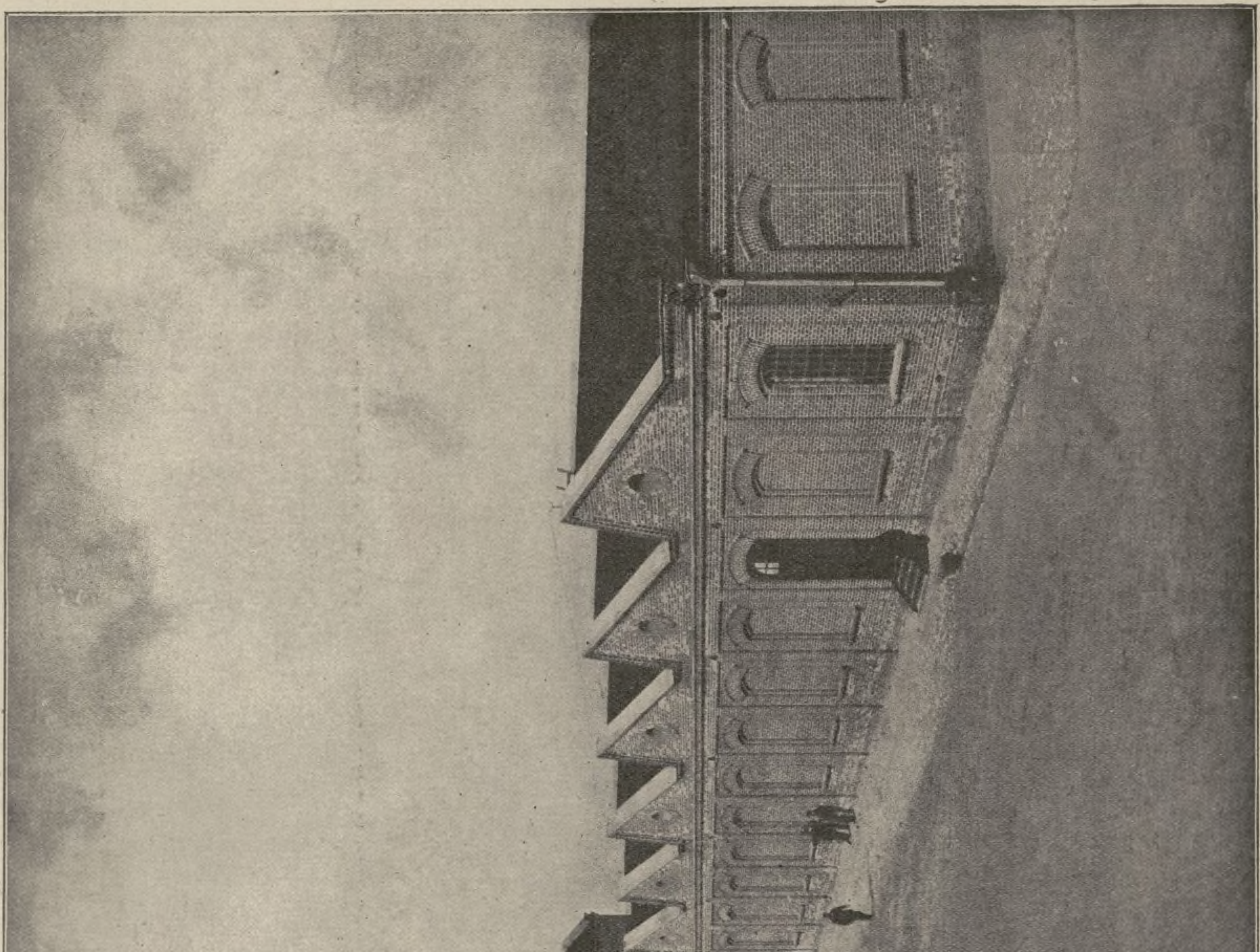
wheel M engaging with the rack E. If now, by means of the lever H, the slide G is caused to move to the right, the toothed wheel K takes into the lower rack, is thereby rotated, and, owing to the chain, also imparts rotation to the toothed wheel L, which engages into the rack E, removing the same from the guide G. Thus it is not necessary to employ on both ends of the loom rods having the length of the half weaving width, because the apparatus, which, when pulled together, is of the quarter length of the weaving width, elongates itself automatically on being brought into action.

New Mill in Russian Poland.

IN our last issue we mentioned the great activity prevailing in Russian textile circles. Not only the political, but the commercial, proceedings of that country seem to be carried out, at the present time, in a most energetic manner, the mill we described and illustrated last month being only one instance of progress in textile manufacture. We are now able to show, in the accompanying illustration, another new cotton mill built by the Actien-Gesellschaft der Halbwoll Mftr. von R. Kindler, Pabianice, and which has been supplied by Messrs. Dobson and Barlow Limited, Bolton, with spinning and preparation machinery.

The equipment consists of a *bale breaker*, supplied with the latest improvements, and about 133ft. of mixing lattices of different widths; a large-size double *opener* suitable for 38in. laps; an automatic *hopper feeder* for use with the opener, supplied with feed regulator and pedal motions; a single *scutcher* for 38in. laps, supplied with cone feed regulator and pedal motion; revolving flat *carding engines*, 37in. wide on the wire, with antiflexion grinding motion; *drawing frames* with loose bushes to all four lines of top rollers, back roller motion to prevent single, weight-relieving motion, casehardened front line bottom rollers, and indicator; *slubbing frames* of 80 spindles each, with polished steel division plates, patent differential motion, outside support for driving shaft, round clearers, self-weighted rollers, and other roller improvements similar to the drawing frames; *slubbing frames* of 64 spindles each, similar to the previous slubbers, with the omission of the round clearers and self-weighted rollers; *intermediate frames* of 134 spindles each, extras exactly similar to first set of slubbing frames; *intermediate frames* of 98 spindles each, with the same extras as the previous frames, with the exception that there are no round clearers and heavy self-weighted rollers; *jack frames* of 204 spindles each, with extras similar to the last intermediate frames; *roving frames* of 164 spindles each and of 120 spindles each, with similar extras to the jack frames.

The *ring spinning frames* have 416 spindles each, loose boss top rollers to the front line, flexible



New Mill in Russian Poland

spindles with self-lubricating attachment, front line bottom rollers casehardened all over, two back lines casehardened in necks and squares only, indicator, and creels for double roving; also *ring spinning frames* of 396 spindles each, with similar particulars to the previous frames with the exception that there are no creels for double roving; *mules* of 976 spindles each, with single-speed countershaft driving, governor motion, nosing motion, backing-off motion, roller motion whilst winding, iron creels, plate bolsters and footsteps, front line of bottom rollers casehardened all over, two back lines casehardened in necks and squares only, duplex driving arrangement, treble-grooved rims, creels for double roving and middle traverse guides, jacking motion, roller delivery whilst winding, patent faller lifting motion and anti-friction bowls, tin roller pulleys in halves, travelling scavenger, stop motion when cops are full, indicator for draws, and single boss top rollers; quick-traverse drum *winding frames* of 120 drums; *ring doubling frames* of 416 spindles each, for wet and dry doubling; *cop reels*, on Coleby's principle, of 40 hanks, arranged to reel from cops or ring spinning bobbins; *yarn-bundling press* to make bundles of 10lb. each, with blocks and linings to make bundles of 5lb.

Machinery Foundations.

The cost of a foundation will depend, of course, upon the material of which it is made, its size and form, as well as upon the price of the material and of labour in the locality. A foundation for a pump is perhaps the simplest in form; but if the pump be a large one, such as a fire pump, or even larger, the foundation must be of good materials and properly built. Where the earth under the foundation is composed of a mixture of sand and gravel, a footing stone is usually laid first, and the brickwork built on the stone. This construction is illustrated in Fig. 1. The thickness of the footing stone required will depend somewhat upon the kind of stone used and the nature of the earth under it, and it is usually greater in proportion to the weight borne by it, in small than in large sized foundations. Where sandstone is employed a fire pump having cylinders 18 and 10 by 12in. stroke will have a footing stone 6in. thick and an area of about 50 sq. ft. Where stone is very expensive, a layer of concrete may be laid, and the brickwork built on this. The thickness in this case is about the same as for stone. When concrete is to be used it is a good plan to dig the hole for the foundation no larger at the bottom than the required size of the block of concrete, as shown in Fig. 2. This leaves the block surrounded by hard earth without tamping and without the necessity of constructing a form or mould, and incidentally reduces the first cost.

The block of concrete is made of finely-broken stone and cement, the latter being composed of one part of cement and two parts of sand. The proportion of this cement mortar to broken stone may be one of mortar to five of stone, for machinery foundations. The concrete block, when 6in. thick or more, is made by mixing the whole thoroughly in a mortar box before placing it in the pit, where it is then tamped down solid and level. For thin layers of concrete the broken stone may first be spread evenly to the required thickness, and the cement poured over it until a level surface is obtained. The concrete should be allowed to harden somewhat before attempting to lay the first course of brick. The stone for this kind of work should be broken into 1in. cubes, never larger than 1½in. After levelling the footing stone—which will require but little attention when the bottom of the pit has been properly levelled beforehand,—a wooden template, having holes bored through it corresponding to the holes in the cylinder feet of the pump, is then supported over the pit, as in Fig. 3, and at such a height that the anchor plates at the lower end of the foundation bolts will clear the footing stone sufficiently to permit the lower nuts being removed, should this become necessary.

It is a good plan to lay the template on the capstone and locate the holes for the foundation bolts before placing it over the pit. These holes may then be cut through while the brickwork is being laid, and a considerable amount of time saved. The brickwork is then commenced, the brick being so laid as to leave a pocket for the anchor plates, with an opening to the outside to allow the nuts to be held by a wrench in case they are removed from any cause. This construction is illustrated in Fig. 4. The brickwork should not touch the bolts. On the other hand, they should be given a space equal to the diameter of the bolt all around them, so that should any mistake have been made in the template, when the pump or other machine is finally placed on the foundation the bolts may be made to enter the holes in the frame without bending them.

When the building of a foundation is done under contract it is a good plan to keep an eye on the work as it progresses, for there is ample opportunity for dishonest work, which cannot be detected after the foundation is once completed. We refer now to the "filling," which, in a foundation for running machinery, should be of brick carefully laid, the same as the outer courses—in other words, it should be built up solidly, as shown in Fig. 5. Fig. 6 represents a foundation filled with pieces of brick and broken stone, which is finally covered with cement, but this is not as substantial as the former.

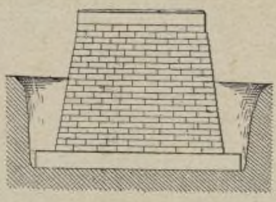


Fig. 1.

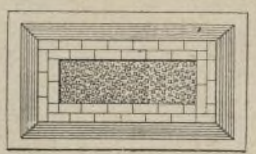


Fig. 6.

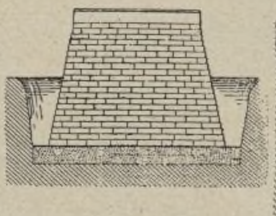


Fig. 2.

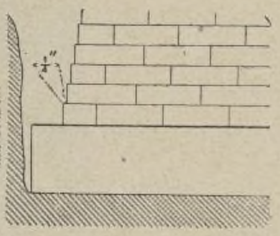


Fig. 7.

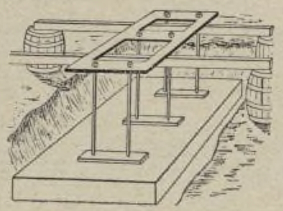


Fig. 3.

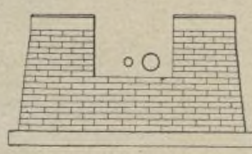


Fig. 8.

The crevices in each layer of brick should be filled with cement so as to leave a smooth and level surface for the next layer. It is not necessary that the entire area of the foundation be levelled off as each layer is completed. The result may be obtained by levelling off, say, 2 sq. ft. at a time, as the work of laying the brick advances.

The "batter" of the foundation—that is, the inclination or slope of the sides from the footing stone to the top of the brickwork—should not be less than 1½in. to the foot. This will require each course of brick to be set back about ⅛in. from the outer edge of the preceding course or layer, as shown in Fig. 7. The batter of engine foundations frequently exceeds 3in. to the foot, especially in the case of high-speed engines with overhanging cylinders, and the pedestal or foundation for the outboard bearing of engines which are not self-contained, such as the Corliss and similar types. A capstone should be laid on the brickwork and carefully levelled, and of such a size as to fully cover the top course of brick, as shown in Figs. 1 and 2.

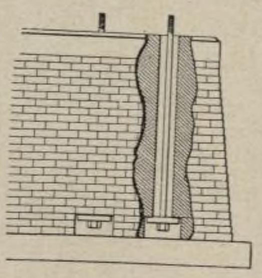


Fig. 4.

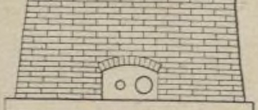
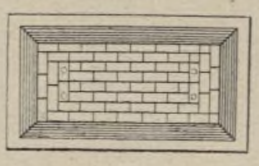


Fig. 9.



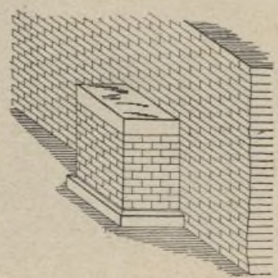


Fig. 5.—Machinery Foundations.—Fig. 10.

A foundation of the design shown in Fig. 8 should never be built for pumps, much less for engines. While a saving in brick and stone is possible, it is not a substantial design, and in time will show signs of weakness, unless, of course, it is made of unusual and unnecessary size, in which case there would be no saving of material.

When pipes must be carried through a foundation, it is much better practice to throw an arch in the lower part of the structure, as in Fig. 9, than to attempt to support a pump or an engine upon pedestals, as in Fig. 8. We have frequently seen pump foundations carried up the side and forming a part of one of the boiler or engine-room walls, as shown in Fig. 10. This is bad practice, whether the foundation is tied to the wall or not. It may prove successful in three places out of four, but in the fourth either the wall or the foundation will settle the most. This will throw the pump foundation out of level, bringing heavy strains on the piping, and these being under more or less high pressure, will cause no end of trouble should they fall. It is not safe to run the risk of being the fourth and unsuccessful case referred to. When a pump foundation is to be built close to a wall it is better to provide a good broad footing stone, to give the ends and side considerable batter and carry it up independent of the walls.

(*To be continued.*)

Chimneys for Steam Boilers.

The statement that a chimney or stack is necessary to create draught under a steam boiler, except where forced draught is used, will occasion no surprise, because it is a self-evident truth. But all of the necessary appliances are not equally efficient, and in some cases the cause for the deficiency may be easily traced out, while in others it requires careful investigation in order to locate the trouble.

The theory of the cause for draught in a chimney is well known, but no other theory in relation to engineering is more persistently doubted by the "practical" man, and there are not sufficient causes to warrant this continued opposition. I have never met a man, says W. H. Wakeman, in "Modern Machinery," who doubted the theory and could substitute a better one for it; the large majority of unbelievers do not attempt it.

This theory is as follows: Currents of air vary in density; consequently the more dense parts seek the lowest level, while the lighter parts rise as high as possible. As the lighter parts rise, the heavier parts are drawn in to take their place, and if this process takes place in a chimney, and the only entrance to the base of it is through the furnace of a steam boiler, a draught will be created, the force of which will depend upon the comparative density of the air and gases inside and outside of the chimney, and for convenience sake this force is measured in inches of water.

From this it is evident that the lighter the gases are in the chimney, the stronger will be the draught, so that while a high temperature of escaping gases denotes that much of the heat in the coal burned has not been absorbed by the boiler, and hence is at least a partial loss, the draught is increased over what it would be with a lower temperature, therefore more power can be developed by the plant.

In many cases chimneys do not give as much draught as they were expected to, and are therefore considered detrimental to the economical combustion of the coal burned, and are condemned by the engineers in charge. The objects sought in writing this article are to point out some of the causes that are responsible for this undesirable state of affairs, in order that the blunders made may be rectified in the best way, while others may profit by the suggestions here offered and avoid future failures along this line; also, to show that the problems of chimney design are not as complicated as certain mysterious formulæ used in this connection in works on the subject would naturally cause us to believe.

In many cases the surrounding objects will determine the necessary height of chimney, for it would be a mistake to erect a chimney 100ft. high near a building that stands 125ft. above the ground, as the draught would be poor.

For the purpose of illustrating the rules to be given and explained, I shall assume that the chimney is to be 144ft. high, the temperature of the air 60° F., and of the gases 500° F.

The draught will be determined by the difference in the density of the air and the gases, and by the height of the chimney. The density will vary as the absolute temperatures, and for the air it may be determined by dividing the absolute temperature of melting ice by the absolute temperature of the air, and multiplying the quotient by 0·0807. As the absolute temperature of a body or of gas is 461° more than its temperature by the thermometer, it is 32 + 461 = 493° for melting ice. The absolute temperature of the air is 60 + 461 = 521°.

Then 493 ÷ 521 × 0·0807 = 0·0763.

The density of the gases is found by dividing the absolute temperature of melting ice by the absolute temperature of the gases, and multiplying the quotient by 0·084. Then 493 ÷ 961 × 0·084 = 0·0430.

Using the foregoing data, we can determine the draught in inches of water by subtracting the density of the gases from the density of the air, and multiplying the remainder by 0·192, and again by the height of chimney in feet. Then 0·0763 − 0·0430 × (0·192 × 144) = 0·92in. of water.

I have given this example because it explains the process; but where no explanation is desired the following rule may be used, as it gives nearly the same result. Divide 7·66 by the absolute temperature of the gases, and subtract the quotient from 0·0146. Multiply the remainder by the height of chimney in feet. In this case it is 7·66 ÷ 961 = 0·00797 and 0·0146 − 0·00797 × 144 = 0·95in. of water.

For the same temperature the draught for any other height may be found by proportion, as it varies with the height. For a chimney 200ft. high it is as follows:—144 : 0·92 : : 200 : 1·27in. of water.

Disappointment is the result of expecting that the actual draught will equal this, as it will not; and yet the calculation so far given is correct, but no allowance has been made for the friction of the gases as they pass upward through the rough and sooty chimney or stack, and for ordinary cases; 10 per cent. should be deducted for this, which leaves 0·93in. of water for the first illustration given.

Where we need the draught is at the grate where the fuel is burned, and between this and the chimney the passage-way contains several obstructions in the form of a contraction at the bridge wall where tubular boilers are used, a return bend in the combustion chamber, a division of the current when passing through the tubes, a right-angle turn at the front end of the boiler, and another one when the nearly horizontal flue is reached, and perhaps one or two more before the chimney is reached. About 25 per cent. reduction must be made for these, leaving an available draught of 0·93 − (0·83 × 0·25) = 0·63in. of water, and where several boilers are connected to the same chimney it may be expected that some of them will realise more of the draught than others. These rules for chimney draught are based on the assumption that the gases maintain a uniform temperature throughout their ascent through the shaft. But this is not true in practice, for as they travel farther away from the boiler the temperature is reduced, thus bringing the density of them nearer that of the outer air. This will detract from their drawing power, and still it must be remembered that as the temperature is lowered the volume is reduced, so that one tends to offset the other.

As already mentioned, some men dispute this theory, and, as evidence in their favour, point to the fact that a chimney will draw when there is no fire to heat the air in it. This is not strange, for in many cases it is heated by natural means, which answer every purpose. If the sun shines on an iron or steel stack, the internal air is warmed more than the outer, and draught is created. Even when the sun does not shine on it, the inside of the shaft is not exposed to the wind; hence it may be much warmer than the wind that blows against the outside of it.

Draught does not exist in all chimneys when cold, for I have had to build a fire at the base of the shaft on several occasions in order to make the chimney carry off the smoke of a fire on the grate.

It is not a difficult matter to measure the draught of various chimneys and note the results, taking their height and other conditions into consideration, when it will be found that sometimes a high chimney will give no more draught than a lower one does, in another locality; but in all such cases there is some reason for the results, although it may not appear on the surface. A few years ago much was written concerning the great advantage of having a chimney flue larger at the top than at the bottom, and apparently very good reasons were given for the plan; but where one built in this way did give good results, we were never sure that some other condition was not responsible for the desirable condition of affairs.

I know of but one case where a stack that was larger at the top than at the bottom was taken down and reversed. This was of much interest because it was set up again in the same locality, and the same boilers were used. After the change, there was not enough difference to be perceptible in every-day service, but a carefully graduated draught gauge showed a slight improvement with the small end of the stack uppermost. As already observed, the ascending gases become cooler, and hence are reduced in volume, therefore there is no logical reason for the top being the larger.

It is important that we know the amount of coal it is possible to burn in one hour on each square foot of grate surface, and for making this calculation Professor Thurston gives the following rule:—Multiply the square root of the height by two, and subtract one from the product. In this case it is 23lb.

Now I have no doubt that this rule is correct, for it is based on the results of experiments made, and it can be and is done in every-day practice, but it results in a lower efficiency than can be secured by a slower rate of combustion. Where this rule is applied to lower chimneys with feebler draught, in order to burn the coal it calls for, it becomes necessary to "break the fire up" at short intervals, where bituminous coal is used, and every time this is done, some of the good material is lost through the grates, and there is no help for it. Where anthracite coal is used, the fires must be cleaned often, which results in a direct loss.

If a mechanical engineer should design a plant with the expectation of burning this amount of coal for ordinary service, it would be a great mistake. I would reduce it by 40 per cent., making it 13·8lb., as that is the most that should ever be burned, and when the load is lighter (as it varies in almost every plant) the amount would be less. Still, this will admit of an increase for short periods without serious detriment. It is proper to make the area of a chimney large enough to burn the maximum amount of coal that can be used on the grates, and then it can easily dispose of the smoke and gases resulting from any smaller quantity. This makes it necessary to know the number of square feet of grate surface, and for illustration it is assumed that there are three boilers, each having 30 sq. ft. of grate surface. We then have 90 sq. ft., and 23lb. for each, or 2070lb. per hour as the maximum quantity that can be burned.

The area of chimney in square feet is found by dividing the pounds of coal burned per hour by the square root of the height, multiplied by 12. In this case it is 2070 ÷ 144 = 14·4 sq. ft.

The diameter of a round flue that will contain this area is found by dividing by 0·7854 and extracting the square root of the quotient: 14·4 ÷ 0·7854 = 18·5, the square root of which is 4·3ft. If a square flue is wanted, it should not be less than 4ft., because the corners are of little value, for the friction of the gases as they ascend in these parts is excessive, hence they may be ignored in a case like this. The horse-power of boilers that may be operated by this chimney can be determined by dividing the coal burned by 5, and 2070 ÷ 5 = 414H.P.

The allowance of 5lb. of coal for a horse-power may be considered excessive; but it is customary to make this allowance, in order to be on the safe side. Automatic engines require less than this as a rule, but pumps require much more.

If it is desired to calculate the required area of flue by the horse-power of chimney, it may be done on the same basis, by dividing the horse-power by 0·2 of the height. Applying it here shows that the area is 414 ÷ (0·2 × 144) = 14·4 sq. ft. It is much better, however, to calculate directly on the amount of coal burned.

I am convinced that some reader will look over these calculations, and then find one or more chimneys that are not so large as they call for, so that a text will be afforded for another sermon on the difference between theory and practice. But I will make such investigations unnecessary by saying that I know of such cases right in the vicinity of where this is written, but they prove nothing against theory. If it could be proved that the best results are secured where such monstrosities are in use, then theory would have to be discounted; but as this is not done, it will have to stand approved. I will mention the essential features of a case with which I am well acquainted. The horizontal flue leading from a battery of boilers to a chimney is of the right size to suit the capacity of the steam generators, but the chimney area is only a trifle more than one-third of the flue area. This plant is run nearly every working day in the year, but an examination of the practical results, and an interview with the engineer in charge, would convince the most sceptical that there is chance for much improvement.

In another case the brick chimney of a small plant did not give satisfaction, and the owner put an iron cap on the top of it in which was a hole smaller than the conditions called for, and over this was erected an iron stack, which showed that the designer believed in having it high enough, but cared nothing for the area.

A certain class of objectors claim that it is not necessary to have a strong draught because the damper regulator is shut for a portion of the time, so that it is just as well to have less draught, and let the damper be open for a greater portion of the time. This is a mistaken idea, for the fire should burn briskly while the draught is on, and when the required steam pressure is secured, it should be shut off until the pressure is slightly reduced. A good damper regulator will attend to this duty in a perfect manner. The philosophy of this is that while the draught is strong the combustien is more complete than when it is feeble. Another reason is that under these conditions much of the soot is swept through the tubes, instead of being left in them; consequently the boiler gives better results from the fuel burnt under it.

In some cases it may be convenient to know the power of a certain chimney to burn coal, as, for instance, where an old chimney is to be used for a new plant or boilers, or where a new chimney of a given size may be desired. This may be determined by multiplying the area in square feet by 12, and the product by the square root of the height. Suppose that a chimney is 120ft. high, with a round flue 5ft. in diameter. The area is 19·6 sq. ft., and the square root of height is 11. Then 19·6 × 12 × 11 = 2587lb. per hour.

According to a rule already explained, a chimney 120ft. high will burn 21lb. of coal per hour on each square foot of grate. By dividing the total weight burned by the latter, we find that the chimney will furnish draught for 2587 ÷ 21 = 123 sq. ft. of grate, and for four boilers it will be 31 sq. ft. for each.

I have noticed that in several cases where chimneys have not given satisfaction they have been built higher in order to increase their capacity. This is good practice, but I wish to call attention to the fact that while the force of the draught increases directly as the height is increased, its capacity for burning coal increases only as the square root of the height. This is an important point, for if it is not understood, disappointment may result where an addition is built on to a chimney. If a chimney 80ft. high does not give sufficient draught, and it is possible to build it 80ft. higher, the force or intensity of the draught should be very nearly doubled.

To conclude that it will be possible to burn double the amount of coal with it would be a great mistake. Each pound of coal requires a certain amount of air for its combustion, and the amount passing into the furnace of a boiler will, of course, depend upon the rate at which it travels. Now the intensity of the draught denotes the pressure that is forcing air into the ashpit and up through the grates; but if this force is multiplied by two, the speed will be increased as the square root of two, which is 1·414. It follows as a natural consequence that if it is necessary to double the amount of coal burned, the height of chimneys must be multiplied by four; and if great exactness is desired, enough more must be added to overcome the friction of the increased length of shaft.

A few years ago, if I had been called upon to decide whether to use a brick chimney or an iron stack, I should have favoured the brick structure without hesitation, because iron stacks were proving failures after a few years of service, while bricks and mortar were not ruined by the different kinds of gases travelling upward, and were affected little by the rain travelling downward, while a coat of paint every year or two was not necessary.

Conditions are somewhat different now, for steel has replaced iron, proving much more durable, while improved methods have made it possible to erect these stacks and keep them in place during heavy gales without guys of any kind, so that as far as present experience will warrant an opinion, the two kinds are about on a par.

Before closing this article I wish to correct a mistaken idea that is often expressed by thoughtless people concerning the cause of a poor draught on some days in plants where it is usually very good. Whenever the smoke curls lazily out of a chimney, and then seems inclined to come down to the ground instead of going into the clouds, the remark is made that the draught is poor because the air is "heavy." If this is disputed, attention is called to the fact that the smoke comes downward, as proof of the truth of it.

The foregoing calculations concerning chimney draught were made with the assumption that the barometer stood at a certain given point, and the density of the air would correspond. If the barometer shows that the air is indeed heavier than the standard taken, the difference between the density of the air and of the gases will be greater, hence the draught will be stronger and not weaker. On the other hand, if the barometer shows the air to be lighter, the comparative density will be less, and as a natural consequence the draught will be less, in direct contradiction to the popular expression.

ON the 31st ult. the engines at the new Bee Mill, Royton, were started for the first time. The makers are the firm of Messrs. George Saxon, of Openshaw. The mill will contain some 80,000 mule spindles.

MESSRS. JOHN TURNBULL, JUN. AND SONS, consulting and hydraulic engineers, of Glasgow and London, have just signed a contract for the largest water-power installation that has ever been established in Ireland. This is for a flax mill on the river Mourne, and includes the complete outfit for 1100H.P. on a 16ft. fall. This power will be developed from five of their improved Hercules turbines, placed vertically in steel cases, and transmitting their power to one line of horizontal shafting, which again will transmit it to the various flats of the factory by a rope-drive through a counter shaft. Five turbines are preferably adopted to meet the exigencies of the summer supply as well as floods, and for partial disconnections for nightwork and electric lighting. Messrs. Turnbull and Sons have also in hand and in process of erection 600H.P. for one of the English Sewing Cotton Company's mills, near Derby, as well as 450H.P. on a 35ft. fall for an installation in South America, and many other smaller schemes for falls down as low as 5ft.

RAW MATERIALS, PROCESSES, FABRICS, &c.

Annual Review of the Textile Trades.

COTTON.—If the past year had not been immediately preceded by the exceptionally good trade of 1899, it would have been classed as one of the most prosperous of late years. As it was, everybody had been exceptionally busy, and when 1900 commenced stocks were beginning to accumulate, and foreign markets were well stocked. Then with the new year came fears about cotton supply, and higher prices during the season seemed likely to trouble the market. Business in cotton became more lively as buyers made provision for the future, and there was a steady rise in prices. The stock in Liverpool was small, deliveries to the trade were large, and spot prices rose steadily week by week up to the middle of February. The steady reduction of the stock at a time when it usually increased had a disturbing effect. Mr. Neill's estimate of 11,000,000 bales was generally relied upon by the trade, although other American authorities prophesied only 9,000,000 bales, yet in time it became necessary to face the possibility of a shortage. By the end of March prices of middling American had risen a penny (from 4$\frac{7}{16}$ to 5$\frac{7}{16}$d.); then this was almost reduced to the original price by the end of May, when the rise set in and prices reached 7$\frac{3}{8}$d. by the middle of September. This was really a panic price, and did not hold long, the amount gradually decreasing as the year ran out, when it closed at just on 5$\frac{1}{2}$d. This price was also the average of the year—an average higher than that of any since 1890.

The rise in raw material in the early part of the year did not improve the yarn market, and buyers were reticent in giving increased prices. When spinners' order-books got low there was great competition for the orders offered, and prices were of a varied, fluctuating, and unreliable nature. By June the majority of spinners were very quiet. Egyptian yarns also, which are usually in good demand, began to show signs of weakness, and almost all foreign customers were quiet. The famine and plague in India and the unsettled state of affairs in China affected all markets in a marked degree. The outlook both in the direction of the consumer and the cotton fields was far from hopeful, but in both cases it worked round in a manner much better than was expected. The abnormal price of raw material was met by a stoppage of all buying transactions, and the bulk of the spinning mills were idle for three or four weeks during September and October. This step of the Federation of Cotton Spinners' Associations went a long way towards restoring a healthy tone of the market. This remained, and spinners were able to buy at receding prices in spite of frosts and rumours of frost and of the disaster at Galveston.

Manufacturers were very busy during the early part of the year, all markets taking a fair share of goods. India took large quantities, good contracts were placed for dhooties, and light cloths for Calcutta were in great request. Jacconettes were dealt in to a large extent, and there was a fair demand for low qualities of India shirtings. China staples, bleaching cloths, and other suitable goods for the markets of the Far East were bought in large lines; and encouraged by the doings for the larger markets, buyers for the smaller outlets began operations on a free scale. South American buyers bought fair lines of standard qualities, and moderate business was done for Mediterranean ports and Egypt. Levant business rather dragged, but there was a healthy trade in finishing cloths for the home houses. During the summer, this state of things unhappily changed. It was found that India and other markets were too heavily bought. China also held large stocks, and manufacturers could find little business except finishing cloths and fancies. However, some of the smaller Eastern markets and South America continued to take small but regular quantities, and makers were, in almost all cases, able to keep their looms running. Towards the close of the year business brightened. India recommenced buying on a substantial scale, and by the end of December most of the makers and printers of goods for India and China were well under contract.

Wool and Worsted.—Although failures in the wool trade were very scarce during the past year, there must have been heavy losses suffered in many quarters. The previous year had seen a boom, prices had been raised in an unwarrantable manner, and the first part of 1900 saw a gradual decline in merino wool until it reached almost half its original value. At the end of 1899 60's tops stood at thirty-four-pence, whilst before the end of 1900 they were down to eighteen-pence. It is needless to comment on the effect which this must have had upon holders of stock, whether in small or large quantities. Cross-bred tops also declined in value, but as their prices had not been inflated as much as the softer fibres, their fall was shorter, ranging between thirteen-pence at the end of the previous year to tenpence last December. Most of the fall in cross-bred prices took place in the first four months of the year, whilst 60's Botany made a hurried descent throughout the year, with the exception of faint, but ineffectual, rallies in April, July, and November. Lustre wools were very regular throughout the year, varying about a penny on either side of eightpence. The imports of wool from Australia were less than any year since 1885, there was less River Plate wool, while the African supply ran down to little more than half its usual amount, owing to the war. Taking the wool from all sources, about 100,000,000lb. less was received last year than in 1899, although most of this amount was allowed for by the greatly reduced amount of wool re-exported in its raw state, leaving the home supply very little less than in the previous year. Like lustre wools, mohair and alpaca were extremely steady, although slightly declining during the first half of the year. There was a steady demand for the fine Turkey and Cape fleeces, but the low qualities were very much neglected.

Yarns.—Many Bradford spinners maintain that the past year was the worst the century had seen, as regards the spinning of fine wools. Spinners and woolmen take a long time to find that inflated prices mean a substitution of some other fibre for that of unwarrantable cost, and during the past year the lesson was once more enforced. The collapse of French wool merchants, and the heavy failures of firms in Roubaix, fortunately had no parallel in England. Luckily, most spinners had the sense to abstain from holding large stocks, but those who held such as a speculation got severely bitten. Particulars of contracts have been bad to get, and fine worsted spinners generally were very slack. Their case was only equalled by spinners of coating yarns. These yarns did not drop quite so much in price, but the trade was very much depressed, and very little inquiry was made from any quarter. Really, the high prices of the previous year drove many consumers into other channels, and it will take some time to regain the lost position. Spiral and fancy yarns were quiet. The German manufacturers, who take the larger part of such yarns, were unable to purchase, as their own trade was very flat. Loop yarns for export also failed the spinners owing to the large stocks held by consumers. All branches of the worsted spinning industry were unsatisfactory, and the exports, as could only be expected, showed a great falling off; in fact, with the exception of Denmark and Holland, who do not take large amounts, every one of our foreign customers took less yarn during the year just past than in 1899.

Pieces.—The piece trade also felt the disastrous effects of the feverish speculation of 1899. The fall in prices was accompanied by cancellations on the slightest pretexts, many makers being thus saddled with returned goods of rapidly-decreasing value. The export trade showed a decrease of 10 per cent. in worsted goods, and during November worsted coatings could be bought at within 1$\frac{1}{2}$d. a yard of the lowest price ever reached. The dress goods trade was not so bad, owing in a large measure, if not entirely, to the substitution of fibres other than wool for ladies' wear. Mercerised cottons were bought in gigantic quantities, and many Bradford makers also used spun silk, which they found much easier to manage than they supposed a few years ago. There was also a good demand for ladies' coatings. Most of the goods made were of comparatively plain types, the fancies being chiefly blouse cloths. Figured mohairs, in blacks, went well, as did also other black lustre goods.

Woollens.—The woollen trade was affected by the conditions already referred to in respect of the wool market. The year began well—in fact, too well,—but declined as the months went on. In low goods business was, however, good, the scarcity of money causing many customers to retrench in the matter of cheaper clothing. The ready-made factories, invariably good customers of Leeds looms, took large quantities in tweeds of a Saxony character, vicunas in black and blue, and low serges. For mantles of the better class, there was a fairly good demand for rough tweeds in bright, neutral tints, with a Harris effect. The lower-class mantle trade was chiefly cut-up fabrics of a light fawn colour or black. Tweeds of a lighter but otherwise similar kind were being produced during December for the spring mantle trade. The branch of the woollen trade peculiar to the Yeadon and Guiseley district suffered greatly, many places being cleared of their machinery, and unable to make the business pay. In the Morley district trade was good in the early part of the year, but it is doubtful whether, considering the increased cost and other necessities, that manufacturers were able to work at a profit. The cloths most in demand were mixtures and dyed colours for the dress and costume trade, and Venetians, twills, and plain goods; and there was a great improvement in the colours during the year, the goods maintaining their superiority for utility and cheapness. A fair amount of serges and other goods suitable for the clothing trade were made, but not in such large quantity as formerly. There was a revival in the manufacture of union cloths for export. Prints and meltons were also amongst the list of goods manufactured for home and foreign trade. The shipping houses doing business with Australia had a very good season, probably the best which has been experienced for several years, as that colony is now in a very sound and flourishing condition. A good trade was also done with Canada, which is an increasing market for the goods of the Morley district. On the other hand, the Continental trade was only moderate; but that market is so hampered with tariffs that it is extremely difficult to do a profitable business. In Huddersfield the manufacturers had a continual struggle to keep running at all. Fine worsted goods, especially the better-class makes, were ignored. A feature was the change to suitings from trousering patterns, stripes being in only slight demand. The demand for khaki cloths, which seemed very promising at the commencement of the year, was short-lived, for the ugly shade would not even come into favour when classed amongst the most fashionable colours. The result was that large numbers of khaki pieces had to be redyed to a more sober tint. The year closed with inquiries which gave a much more hopeful outlook as regards future business.

The shoddy trade in Batley was fairly busy throughout the whole of the year, full time being general, while in some instances overtime was worked. The prices obtainable for finished goods, however, tended downwards. The position of manufacturers was rendered difficult by the exceptional rise in the price of cotton and the decline in the price of fine wools. The prevalence of mild weather had the effect of curtailing the demand for overcoatings, and manufacturers at the end of the year were busy on spring goods. Employers continue to grumble at the meagreness of profits, and suggestions are being made of a combination of manufacturers and the introduction of a more equitable credit system. The outlook for the future is regarded as encouraging, without being brilliant. The dyeing and carbonising industries were fairly busy, and cloth-rug making seems now to be well established. Such a fluctuation in the price of rags was not previously experienced, and this made the trade difficult to manage, though the amount of business done was up to the average.

Carpets and Blankets.—The state of the wool trade did not affect the Heckmondwike carpet industry, as the coarser grades of wool are those chiefly used. Blanket manufacturers were affected by the mildness of the closing year as regards the home trade, but were busy throughout in the shipping trade. Brussels and Kidderminster carpets were in active demand, and promise to continue so. The Cape rug trade was a failure, owing to the war. There was also a good home demand for woollen cloths, but the orders from South America and other shipping firms did not come up to previous years. The flock, feather, and down quilt trades had an active year, but the high price of coal was a drawback to this as well as other industries.

Lace.—The Nottingham lace trade was fairly prosperous during the year. Perhaps only one branch—that devoted to the production of plain cotton nets—was uniformly active, but in the fancy department, during some months, a good business was done. Early in the year manufacturers found it necessary to advance their prices, as a result of the considerable rise in the value of cotton yarns. These enhanced prices were maintained throughout the year, and although there was some little fluctuation in the quotations for yarns, the firmness of manufacturers was throughout quite warranted by the price of the raw material. The year opened with a good demand for cotton fancy laces. The torchon laces in linens and cottons were very popular, and there was also a considerable run upon goods in the Valenciennes style. These varieties held a foremost place in public favour during the whole of the year, although the demand was not always maintained at the same level. Amongst other descriptions of cotton millinery laces which attracted the attention of buyers early in the year were the Malines, guipure, Victoria, and Maltese; but later the demand for these goods abated a good deal. As the year advanced the American trade was seriously interfered with by the approach of the Presidential election, and after the contest was over the demand from that important market did not improve to the extent that was anticipated. The edelweiss lace sold only to a moderate extent, severe foreign competition having to be encountered. A steady business was done in Irish crochet edgings, but the demand for ever-lasting trimmings and Swiss embroideries was disappointing, and production had to be curtailed. During the later months of the year all-over nets sold freely. The silk branch was decidedly the least satisfactory section of the Levers lace trade. At no time was there any run upon silk laces. Neither the Chantilly, blonde, guipure, nor Spanish style was in much request, and in some instances machinery previously making these goods was adapted to the production of cotton laces. An extensive trade was done in plain and fancy veilings. The supply of these goods was, however, always equal to the demand, and keen competition prevailed among manufacturers. Business in the lace-curtain trade was steady.

Jute and Linen.—The year was, on the whole, a prosperous one for Dundee trade. With regard to the linen branch the great demand for army and navy purposes benefited manufacturers here to a considerable extent, and mills and factories that had for years past paid only small dividends, and some which paid none at all, yielded handsome profits. The great increase in the value of flax was a fortunate circumstance for many firms, especially the larger concerns. The increase during the year was quite 70 per cent., and as most of the manufacturers had some stocks on hand, they were enabled to work at much profit. Unfortunately, however, that condition of affairs does not now exist. The demand has fallen away, and spindles and looms are now either standing idle or are on notice for short time. The new flax crop also does not promise well, and the price has risen. The jute trade did well. Values improved and orders employed all machinery. There was no spurt, but a steady demand, giving employment to all and a fair return for capital. An unexpected demand caused values to become inflated, but towards the close of the year prices gave way, and jute fell quite £1 per ton. The year was a prosperous one for Barnsley, as a whole, the high wages of the miners having given them greater spending power than usual, so that every local industry felt the influence. In the linen trade, the most important industry of the town after the coal trade, the year was very unsatisfactory and disappointing. Yarns began to rise rapidly in 1899, but the manufacturers of the town were well bought, and were able to go on selling at the old prices until the first half of the year was nearly completed. Perhaps this had something to do with the fact that during the first half of the year trade was brisk, demand steady, and larger parcels were despatched from the town than for years previously.

A continuance of good business was looked for in the second half of the year, but yarns had continued to advance, values had gone up in various ways, and revised price lists had to be issued. The demand instantly fell off. Manufacturers believed this was but temporary, and that business would brighten up again; but this did not prove to be the case. For some time they were afraid they would be compelled to adopt short time, but this was avoided, though the winter season was very unsatisfactory. In the export trade the experience was not dissimilar. Makers of fine drills and cloths trading largely with South Africa and the Indies had a good trade in the first half of the year, but with unfavourable exchanges and higher prices it fell away, and for some time the looms were working only four days a week. The volume of trade with the United States had a falling off of 12½ per cent.; and France, Spain, and Italy took less than the year 1899, frequent inquiries showing that in these cases the decline was due to the advance in prices. Barnsley was not worse off than other centres in relation to this matter, and probably the proportion of idle looms in the Scotch and Irish centres of the trade was as large or larger than in Barnsley.

THE death occurred at Burnley on the 20th ult. of Mr. W. Carey Hargreaves, J.P., at the age of sixty. He was a native of Sabden, and in his younger days he was engaged at the Broad Oak Printing Works, Accrington, but many years ago he removed to Burnley and became manager of a cotton mill. He was afterwards a partner in the well-known firm of Messrs. Jackson, Sons and Co. Latterly the three sheds formerly run by this firm have been divided among the three partners, and Mr. Hargreaves had since carried on business on his own account at New Hall Mill.

Modern German Weaving Schools.*

THE cause of the present need of technical education is found in the altered industrial conditions which at present prevail. About a hundred years ago handicraft began to be menaced by the introduction of machinery, and scientific investigation was made of the various crafts. This evolution involved the necessity of communicating to workmen information which they had not previously required, and foremen especially began to require some knowledge of technological science. In several European centres special industrial schools were established, teaching subjects which had a practical application in industry. These schools were the forerunners of the present technical schools. At first these schools only helped foremen and managers, but the advance of industrial conditions eventually required that the ordinary rank of workman be more proficient. The procedure in a mill was too rapid for the education of men, processes could not be delayed, and if they could, they would only give the perfected movement, not its scientific basis. To teach these subjects properly it was found necessary to have special schools.

Schools for aiding industry may be divided into three classes: (1.) Higher schools, for educating managers, foremen, or masters. (2.) Industrial schools, for educating overlookers, assistants, and others. (3.) Lower schools, for educating work-people and the lower assistants. The higher weaving schools are divided into day classes for overlookers, and evening classes for their assistants and others who are compelled to keep mill hours. The day classes take the subjects of weaving, knitting, lace, embroidery, dyeing, mending, dressing, and spinning. The schools are not confined strictly to weaving, as will be seen. The weaving course comprises lessons for managers and overlookers, and a series for designers. Classes with similar subdivisions are held in the evenings and on Sundays for overlookers' assistants.

The syllabus of the greater number of schools makes a speciality of one branch of weaving, generally the branch which is practised in their particular district. Thus one school takes wool weaving, another silk weaving, others jute, cotton, or flax. The tendency is towards a still narrower specialisation of the schools, and amongst the various schools visited chemistry formed the only exception. The aim there is to study weaving in its different branches, the student also systematically examining woven cloths of different fibres.

The course is covered in one year of two terms, each term lasting twenty-one weeks of forty-four hours each. Some schools extend the course to three terms, but in that case a special subject is included. The school at Berlin takes carpet weaving as an extra subject, or has a special course of lectures which prolongs the usual course. Crefeld takes the more complicated systems of silk and velvet weaving in a similar manner. The 44 hours per week are covered in the following manner:—Cloth structure, 3 to 6 hours; cloth analysis, 11 to 18 hours; fibres, 1 to 3 hours; weaving, 4½ to 10 hours; mechanics, 1½ hours; designing, 5 to 18 hours; calculations, 1½ to 3 hours; dyeing, 2 hours; law, 1 hour; practical work, 8½ to 15 hours.

The first two subjects are considered most important. Cloth structure comprises the classification of designs, simple weaves, colour and twist effects, extra warps and wefts, and the classification of fabrics. To give an idea of the scope of this subject it may be stated that the Berlin students take 450 different types of designs, 150 of which are double cloths. The school in Chemnitz takes 236 kinds of designing. Cloth analysis consists of: difference between warp and weft, weave, shrinkage, twist, warping plan, looming pattern, the mounting in the loom, quality of material, and counts of yarn. For carrying out this latter process the students are provided with an assortment of yarns of different counts and material, to be used as comparisons. Such samples are also prepared by the Berlin school for distribution among the small schools which have not the means or opportunity of otherwise obtaining them.

In weaving, the students are made acquainted with the various kinds of looms, also preparation machinery, hand weaving, power weaving, and dressing. In mechanics, the chief subjects are confined to elementary mechanics, details of machinery, sources of power—all taken in a broad and popular manner. In designing, the student is given a good knowledge of designing and card stamping, drawing being also taught. Calculations cover the loom change wheels and the various gaiting changes, and the book-keeping of a weaving mill is thoroughly taught. Dyeing is treated so as to give the student an elementary knowledge of processes, dyes, chemicals, tests, and machines. These studies are usually conducted on practical lines in the laboratory.

As the students are educated with the aim of eventually becoming managers, law is treated as bearing upon the industrial laws, labour questions, hours of labour, inspection, arbitration, regulation of boilers, accidents, clubs, patents, telegraph and railway regulations, commerce, bills of exchange, legal proceedings, meetings of creditors, etc.

Practical work is divided into the weaving of goods and the treatment of the looms. It is carried out under the supervision of practical weavers, and everything is explained theoretically. Later, the student is expected to carry through all the processes without aid. In some schools looms are taken to pieces, and the students required to reconstruct them.

(*To be continued.*)

* A paper read by Mr. V. A. Philippoff before the Moscow Society for the Improvement and Development of the Manufacturing Industry. Specially translated by Mr. K. Szymanowski.

Hints for Finishers.

THE selection and manipulation of the stock, as well as the construction of the fabric in the loom, has very much to do with the finish of the goods, and the designer who is familiar with the finishing, as well as other departments of the work, and especially who has a correct knowledge of cause and effect as demonstrated between the construction and finish of the fabric, is far better equipped for the work than he otherwise would be. It is a lamentable fact that a failure to secure a good finish, and a consequent disappointment to the manufacturer, is sometimes the result of ignorance in this particular, and not infrequently the finisher is held responsible for results the cause of which is in the work done before the cloth comes to his hands. There is a laudable, though misdirected, ambition among some of the young weavers of to-day, who, having become familiar with and possibly expert in their line of work, become possessed of the idea that a course at the textile school will fully equip them for the position of designer or manager. We would not discourage this ambition, nor underestimate the worth of the instruction given in the school, and it is an encouraging sign that the schools do not confine themselves wholly to weaving; yet there is much to learn, coming through practical experience on a variety of work in the mill, which it is nearly impossible for the school to impart. We would not, as already stated, undervalue the instruction obtained at the textile school, but we believe that he who has first schooled himself by some experience in the different departments of the mill, and especially in the finishing-room, will be by far the best equipped for the business.

The selection and combination of stock adapted for the goods to be made is a matter of much importance. Heavy felted goods for steam finish, cassimeres, cheviots, and serges, as well as other kinds of goods, require stock specially adapted for each, and what would be best for one kind would be entirely out of place for the other. Then, when it comes to the use of shoddy, great care should be exercised, both as to quantity and quality. A little change or variation in the shoddy used is liable to make a decided change in the finish of the goods, on account of the variation in the fulling capacity of the stock. Owing to the oily state of the shoddy, one is more liable to be deceived regarding its quality. In fact, it is a trick of some shoddy men to add extra oil to stock that is especially dry and harsh, and devoid of fulling quality, in order that it may feel soft and agreeable.

Whatever the wool that is used may be, it of course possesses its original quality as to its felting capacity. But there is always a chance for a question as to stock that has been once used. If the shoddy should be inferior in this respect, there is a danger of its ceasing to full before the goods are ready to come from the fulling mills, and the result will be a constant chafing and loss of stock, and a consequent inferior felt upon the goods.

It would be impossible to begin to give definite instructions upon all these points, but we bring them up as being of great importance, and likely to have their effect upon the finished fabric, in a degree that calls for special care. While upon the subject of the use of shoddy—or, in fact, of any low stock used as a matter of economy—we wish to speak of the too common practice of using a better grade of cloth in samples than is subsequently used in the goods. We call to mind one case in particular, where the manufacturer sought to cheapen his goods after the samples had been shown and orders taken. Of course the buyer, having reference samples, could very readily discover the trick; and, in fact, had there been no reference samples, the change in the goods was so marked that it would have been discovered. No manufacturer can afford to practise this method. If the goods are to be low grade, show the samples to represent them; keep them up to the standard, and, above all, don't expect the finisher to rectify errors or overcome the effects of unwise variations made in the stock used.

Another matter of equal importance, and coming more especially under the supervision of the designer, is the construction of the cloth in the loom. This is, in fact, the designer's business. While the selection and mixing of the stock may fall to another, if a designer is employed it is he who does the preliminary work of laying out and directing in the construction of the fabric. The size of the yarn to be used, the number of ends and the width to be laid in the loom, are largely dependent upon the weave, whether plain, twill, close or open. The designer is supposed to know the number of ends that will go within a given width, and the number of picks, etc., to produce a desired fabric. But the weaving is not all, and it is quite possible for the warp to be laid so that it will weave fairly well, and yet not be adapted for the best results in finishing. If there should be an insufficient number of ends in the warp, then the goods will full too quickly, and come out slazy and soft. On the other hand, too many ends tends to the necessity of over-fulling, and the goods will be stiff and boardy and likely to mill marks lengthwise of the cloth. And if this defect is very marked, the goods will sometimes cease to full, and chafe, and become tender in the milling, for which the finisher is powerless to apply a remedy.

The writer calls to mind an instance where the lay-out in the loom was not correct, there being too much warp for the weave, and the result was that the cloth had received all the fulling possible, when it was yet 4in. too wide. The stock being of extra fine quality, the continued tendency for the filling to shrink after the warp threads had been brought as closely together as their size and the weave would permit, caused it to full itself tender. This was an extreme case, and showed a great lack of good judgment in the planning of the work. But from this to the opposite extreme there are many chances to err and cause a corresponding unfavourable effect upon the finishing and the final excellence of the fabric. Another thing that often causes trouble in the finishing room, and in many cases perplexes both the finisher and his employer, is the frequent change made in the oil used upon the stock in the preparatory process of picking.

It is sometimes the case that the manufacturer does not fully realise the importance of uniformity. This is a matter of which, above all others, it may be said it is best to let well enough alone, especially if you have a fairly good article at a fair price. There are wool oils and wool oils, says the "Boston Journal of Commerce," and the tendency of some manufacturers to be constantly trying to find something better or cheaper is always met by the persistent oil man. But the manufacturer never realises its cost, or knows the hours of anxiety the finisher spends in trying to solve the problem, as he contends with difficulties which he cannot understand, but would be made clear to him if he could be informed that he is contending with the results of half-a-dozen kinds of oil that are coming through the works.

When the finisher gets his soap and method of scouring on a safe basis, after contending with one kind of oil, and a cheaper kind is introduced without his knowledge, it is not at all surprising if he is puzzled to know why there is trouble; and with probably the two kinds coming along at the same time, it renders it doubly perplexing to understand why some pieces are right and others wrong. A good, reliable oil that works well all round should not be put aside for something "just as good," to save a halfpenny, unless there is some probability that it will be better in the end; and then it will be well for the finisher to know of the change, and if he finds a variation in his results on account of it, he can the more readily and intelligently adapt his work to the new order of things.

The finisher has to meet and contend with the results of all the mistakes made in subsequent work upon the goods, and the designer and manager who has a fairly familiar knowledge of finishing may find it helpful to the general interest of the mill in many ways.

Fibre-yielding Plants.*

AGAVE RIGIDA.—The *sisal hemp* plant (of the var. *sisalana*): This succulent of the so-called aloe type is indigenous to Yucatan, and has been largely cultivated in the Bahamas and in Florida. The Mysore Government imported upwards of 4000 plants direct from the latter place about seven years ago. These have taken kindly to the climate, and now afford material for extensive propagation. Although the plant grows rapidly and attains a large size in rich land, it is said to be most productive of the best quality of fibre when grown on stony or gravelly soil of medium quality—there is then less succulence in the leaf and more fibre. In Mysore there are many tracts of comparatively useless scrub jungle possessing such land, and it is assumed that these tracts could be profitably utilised for a culture of this kind. Having the material, the climate, and the land, let us see briefly what is likely to be made out of the industry. In the Bahamas 650 plants are allowed to the acre, and estates run from 250 to 3500 acres. But in Yucatan the planting is closer and estates very much larger, the finest being valued at 500,000dols. The annual outturn of fibre per acre varies considerably in different localities; but in Yucatan half-a-ton may be taken as a good average. A ton of green leaves should give about 80lb. of dry fibre.

During the past twenty-five years prices (London and Liverpool) have fluctuated between £15 and £56 per ton. But worked on a large scale under a good reputation, £25 may be taken as a safe average for this important fibre. When left to Nature, the plant throws up a flowering pole in the seventh or eighth year, on which hundreds of bulblets are formed for the reproduction of the species. Shortly after this supreme effort the plant dies. But under cultivation, and when annual cuttings of leaves are made, the life of the plant is prolonged for at least a dozen years. The first cutting should be made in the fourth year, when the plant is well grown. Leaves should range from 3½ to 7ft. In preparing land for aloe cultivation it should be well opened, as subsequently there would be no means of doing so. When planting operations are done, the cost of labour is nominal for four years, or until harvesting begins. All the Agaves, of which there are many fibre-producing species, require about the same conditions of climate and culture.

Bœhmeria nivea affords a bast fibre popularly known as *china-grass*, much confounded with rhea, or ramie, of which it may be only a variety produced under different conditions of climate. It is a hardy shrub of the nettle family, *Urticaceæ*. Indigenous to China, Japan, and the cooler parts of the Indian Archipelago, it is cultivated on a limited scale and domesticated in some of the cooler parts of this country. It is not recommended for cultivation in the plains. The species grows in the open at Kew, and in Paris, where it is subject to a low temperature in the winter season. In this respect it differs from the rhea plant, which is of tropical origin and indigenous to India. It also differs in the leaf being snowy-white on the underside. When cheap and efficient methods for decorticating the fibre have been secured, china-grass cannot fail to become a valuable hill product; in common, perhaps, with rhea, Ban rhea, and other fibre plants of the *Urticaceæ*.

Ban rhea, derived from *Villebrunea integrifolia*, a small tree of the sub-tropical Himalaya, has been written up a great deal of late. But the species is unknown in the south, although it is said to be found on the Western Ghauts. The leaves are ashy-white underneath, and the upper stems are covered with yellow berries. This bush affords a good fibre. The Nilgiri nettle, and several other indigenous plants of the *Urticaceæ*, are also productive of superior fibres.

Of introduced fibre plants, one of the best known and most encouraging is the *Mauritius hemp* (*Furcræa gigantea*). It is the largest of the so-called aloes, having leaves 5 to 8ft. in length, and is closely allied to the *Agaves*. It requires the same treatment in cultivation as the latter, and the fibre can be prepared by the same class of machinery. Dr. Watt observed during his recent tour in Southern India that the species had run wild to some extent on the Shevaroy Hills, and I have no doubt that the same thing will happen in Mysore in time to come. It is one of the useful plants I should like to see established on abandoned coffee estates and in lands now occupied by *Lantana*. Being a fibre that does not rot readily in water, it is invaluable for textile manufactures in connection with shipping, and it is probably on this account that the market value has risen of late. An allied species, *Furcræa cubensis*, known in Central America as the *Cajun*, and also as *silk grass*, yields a fibre worth £27 per ton. But Mauritius hemp is the hardier and more productive plant of the two, and would probably realise a steady income little inferior to that of sisal hemp.

The next commercial plant deserving of notice is one of much importance to the Indian Stationery Department, inasmuch as it provides excellent material for paper-making. It is the *Bhabur grass* (*Ischœmum angustifolium*) of Northern and Central India. I have a suspicion that it may also be found in Southern India, although I have not come across it in the wild state. But we are cultivating it in the Lal Bagh, where it grows and seeds like a weed.

* A paper read by J. Cameron, F.L.S., before the United Planters' Association of Southern India.

A FACTORY for the production of artificial silk has been established by a French firm in Soignies, in Belgium. This factory, which is the first of its kind in Belgium, commenced work on October 1 last. About 40 operatives are employed.

Fulling Mills.

BY a retrospection of fifty years, and comparison of the methods of the old times with those of to-day, many things worthy of note and consideration are brought to mind, and while there have been many changes in all the processes pertaining to finishing, it is a question whether they may all be counted as improvements. While it is true that there have been many improvements made in the machinery used, and the methods adopted, it seems that the object of some of the modern so-called improvements is rather to save labour and time than to improve the work. So far as the change in machinery is concerned, it is doubtful if any greater change has been wrought in any of the processes than in that most important one of fulling. A writer in the "Textile World" remembers when this work was done in the old-fashioned falling stocks and crank stocks.

These two machines accomplished the work after very nearly the same method. They had ponderous feet, which were forced against the cloth in a case or trough, of such a construction that when the feet struck the cloth the whole mass tended to revolve, and the constant pressure caused the goods to full, while the revolution tended to a uniformity of the work, and in some measure a continual changing of position. The difference in the two machines consisted in the manner in which the feet were forced against the cloth. In the crank stocks, this was done by a connection of the two feet with a crankshaft underneath, which worked them alternately against the cloth.

The falling stocks were so constructed that the feet were lifted by a sort of cam arrangement and allowed to fall with their full weight upon the cloth, which revolved in the same manner as in the crank machine. Of these two machines, it was considered that the falling stocks did the best work, because the feet always came upon the cloth with equal pressure, stopping only when they had fallen as far as the cloth would allow, while the stroke of the feet in the crank stock was limited to the reach allowed by the crank, and did not always act upon the goods as forcibly and with as uniform pressure as in the other machine.

The soaping of the goods had to be done before they entered the machine, and as soaping machines had not then come into general use, it was usually done by sprinkling the pieces with soap as evenly as possible when spreading and folding the goods over on the floor. It would perhaps be incorrect to say that the fulling machines and methods have not improved since these old machines were in use, and yet it is nevertheless true that they produced, as a rule, a far better and more compact felt than is obtained by the modern machines. The fact is, the old-fashioned machines were very slow, and the first improvements upon them were improvements only by reason of their time and labour-saving qualities, which were at the expense of the quality of the work.

Since the first rotary fulling mill came into use many improvements have been made, which have rendered it possible to approximate the result of the old machines, and with the rush and hurry of these modern times, the manufacturer has come to value the advantage of time saved above the quality of slower and consequently more expensive methods; and as his competitors have fallen into line, he could not afford to return to the old methods, even were he inclined to do so. One of the peculiar features of the old fulling stocks, and one which had very much to do with the excellent quality of the work produced, was the tendency to full the goods in length; in fact, there was no possible way to avoid it. There being no strain lengthwise upon the cloth, as in the rotary mill, the piece must full in length, and only the compactness of the warp and the extra twist it had hindered it from fulling in the same ratio as the filling. There was nothing about the machine to control the fulling in length. The shrinkage in length could in a measure be regulated by the construction of the fabric. With a machine fulling both ways in spite of the operator, it is no wonder that an excellent felt was obtained. The same results could be secured to-day if the manufacturer were willing to sacrifice his woven yardage to the extent that was unavoidable with the old machines.

The old machines gave the best results, because the fulling was in both directions, and so far as pertains to the right principles of obtaining a compact and perfect felt, there never need have been any departure from the way of our fathers. As already stated, a demand arose for quicker methods. The rotary machine was the result of that demand, and the improved rotary of to-day is far ahead of the old machines in their adaptability for the regulation of the work and arriving at such results as may be desired. With the modern rotary machine the shrinkage in length may be intelligently regulated, or, if desired, avoided altogether, an advantage which the old machines did not afford. This, together with the saving in time and labour, renders the present machines and methods a great advance over those of fifty years ago.

If the manufacturer were willing to shrink his goods in length, as they did in the old stocks, he could get very nearly the same results, because the necessary moderation and low temperature of the old machines contributed somewhat to the excellence of the results. Were this not so, the manufacturer would not gain anything by using, as is sometimes done, the old-fashioned machine, or one accomplishing the work on the same principle, as a finishing touch to his fulling; in other words, fulling in part by the rotary, and then finishing the work in the stocks. Since the rotary mills have been brought to their present state of perfection, the manufacturer has found the convenience of holding the goods out in length, upon some kinds of work, of marked importance to him, while the possibility of fulling in length when required and regulating this shrinkage to a nicety are of great value, not only in producing results similar to the felting obtained in the old machines, but in bringing about a uniformity of weight, by shrinking in length such as come light from the loom.

While it is now possible to shrink the goods in length as much and even more than with the crank or fulling stocks, and thus attain very nearly the same results, yet it is true that there was a quality of firmness to the felt produced by the old methods which the new machines fail to give. This can be easily accounted for when it is remembered that, as a rule, other things being equal, the slower the work the better the result, provided the slowness is not caused by any unfavourable conditions. It is frequently the case that the finisher gives his rotary mills extra ventilation so as to retard the work, thereby improving its quality. So with the fulling stocks; the fulling was not only done at a lower temperature, but the slowness of the operation, and absence of a tendency to chafe or wear the cloth, contributed to an excellence which a high-speed operation could not produce. As the railroad express has superseded the old stage coach, and the electric telegraph the old mail wagon, so the tendency of the age is toward the economy of time in all branches of human industry, and the rotary fulling mill has come to stay, with possibilities for still further improvements.

A New Textile Fibre.

NEW textile fibres of a real or imaginary value are constantly being brought to the front. Although some of these retain interest longer than others, operations of any moment are still confined to the use of the old fibres. Amongst the large number of new fibres which have been pushed forward during the last few years, only two remain—artificial silk and ramie. The first of these continues to thrive; the progress of the other is but doubtful.

The latest fibre is that obtained from palm limbs, and a process for obtaining it in workable form has recently been tried. Where a machine or apparatus is available, the process consists in causing the palm limbs to ferment for five hours, using boiling water, steam, lye, or some other suitable agent, the lye being at a temperature of 90° C., and a specific gravity of about 1·045, and then passing the limbs, when dried and fermented, through a suitable machine in which they are intermittently pressed upon flat tables by means of cylinders; thus the gummy parts are completely separated from the fibres, and the latter remain more or less light in colour, according to the duration of the fermentation, but always in excellent condition for rendering them useful to industries.

Where no machine is at disposal, and the fibre has to be extracted by chemical treatment, the process employed is the following:—Once the palm is cut from the palm tree, it is dried immediately. After the limbs are sufficiently dry, they are caused to ferment by means of a caustic-soda lye of 8° Bé. for forty-eight hours, and when it is found that the fermentation has reached the point at which the fibres are found to have become readily separable (which is found by trying from time to time to take out the fibres of a small part of the limbs), they are washed in water for twenty-four hours, treated with a mixture of equal proportions of cocoanut oil and colophony, submitted for four hours to a bath of sulphuric acid and water of 5° Bé., and, finally, washed again with common water until the fibres are separated, entirely white and clean.

Where the process is to be carried out by combing or hackling, this consists in removing the fibres from the limbs in their natural state, by combing or hackling them with a toothed roller of any suitable construction; in fermenting this rough fibre in the manner described, and submitting it after fermentation to bruising by intermittent pressure between suitable cylinders, or by means of cylinders bearing upon flat surfaces, so that the only difference between this process and the two previous ones consists in fermenting the fibre instead of the palm limbs.

Wool Scouring.

THE Malard wool-scouring machine is used largely in France, and is the invention of Mr. Georges Malard, of Tourcoing. Its aim is not only the scouring of the wool, but eliminating from the wool secretions from which industrial potash is obtained, which thus renders the water that passes off into the streams less poisonous. The complete purifying of the waste water may be effected by the addition of less acid, as the acid is not neutralised by the addition of salts of potash. Some French combing establishments produce annually more than 2,204,600lb. of potash obtained from wool grease, and sell it at prices ranging from 27s. to 37s. per 220lb. of carbonate. The potash is obtained from the soluble grease secreted in the raw wool that is run off in the scouring process in juice or concentrated liquid, having a density of from 12 to 13° Bé. areometer (corresponding density, from 1·0744 to 1·099). This liquid is evaporated and calcinated in special ovens made of masonry, and leaves a saline residue of spongy form and grey blue in colour. The product is known as wool potash, and contains from 75 to 90 per cent. of carbonate of potash, and very little soda. It is much used in glass works, the manufacture of soap and chemical products, in the preparation of refined and caustic potash, and in the manufacture of prussiate of potash. It is thus of commercial value.

The Malard scouring machine is very simple, requiring neither cellar, cistern, nor upper storey, like many old machines. It is movable, works on a level, and, being automatic, requires no special superintendence. One workman can easily feed several machines that extract the grease, and consequently several washing machines, since the wool leaving the first machine falls directly into the first tub of the second or washing machine, which may be of any pattern. The wool is first spread on an openwork metal plate of about 6½yds. in length, and carried over this to the first washing bath. The plate is of malleable sheet iron, and serves to carry the wool in layers of from 9½ to 19½in. It is solid, holds its shape, and lasts indefinitely, as it offers the maximum of resistance. This plate is placed over a vat divided into six compartments, which is placed next to the receiving tub of any washing machine.

A battery of centrifugal pumps puts in motion a small quantity of the liquids contained in the compartments, so that they moisten and pass through the layer of wool, eliminating its grease. The wool in its progress receives each one of the dissolvents, the strength of which decreases in regular proportion as the wool reaches the point from which it passes into the receiving tub. The pumps are worked by a single belt, and are started into action simultaneously with the plate, by a single turn of the gear. An ingenious mechanism produces the automatic evacuation of a variable amount of the first grease drippings, when sufficient density is obtained. Hinged valves worked by floats constantly maintain a high level in each of the compartments of the machine, so that they neither overflow nor get empty. The automatic passage of the liquids from one compartment to another is obtained by means of these hinges. This passage is regulated as required, and is in an opposite direction from the movement of the wool.

A very simple and absolutely sure contrivance regulates the supply of water for rinsing. This water, which takes the last alkaline traces from the wool, then passes into the last compartment of the machine. Its flow is constant, as it must supply the loss of the liquid sustained by the receiving compartment, which pours the liquid through succeeding compartments by means of the valves spoken of above. The automatic operation of the machine, regulating the duration of the cleansing process, preserves the strength of the wool and gives a clearer white. The wool is impregnated successively with liquids that lose in alkaline properties as they gain in heat, until the wool reaches the temperature of the first washing bath. The machine permits absolute cleansing or partial cleansing to any degree desired. All of the wool may leave the machine carrying a portion of grease regularly distributed, or it may be absolutely freed from the grease that clings to its filaments by means of six liquids of decreasing density (12, 9, 7, 5, 3, and 1° Bé.), and thence by rinsing in warm water.

The liquid products are usually 2° greater in density than in other modes of extraction, and this can readily be raised to 10° even with lamb's wool not rich in fatty matter. This is regarded as a great factor, in view of the constant rise in price of coal. Australian wool gives about 160grms. of carbonate of potash, and fine qualities of Buenos Ayres as high as 190grms. to each kilogramme of combed wool. The machine has a capacity per day of ten hours of from 141 to 318 cub. ft. of grease, 12° Bé., according to the kind of wool and capacity of washing tub. Each 35·36 cub. ft. yields about 172lb. of wool potash.

Gleanings from Consular Reports.

GHENT (BELGIUM).—There was a manifest falling off in imports from the British Isles of yarns, chiefly of cotton and jute. During 1898 cotton yarns attained to 3423 tons, and jute yarns to 2747 tons, as compared with 2063 and 1356 tons respectively for 1899. The decrease in cotton yarn imports may be explained, in a certain measure, by the fact that several mills have been erected here to spin those numbers in yarns which it has been usual to import, and which have had to bear import duty. But, besides this, the trade in these particular branches was in general dull throughout the year, and importation was affected thereby.

Raw jute imports, also, only appear for 8911 tons in 1899, against 13,414 tons in 1898. High prices of the jute are assigned as the chief cause; and one local jute spinning mill, the largest in Belgium, worked with but half the number of its spindles through the greater part of the year.

Exports of yarns of hemp, cotton, jute, flax, tow, and wool, as also of piece goods of cotton, flax, jute, wool, etc., were greater in 1899 than they have ever yet been, the totals for these manufactures having attained to 11,808 tons for yarns, and 3455 tons for piece goods. The increase is pointed out, but no suggestion is ventured on as to the cause. The general activity, however, in the cotton, flax, tow, and hemp spinning and weaving industries at Ghent is certainly great, and the export trade is the subject which never tires in all commercial circles.

The decline in raw flax and tow shipments, from 15,322 tons in 1897 and 13,482 tons in 1898 to 12,267 tons in 1899, is thought to be due in a certain measure to Spanish-Cuban troubles. Spain and her colonies are large consumers of linen, but during their troubles the Cubans bought very little, and British manufacturers tried them with cheaper goods made from Russian flax, instead of the customary Continental supplies. Besides which, prices for yarn have been low, and spinners have only bought flax for their immediate requirements.

The Belgian flax crop for 1899 was very fine in quality, but small in quantity—not more than two-thirds of an average yield. Only a small portion of it was ready for shipment last year; the bulk has been shipped this. Last year's shipments were mostly from the crop of 1898. Values since November, 1899, have advanced about 50 per cent. for low grades, and 35 per cent. for good.

Nagasaki (*Japan*).—A decrease in both quantity and value in the import of raw cotton. The whole import (included under both Eastern and Western produce) was divided as follows:—

From	Value.
British India	£102,118
China	45,382
United States	23,461

And the decrease was almost entirely in that from the United States.

The import of textiles continues, as it has always been in the trade of Nagasaki, to be of a very insignificant nature. In the return, the import of silk is, for the sake of convenience, grouped with that of other textiles under the heading of "Western Productions," but nearly the whole of the import (to the value of £5675 out of the total of £6639) took place from China. The large falling off in the total value in 1899 is ascribable both to the increased original cost of silk and to the high rates of duties levied on it in Japan as compared with those on cotton and woollen piece goods, both causes combining in influencing people of good circumstances to use woollen in preference to silk garments. There was a substantial *pro rata* increase in the import of the material for the former, the value of that from Great Britain having been £2835.

Bangkok (*Siam*).—Cotton goods have very largely increased. In the custom-house returns for 1898 and previous years there appeared an item of "miscellaneous piece goods," which included various sorts of manufactured soft goods, and had to be separately scheduled in these summaries. That item is now omitted, the goods being properly classified according to material under their respective headings. A large proportion of these miscellaneous piece goods was probably cotton, and had it been classified as such last year the import of cotton goods would have appeared larger. However, even taking this into consideration, there will remain a very large increase in the import of cotton goods. As the figures stand, the increase amounts to £195,513.

The classification of cotton goods in the customs returns has been rearranged and much improved.

There are three generally recognised forms of the "panung," or lower portion of the national costume—viz., the "palai," printed and finished with a glaze; the "papoon," woven; and the "pata," woven in a cross or check pattern. Taking the items as they now stand, "palais" were imported to the extent of £61,043. More than half of these come from Bombay. Shipments from Singapore (of which the place of origin is, of course, unknown) were next in order. Direct shipments from Switzerland were more than twice as numerous as those from England. "Papoons" came to £54,721. About one-half were imported from Singapore. Then came Switzerland, Italy, and England in the order named. "Patas" were imported to the value of £8500, of which £6965 were Swiss in origin, England and Holland dividing most of the remainder. The "sarong" is the all-round form of the same garment as usually worn by Malays. The import amounted to £10,612, of which nearly half came from Singapore and the remainder from England, Switzerland, and Holland, imports from England amounting to more than double those from Switzerland. "Slendangs" are a sort of scarf or narrow cotton shawl. Their import during the year was valued at £20,057. In these England led with £9539, Holland, Switzerland, and Singapore dividing a similar amount in about equal proportions.

Prints and chintzes were nearly all from Singapore, India, and England. Their value was £37,300.

White and grey shirtings, which are mostly of British manufacture, increased from £69,634 in the previous year to £96,310. According to the returns, £84,065 of this was imported from Singapore, and the balance mainly from England, Holland, and India.

Turkey-red cloth continues to be chiefly Swiss. It also increased, the import amounting to £8288, of which £4528 come from Switzerland direct, and the rest mostly from Singapore.

In the import of singlets (£26,334), England stood first with £13,302, and Germany second with £8910. The import was 111,702 dozen.

Cotton piece goods not specified were valued at £49,666, of which £17,553 were from Singapore and £13,518 from England.

Miscellaneous cotton goods, including such articles as towels, blankets, handkerchiefs, shawls, curtains, tablecloths, sewing-cotton, etc., show a total of £51,728, of which £11,449 came from England direct, and about an equal quantity from India and Hong-Kong combined.

According to these figures the proportionate shares of the various countries in the import of manufactured cotton goods (cotton yarns which appear separately below are not here included) would roughly be :—

Country.	Per Cent.
Singapore	43·00
Great Britain	17·00
India	14·50
Switzerland	9·50
Holland	2·00
Other countries	14·00
Total	100·00

Uruguay.—Sheep owners had nothing to complain about the prices obtainable during 1899 and the early part of 1900 for wool, the figures being very considerably higher than for many years past. The actual quantities of wool exported do not seem to increase, being in 1899 39,315,000 kilos., as against 51,678,000kilos. in 1897, and 38,000,000kilos. in 1888. The average prices obtained for wool during the year work out at 3dols. 63c. the 10kilos., the highest prices in the last ten years being 3dols. 59c., the average in 1890. The average prices of superior wool in the months of October, November, and December, 1899, varied from 4dols. 60c. to 5dols. 70c. the 10kilos., as against 2dols. 45c. to 2dols. 60c. for the similar period in 1898.

EXPORT OF WOOL.

Year.	Quantity.	Value.	Average Price per 10kilos.	
	1000 kilos.	dols.	dols.	c.
1890	21,939	7,865,811	3	59
1891	25,910	8,206,692	3	16
1892	27,972	7,420,295	2	65
1893	28,789	7,678,426	2	69
1894	39,157	9,061,015	2	31
1895	50,765	10,252,491	2	02
1896	42,850	10,284,055	2	40
1897	51,678	12,402,802	2	40
1898	41,012	10,716,152	2	61
1899	39,315	14,271,628	3	63

The United Kingdom sends more than half the cotton goods, with Italy next in order of importance.

In linen goods the United Kingdom has lost her leading place, which has been taken by Belgium. The value of this market is 120,300dols. Mixed goods are a small market, in which the United Kingdom plays a poor third to Belgium and Germany.

France leads the way, as formerly, in woollen goods. The United Kingdom practically holds the mixed goods market, sending 112,110dols. worth. France and the United Kingdom divide the trade in silk and silk mixed.

Clothing in general is an important market for the United Kingdom, which supplies about a quarter of the total, or 420,000dols. worth.

Switzerland.—The total imports of wool and woollen goods in 1899 amounted to £2,540,572 (raw, £742,722; manufactured, £1,797,850), of which Great Britain supplied £345,060, 19 per cent. of this amount being for manufactured goods.

British imports show an *increase* of £47,757 on those of 1898, being principally in worsted yarns (£11,400), yarn on bobbins (£5500), heavy textures (£21,000), and light textures (£14,000). On the other hand, there was a decrease in the imports of carpets (£4300); as the total value imported during the year amounted to £125,000, it is evident that there is more trade to be done by British manufacturers in this article.

The imports of raw wool into Switzerland from neighbouring countries, with the exception of Italy, show an increase. On the other hand, 374,200kilos. less were imported from La Plata and Australia, so that the total imports amounted to 265,000kilos. *less* than in 1898. The purchase value, however, increased by £120,000, the average price being £10 15s. per 100kilos., against £7 12s. 9d. in 1898. Germany and Belgium considerably increased their imports.

The imports of woollen yarn amounted to 102,800kilos., being an increase of 13 per cent. The prices for worsted yarn increased from 15 to 32 per cent., and for carded yarn from 6 to 18 per cent. The imports of raw and unfinished carded and worsted yarns increased by 160,300kilos., or about 5·18 per cent., the supplies coming principally from Germany.

The total imports of cotton and cotton goods were £2,577,857 (raw and waste, £1,108,774; manufactured, £1,469,083), of which Great Britain supplied £795,314, or about 54 per cent. of the manufactured goods. British imports show an *increase* of £100,000 on 1898, the principal items being yarns (£50,000), raw textures (£38,000), bleached and dyed textures (£9500), oilcloth and linoleum (£7650), lace goods (£1900), various (£2550), while there was a *decrease* in tulle (£2400), dyed and velvety textures (£4800), cotton waste (£1500), and various (£900).

The year 1899 proved to be the most prosperous which the Swiss cotton industry has enjoyed for a long time past. Cotton yarns show a large increase in the imports from Great Britain (1898, £117,657; 1899, £167,826). This increase is explained by the heavy demand for superior embroidery yarns, which increased in a short space of time to such an extent that the Swiss spinning and threading industries were not able to cope with it. It is hardly to be expected that this increase in the import of yarns from Great Britain will be maintained, as several new factories have been started in Switzerland, and some of those already existing have been enlarged.

The imports of plain tulle from England showed a decrease, but, on the other hand, British imports in raw textures showed a considerable increase, as also coloured, printed, and especially fancy-woven textures.

Formosa (Japan).—The import of cotton goods shows signs of further dwindling away. Such trade as exists in these articles is now very trifling, and is chiefly in the hands of Chinese merchants.

Grey shirtings have fallen from £14,196 to £8266, whilst white shirtings, though they have not diminished as much proportionately, have decreased in value by £9577.

The import of woollen goods calls for no particular comment. The value of the whole trade in 1899 amounted to £15,760, the largest item being £7163 for camlets and lastings.

Zanzibar.—It will be of interest to note what has been the experience of merchants during the year under review with regard to the trade in piece goods, which stands above all others in magnitude. The grey cloth or sheeting known as Americani, an important article under this heading, can be bought locally much cheaper than by direct importation, owing to the large quantities held in Zanzibar, and to an overstocked market in the Benadir ports, through the failure of the rains and the consequent famine in that territory; whilst prices have risen fully 25 per cent. in the United Kingdom. Over 2000 bales are reported to be lying at the Benadir ports. A very large trade continues in the printed cotton handkerchiefs worn by native women, and known as "kangas." The cost of printing these articles in Manchester is very great compared with those printed by the Dutch system. They are printed there on large copper rollers, which are, of course, not to be obtained in the first place by any means as cheaply as the wooden blocks used for the purpose in Holland, and if the latter are not required for use a second time no great loss is entailed. Owing to their more expensive methods of printing, British manufacturers require such large numbers to be taken of each separate design that they become a drug in the market. Manchester printers require an amount of about twelve bales (value from, say, £250 to £270) of one design in kangas, whereas Dutch printers require only two bales of the same pattern. In spite of this advantage, and though in former years the bulk of kangas imported were of Dutch manufacture, yet in the past year fairly large quantities have arrived from Manchester, and patterns designed in Zanzibar have been approved in England and preferred to those which were block-printed in Holland on account of their being clearer and better.

One of the German firms in Zanzibar imported certain kisutus of one kind of Dutch printing some months since, and the demand was so great for this particular article that 20 cloths of it realised 22rs. (the probable cost to the importer being from 12rs. to 12rs. 12a.), as compared with the amount realised by the Manchester printed article of from 12rs. to 13rs. 8a. for the same number. Before leaving the subject of these articles it may be mentioned that the native is greatly taken with any bright and striking device, and clearness in the printing of these cloths or handkerchiefs is a matter of great importance. In the year 1896 a fanciful picture of the bombardment of the Palace had a good sale along the coast, and the native is much taken with devices of bicycles, flags, etc. The greater part of the trade in fez caps (of Austrian manufacture) is in the hands of the German firms, and a regular and steady business is done in the woven loin cloths with coloured borders known as "kikoi," which come chiefly from Manchester, while the very fine hand-made qualities with silk borders continue to be imported in small quantities from Muscat.

Königsberg.—The trade in flax, hemp, and codilla was about the same as in the preceding year, but the import and export for account of Königsberg merchants show again a decrease. They amounted to about 6000 tons flax, from 2000 to 2500 tons flax-tow, about 14,000 tons hemp, and 750 tons hemp-tow. The export by sea was about 2000 tons smaller. Prices were firm throughout the year, and were rising in the latter part of the year rapidly on account of the bad crop of flax in Russia, and in consequence of the great demand for hemp abroad, caused by the war in the Philippine Islands and the cessation of the export of Manila hemp.

The imports and exports show the following figures :—

Description.	Imports.			Exports.		
	By Rail.	By Sea.	Total.	By Rail.	By Sea.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Flax	21,606	—	21,606	21,042	729	21,771
Hemp	25,393	14	25,407	6,455	16,464	22,919
Tow	10,374	9	10,383	6,731	2,857	9,588

Memel.—Trade in flax was disappointing at the beginning of the season, but turned out later better than was expected. The new flax was of inferior quality, the worst known for many years. It suffered from the unfavourable weather when in the ground. Several mills that usually buy flax at Memel did not purchase in consequence. But other mills making the rough yarns found this flax suitable for their purposes, and prices being very low, they bought large quantities. In autumn, business got better, and higher rates were paid, as it was thought that next year's crop would be less than the demand. Prices opened with 5s. 6d. per 15½kilos., other sorts in proportion. 3318 tons, value £56,400, as against 3477 tons, value £62,600, in 1898, were exported.

Catania (Italy).—A cotton-spinning mill has lately been started for producing single and double twist; number of spindles, 4000; quantity of cotton worked up in 12 hours, 900kilos. Two hundred and ninety operatives are employed, and the weekly wages bill is about £50; female labour is largely employed, the women earning 10d. per day of 12 hours. The motive power consists of a Dowson plant and a 180H.P. twin-cylinder gas engine. The spinning machinery has been supplied by a Manchester firm, and gives satisfaction.

Iceland.—Wool is mostly exported to Great Britain, Denmark, and partially to Norway. The wool exported to Denmark mostly goes to England, but last year a good deal was sent to Poland and Germany, as well as Norway, through the low prices prevailing in England. At present wool prices are exceedingly low.

The value of exported wool has been as follows:—

Country.	Value.		
	1895.	1896.	1897.
	£	£	£
Denmark	40,452	30,437	36,738
Great Britain	15,815	16,881	13,172
Norway and Sweden	18,537	4,620	2,920

Kagoshima (*Japan*).—Cotton and hemp are grown with great success, the former being chiefly for home use, being manufactured into a kind of coarse light cloth known as "Satsuma gasuri," much used for summer wear. About 330,000lb. were grown last year.

Although much of the hemp grown is also for home use, about £13,000 worth was exported last year to other parts of Japan, chiefly Osaka. The total produce last year was 1,500,000lb. weight.

Indigo is also largely cultivated, and the preparation of dyes forms a considerable item in the industries of the Prefecture. Upwards of 1,600,000lb. were produced last year.

Adis Abbaba (*Abyssinia*).—Cotton grows wild in many districts, notably Minjar, Iffat, Walkaet, and in most of the country bordering on the Blue Nile. It is also largely cultivated in these provinces, and throughout the greater part of the middle Abyssinian Plateau. Cotton blankets and "shaamas" are worn throughout the above districts, and fetch on an average 5dols. each. They are preferred on account of their warmth, softness, and durability, to all European imitations which have hitherto been put on the market.

Woollen burnouses are made locally and worn by all Abyssinians during wet or cold weather. They are made in the districts of Mens Tangalet, Bagaminder, Wollo, and Damot. The average price is from 3 to 5dols. each.

THE GAZETTE.

ENGLAND.

Partnerships Dissolved.

Maurice Makower, Louis Makower, and Hermann Jolowicz, silk merchants and warehousemen, as M. and L. Makower and Co., Old Change, London, Lyons, Melbourne, and Sydney.

John William Turner and Richard Turner, rag merchants, Bunkers-lane, Staincliffe, Batley, as Richard Turner and Sons.

Spencer and Exley, dyers, North Bridge Dyeworks, Halifax.

Joseph Fowler and Arthur Elias Levy, silk manufacturers, Wavertree Mills, Macclesfield, as Joseph Fowler and Co.

James Walton, Allan Walton, and George Downs, bleachers, dyers, printers, and finishers, Little Green Dyeworks, Collyhurst-road, and Fountain-street, Manchester, as John Walton; as regards James Walton.

Edward Milnes, James Edmondson Ackroyd, and William Hurst Boothroyd, stuff merchants, Leeds-road, Bradford, as Boothroyd, Milnes and Ackroyd; as regards Edward Milnes.

Abraham Crabtree and Herbert Armitage, commission worsted spinners, Kirkburton, near Huddersfield, as A. Crabtree and Co.

William Morgan and William Morgan the younger, Upper East Smithfield, ship store dealers, and at Limehouse, London, wool manufacturers, as the Regent's Canal Wool Mills.

John and Thomas Donaldson, rope and twine manufacturers, Haslingden.

James Paterson and John Isaac Tinkler, cotton manufacturers, Thistle Mills, Harpurhey, and 4, York-street, Manchester.

Carl Christian Adolph Jacobs, Ernest Jacobs, and Adolph Jacobs the younger, wool and yarn merchants, Manor-row, Cheapside, Bradford, as Adolph Jacobs and Co.

Hahle and Liebreich, machine makers and merchants, Bradford.

W. and E. Taylor, manufacturers' agents, Lion Arcade, Huddersfield.

Whiteley and Co., cotton spinners, doublers, and warpmakers, at Huddersfield and Rishworth, near Halifax.

John Cheetham and Sons, silk spinners, Rastrick, Brighouse.

Voluntary Winding-up.

Bradford Patent Dyeing Company Limited, to sell to the British Cotton and Wool Dyers' Association Limited.

The Bankruptcy Acts, 1883 and 1890.

Receiving Orders

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

William Sidney Smith, lace manufacturer, First-avenue, Bush Hill Park, Enfield.

John Shore, wool stapler, Drake-street, Rochdale, carrying on business at Butterworth-street, Rochdale.

NEW COMPANIES.

Garlick and Dyson Limited.

Registered December 4, with a capital of £25,000, in £10 shares, to acquire the business carried on at Orleans Mill, Newton Heath, near Manchester, as Garlick and Dyson, and to carry on the business of combing, spinning, weaving, doubling, bleaching, dyeing and manipulating cotton, wool, flax, hemp, linen and other goods. The number of directors is not to be less than two nor more than five; the first are J. Garlick, E. Hague, A. D. Garlick, and A. L. Dyson; qualification, £500. Registered by C. Doubble, 14, Serjeant's Inn, London, E.C.

Rochdale Asbestos Company Limited.

Registered December 5, with a capital of £2000, in £1 shares, to acquire and carry on the business of an asbestos spinner and manufacturer, engine packing manufacturers, etc., carried on at Shawclough, Rochdale, as the Rochdale Asbestos Company, and to adopt an agreement with L. Garside. The number of directors is not to be less than three nor more than five; the subscribers are to appoint the first; qualification, £50. Registered by Waterlow Brothers and Layton Limited, Birchin-lane, London, E.C.

Wrigleys and Schofield Limited.

Registered December 4, with a capital of £30,000, in £5 shares, to acquire the Green Brook Mill, at or near Chesham-road, Bury, now belonging to J. Wrigley, G. Wrigley, and J. J. Schofield, trading as Wrigleys and Schofield, and to carry on the business of spinning, doubling, bleaching, dyeing and printing fibrous substances. The number of directors is not to be less than three nor more than six; the first are J. Wrigley, G. Wrigley, J. J. Schofield, and F. R. Jones; qualification, 100 shares; remuneration, as fixed by the company. Registered by Hooper and Son, 69, Ludgate-hill, London, E.C.

Cooke, Sons and Co. Limited.

Registered December 10, with a capital of £210,000, in £10 shares (7000 preference), to acquire the business of carpet manufacturers and warehousemen, carried on by W. Cooke and J. S. Cooke at Liversedge, Yorkshire, at Hadleigh, Suffolk, and at 12, Friday-street, London, E.C., as Cooke, Sons and Co., and to carry on the business of carpet manufacturers, warehousemen, wool combers, carders, woollen and worsted spinners, linoleum and mat manufacturers, general textile manufacturers and merchants, chemical manufacturers, drysalters, etc. The number of directors is not to be less than three nor more than six; the first are W. Cooke and J. S. Cooke (permanent governing directors), S. Cooke, H. M. Cooke, R. Cooke, and A. B. Burrows; qualification, £5000; remuneration, as fixed by the company. Registered by A. H. Cooke, 10, Old Jewry Chambers, London, E.C.

Coventry and Co. Limited.

Registered December 8, with a capital of £10,000, in £1 shares, to acquire the business of cop dyeing now carried on by Walter Coventry, under the style of Coventry and Co., at 295, Liverpool-street, Salford, Lancashire, and to carry on the business of dyers, sizers, bleachers, and finishers of cotton, wool, silk, worsted, and other fibres, whether in a raw or manufactured state, manufacturers of dyeing machinery, etc. Table A mainly applies. Registered by T. T. Hull, 22, Chancery-lane, London, W.C.

Daniel Arkwright Limited.

Registered December 6, with a capital of £50,000, in £1 shares (40,000 preference), to acquire the business carried on at Arkwright Mill, Preston, by Alexander Foster, J. Foster, and Arthur Foster, as Daniel Arkwright, and to carry on the business of cotton spinners and doublers, flax, hemp, and jute spinners, linen manufacturers, wool combers, worsted spinners, dyers, bleachers, etc. The number of directors is not to be less than two nor more than seven; the first are Alexander Foster, J. Foster, and Arthur Foster (all permanent); qualification of permanent directors, £1000 ordinary shares, of ordinary directors £100 ordinary or preference shares. Registered office, Arkwright Mill, Preston, Lancashire.

Halliday and Constantine Limited.

Registered December 8, with a capital of £60,000, in £10 shares, to acquire and carry on (*a*) the business of cotton manufacturers, dyers, and finishers carried on at Golborne and Manchester as Halliday and Constantine, (*b*) the business carried on at Aspull, Lancashire, by the Halcyon Mills Company Limited, and (*c*) the business carried on at Walkden, Lancashire, by William Halliday and Co. Limited; and to carry on the business of cotton spinners and manufacturers, bleachers, dyers, raisers, calenderers, finishers, packers, and general textile manufacturers. The number of directors is not to be less than three nor more than five; the first are Thomas Halliday, H. H. Constantine, W. Halliday, and H. A. Constantine; qualification, £100; remuneration, as fixed by the company. Registered office, 45A, Portland-street, Manchester.

A. Hardman and Son Limited.

Registered December 14, with a capital of £15,000, in £10 shares, to acquire the business carried on by A. Hardman, Sarah J. Hardman, and E. Hardman, as A. Hardman and Son, at Bailiff Bridge, Yorkshire, and to carry on the business of cotton spinners and doublers, yarn spinners, cotton merchants, bleachers, dyers, finishers, etc. The number of directors is not to be less than two nor more than five; the first are A. Hardman and E. Hardman; qualification, £500. Registered office, Bailiff Bridge, Brighouse, Yorkshire.

Edmund Heuer and Co. Limited.

Registered December 12, with a capital of £50,000, in £5 shares, to acquire the business carried on at 76, Princess-street, Manchester, as E. Heuer and Co., and to carry on the business of merchants, shippers, commission agents, factors, brokers, warehousemen, cotton spinners, and manufacturers, etc. The number of directors is not to be less than two; the first are E. N. Heuer and P. A. Moll; qualification, £500; E. N. Heuer is chairman, with £300 per annum as remuneration. Registered office, 76, Princess-street, Manchester.

James Cheetham and Sons Limited.

Registered December 13, with a capital of £42,000, in £5 shares, to carry on the business of spinning, doubling, weaving, bleaching, dyeing, printing and manipulating cotton, flax, wool, jute, silk and other fibrous substances, and to deal in such substances in their unmanufactured state, and in the products of the company's mills or the yarns, fabrics, and goods of other firms. The number of directors is not to be less than two nor more than five; the first are J. M. Cheetham, James C. Cheetham, John C. Cheetham, J. Hall, and J. M. C. Cheetham. Registered by Waterlow Brothers and Layton Limited, Birchin-lane, London, E.C.

Joseph Clegg Limited.

Registered December 7, with a capital of £65,000, in £5 shares, to carry on the business of spinners, doublers, weavers, bleachers, dyers, printers and manipulators of cotton, wool, flax, jute, silk and other fibrous substances, buyers and sellers of such substances in their raw (unmanufactured) state, and dealers in the products of the company's mills, and in the yarns, fabrics and manufactures of other firms. The number of directors is not to be less than two nor more than five; the first are H. Clegg, J. Clegg, and J. W. Clegg, each of whom may retain office so long as he holds 500 shares. Registered by Waterlow Brothers and Layton Limited, Birchin-lane, London, E.C.

Joseph Sykes and Co. Limited.

Registered December 6, with a capital of £125,000, in £5 shares, to acquire the business of woollen and worsted cloth manufacturers and merchants, carried on by E. Crowther, A. Sykes, J. D. Crowther, and A. H. Sykes, at Brockholes, Huddersfield, and in London, and to carry on the business of woollen and worsted cloth manufacturers and merchants, buyers, combers, doublers, spinners, dyers, weavers and manufacturers of fibrous materials, etc. The number of directors is not to be less than three nor more than seven; the first are E. Crowther, A. Sykes, J. D. Crowther, A. H. Sykes, O. H. Sykes, and J. H. Crowther; qualification, 100 shares; remuneration, as fixed by the company. Registered office, Rock Mills, Brockholes, near Huddersfield.

A. Marshall and Son Limited.

Registered December 17, with a capital of £20,000, in £10 shares (6000 preference), to acquire and carry on the business of a cloth manufacturer, cloth merchant, dyer and finisher, carried on at Leeds, and Morley, Yorkshire, by T. Marshall, trading as A. Marshall and Son. T. Marshall is permanent governing director. Registered by Jordan and Sons, 120, Chancery-lane, London, W.C. Registered office, Perseverance Mills, Station-road, Morley, Yorkshire.

Ephraim Hirst and Co. Limited.

Registered December 17, with a capital of £10,000, in £10 shares, to take over the business of cotton spinners and doublers and warpmakers carried on by Geo. Hirst at Britannia Mill, Birstall, and elsewhere, as Ephraim Hirst and Co. The number of directors is not to be less than three nor more than seven; the first are George Hirst, Ephraim Hirst, James J. Hirst, and Joseph W. Fox; qualification, 30 shares. Registered office, Britannia Mill, Batley, Yorkshire.

S. Whittaker and Son Limited.

Registered December 17, with a capital of £6000, in £10 shares, to adopt an agreement with J. T. Whittaker for the acquisition of the business, looms, plant, stock-in-trade, etc., therein mentioned, and to carry on the business of spinners and weavers of cotton, woollen, silk, and other fibrous substances, etc. The number of directors is not to be less than two nor more than five; the first are J. T. Whittaker (permanent governing director) and W. T Whittaker; renumeration of governing director, £250 per annum. Registered office, Albert Mill, Trafalgar-street, Burnley.

Textile Mutual Fire Insurance Company Limited.

Registered December 18, with a capital of £100,000, in £1 shares, to carry on in the United Kingdom or elsewhere the business of insurance against injury, loss, or damage resulting indirectly or directly from fire, lightning, explosion, or similar causes. The number of directors is not to be less than five nor more than nine: the subscribers are to appoint the first; qualification, £500; remuneration, as fixed by the company. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C.

Union Ring Mill Company Limited.

Registered December 15, with a capital of £60,000 in £5 shares, to carry on the business of cotton spinners, doublers, manufacturers, dyers, finishers, bleachers, merchants, cotton waste dealers, cotton, wool, silk, flax, hemp, and jute manufacturers, etc. The number of directors is not to be less than three nor more than seven; the first are W. Cunliffe, J. Hamer, W. Thompson, and W. H. Waller; qualification, 200 shares; remuneration, £240 per annum. Registered office, Castleton, Gales, Rochdale.

Buist Spinning Company Limited

Registered at Edinburgh, December 20, with a capital of £30,000, in £10 shares, to acquire the Stobswell Works, Dura-street, Dundee, and contents thereof, and to carry on the business of flax, hemp, and jute spinners, linoleum, floorcloth and carpet manufacturers, etc. The number of directors is not to be less than two nor more than five; the first are C. Ovenstone and A. Buist; qualification, £1000; remuneration, as fixed by the company. Registered by Johnson, Simpson and Thomson, 87, Commercial-street, Dundee.

Thomas Goldie and Co. Limited.

Registered at Edinburgh, December 19, with a capital of £20,000, in £10 shares, to carry on the business of bleachers, stovers, weavers, winders, printers, dyers, manufacturers, and merchants. The number of directors is not to be less than three nor more than five; the first are J. Goldie, G. Goldie, and A. Gardiner; qualification, 20 shares. Registered office, Airdrie Cotton Works, Airdrie.

Gault Brothers Limited.

Registered in Dublin, December 18, with a capital of £12,500, in £5 shares, to acquire the business now carried on at Ballymena, county Antrim, under the style of John Gault, and to carry on the business of cotton spinners and doublers, flax, hemp, and jute spinners, linen manufacturers, etc. The number of directors is not to be less than three nor more than five; the first are M. Gault, W. C. Gault, and R. Wright; qualification, £5; remuneration, as fixed by the company. Registered office, Queen-street, Ballymena, county Antrim.

James Murland Limited.

Registered in Dublin, December 21, with a capital of £30,000, in £10 shares, to acquire and carry on the business of a flax spinner, linen manufacturer, bleacher and finisher, now carried on by C. W. Murland, under the style of James Murland, at Annsborough, county Down. The number of directors is not to be less than two nor more than five; the first are C. W. Murland, J. W. Murland, and C. W. Murland, jun.; qualification, £50; remuneration, as fixed by the company. Registered by L'Estrange and Brett, 13, Bachelors'-walk, Dublin, and Belfast.

A. S. Orr and Co. Limited.

Registered December 19, with a capital of £40,000, in £5 shares (5000 preference), to acquire the business of cotton spinners and manufacturers carried on at School-lane Mills, Walton-le-Dale, Lancashire, as A. S. Orr and Co., to adopt an agreement with A. S. Orr, and to carry on the business of cotton spinners and doublers, cotton manufacturers, flax, hemp and jute spinners, bleachers, dyers, etc. A. S. Orr is permanent governing director. Registered by Pitman and Sons, 5, Laurence Pountney-hill, London, E.C.

Birtwistle and Fielding Limited.

Registered December 20, with a capital of £100,000, in £100 shares, to acquire and carry on the business of cotton spinners, manufacturers of cotton goods, cloth merchants, etc., now carried on by Alfred Birtwistle, Albert Birtwistle, and Arthur Birtwistle, at Great Harwood, under the style of Birtwistle and Fielding, at Clayton-le-Moors under the style of William Birtwistle and Sons, at Blackburn under the style of A., A. and A. Birtwistle, and at Manchester under the style of A. Birtwistle and Brothers. The number of directors is not to be less than three nor more than seven; the first are Albert Birtwistle, Arthur Birtwistle, and Alfred Birtwistle; qualification, 10 shares; remuneration, as fixed by the company. Registered by Jordan and Sons Limited, 12, Chancery-lane, London, W.C. Registered office, Britannia-street, Great Harwood.

G. and J. Lowe Limited.

Registered December 17, with a capital of £8000, in £10 shares (20 founders'), to carry on the business of textile manufacturers and merchants, spinners, reelers, doublers, weavers, etc. The number of directors is not to be less than two nor more than five; the first are George Lowe and John Lowe (permanent governing directors). Registered office, 12, Queen-street, Manchester.

Eli Fielding and Co. Limited.

Registered December 20, with a capital of £15,000, in £1 shares, to acquire the business carried on at Salem Mills, Hebden Bridge, Yorkshire, as Eli Fielding and Co., and to carry on the business of cotton spinners and manufacturers, warp sizers, cotton weavers, woollen manufacturers, etc. The number of directors is not to be less than three nor more than seven; the subscribers are to appoint the first; qualification, £100; remuneration, as fixed by the company. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Salem Mills, Hebden Bridge, Yorkshire.

John Cheetham and Sons Limited.

Registered December 19, with a capital of £50,000, in £10 shares, to acquire the business of silk spinners carried on by F. A. Cheetham, James Cheetham, and J. A. Cheetham at Calder Bank, Snake Hill, and Albert Mills, in Rastrick, Brighouse, Yorkshire, as John Cheetham and Sons, and to carry on the business of silk spinners, throwsters, dyers, textile manufacturers, etc. The number of directors is not to be less than two nor more than seven; the first are F. A. Cheetham, James Cheetham, and J. A. Cheetham (all permanent); qualification, £5000. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C.

Andrew J. Sutton and Son Limited.

Registered at Dublin, December 24, with a capital of £1000, in £1 shares, to acquire the business carried on by J. Sutton and T. Sutton, trading as A. J. Sutton and Son, at Belfast, Portadown, and elsewhere, and to carry on the business of flax spinners and doublers, etc. The first directors are J. Sutton and T. Sutton; qualification, 10 shares; remuneration, as fixed by the company. Registered office, 7, Linen Hall-street, Belfast.

Robert McBride and Co. Limited.

Registered at Dublin, December 24, with a capital of £165,000, in £10 shares, to carry on the business of linen merchants and manufacturers in all its branches. The number of directors is not to be less than two nor more than five; the first are S. McBride, R. McBride, and W. D. McBride; qualification, £1000; remuneration, as fixed by the company. Registered by Robert J. Porter, 143, Royal-avenue, Belfast.

Robinson and Cleaver Limited.

Registered at Dublin, December 10, with a capital of £450,000, in £1 shares (200,000 5 per cent. cumulative preference), to acquire the business now carried on by Robinson and Cleaver, in Belfast and Bainbridge, and elsewhere in Ireland, and at Regent-street, London, and to carry on the business of linen, damask, lace, shirt, collar, underclothing, woollen and cotton manufacturers and merchants, bleachers, dyers, finishers, and general warehousemen. The number of directors is not to be less than seven nor more than ten; the first are E. Robinson, J. Cleaver, W. T. Hamilton, H. M. Robinson, A. S. Cleaver, E. Robinson, and J. G. Lack; qualification, £5000; remuneration, as fixed by the company. Registered by Carson and McDowell, 51, Royal-avenue, Belfast.

Richard Clarke and Sons Limited.

Registered December 19, with a capital of £35,000, in £10 shares, to acquire the business of a flock manufacturer recently carried on by the late B. Clarke at Beehive Mills, Heckmondwike, at Milton Mills, Liversedge, and at 61, Piccadilly, Manchester, as Richard Clarke and Co., and to carry on the business of woollen and cotton flock manufacturers and merchants, bedding manufacturers, etc. W. E. Clarke and B. A. Clarke are permanent managing directors; special qualification, £1000; ordinary qualification, £250. Registered by Van Sandau and Co., 13, King-street, London, E.C.

Simplex Art Embroidery Company Limited.

Registered December 19, with a capital of £10,000, in £1 shares, to acquire from Messrs. Myrthil, Rose and Co., and to turn to account, the French Brevet d'Invention of J. Lowenger for the Simplex apparatus for art embrodiery. The number of directors is not to be less than three nor more than seven; the first are J. Lowenger and others to be appointed by the subscribers; qualification, £100; remuneration, 10 per cent. of the net profits, divisible. Registered by Sims and Syms, 70, Queen Victoria-street, London, E.C.

Syddall Brothers Limited.

Registered December 20, with a capital of £100, in £1 shares, to acquire the goodwill, trade marks and designs of the business of Syddall Brothers Limited (incorporated in 1890), and to carry on the same or any other business acquired by this company, as agents for the Calico Printers' Association Limited, or otherwise. The directors are to be appointed by the Calico Printers' Association Limited. Registered by Grundy and Co., 4, New-court, London, W.C.

Textile Winding Company Limited.

Registered December 20, with a capital of £50,000, in £5 shares, to acquire the business carried on at Ashton-under-Lyne as the Textile Winding Company, to adopt an agreement with J. H. Holt, and to carry on the business of winders of yarn, silk and other textile substances, cotton spinners and doublers, flax, hemp and jute spinners, linen and woollen manufacturers, dyers, bleachers, engineers, etc. The number of directors is not to be less than two nor more than seven; the first are J. T. Booth, J. H. Holt, and J. J. Stott; qualification, £200; remuneration, as fixed by the company. Registered by Grundy and Co., 4, New-court, London, W.C.

JOTTINGS.

THE Home Secretary has appointed Mr. Leonard Ward to be an inspector of factories and workshops.

WE are informed that the action for alleged infringement of Patent 15,807, 1894, which was brought by Messrs. Combe, Barbour and Combe Limited, Belfast, against Messrs. Douglas Fraser and Sons, Arbroath, has been withdrawn, an arrangement having been made to the mutual satisfaction of both parties.

THE directors of Messrs. A. and S. Henry and Co. Limited have decided to recommend a dividend on the ordinary shares of the company at the rate of 6 per cent. per annum for the half-year ended November 30, 1900, and making 6 per cent. for the year, placing £10,000 to the reserve account and carrying forward £11,690.

IN Great Britain 77 cotton spinning companies have declared in the aggregate a profit of £322,000 during the past year, as against £330,000 for the same number of companies in 1899. The nearest approach to the total gain of 1899 was in 1890, when 91 companies declared a profit of £384,000. There were fewer textile failures last year than for a very long time past.

OVER 1,000,000 spinners and weavers find occupation in Germany, and the export trade would be relatively small were it not for its textile industries. In the Rhineland and Westphalia there were 717,000 spindles in the cotton mills in 1888, and these more than doubled in 1897, when the number was 1,636,000. These mills consumed, in 1885, over 22,500,000lb. of raw cotton, and in 1897, 47,000,000lb.

THE directors of Messrs. J. and P. Coats Limited have resolved to pay off two millions 4½ per cent. debenture stock of the company on July 3 next, with a premium of 10 per cent. For this purpose it is proposed to create two millions new debenture stock at 3¾ per cent., of which one and a half million will be issued then, while the remaining half-million will be issued if and when required. The directors, who hold 700,000 of the existing stock, will take the new issue in exchange.

THE directors of Messrs. John Crossley and Sons Limited, of Halifax, have decided to recommend that after providing for payment of the dividend on the preference shares at the rate of 5 per cent. per annum, there be paid a dividend of 4s. 6d. per share on the ordinary shares of £4, which, with the dividend of 2s. per share paid on these shares in August, is equal to 6s. 6d. per ordinary share for the year ending December 8, 1900. The profits for the year, including £1436 brought forward from last year, amount to £74,657. It is proposed to place £5000 to the credit of reserve fund No. 2, and to carry the balance of £1349 forward to next year.

FOR the six months ended September 30, the following was the output of Indian yarn in pounds, and cotton woven goods in yards:—

	Lb.		Yds.
1898	252,181,921	....	170,728,514
1899	290,481,161	....	167,524,636
1900	148,510,081	....	149,147,731

The output of yarn from the Bengal mills has declined during the six months from twenty-two million to five million pounds. That in face of this there should be no rise in values shows how serious the over-production has been in the past, and what it may become again in the future.

THE Board of Trade returns for December and the year ended December 31 have now been issued. The declared value of goods imported during the month amounted to £46,446,662, against £40,738,896 in 1899 and £45,364,785 in 1898; and during the year to £523,633,486, against £485,035,583 in 1899 and £470,544,702 in 1898. Of foreign and colonial merchandise exported in the month the value was £5,087,220, against £5,625,891 in 1899 and £5,535,953 in 1898; and in the year £63,099,288, against £65,042,447 in 1899 and £60,654,748 in 1898. The value of British and Irish produce and manufactures exported in the month was £23,611,972, against £22,038,489 in 1899 and £20,978,408 in 1898; and in the year £291,451,306, against £264,492,211 in 1899 and £233,359,240 in 1898.

THE American census returns of 1890 gave the South 1,725,000 cotton spindles. The census of 1900 gives the South 4,302,000 spindles. The spindles in the United States increased 50 per cent. in the decade ended this year. The spindles of the South increased 150 per cent. Ten years ago the South had 12 per cent. of all the spindles. In 1900 the South has 20 per cent. of the whole. Estimating the value per spindle at £5, the actual cash invested in Southern mills is £19,208,000. Practically all of this development has occurred since 1870; far the larger part since 1890. But the growth of the Southern cotton trade is by no means shown by a statement of the increase in number of spindles. The investment in knitting mills in the South since 1890 has and is being something very large.

As a rule the persons engaged in a particular industry are inclined to advocate Protection for their own interests, however willing they may be that manufacturers of other wares should forego it. But this is not the attitude taken by the Lyons Chamber. Recently, certain producers in the French silk trade who are, or imagine themselves to be, troubled by foreign competition, have been agitating for the ancient Protectionist *régime* in regard to their fabrics. It is as a counterblast in response to this movement that the Lyons Chamber has issued its report, going into the subject from every point of view, and condemning Protectionism for silks as purely mischievous. "Give us free importation of our raw materials," is the conclusion, "and we ask no import duties on our products." Needless to say, the realisation of this ideal is not seriously anticipated, even by the Lyons Chamber. But that it should be even remotely contemplated in such a quarter is a notable sign of the times.

ACCORDING to the "Bourse Gazette" of St. Petersburg of November 22 and December 5, 1900, the Department of Agriculture has undertaken the distribution in considerable quantities, through the medium of the zemstvos and agricultural societies, of flax-dressing machines, both of the cheaper hand-made kind and of the more finished metal article of foreign manufacture, among flax cultivators in Russia. This measure has been called forth by the considerable demand, even among the peasants, for the above-mentioned machines. The department has also established, with the assistance of the zemstvos and agricultural societies, a series of flax-dressing and seed stations, providing them gratis with a complete collection of the requisite machinery and apparatus. Besides the stations of Kashin, Pskoff and Kostroma so organised, similar ones are already established in various districts of the governments of Kostroma, Tver, Yaroslav, Perm, Viatka, Witebsk, Orlaff, Valogda, and Bessarabia.

A NEW mill erected by the Bradley Manufacturing Company was formally opened at Standish, Wigan, on the 27th ult. For many years endeavours have been made to provide a weaving shed in the township to furnish employment for the female portion of the population, but it was not until eighteen months ago that these efforts assumed a definite form. Among those who have interested themselves in the undertaking is the Rector of Standish, the Rev. C. W. N. Hutton, who furnished a site at a nominal rent of a shilling a year. The Standish Miners' Union has also prominently identified itself with the venture, the society having taken up a thousand shares, whilst the workpeople of the district have likewise contributed to the capital of the company. The buildings already erected comprise a weaving shed and preparation-rooms for 650 looms, and so far 300 looms have been put down, the expenditure amounting to about £10,000. Miss Horrocks, of Douglas House, Standish, opened the mill and named the engine.

FOR the year 1900 the sixty-nine companies in the Lancashire sharebrokers' list that issue balance-sheets declared an aggregate profit of £244,575 6s. 11½d., which is equal to £8 7s. 2d. per cent. on the capital invested. This is considerably less than the year 1899, and the deficiency is accounted for by the cotton "squeeze." During the second half of the year prices for cotton increased by leaps and bounds. The highest point was reached on September 13, when the quotation was 7⅜d. This entirely upset business, and many mills had to curtail their production. All the sixty-nine companies (with three exceptions) have paid dividends ranging from 2½ to 12½ per cent. There are other thirty-two companies in the Lancashire sharebrokers' list that do not issue balance-sheets, but the dividends are recorded, and these range from 4¾ to 13⅓ per cent. The 101 companies referred to have balances carried forward and reserve funds amounting to 2¾ millions. On the whole, the results are very fair, considering all the circumstances. Better results are expected in the first year of the new century. No crisis stared the trade in the face at the close of 1900.

THE French Customs authorities have the following way of determining the amount of wool and cotton in mixed textile fabrics:—Three pieces of the fabric are cut of the same weight—say, 10grms. One of these (call it A) is kept for reference. The others (B and C) are boiled for fifteen minutes in a 3 per cent. solution of hydrochloric acid to remove impurities; the pieces are then washed several times. B is thoroughly dried and weighed, when the percentage of impurities is ascertained. It is kept for reference. The other piece (C) is then boiled for fifteen minutes in a solution of caustic soda, whereby the wool is dissolved out, leaving the cotton. After the boiling the piece is well washed in water, dried, and allowed to hang for twenty-four hours in the air; it is then weighed, and 5 per cent. of this weight is added to allow for some loss of cotton carried away by the soda solution. The weight of C gives the amount of cotton; that of B minus C the amount of wool; while that of A minus B the amount of impurities. Boiling with caustic soda is found to answer very well when the fabric contains much cotton, but when there is only a small amount of that fibre, the best plan is to boil with hydrochloric acid, which disintegrates the cotton, then to wash well, dry, and weigh. The weight of the wool is thereby ascertained.

MR. B. F. STONE, United States Consul for Huddersfield, has just issued his returns of the value of the goods as declared to him exported to the States during the four quarters of last year. The totals are:—March quarter, £96,987 19s. 8d.; June quarter, £77,599 16s. 2d.; September quarter, £67,715 1s. 9d.; December quarter, £51,404 9s. 3d., making a total of £293,707 6s. 10d., or £4323 6s. 4½d. less than in 1899. The total for the December quarter was £31,411 8s. 9d. less than for the final quarter of 1899. Woollen goods are represented for the year by £87,629 19s. 8d., and worsteds £98,230 12s. 10d. The decrease in woollens and worsteds for the past quarter as compared with 1899 was £25,677 13s. 3d. During last year card clothing was sent to the United States to the value of £25,257 11s. 9d., chemicals and dyes £30,891 15s. 4d., and sewing cottons £18,705 2s. 2d., wool £3751 9s. 1d., silk and silk yarn £3840 12s. 6d., and machinery £5230 18s. 5d. Last month's returns give the total value of the exports as £23,841 11s. 8d., or a decrease of £27,966 9s. 9d. on the figures for December, 1899, and of £4459 16s. 11d. on December, 1898. Woollens last month were represented by £8601 13s. 8d., or £9733 0s. 1d. less than in December, 1899; and worsteds £9132 3s. 8d., a falling off of £12,722 11s. 10d. compared with December, 1899. There was a fall from £4344 11s. 7d. in December, 1899, to £2495 18s. 8d. last month in the exports of chemicals and dyes, and a decrease of £779 15s. 11d. in card clothing and of £917 16s. 6d. in sewing cottons.

THE TEXTILE COLOURIST:

DEVOTED TO

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

Experiments in Dyeing Mercerised Cotton.

By P. Hoffmann.

THE dyeing of mercerised cotton is still in its infancy; the material itself, which has only been in use for about eight years at most, not having been long enough in the market to have received the personal attention of every dyer, and for the behaviour of all dyestuffs towards this new fibre to have been investigated. The author has therefore published the results that have attended his own tests made with the majority of usual dyes, and on which his conclusions have been based, hoping that others will bring forward their own experiences, and thus bring into complete form the sum of present-day knowledge, from the dyer's point of view, on this product, which has so deservedly attracted the attention of practical men. The subject has been divided into three principal branches:—(1) The examination of mercerised cotton from a tinctorial standpoint; (2) dyeing the fibre in general; (3) dyeing experiments with the shades in current use.

1. *Examination from a Tinctorial Standpoint.*—Mercerisation constitutes an elegant conversion of a common material (cotton) into a superior textile of silky appearance, and but slightly more expensive. This operation will remain characterised, as regards the textile arts at the end of the century just closed, with the seal of delicacy and good taste. The brilliant appearance of mercerised cotton at once opens to this material the doors of the manufacturer of fine textile fabrics, who is thus enabled to supply them at prices to which silk is a stranger. In itself, however, this conversion of the fibre is a small affair. It consists of an intelligent combination of a chemical process and a mechanical operation: the modification of cotton by a lye of caustic soda which causes the fibre to swell up and thicken; and an operation of stretching the material, which thereby receives a silky lustre.

These two processes, or rather these two qualities just acquired by the fibre, both have their importance as regards dyeing. In fact, by the action of the caustic soda, mercerised cotton has acquired a singular affinity—a conjunction of porosity and chemical attraction—which causes it to combine in a peculiarly powerful manner with the majority of the mordants and dyestuffs now in daily use. Moreover, the lustre imparted by the stretching process must influence the dyer in selecting dyes and rejecting those likely to dull this sheen.

It must not, however, be imagined that all cottons without exception are capable of being "similised," as the term goes, and of acquiring the lustre regarded as the distinguishing characteristic of mercerised cotton; for though it may certainly be granted that the majority of cottons, if not all, are amenable to the (more or less prolonged) action of caustic soda, and even acquire a certain degree of brilliance under tension, still the torsion of the yarn causes very considerable modifications even though the loose threads become lustrous.

In Fig. 1 various cottons are shown in magnified form. Jumel cotton mercerised without tension is shown at A; B is Egyptian jumel cotton; C is a burst cotton fibre; D shows immature cotton; E is jumel cotton mercerised under tension; F is a cotton fibre cut across; G is Florida cotton; H is Peruvian cotton; J is Japanese cotton; K is Indian cotton; and L is Algerian cotton.

To summarise, mercerisation consists in subjecting a special, previously-boiled-out cotton to the action of cold concentrated caustic soda, and in stretching this fibre, in a still moist condition, on a frame fitted with rollers at least 4in. in diameter, on which it is washed carefully at the same time. What happens during mercerisation, and in what sense the properties of the fibre have undergone alteration, is revealed by the aid of chemistry. The cotton fibre is formed of cellulose identical with that of wood and plants in general, but differing from the latter in being almost perfectly pure. Caustic soda acts upon it as a hydrolysing reagent, and forms a special hydrocellulose—*i.e.*, substitutes one or more molecules of water in the constitutional formula of the cellulose. By this simple substitution the textile material has acquired special characteristic properties, not merely from the physical point of view, with regard to the acquired lustre, but also from a chemical standpoint. It enjoys a particular affinity for metallic salts (mordants), which it decomposes, attaching the metallic bases to itself; it also rapidly absorbs dyestuffs and assumes very deep shades, its special affinity being for the basic dyes—in other words, it acts as a powerful acid. As we shall see further on, this intensified property of chemical attraction is also a source of continual trouble; and the practical dyer needs to have great patience, and a good selection of the numerous dyes placed at his disposal by the chemical industry—a selection based on the affinity of the fibre for the dye, and also on the mutual combinations existing between the dyestuffs themselves. And it is on this point our attention will be concentrated in the following sections, in which we shall endeavour to point out the best path to follow in dyeing this handsome but capricious material.

2. *Dyeing Mercerised Cotton in General.*—Although during the comparatively long time mercerised cotton has been the subject of industrial attention, nearly everything concerned with the silky lustre of this material has been published, very little has been written with regard to dyeing the product, notwithstanding that many details on this head would profit by publicity, the manufacture and consumption of mercerised goods being on the increase year by year. In dyeing this article it must not be forgotten that the true character of the cellulose constituent of the fibre is entirely modified, in a superlative degree, with regard to its affinity for dyes; and neglect to recognise this

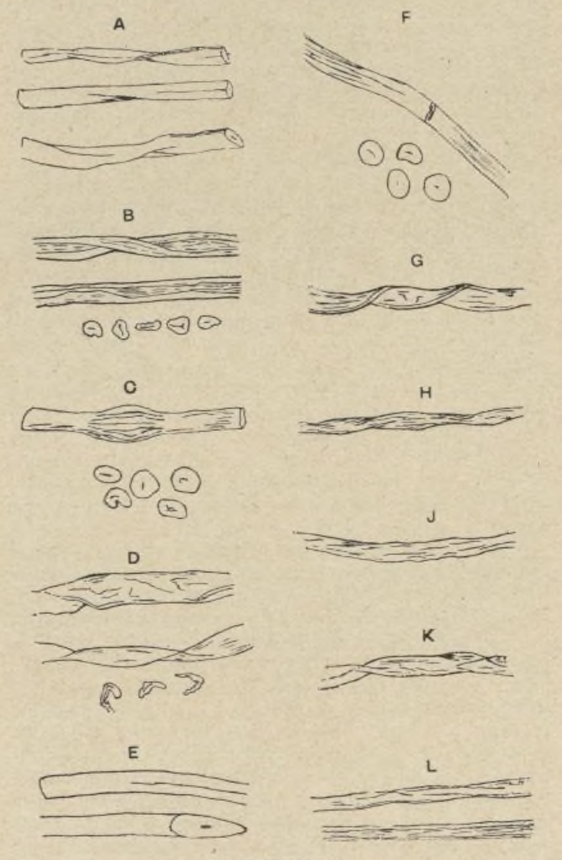


Fig. 1.

fact has been the cause of a good many returns and rejected parcels by dyers' clients. It is by no means infrequent that goods which appeared perfectly uniform in the vat come out irregular, streaky, and defective in all points when dried and delivered. This is notably the case when the bath has been prepared with metallic salts—for, in addition to the irregularities caused by the imperfect fixation of the mordant, come those due to the defective application of the dye. Moreover, it is indispensable to realise that, in order to bring out the lustre of mercerised cotton in the highest degree, the drugs employed in dyeing must be of such a nature that they will not change that lustre. Alum (especially when used hot), which is so largely employed in cotton dyeing, is here one of the most injurious reagents in dyeing, and has a most prejudicial effect on the silky lustre of this material.

For these reasons, the practical dyer will find it far preferable to use only such dyestuffs as do not require the aid of any special fixative agents—the substantive dyes, or others, which are often more permanent than the basic dyes, and are now plentiful enough in commerce. But very grave precautions are frequently necessary on account of the very great affinity exhibited by the mercerised fibres towards this class of dyes, and the rapidity with which they are deposited on the fibre; and the bath becomes exhausted, a very fertile source of unsatisfactory results. A very important, and, indeed, the only special, point to notice is the proper degree of heat for the dyeing bath. If the bath be too hot, the shade deepens so rapidly that the dyeing will be streaky and irregular; whilst if the bath be too cold, the same results will be manifested, and at the same time aggravated by an insufficient depth of colour due to imperfect exhaustion of the bath. In short, the most favourable temperature, and the one that should be generally employed to obtain reliable results, is the lowest possible compatible with the retention of the dyeing property. This degree should vary with the depth of shade desired, light tints dyeing best in the cold or lukewarm—about 30 to 40°,—medium shades being entered cold and then warmed up to not more than 60°; whilst dark shades dye rapidly if entered at about 40°, and then gradually raised to nearly, or quite, boiling heat, for the final stage.

As regards the addition of metallic salts, such as sulphate of soda, common salt, carbonate of soda, and other similar ingredients, this is in many cases superfluous, although not a few dyers believe that this addition accelerates dyeing and gives better results. Nevertheless, a close observation of facts, and the performance of personal experiments, will always tend to show the practical dyer that the best results are obtainable by commencing to dye at as low a temperature as possible, and by deferring the addition of the product selected as the best adjunct until the bath is partly exhausted—*i.e.*, after a lapse of about three-quarters of an hour. This method of procedure will furnish very practical results, and at the same time protect in the highest degree the natural lustre of the fibre.

Many manufacturers of dyestuffs, and also practical men, have recommended the use of certain kinds of soluble or sulphonated oils. True, these oils give very superior results, the effect being identical with that obtained from oil cotton, but in the author's opinion the method has little to recommend it in view of the much higher cost of treating and dyeing it entails, as also of the grave inconveniences that may arise in the goods. In the first place, the peculiar smell left by the oils on the cotton forms a considerable drawback: thus, castor oil, the chief constituent of most soluble oils, leaves on the fibre a characteristic scent incompatible with its mercantile value, but very difficult to remove, especially when the goods have been dyed in bright and delicate colours. When the same results can be obtained by the aid of alkali salts, and especially with soap, it is better to avoid oils, although in many cases they are almost indispensable. The proportions of these ingredients vary according to the shades to be obtained, as in ordinary dyeing, though they differ from the latter. Generally speaking, it may be assumed that the operation of dyeing requires:—

(1.) *For Light Shades.*—Charge the bath with 1 per cent. of Solvay soda, and 1 or 2 per cent. of sulphoricinate of soda; after half-an-hour add 2 to 5 per cent. of phosphate of soda. Another and much less expensive method is to dye in the cold with an addition of 10 per cent. of soap. Again, dyeing may be effected with the aid of 5 per cent. of Turkey-red oil and 5 per cent. of soda; this method gives the most permanent shades. Finally, another method consists of dyeing in a bath containing 5 per cent. of soap and 1 per cent. of Solvay soda to commence; after about three-quarters of an hour the goods are taken out and an addition is made of about 5 per cent. of sulphate of soda, or 7 to 8 per cent. of common salt. These various methods of dyeing can be applied to all; the other dyes will be dealt with in a subsequent paragraph.

(2.) *For Medium Shades.*—Commence to dye at over 60° in adding 10 per cent. of soap and 5 per cent. of sulphate of soda to the bath; the aforesaid quantity of soap may be replaced by a mixture of 5 per cent. of soap and 1 per cent. of Solvay soda, or by 2 per cent. of sulphoricinate of soda, 1 per cent. of Solvay soda, and, half-way through the operation, 3 to 4 per cent. of calcined sulphate of soda.

(3.) *For Deep Shades.*—Dye between 40 and 100°, adding 10 per cent. of sulphate of soda, and 5 per cent. of soda; or 5 per cent. of soap, 1 per cent. of soda, and 20 per cent. of common salt or sulphate of soda; or, again, 2 per cent. of sulphoricinate of soda, and after three-quarters of an hour 8 per cent. of sulphate of soda (15 to 20 per cent. for black).

One important point that should be noted by the dyer is that if the mercerised cotton has not been thoroughly washed in the neutralising process, there remains on the fibre a small quantity of acid, which in certain cases may be of sufficient concentration to modify the fibre. This point is of importance when the detection of the causes of irregularity in dyeing is in question. Another remarkable peculiarity in the dyeing of mercerised cotton relates to its ready absorption of certain basic dyestuffs, even if it has not been previously shaded with substantive dyes, which enables it to be dyed or topped with these dyes, and is an extremely valuable property by reason of their importance and high tinctorial power. This property is still further increased by the affinity of the substantive dyes themselves, which certain of them exhibit in a very marked degree, and which is of great assistance in the operation. In applying these basic dyes it is important to regulate with precision the amount of free (*e.g.*, acetic) acid to the quantity of dye to be used; and a considerable amount should be added if uniform absorption is desired. The most satisfactory *modus operandi* to be adopted in dyeing is the following:—

Work the yarns about incessantly in the cold bath, agitating them moderately, in order that the absorption of the various dyes may proceed uniformly; heat the bath gradually until the prescribed temperature is attained, and do not apply heat again afterwards—at least no more than necessary. The bath must not be overcharged with salt, sulphate of soda, or other products; in fact, as little of these as possible should be used, and that, too, only towards the close of the operation. In selecting the dyes, preference should be given to such as are easily soluble and harmonise well. Finally, after dyeing, the goods should be carefully rinsed, drained thoroughly, and frequently turned in the drier. Again, after dyeing, the goods may be brightened by means of acetic acid or a mixture of acetic and lactic acids, or acetate of lime. This operation also imparts "crackle" to the goods.

3. *Typical Methods of Dyeing.* — As already mentioned, considerable differences exist between the various classes of dyestuffs, both with regard to their affinity to, and unification upon, the mercerised cotton. The action of all the dyestuffs will now be described in succession.

(*a*) *Mineral Dyes.*—Dyeing with chrome yellow deprives the fibre of all its lustre; besides, it is exceedingly irregular, even though a comparatively large proportion of acetic acid be added to the lead acetate. Prussian blue does not dull the fibre, and may be rendered uniform by degrees, by adding to the basic ferrous sulphate about one-twentieth part of acetic acid, and slightly diminishing the quantity of sulphuric acid added to the prussiate.

(*b*) *Natural Dyes.* — Sandalwood, dyed on a mordant of tinsalt and sulphuric acid, gives a magnificent dark red brown; with a mordant of iron alone, the dyeing is irregular and of low intensity. Fustic, with an addition of alum, comes out very streaky; but the author has obtained excellent results in applying it alone at first, at a temperature not exceeding 60°, and, after draining, fixing with a weak bath of acetate of alumina ($1\frac{1}{2}$ to 2° Bé.). Campeachy, on a copper and iron mordant, and slightly acidified with acetic acid, gives handsome blacks and blue blacks, but the operation should be performed slowly and at a moderate temperature—not exceeding 80 to 90°. Indigo takes admirably on this fibre, and gives bright, full shades if the operation be effected with a little precaution: the lustre and feel of the material are very well preserved. The author has obtained by four quick passages a rich dark blue, coppering with ease. The sulphide bath alone should be employed, the lime and zinc baths rendering the material harsh, and spoiling the lustre.

Cochineal on a triple mordant of alumina, lime, and tin, has given a very deep, handsome scarlet, dyed at a temperature of about 60°. Catechu gives full shades, but requires care in dyeing, especially in fixing with bichromate, which ought to be done at barely lukewarm heat. The author has tried oxidation by hydrogen peroxide, rendered alkaline with silicate of soda, which gives good results, but necessitates a considerable degree of concentration, and is, on this account, troublesome. The material should not be left at rest on the supports, or else the dye will settle on the lower part, mainly in the spaces between the bars. Tannins fix with a fair amount of regularity on mercerised goods; but if fixed with tartar emetic or its substitutes, or by salts of iron, they accumulate in places and render the subsequent dyeing very irregular. It is far better not to mordant with tannin previous to dyeing.

(*c*) *Artificial Dyes.*—We will pass under consideration the five principal classes of dyes—basic, acid, direct, mordanted dyes, sulphines,—and various dyestuffs.

(1.) *Basic Dyes.*—Some of these dyes are attracted very energetically without the use of mordants, and are very fast towards washing, even without any fixing process. To this kind belong methylene blue, heliotrope (with tannin), Bismarck brown, leather brown, and cinnamon brown; Safranine S, vesuvine, Victoria blue, rhoduline red and violet, methyl violet, Direct Grey G, phosphine, etc. It is, however, a comparatively easy matter to dye with the other basic dyestuffs, the fixing, as in the foregoing instances, being effected afterwards. To summarise, the best method of applying the basic dyes is to enter cold, with about 5 per cent. of acetic acid (more for a light shade), working quickly and warming up again gently, but at the lowest temperature possible, and fixing in a bath containing 1 to 5 per cent. of tannin. Some basic dyes, like malachite green, bright green, fuchsine, auramine, methyl blue, turquoise blue, etc., give shades that are rather fugitive, and bleed a good deal during rinsing.

(2.) *Acid Dyes.* —Few of the acid colours dye well on mercerised cotton, though the number is larger than with ordinary cottons. The best are the croceïns (croceïn scarlet, poppy-red, and orange), Indian yellow, etc. They dye in the same manner as the basic dyestuffs, but some of them may be fixed in the cold by an addition of acetate of alumina and acetic acid.

(3.) *Direct Dyes.*—These dyestuffs are of first importance for this class of dyeing, being attracted by mercerised cotton with great facility. The mode of their application has been already indicated. Sulphoricinate of soda (Fankhausine) or soap should be used, together with a larger or smaller quantity of carbonate of soda, sulphate of soda, or common salt. The operation should be commenced cold and the temperature gradually raised to 40° for light shades, 60° for medium shades, and to boiling point for dark shades and blacks. The principal substantive colours to be recommended are:—The benzopurpurines, Diamine Blue Black B, steel Blue Diamine L, Violet Diamine N, Diamine Pure Blue F F, thioflavine, the benzo browns, Brilliant Geranine 3 B, Diamine Scarlet B, chrysophenine; Titan reds, yellows and browns; oxamine red, blue and violet; oranges "for cotton," naphthamine blues, thiazine reds and browns, pyramine orange, primuline, Trona red, diamine jet blacks (chiefly the mark C R), diamine browns and oranges, most of the diamine reds, Brilliant Azurine 5 G, chloramine yellows, most of the benzo dyes—benzo-chrome blacks N and B, the diazo blacks, diazo-ethyl blacks, etc. Diazotising and development are performed in nearly the same manner as on ordinary cotton. Contrary to the author's opinion expressed on this point about two years back—which was based on the results of a defective method,—these operations give good results; but, as in previous experiments, it has been found that in the case of certain colours (chiefly with paranitraniline red and brown) the lustre of the material is affected to a certain extent.

The chrome and copper processes are also carried out as with ordinary cottons, and the silky lustre undergoes scarcely any alteration.

(4.) *Mordanted Dyes.*—It has already been stated in the foregoing that mercerised cotton exerts a powerful attraction towards mordants, this attraction, however, rendering the mordanting very irregular, especially in the warm, and in presence of alum. In any case, calcareous water must be avoided, and an addition of acetic acid should be made to the bath, which precaution is indispensable for the attainment of proper unification. The mordanted dyestuffs, especially the alizarin dyes, Alizarin Saphirol B (which gives magnificent, very fast light blues on acetate of alumina), anthracene red, etc., distribute well if properly mordanted. The goods should be entered into the bath cold. One precaution that has been found successful is to add a small quantity of ammonia (about one-tenth the weight of the dye in the state of paste), which is neutralised by gradually adding acetic acid as dyeing proceeds. If the shade has to be fixed by prolonged steamings, as is the case with Turkey-red, the fibre loses all its brightness, especially if steamed under pressure.

(5.) *Sulphine Dyes.* — These sulpho dyes are attracted in a very powerful and regular manner by the fibre. The bath should contain a relatively smaller quantity of the dye than for ordinary cottons. If desired, very full shades can be obtained, the lustre of the fibre remaining unaltered. The composition of the baths for several of these dyestuffs will be given later on. The most useful members of this group are:—The immediate blacks, blues, and browns; catigene black, olive, yellow brown, and black brown; cachou de Laval; the thiocatechines; Eclipse black, etc.

(6.) *Various Dyes.*—The aniline blacks, and the oxidised blacks in particular, have a more or less dulling effect on the lustre of mercerised cotton, and they furnish results inferior to the diazotised or sulphine blacks. The phthaleïns (eosines, erythosines, phloxines, Bengal rose, rhodamines, etc.), Irisamine G, etc., should be dyed in a bath of soap (about 10 per cent. of the weight of the fibre) at a temperature of 40°. It is better to rinse the goods after dyeing, or, if this is dispensed with, to dye with 5 per cent. of salt and 4 to 5 per cent. of soap. After drying, beat thoroughly to detach the soap found on the surface.—" L'Industrie Textile."

(To be continued.)

Antimonine.

THE ready acceptance which Antimonine, the latest of the antimony salts, has found in cotton dyeing, and especially in the great calico-printing works, renders it desirable to say a few words about it. The antimony salts hitherto in use for fixing tannin in the use of basic dyes on cotton and linen have the disadvantage that they contain antimony trioxide combined with acids which are too strong. The result of this is that the tannined fibre is only able to remove a part of the metallic oxide from the bath, and hence causes much of it to be wasted. This imperfect exhaustion depends upon the liberation of free acid in proportion as the lake is formed. These acids check the further action of the mordant, and even dissolve again some of the lake already formed. In calico printing the presence of these free acids has the further disadvantage that the tannin lake, only loosely fixed upon the fibre by steaming, is altered in shade, a circumstance which absolutely prevents dyes very susceptible to acid being used at all—logwood, for example. The acids are also apt to cause the colours to bleed and spoil the patterns. The practice has been to overcome these difficulties as far as possible by adding soda or chalk. These help much, it is true, but it is impossible to know how much of the alkali to add. Any excess is as bad as the original evil.

The appearance of the double oxalate of antimony and potassium seemed at first to prevent this waste of expensive antimony trioxide, for it was as efficient, weight for weight, as tartar emetic, although it only contains 25 per cent. of Sb_2O_3, as against 43 per cent. Noelting proved this, but also that the acid potassium oxalate set free during the mordanting was injurious, although not so much so as the acid potassium tartrate formed from tartar emetic. If the antimony oxalate was used with hard water, an additional trouble was caused by the formation of oxalate of lime, and the formation by hot water of useless basic antimony compounds. All these circumstances together more than made up for the advantages mentioned. The solution of the problem has been found in combining the trioxide of antimony with lactic acid. C. H. Boehringer Sohn has patented double lactate of antimony and calcium, by the name of Antimonine. The tanned fibres are able to decompose this salt completely into antimonious oxide and calcium lactate which has no action either on the fibre or on the lake. The following is an account of some laboratory researches made with Antimonine.

Skeins of scoured cotton were treated with 5 per cent. tannin, fixed with $2\frac{1}{2}$ per cent. tartar emetic, rinsed well, and heated for an hour at 60° C. with separate solutions, containing in each litre the tartar, acid oxalate of potash, hydrofluoric acid, and calcium lactate, formed from $2\frac{1}{2}$grms. of tartar emetic, potassium antimony oxalate, antimony salt and Antimonine, respectively. After thorough rinsing and dyeing with 3 per cent. of Methylene Blue, Solid Green, Auramine, Safranine, and Methyl Violet, the skeins treated with calcium lactate showed in each colour the deepest shade, showing that the others had dissolved more of the lake than it had done. Additional proof of this is afforded by the fact that if the dyed fabrics are digested in the above solutions the colour was least altered by the lactate of lime.

Antimonine secures the full exhaustion of the antimony bath, all the 15 per cent. of antimony trioxide which it contains going on the fibre. The following additional experiments were made:—3kilos. of Antimonine were boiled up in a tinned vessel with a little water and a litre of acetic acid to prevent any precipitation of tannate of lime which might dull the colour. Many of the initial difficulties with Antimonine were the result of neglecting this precaution. The solution was added to a 500-litre vat of mordant liquor. Through this 12 pieces, each of 44yds., were passed. A sample of the bath was then taken, and showed 0·021 per cent. of antimonious acid. 2kilos more of Antimonine were then put in, and 12 more 44yd. pieces were drawn through. A sample taken after this showed 0·0306 per cent. of trioxide. 2kilos. more were then added, 12 more pieces of 44yds. each put through, when a third sample showed 0·044 per cent. of trioxide. A fourth and last sample was taken at the end of the day, after heavy goods requiring much antimony had passed the bath. This fourth sample contained 0·0286 per cent. of Sb_2O_3. No chalk or soda, or other alkali, was used at all. We see from these results that, in spite of the good exhaustion, a first lot of 3kilos. of Antimonine leaves enough to permit continuous working. This reserve, as it were, of antimony trioxide is only slightly increased during the further operations. That this little reserve, however, is still a fixitive is shown by the fact that, although taken at the end, after heavy drafts on the antimony had been made, the fourth sample was more exhausted of antimony than the third. We have thus the following table :—

Volume Percentage of Sb_2O_3 in the Bath.		Percentage of Sb_2O_3 Present Used.
1. After adding 3kilos.	0·09	—
Remaining	0·021	76·7
2. After adding 2kilos.	0·06	—
Remaining	0·0306	—
Or deducting first remainder	0·0096	84·0
3. After adding 2kilos.	0·06	—
Remaining	0·0439	—
Or deducting first two remainders	0 0133	77·8

The final remainder of 0·0286 per cent. (volume), or 0·19 per cent. of Antimonine, means 950grms. of that substance, or a loss on the day's working of ninepence-worth. No other antimony compound can show results in any way comparable to this. In dyeing where larger relative amounts of tannin are used than in calico printing, it is still easier to procure good exhaustion, and the whole of the antimony is often taken out. In the great majority of cases in which 5 per cent. of tannin and 2·5 per cent. of Antimonine had been used, the spent bath gave only a feeble precipitate with sulphuretted hydrogen.

Antimonine, says the Berlin "Färber Zeitung," is mostly used in dyehouses where basic dyes are only used at intervals, and which therefore would incur great loss of antimony when using other antimony salts. Also by half-wool and half-silk dyers who still work by the two-bath method, and are averse to using an acid antimony bath for already-dyed animal fibres. Comparative experiments in mordanting with Antimonine and antimony salt showed that the dyed wool came with less loss of colour from the former than from the latter, while the exact fixing of the cotton dye and the uniformity left nothing to be desired in the matter of appearance. In America and England, Antimonine is preferred for tannin iron black as bottom for basic colours, on account of the great effect of acid on that colour. As Lauber has recommended, Antimonine can be used with advantage to replace soda tartar emetic in reserves with basic aniline dyes. In this the cheapness, ready solubility, and want of acidity possessed by Antimonine enable it to compete successfully with the tartar emetic. One of the brands of Antimonine—namely, R—is pure enough to be used for white reserves.

Bleaching Vegetable Fibres.*

By E. Tassel.

(Continued from page 433, vol. xxvi.)

FIRST CHEMICKING BATH.—The chlorine treatment of linen thread is carried out in cemented brick tanks about 20in. deep, in which the hanks are suspended vertically. There are two methods of procedure—either the hanks are suspended in such a manner that they do not dip entirely into the bath, in which event they are caused by mechanical means to rotate so that they are alternately exposed to the bath liquor and to the air ; or, in the second method, the hanks are suspended from rods mounted parallel on a wooden frame, the hanks being, under these circumstances, entirely immersed. If the bleaching goes on more rapidly in the first-named case it is because the rotary movement of the hanks facilitates the action of atmospheric carbonic acid, which by its reaction on hypochlorites liberates chlorine, and thus assists bleaching.

Unfortunately, chlorine is not without some action on the fibre, which it attacks when the solution is concentrated, and therefore this first method is only applicable to the coarser numbers of thread. Moreover, the rotary movement results in the inconvenience that the threads are rendered somewhat rough ; and for this reason the frames are always preferred for high-numbered yarns. In this case the thread is entirely submerged, and is therefore completely out of contact with the air ; but though, under these conditions, bleaching is retarded, the result is more certain, because, in the absence of atmospheric carbonic acid, hypochlorous acid is liberated in place of chlorine, and this acid has but an insignificant effect on the fibre when the solution is weak. The manner, however, in which the hypochlorites act and are decomposed, will be fully discussed in dealing with the bleaching of fabrics.

The strength of the bath liquor is variable, and depends on the counts of the yarn to be bleached. For sewing-thread it should never be stronger than 1° of the chlorimeter scale. The length of treatment is generally three hours. In chemicking yarns, the fibre not having been fully boiled out, the oxidising influence of the hypochlorites is solely exerted on the pectic principles, which are thereby decolourised ; the thread assumes a uniform yellow tinge, and at the same time a portion of the adipose compounds is fixed on the fibre. This fixed material forms a new protecting sheath on the yarn, the subsequent bleaching action being then merely superficial, and the weight of the yarn is thus better preserved.

The yarn is next washed in the chemicking vat, or, if the liquor be destined for treating further parcels, another similar vat is employed for the washing process. The object of washing is principally to remove all traces of chlorine or hypochlorite, which might afterwards react upon and corrode the fibre. After washing, the hanks are steeped in acidified water, the object being not only to eliminate all traces of chlorine that may have withstood the washing process, but also to neutralise the base (soda or lime) retained mechanically in the fibre. If the washings have been sufficient, the acid bath will not of itself exert any bleaching action ; in fact, it acts in a visible manner only when the yarn still contains hypochlorite, the latter being then decomposed and liberating active hypochlorous acid or chlorine. Unfortunately, this sudden liberation of gas in the nascent state always results in corrosion of the cellulose of the fibre, and should therefore be entirely prevented. Two different acids are generally used—hydrochloric acid and sulphuric acid ; but the author advises that the former of the two should be shunned completely, for reasons that will be detailed in connection with the bleaching of fabrics.

When taken out of the acid bath the yarn should be thoroughly washed, since it is only in the cold that the acids have no action on cellulose ; and, therefore, the succeeding treatment being a boiling with lye, a simple immersion of the acidified yarn in the hot lye would result in the corrosion and consequent weakening of the fibre. After the first chemicking the yarn is subjected to a series of treatments, alternate lye-boilings and chemickings, varying in number and intensity according to the nature of the yarn to be treated. The question why the necessity for such repetition of analogous operations, and why could not the exact degree of whiteness required be obtained by a single lye-boiling and chemicking, is rather complex, and as in the author's opinion a discussion of this point would be more *apropos* in dealing with the bleaching of piece goods, it will be sufficient for the moment to merely point out the results. The lye baths succeeding the first one are progressively weaker, less caustic, and contain about 5lb. of soft soap per 100gals. of liquor. The chemical effect of soap, especially of ordinary soap, in the lyes is difficult to explain, if we consider the bleaching power merely ; this latter is inappreciable, and in fact soap is used solely for the sake of its fatty acids, which attach themselves to the fibre and make up for the loss sustained in respect of the ordinary fatty and oily matter thereof. The chemicking liquors are also employed of progressively diminishing strength, and the time of exposure is shortened, as determined by experience. After the first bath, too, the hanks are always suspended on frames.

Grassing.—After the third lye-boiling the yarns are thoroughly washed, shaken out on pegs so as to straighten the threads, and are then grassed. The grassing grounds are divided into long-ridged plots about 13yds. long, separated by trenches. This method enables the water to drain away without staining the yarns by prolonged contact. The chemical action of grass bleaching is precisely similar to that of the chemicking bath, and though less energetic on account of being slower, is at the same time less injurious than the latter.

The bleaching influence of grassing is certainly due to the atmospheric ozone ; it should also be mentioned that light, moisture, and even the grass contribute to this natural bleaching action. The influence of light, and of sunlight in particular, is well known, everyone having suffered from its fading influence on dyed fabrics. Moisture appears to serve as a vehicle for the conveyance of ozone and oxygen, the morning dew being endowed with a remarkable bleaching power, which can only be attributed to the oxygen it carries down in falling. This matter will be referred to again later.

Dressing the Thread.—When the yarn has been bleached, it is put into a hydraulic press and then thoroughly dried, after which it is dressed. The object of chemical dressing is to add to the yarn (1) a certain quantity of fatty or waxy matter destined to impart the necessary flexibility and elasticity ; (2) to thoroughly gum the down of the thread ; (3) to render the thread smooth.

In Germany these results are obtained by the following method :—Flexibility is imparted by soap, the down is gummed by means of glue, and smoothness is imparted by starch. The different ingredients are dissolved separately, and then mixed together in an ordinary lye vat containing about 300gals. of water. The average proportion employed is : Soap 10lb., starch 10lb., glue 8lb. Frequently a little soda is added, this softening the fibre and neutralising all traces of acid ; finally, a little ultramarine is mixed in to give a bluish tinge. The mixture is heated to about 40° C., whereupon the yarn is entered in the bath, and the temperature is raised to 60° C. At the end of about a quarter of an hour the yarn will be fully impregnated with the dressing, and is then withdrawn, placed in the hydraulic press, and dried without washing.

Drying.—A number of machines have been invented for rapidly drying yarn ; nearly all of them yield good results, though they exhibit the defect of drying too quickly, thus rendering the yarn harsh to the touch, and diminishing the brilliance of the white. The best method of drying is still that of hot rooms, the temperature of which can be modified and the moist air removed by the aid of a good ventilating fan.

(To be continued.)

* "Revue Générale des Matières Colorantes."

Heating Dye Vats.

AN important point for the dyer to consider is the method of heating the various liquors which he uses to dye the cotton, wool, or other fibre with which he is working. The temperature at which a dyeing operation is carried out varies from that of the ordinary atmospheric temperature ; it is usually higher—ranging, say, from 160° F. to boiling point, but it may be even colder in some cases. In dyeing such colours as paranitraniline red or alpha-naphthylamine claret on cotton (ice colours), the temperature of the dye liquors cannot be too low, and naturally the dye vats, tubs. or kettles used with these colours need not be fitted with appliances for heating them. Then the oiling and mordanting of cotton for dyeing Turkey-red and basic dyes like Magenta, Irisamine G, Brilliant Green, etc., are operations which are usually carried out at the ordinary temperature, and here again the dye machines, vats, etc., which are used need not be provided with any heating appliances. The construction of vats for use in the dyeing of these various colours is therefore much simplified.

With some operations, such as the mordanting of cotton with sumach, the dyeing of cotton and linen with basic dyes—*i.e.*, Saffranine, Thioflavine T, Methylindone, Methyl Violet, etc.,—the various liquors are best used at a moderate degree of heat. In such cases the dye vats, etc., may be provided with means for heating the dye liquors to the required degree of temperature, or, says the "Dyer and Calico Printer," the dyer may make this liquor with hot water in plain dye vats and trust to finishing his operations before the liquor gets too cold. This is quite possible in many cases. There are, however, a large number of operations—dyeing cotton, linen, or jute with the direct dyes ; dyeing cotton or linen with alizarin and similar dyes ; dyeing and mordanting of wool and silk—where the operations must be carried on at, or near, the boiling point (212° F.) of water, in order to ensure that the best results be attained, and the dye or colour firmly fixed on the fibre. Now, it is obvious that in such cases means must be taken to heat the various liquors, and with the means that are or may be adopted it is proposed to deal in this article. Dye vats and kettles may be heated directly by fire or gas, or similar means, or indirectly by the use of steam. Which of these means is employed will depend on the amount of work that is required to be done at a time. A small dyer dealing with only a few pounds' weight of material at a time would find it more convenient and economical to heat his kettles by fire—or, better still, gas, for it is much handier to use a gas-burner than a fire ; the heat can be better and more uniformly regulated, and as soon as the operation is over, a simple turning of a tap stops the expense at once. Failing gas, the next best thing would be a burner consuming petroleum or paraffin oil, and these can be purchased nowadays, and may be used in places where gas is not available.

Where the dyer has large quantities of material to deal with—say, from 100lb. upwards,—fire, gas, or oil is not satisfactory or economical ; these introduce constructional difficulties into the building of the vats and kettles that make them awkward and troublesome to work. Therefore steam is the universal heating agent adopted in dyeworks and dye machines where large quantities are dealt with. It may, perhaps, be convenient here to deal with some of the properties of water and steam which render the latter so useful as a heating agent in the dyehouse, for the purpose of giving some units or standards that may hereafter be useful. Water makes its appearance in three forms, which are familiar to all—solid, as ice ; liquid, as water ; gas, as steam. To transform ice into water requires the application of a considerable amount of heat, while the transformation into steam requires a still larger amount of heat.

Some experiments that are both interesting and instructive and easily carried out are the following :—Place some cold water in a thin glass beaker, or a small saucepan, over a gas burner, suspend a thermometer in the water, and heat the water. It will be observed that the thermometer slowly and steadily rises as the water gets hotter until it reaches the temperature of 212° F., when the water goes into ebullition, or boils, and at this point the thermometer stands still; if the heat is continued, the water will all pass off in the form of steam. Now, it is obvious that as the heat must be continued to drive off the water, as steam the latter must carry the heat along with it; as a matter of fact, if the apparatus used was such that the steam could be carried into some cold water, the latter would be heated. The steam and the boiling water, no matter how long the heat may be continued, will not have a higher temperature than 212° F.

Take another experiment. Place some ice, broken up into small fragments, in the beaker, or saucepan, with the thermometer. This latter will register a temperature of 32° F. Now apply the heat: the temperature will not rise until the whole of the ice has been converted into water. From these experiments we see that heat is necessary to melt ice or convert water into steam. Although it is not so obvious, yet to convert steam back again into water we must cool it or take away its heat, the cooling agent becoming heated in so doing; while if we wish to convert water into ice we must also cool it. Experimental determinations have been made as to the quantity of heat necessary to convert ice into water, and water into steam. If 1lb. of water at 175° F. be mixed with 1lb. of ice at 32° F., the latter is completely melted, and we shall have 2lb. of water at 32° F.; the heat of the warm water has been absorbed in changing the ice into water. If, instead of ice at 32° F., we had taken water at that temperature, we should have had 2lb. of warm water at 103·5° F., which is the mean of the temperatures of the 2lb. of water. Now the heat in the pound of hot water used in changing the ice into water has apparently disappeared, but it has done work, and if the water is to be reconverted into ice, it must be taken out again. This heat is known as the latent heat of water, and is 143 units on the Fahrenheit scale, or 79·4 units on the Centigrade scale. In the same way, if 1lb. of steam at 212° F. be passed into 9·669lb. of water at 32° F., it will be condensed and raise the heat of the water to 212° F., so that we shall have 10·669lb. of water and 212° F. Evidently steam contains sufficient latent heat—that is, heat not shown by the thermometer—to raise the temperature of a large volume of water. Now, taking the unit of heat as that required to heat 1lb. of water 1° F., we should find that 1lb. of steam will raise 966·9lb. of water from, say, 32 to 33° F.; 966·9lb. is, therefore, the latent heat of steam on the Fahrenheit scale, or 537·2 on the Centigrade scale.

A knowledge of these units enables one to calculate how much steam is wanted to heat a given quantity of water to a required temperature, as perhaps will be seen later on; in the meantime it will be sufficient to say that it is to the latent heat it possesses that steam owes its value as a heating agent for dye kettles and dye vats of all kinds, and also for other heating purposes. Steam can be applied to the heating of dye kettles in several ways, each of which has its advantages and disadvantages, although all are about equally efficient, and in the choice of which regard must be had to the special circumstances of each case.

The first method is the steam jacket. In this plan the liquor is placed in a copper or iron vessel made of any convenient shape; surrounding this vessel is a slightly larger one, and into the cavity between the two thus formed is sent the steam. This plan of heating is not often used in dyehouses, and then only for small vats and kettles. It is naturally expensive, for the vat has practically to be a double one, and for all purposes of the dyer has no material advantage over the other methods. There is one feature which may be perhaps considered an advantage—the interior of the vessel is free from any obstruction. It is found in the practical work of a dyehouse that uniform shades can only be obtained when every part of the material is subjected to the same degree of heat, that excessive heating of one part more than another invariably leads to that part taking a darker colour than the rest. Now, in a steam-jacketed dye kettle the interior of the pan is practically the medium for conveyance of the heat of the steam to the dye liquor, and naturally this must be of a slightly higher temperature than the liquor; it follows that any cloth or yarn falling on the sides of the vat must be heated more than the rest of the material in the dye liquor, and hence it is liable to take a stronger shade than any other part. It is quite impossible, when working with large quantities, to keep the material well in the liquor, and so there is a risk of uneven dyeing. It is for this reason, as well as the greater expense of steam-jacketed pans, that the latter are not used to any large extent in the dyeing trade.

The second mode of heating dye vats by steam is that where a coil of pipe is placed inside the vat, and steam is sent through this coil, passing out at the other end of the coil, and during its passage through, it parts with its heat to the dye liquor which surrounds it, and heats the latter up to the desired temperature. At the same time, some of it becomes condensed into water, which, if collected, can be used in preparing dye liquors, for which purpose it would be preferable in many cases to the water ordinarily available, for it will be soft and pure. This form of coil is known as the closed steam coil. The third method is very similar to the second, consisting of a coil of pipes, only that in this case the portion of the coil which is in the dye liquor is perforated, so that the steam passes directly into the dye liquor. This is called the open steam coil. So far as efficiency is concerned there is very little to choose between the closed and the open steam coil; if anything, the latter yields up more of the heat of the steam to the dye liquor, but in this respect there is not much to choose between them.

Before proceeding further to discuss the other points of difference between the open and closed systems of steam coil heating it must be pointed out that the steam coil should be laid along the bottom of the dye vat or kettle, and above it should be built a false bottom of wooden lattice work, so that the goods which are being dyed shall not come in contact with the steampipe in any way; if they did, the result would inevitably be uneven dyeing, the exact cause of which might remain unsuspected. Any other portion of the steampipe besides the coil, which may go through the dye liquor, should also be boxed off; as a rule, the best plan is to run the steampipe down one corner of the dye vat, and to fix a strip of wool, enclosing it from the rest of the vat, so that no material can come in contact with it. The writer has seen instances in dyeing of woollen cloths where one edge of a piece has come in contact with a steampipe that has not been boxed off, and that edge was dyed a deeper shade than the rest of the cloth; boxing off the pipe at once remedied the defect. When the open steam coil is used, the steam passes into the dye liquor, and becomes condensed; it tends, therefore, to increase the volume of the dye liquor. The degree of dilution will depend upon several factors—volume of dye liquor, pressure of steam, and the duration of the time during which the steam is passed in. Against the dilution of the dye liquor thus carried must be reckoned the loss caused by the evaporation from the hot liquor, which is, however, not so great as the amount of dilution. Seeing that the steam in the open-coil system passes into the dye liquor, it is important to see that it be pure, free from any particles of grease, etc., which by being carried into the dye vat might settle on the goods and give rise to stains of various characters, whose real origin would be most difficult to trace.

When a closed steam coil is used, the quality of the steam is of no moment, for none of it goes into the dye liquor. While there cannot be any dilution of the latter, on the other hand the natural loss by evaporation from the hot liquor causes a concentration. So that in one respect the open and closed coils work in the opposite direction to one another; in the one case there is dilution or weakening of the liquor, in the other case there is concentration or strengthening. While, of course, with the great majority of dyeing operations it is immaterial whether the dye liquor becomes weaker or stronger during the operation, yet there are instances, particularly among the direct cotton blacks, where it is desirable to keep the bath as strong as possible, and in these cases it would be better to work with a closed steam coil. The amount of steam that is required depends upon the volume of the dye liquor and the temperature at which the operation is started, for of course it takes less steam to heat a bath from 150 to 212° F. than from 60° F., and every dyer endeavours to start his bath as high as he can, and for that reason he likes to use his liquors over and over again, so far as that is possible. The pressure of the steam has also some influence, for the higher the pressure the higher the temperature of the steam. Thus, for instance, steam at the ordinary pressure has a temperature of 212° F., and contains 966·9 units of heat; at 20lb. pressure the temperature of steam is 230° F., and the steam contains 1152 units, but there is nothing to be gained by increasing the pressure too much, for the number of heat units does not increase proportionately with the pressure, while the cost of producing the steam is much greater.

If a dyer has a vat of 100gals. to work with, and he wishes to start this at 150° F., and to raise it to the boil—that is, a rise of 212 less 150·62°,—he will have to provide for 100 by 10 by 62 (62,000 heat units), and he must see that the pipes supplying the steam are of sufficiently large size to pass enough steam to supply these heat units in the time. Taking steam at ordinary working pressures of 20 to 30lb. as containing 1000 units in each pound, it is obvious that 62lb. of steam must be sent into the dyebath. The table given below contains some information as to the quantity of steam that will flow through pipes of various sizes and at different pressures that may be useful in this connection, and from it the size of pipe to supply any given quantity of steam in a stated time can be readily calculated:—

Initial Pressure by Gauge. Pounds Per Square Inch.	Diameter of Pipe in inches. Length of each: 240 diameters.					
	¾	1	1½	2	2½	3
	Weight of Steam Per Minute in Pounds, with 1lb. Loss of Pressure.					
1	1·16	2·07	5·7	10·27	15·45	25·38
10	1·44	2·57	7·1	12·72	19·15	31·45
20	1·70	3·02	8·3	14·94	22·49	36·94
30	1·91	3·40	9·4	16·84	25·35	41·63
40	2·10	3·74	10·3	18·51	27·87	45·77

Spots in Piece-dyed Goods.

YELLOWISH spots in black piece dyes can arise from various causes. Sometimes they arise from card wire getting into the yarn. The wire becomes wet in the weaving and fulling processes, and the rust from it causes spots on the fibre. The wire itself, however, gets shaken out of the cloth in the gigging, and this makes it very difficult to discover the cause of the spots. Once small oil spots appeared on some goods, caused no one knew how. Oil dropping on the cloth often contains a small quantity of iron, causing bad spots in the goods, which cannot be entirely removed, while they easily escape notice in the white goods, and the defect was traced to this source.

At one time yellowish-green spots frequently appeared in black piece dyes, and could not be removed by any known means. Not the slightest trace appeared in the goods before dyeing; and from this it was assumed that the spots were caused in the dyeing process. They were scattered throughout the cloth, and had the shade of the prepared goods.

It was imagined that they were caused by resin or gum which had got into the cloth in the course of manufacture, but this seemed improbable. This suspicion, however, was completely verified, says the "Färber Zeitung." The tartar used in dyeing the goods had been packed in barrels that had previously contained resin, and small particles of this resin became mixed with the tartar. Not one dyer had thought of this cause, although his work is threatened with dangers from all sides. Spots caused in this way are not susceptible to the action of boiling or of the logwood, and preserve the appearance of the undyed cloth. After the discovery of the cause, the tartar was first dissolved in cold water and filtered before using, which remedied the trouble completely.

Fast Shades on Cotton.

SINCE the direct or Phenedine dyes have been brought to the attention of cotton dyers many improvements have been made in their manufacture and method of application, and they now stand as a comprehensive and representative group of direct dyeing colouring matters without a superior. Although the general methods for dyeing the above-mentioned colours have been very well exploited, there are a number of popular conceptions regarding the best processes of applying them to cotton, which it is our desire to clear up. In the first place, the character of the goods the dyed yarn is to be made into must be considered, the depth of shade desired, whether the dyed goods are to be washed frequently, and also whether likely to be subjected to the prolonged influence of light. Sometimes it is of the utmost importance for the dyer to be assured that brilliancy is more desirable than fastness, a point that may result in a much lower cost of dyeing when using the same dyestuff.

As a general rule, in dyeing ordinary grades of unbleached yarn of medium counts with the Phenedines, common salt will be found to be the most satisfactory assistant to add to the dyebath, except in cases where water is particularly hard or "limey," in which case it will be necessary to add a small quantity of sal soda or an equivalent amount of soda ash, rarely exceeding 2½ per cent. of the weight of the goods to be dyed. The reason for this addition is to prevent the formation of insoluble colour lakes with the lime of the water and the dye. For very light shades or tints soap will be found to be a better substance to add to the bath, along with some phospho-crystals or sal soda; indeed, phospho-crystals will be found a most valuable accessory to use wherever the direct or Phenedine colours are employed, whether for dyeing light or heavy shades, as it causes the precipitation of any lime present, and in no way does it influence the tone of the shade produced, a feature not always absent when low grades of salt are used.

In dyeing cotton with colours of this group it is important to remember that the greatest depth of shade with any given amount of dyestuff is always obtained by allowing the yarn or goods to cool down in the dyebath, after having been boiled for ¾ to 1 hour, but as the average dyehouse practice will not allow this method of cooling down, it is necessary to add an increased quantity of dyestuff in the first instance, which adds nothing to the cost of dyeing if this liquor is retained for subsequent batches of yarn. Where brilliancy is desired on cotton and at a low cost, and where it is possible to sacrifice fastness to washing and rubbing, dyeing with alum and Glauber's salt is permissible; in fact, with the Phenedines many bright shades are obtained by this method which for fastness compare very favourably with similar shades obtained by direct salt dyeing Of course, by "fast" is not meant absolute resistance to all the influences to which dyed fabrics are subjected, but by comparison, as above noted. Most alum-dyed shades are remarkably fast to light, but do not, as a rule, resist soaping. Fastness to light, or at least the greatest fastness to light obtainable by using the direct or Phenedine dyes—not including such as are diazotised and developed, and the blacks,—is secured to a remarkable extent by after-treatment with either sulphate of copper, bichromate of potassium or the now well-known fluoride of chrome, a most valuable substance for the dyer, not only for cotton dyeing, but also for wool mordanting.

Many Phenedines, particularly the blues, when dyed upon cotton and afterwards passed through a warm bath (say 160° F.) containing about 2 per cent. to 2½ per cent. of bluestone, are altered in composition, the result being in some cases a copper compound of the blue colour base, and in others a simple oxidation product; but in either instance the colours so treated are much more capable of resisting both light and washing. In a few cases the original colour as dyed is somewhat modified by the after-treatment process, producing shades that incline in some instances to the red and in others to the blue, while two or three of the Phenedines are sensibly "greened." For raw stock, which from its very nature calls for fast shades, no better method could be recommended to the dyer than the after-treatment of the Phenedines with copper or chrome. True, the cost is slightly increased, but it is so trifling, and the results obtained so valuable and permanent, that the advantages gained far outweigh any objection that could be raised on this score. Comparisons between the Phenedine dyes and the old basic colours do not hold good when it comes to a matter of brilliancy of shade, except on mercerised yarn, when the former are equally desirable, and in many instances superior to the latter, which accounts for the increased consumption noted in places where the basic dyes were formerly used to the exclusion of all other products.

Phenedine blacks comprise a series that leaves nothing to be desired so far as shades go, ranging from a pleasing tone of green black, through blue blacks, and ending with the red tone; the point of demarcation between the green and blue blacks, occupied by the jet-black shade, all enabling the dyer to produce at will such intermediate shades as his work in hand demands. The blacks are remarkable for fastness and depth of colour, and when dyed in water that has been corrected for lime by the addition of a small quantity of soda absolutely resist rubbing. The best value of any black is only to be obtained when it is dyed from a standing kettle, commencing, say, at 9 per cent., and by the time the fourth kettle is reached dropping to about 5 or 6 per cent., and continuing at that amount, regulating the amount of salt so that the bath will always have in solution about 1½ to 2oz. for every gallon of water.

In dyeing any of the Phenedine colours it will be well to note that the best results can always be obtained if the volume of dye liquor is maintained at or near the proportion of 2¾ to 3gals. for every pound of yarn, and increasing or diminishing the original weight of dyestuff used as the volume of the bath is increased or diminished, it standing to reason that the more liquor there is to a given weight of yarn the more dyestuff must be used. In dyeing fine or hard twisted cotton yarns, says the "Textile Colorist," it is always advisable to commence dyeing at or near a temperature of 140° F., gradually increasing to the boil, and boiling for an hour or thereabouts, or until the proper shade is obtained, giving the regular number of turns to ensure level shades. This can be positively assured by using a small quantity of Solvine S, say in the proportion of 2lb. to the 100lb. of cotton; this causes a quicker and more thorough penetration of the hard-twisted stock by the dye liquor, and besides it imparts a very desirable degree of softness to the yarn that cannot be as easily obtained by any other means.

In matching up with the Phenedines no trouble is experienced whatever, on account of the remarkable solubility of the various members of the group, but it is always advisable to add the requisite amount of dyestuff to the dyebath in solution, so as to obviate the possibility of spotting, due to particles of colour becoming lodged on the fibre.

NOTES. ON DYEING, BLEACHING, FINISHING, &c.

Specially compiled for THE TEXTILE MANUFACTURER.

Substantive Colours on Loose Cotton.—In a shade card recently issued by Messrs. Bayer and Co., a large and varied assortment of shades is given to illustrate the use of substantive colouring matters. The patterns are, as a rule, dyed as follows:—The dark shades with 20 per cent. Glauber's salt and 1 per cent. soda, and the light shades with 10 per cent. Glauber's salt and ½ per cent. soda.

Waterproof Yarns.—Dissolved indiarubber or indiarubber solution cannot by itself be drawn into a useful thread, but when it is mixed with a salt of tin and kneaded with nitrocellulose a material is obtained from which perfect threads may be produced by any of the known processes for the production of artificial silk. The elementary mixture, then, from which new threads are obtained consists of dry nitrocellulose, indiarubber solution, and a salt of tin—such, for example, as the protochloride. A mixture which is generally useful and convenient is composed of 100kilos. of dry nitrated cellulose mixed with 15kilos. of indiarubber solution and 5kilos. of tin protochloride. The quantity of the salt of tin employed may vary within wide limits.

ParanitranilineReserves.—For white reserves, the cotton, first prepared with naphthol, is printed with a mixture of 1kilo. of fifty-per-cent. caustic soda with 160grms. of British gum mucilage (65 in 100), or of a quarter of a litre of dextrine mucilage of the same strength with 1 litre of caustic-soda solution (5 in 4). In some cases glycerine is also added, and sometimes olive or castor oil. The goods are then dried, diazotised, soaped and dried. For indigo-blue reserve 1kilo. of the above white reserve is mixed with 150grms. of solid caustic soda, and then, very slowly, first with half-a-litre of indigo paste (20 per cent.), then 40grms. of glycerine, 300 of glucose, and 40 of water. The naphtholised cotton is printed with this, and steamed for about a minute with wet steam before it is quite dry. It is then diazotised, soured, rinsed, soaped, rinsed, and dried. Chrome yellow reserve is 1kilo. of the white reserve plus 250grms. of nitrate of lead, 100 of glycerine, and 100 of water. The diazotising solution is mixed with 30grms. of chalk to the litre. After diazotising, the yellow is developed in a five-per-cent. solution of bichromate of soda, and the goods are then rinsed and dried. A Prussian-blue reserve is got by mixing 1200grms. of the white reserve with 900 of a solution of 500 of yellow prussiate in 1kilo. of the white reserve, and with a 50° Bé. solution of 375grms. of nitrate of iron and 375grms. of glycerine. After printing with this the goods are diazotised, and passed in turn through baths of chalk, water, and dilute (five-per-cent.) sulphuric acid.

Indigo Paste.—In preparing indigo in the condition of paste for commerce and vat-dyeing, it has proved difficult, when employing pure synthetical or refined plant indigo, to obtain a high-percentage paste, containing from 20 to 40 per cent. of indigo which is sufficiently liquid, and which does not deposit a precipitate. The tendency of pure indigo to form froth when being mixed with water to form a paste is especially troublesome. In this respect indigo behaves differently from alizarin under the same treatment. The Badische Anilin and Soda Fabrik have discovered that this defect is remedied if a very small quantity of certain thickening agents (proteïd or gummy bodies) be added to the indigo which it is desired to bring into the condition of paste. For this purpose bone glue, skin blue, fish glue, silk gum, albumen, caseïn, gluten, gelatine gum solution, starch, dextrin, and the like, can be used, and it is desirable that the indigo paste should be neutral, or alkaline. In this way high-percentage pastes can be obtained which are sufficiently liquid, and do not deposit a precipitate. The following examples illustrate the method of procedure (the parts are by weight):—Gradually add, whilst well stirring, 1000 parts of indigo press cake, containing 40 per cent. of indigo, to a solution of two parts of gum in 500 parts of water. The mass is soon resolved into an even, thick paste, which can be brought to the desired consistency by the further addition of water. Or the following may be used:—Add a solution of one part of gum in 1000 parts of water, to 400 parts of indigo powder, contained in a suitable grinding apparatus, and add $2\frac{8}{10}$ths parts of caustic-soda lye (containing about 14 per cent. of NaOH). Set the apparatus in motion. The indigo soon becomes moist, and in a short time is ground to an even paste, which can be brought to the desired strength by the addition of water.

Cotton Grounds.—In the production of most of the azo colours on the cotton fibre, the addition of a mordant—as, for instance, Turkey-red oil, castor oil, or olive oil, soap, tragacanth, gelatine, or gum of various kinds—is necessary to obtain a ground of fine shade and satisfactory fastness. Messrs. J. R. Geigy and Co., Basle, have found that as fast and even finer shades may be obtained when a rosin soap made from colophony and an alkali is added to the grounds of phenol, naphthols and their derivatives. The rosin soap has, further, the great advantage of being much cheaper than the other mordants hitherto employed. For example: 22kilos. of beta-naphthol are dissolved in hot water and 16 litres of caustic soda lye of 40° Bé., then 70 litres of rosin soap are added and diluted to 1000 litres. The fibre is impregnated in the usual manner, dried and dyed in a solution of a diazo colour, or printed with a diazo colour—as, for instance, the diazo compounds of paranitraniline, naphthylamine, safranine, etc. The fibre may also be mordanted, first with the rosin soap, and afterwards with the naphthol.

Reducing Crystalline Indigo to Paste or Powder.—Artificial indigo in crystalline form is unsuitable for vat-dyeing, for it can only be reduced with difficulty to indigo white. It is therefore interesting to know that by a process discovered by Messrs. John Rudolph Geigy and Co., Basle, it is possible to transform the crystalline indigo into an easily-reducible form. Indigo dissolves in concentrated sulphuric acid with a green shade (probably in forming a sulphate), is precipitated again by adding water, and is chemically unchanged if the temperature is kept down, and if the reaction does not last too long. In order to examine the influence of a treatment of crystalline indigo with concentrated sulphuric acid with reference to its reducibility, the colouring matter is introduced into cooled sulphuric acid and well mixed by stirring, precipitated again after a short time by dilution with water, filtered and washed. In this way the indigo is obtained as an exceedingly fine paste of exquisite reducibility, a fact not only surprising but of eminent technical value. By addition of a sufficient quantity of hydrosulphite to the paste, the indigo blue is transformed after a few minutes to indigo white. Of course, during the reaction the air is to be excluded. When the paste is pressed, dried and ground, a powder is obtained showing almost the same qualities. As an example of procedure:—One part of crystalline indigo is slowly introduced into four parts of well-cooled concentrated sulphuric acid. After a short time the green pap is poured into water and ice, whereupon the indigo is precipitated in an exceedingly fine form. Filtered and washed, the paste may be employed at once for dyeing purposes. The proportion of the sulphuric acid to the indigo may vary considerably without influencing the qualities of the product.

Discharging Indigo-dyed Silks. — Attempts have been made to discharge indigo-dyed silk goods by means of the process generally used for cotton, but the results have not been satisfactory, a pleasing and practically useful white not having been produced. The figures and patterns obtained by the usual discharge methods on indigo-dyed silk are not white, but a dirty or brownish yellow, of no value in practice, and it is necessary to use the long process, with reserves, in order to produce designs in indigo blue and white on silk. Recently the Badische Anilin and Soda Fabrik have found that a beautiful white can be obtained when the indigo-dyed silk goods are first discharged in the usual or any suitable manner—for example, with chromate,—and the silk goods subsequently submitted to the bleaching action of suitable reducing or oxidising agents, such as sulphurous acid in the form of gas, in aqueous solution, or as bisulphite, hydrogen peroxide, and the like. The following example will serve to further illustrate the process, the parts being by weight:—Print the silk which has been dyed in the indigo vat (fermentation, or cold, vat), with a discharge of the following composition:—75 parts of British gum water, 20 parts of yellow (neutral) chromate, 10 parts of bichromate, and 12 parts of water; or, 75 parts of tragacanth water (containing 6 per cent. of the gum), 30 parts of bichromate, and 12 parts of ammonia (containing 20 per cent. NH_3). Pass the goods through the usual discharging bath consisting of sulphuric and oxalic acids, rinse them, and subject them to the bleaching process, which can be effected by means of (1) aqueous sulphurous acid of 4° Bé.; or (2) a bisulphite solution of 5° Bé.; or (3) an atmosphere of gaseous sulphurous acid; or (4) a solution of 5 parts of a commercial solution of hydrogen peroxide, 5 parts of water, and ½ part of ammonia solution (containing 20 per cent. NH_3).

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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.)

1900.

3rd December.

21,864 E. FAIRBURN, London. Rubbers for carding-engine condensers.
21,866 H. L. DAVIS, Manchester. Textile fabric sample holder.
21,867 C. MARTIN and H. PAGE, London. Spindles and flyers.
21,885 H. WERNER, London. Process for printing fabrics.
21,897 H. E. NEWTON, London. Dyestuffs of the anthracene series. (*The Farbenfabriken vormals F. Bayer and Co., Germany.*)
21,898 H. E. NEWTON, London. Dyestuffs containing sulphur. (*The Farbenfabriken vormals Friedrich Bayer and Co., Germany.*)
21,901 C. D. ABEL, London. Colouring matter directly dyeing cotton. (*Actiengesellschaft für Anilin Fabrikation, Germany.*)
21,902 C. D. ABEL, London. Colouring matter directly dyeing cotton. (*Actiengesellschaft für Anilin Fabrikation, Germany.*)

4th December.

21,931 W. BRIGG, Bradford. Letting-off motions for weaving looms.
21,932 H. CLARKE, Nottingham. Warp knitting machines.
21,935 J. MOORHOUSE, Manchester. Self-acting mules and twiners.
21,942 J. E. SHAW and T. WOOD, Huddersfield. Protector for picking sticks.
21,956 E. P. BROWNELL, London. Automatic spool-making machine.*
21,958 J. STEWART, Dundee. Lifting goods, such as garments and hosiery, from dyeing vats or paddle-dyeing machines, and transferring them elsewhere.
21,970 M. LANGE, London. Dyestuffs.*
21,988 R. W. JAMES, London. Straight knitting machines.* (*The Standard Machine Company, United States.*)
22,017 C. O. LIEBSCHER, London. Doffing devices for automatic card feeders for wool, flax, hemp, jute and other fibres.*
22,033 H. W. CHURCH, London. Dyeing machines.*

5th December.

22,048 G. M. HOCKNELL and H. B. BARLOW, Manchester. Heald shafts for wire and metal healds.
22,049 J. BRANDWOOD, Manchester. Apparatus for bleaching, dyeing or otherwise treating yarn in cop, cheese, bobbin or other compact form.
22,053 D. SWIRES, Manchester. Calico printing and like bowls.
22,073 C. STOTT and W. H. SCHOFIELD, Manchester. Automatic feeding machines for feeding and opening fibrous material.
22,077 G. HILLER and R. BERTHOLD, Berlin. Mechanism for uniting the ends of warp threads.*

7th December.

22,241 C. W. BUCKLEY and A. BRADLEY, Manchester. Mules for spinning.
22,252 C. L. JACKSON and E. W. HUNT, Manchester. Apparatus for bleaching textile piece goods in the open state.
22,294 H. STEPHENS, London. Automatic sprinklers.
22,297 H. H. LAKE, London. New sulphonic acids, and colouring matters therefrom. (*K. Oehler, Germany.*)
22,300 H. H. LAKE, London. Moistening, cooling, or heating the air in factories, workrooms, and the like. (*L. Sconfietti, Italy.*)
22,306 W. REINERS, London. Winding frames, twisting frames, and lapping machines.
22,317 C. S. MCCONNAN, Liverpool. Flyers for spinning, twisting, doubling, winding, and balling yarns or other material.

8th December.

22,397 H. H. LAKE, London. New colouring matters. (*K. Oehler, Germany.*)
22,398 H. LOTERY and OTHERS, London. Apparatus for cutting cloth and similar materials.
22,462 B. WILLCOX, London. Printing textile materials with indigo. (*The Badische Anilin and Soda Fabrik, Germany.*)

10th December.

22,415 C. L. JACKSON and E. W. HUNT, Manchester. Stentering machines.
22,420 J. EASTHAM and G. ADCROFT, Halifax. Picking mechanism of looms.
22,455 C. D. ABEL, London. Black colouring matter directly dyeing cotton. (*Actien-Gesellschaft für Anilin Fabrikation, Germany.*)
22,456 C. D. ABEL, London. Sulphonated colouring matters belonging to the diphenylnaphthylmethane series. (*Actien Gesellschaft für Anilin-Fabrikation, Germany.*)
22,457 G. SCHWABE, London. Shedding motion for Crompton looms.
22,461 E. and E. MEUNIER, London. Combing machines.

11th December.

22,523 A. SMITH and S. JACKSON, Keighley. Automatically changing shuttles in looms on failure of weft.

12th December.

22,629 H. THORNTON, Manchester. Means for supplying oil to wool and like fibres in the condensers of carding engines.
22,634 H. HAWORTH and OTHERS, Halifax. Looms.
22,657 J. HAYES and OTHERS, London. Machines for combing and preparing wool and other fibrous materials.
22,676 J. V. EVES, Manchester. Machines for hackling flax and other long-staple fibres.
22,684 H. E. NEWTON, London. Process for giving the crunching of silk to mercerised cotton. (*The Farbenfabriken vormals F. Bayer and Co., Germany.*)

13th December.

22,706 T. MORLEY, Leicester. Circular knitting machines.
22,707 J. HADDOW, Glasgow. Knitting machines of the "Lamb" class.
22,709 J. MOORHOUSE, Manchester. Textile drawing-frame and like stop-motion devices.
22,722 C. NIXON, Keighley. Heddle-operating mechanism for looms.
22,725 R. W. MONCRIEFF, Newport Pagnel. Spinning and doubling frames.
22,773 G. WILLIAMS, Birmingham. Tubes of bobbin or spool carriers for looms for weaving Axminster and tufted carpets.*
22,776 G. DE KEUKELAERE, London. Machines for dyeing textile materials.

14th December.

22,787 J. MASON and F. RHODES, Leeds. To stop the over-running of spindles in twist and other frames and prevent the production of hard twist yarns.
22,793 A. ROBINSON and K. C. MCDOWELL, Belfast. Apparatus for heating air applied to yarn- and fabrics.
22,807 J. JUCKER, Manchester. Loom shuttles. (*N. Rusch, Switzerland.*)
22,812 E. SYKES, Huddersfield. Self-contained spindles for spinning and doubling frames.
22,825 E. IMMER, Baden. Appliance for an automatic change of shuttles shortly before running out, with only occasional tendance of the loom.*
22,896 C. F. and A. RENARD, London. Automatic strippers for carding machines.*

15th December.

22,918 J. KIRKMAN, Manchester. Sliver cans.
22,929 J. BOOTH, Manchester. Picker savers or buffers used in looms.
22,947 R. SPITZ, Bradford. The manufacture of yarn and cloth therefrom.
22,963 W. SCHMIDT, Liverpool. Rag engines.
22,989 B. WILLCOX, London. New products for use in the manufacture of colouring matters. (*The Badische Anilin and Soda Fabrik, Germany.*)

17th December.

23,011 R. M. ORMEROD, Manchester. Picker for looms.
23,022 A. PICKARD, London. Automatic feeding machines for feeding fibrous materials to carding engines.
23,040 C. KRAUSE and A. BEDDIES, London. Process for the impregnation of fibrous substances.*
23,061 H. TUNSTALL, London. Attachments for cotton combing machines.

18th December.

23,068 R. W. MONCRIEFF, Newport Pagnel. Spinning and doubling frames.
23,073 W. RUSHTON, Halifax. Cards and card barrels employed on looms.
23,110 A. J. BOULT, London. Bleaching of vegetable fibres and fabrics. (*A. Gagedois, France.*)
23,157 C. F. TOPHAM, London. Apparatus for use in the production of textile fibres or filaments from solutions of cellulose or of other material.
23,158 C. F. TOPHAM, London. Twisting fibres or filaments and putting them into coil form.

19th December.

23,213 A. G. BROOKES, London. Looms for weaving tufted fabrics.* (*T. J. Drummond, United States.*)
23,229 T. HANSEN, London. Apparatus for cutting pile fabrics.

20th December.

23,262 T. KAY, Bolton. Apparatus for dyeing machines.
23,294 J. DUFOSSEZ-ALLARD and J. SIMON, London. Self-actors for spinning and twisting looms.*
23,299 W. POLLARD and T. HOWARTH, Burnley. Sow boxes of sizing or slashing machines.
23,335 W. P. THOMPSON, Liverpool. Spool, cop, bobbin and like holders. (*The firm of R. Bernheim, Germany.*)
23,338 B. WILLCOX, London. Conversion of indigo leuco compounds into indigo, and the application thereof to colouring textile fibres. (*The Badische Anilin and Soda Fabrik, Germany.*)

21st December.

23,349 F. C. COOPER, Eastbourne. Method of preventing the stretching of cloth.
23,372 R. ASHWORTH and OTHERS, Manchester. Picking mechanism of looms.
23,376 J. ESSER, Glasgow. Bobbin frame for warping machines.*
23,400 W. MATHER, London. Apparatus for bleaching, dyeing, and otherwise treating fabrics.*
23,401 W. MATHER, London. Bleaching and dyeing.

22nd December.

23,444 J. MOORHOUSE, Manchester. Self-acting mules and twiners.
23,445 JOHN SMITH AND SONS LIMITED and E. BREWERTON, Bradford. Ring-spinning frames.
23,453 J. R. and A. E. RAPER, London. Apparatus for freeing or cleansing filamentous substances from burrs and other impurities.
23,470 M. FRINGS, London. Mercerising machines.
23,499 J. BLAMIRES and A. P. ROBINSON, Manchester. Looms.
23,515 E. CURNOCK and S. SUTCLIFFE, London. Apparatus for pressing and finishing woven or textile fabrics.

24th December.

23,538 J. SELCRAIG, Glasgow. Printing cotton cloth and other fabrics used for making ladies' aprons and children's pinafores.
23,541 E. PORTER, Burnley. Picking sticks for overpick looms.
23,548 I. LEVINSTEIN and OTHERS, Manchester. Naphthoacridine derivatives, and colouring matters therefrom.
23,555 C. MARTIN, London. Manufacture of lace and like fabrics.
23,576 J. F. GORDON, London. Winding machines.*
23,600 A. ALLERS, London. Method of manufacturing a brown and dark-brown colouring matter.

27th December.

23,615 F. WADSWORTH and A. BEEDHAM, Manchester. Jacquards.*
23,674 J. D. TOMLINSON, Manchester. Nap-raising machines for textile fabrics.
23,664 J. J. FEARON, London. Cloth-tentering machines.*
23,668 P. SCHIRP, Germany. Apparatus for dyeing, washing and bleaching textile materials.*
23,687 G. W. JOHNSON, London. Triphenylmethane colouring matters.* (*C. F. Boehringer and Soehne, Germany.*)
23,692 G. H. ZEAL, London. Means for putting up threads, ligatures, sutures or the like.

28th December.

23,722 H. H. LAKE, London. Fibrous compositions.* (*National Package Company, United States.*)

29th December.

23,752 W. BIRCH, Manchester. Cloth expanders.
23,762 J. GIBB, Glasgow. Machines for punching jacquard cards.
23,763 J. DRUMMOND, Glasgow. Apparatus for printing both surfaces of cloth simultaneously.
23,769 W. R. G. FAREY and R. LANGHORNE, Manchester. Looms.

31st December.

23,843 S. W. WARDWELL, London. Machines for winding composite cops.*
23,858 H. J. HADDAN, London. Process of obtaining colour substance from ferrous liquors.* (*A. S. Ramage, United States.*)
23,887 J. Y. JOHNSON, London. Production of naphthalene compounds, and their employment in dyeing and printing. (*The Badische Anilin and Soda Fabrik, Germany.*)
23,900 C. B. NEUBAUER, London. Thread tester for shuttle embroidery machines.*
23,902 F. REHRMANN, London. Colouring matters of the thiazine series, and intermediate products therefor.

Recent Textile Patents.

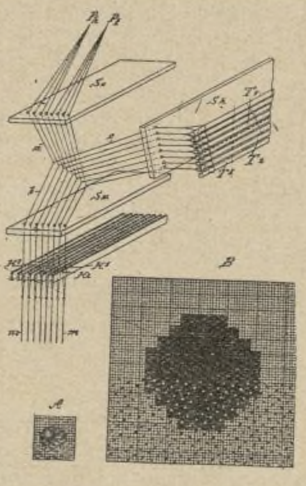
The following are abridgments of patents recently published. The date given at the beginning of each is that of application, whilst that at the end is the date of acceptance of the complete specification. The period of opposition expires within two months of the latter date:—

1899.

19,211. Circular knitting machines Nov. 23. J. C. Moore, 18, Crafton-street, Leicester. Relates to various combinations and improvements for the purpose of improving the manufacture of rib fabric and making such articles as rib stockings and the like, but some of these improvements are also applicable to machines which produce similar articles in plain fabric, and in some cases do not make the heels and toes, but make fabric only, and the heels and toes and the like are made by other means.—Nov. 17, 1900.

20,907. Retting flax. April 15. A. Badoil, 2, Rue Glandevès, Marseilles. Soap has the property of disaggregating the substances which envelop the fibre and of facilitating their solution in water; as a consequence the peel or bark is separated and swells by the action of the soapy water. But the soap, having the disadvantage of adhering to the fibre, and thus rendering it sticky, impedes the subsequent operations; it is therefore indispensable, when the soap has accomplished its purpose, to neutralise it; to this end hydrochloric acid is used, which, whilst decomposing the soap and removing it from the base, renders the fibre whiter and the peel or bark more brittle.—Nov. 19, 1900.

22,630. Producing linen-like damask. Nov. 13. A. Langer, Deutsch-Liebau, Silesia. Relates to an improved arrangement for producing damask upon looms. A and B illustrate the principle of damask weaving. A represents the pattern which without ground binding is transmitted to the cards. Each warp line is supposed to be a jack. In the jacquard machine each jack lifts four warp threads; the picture in the web is enlarged four times, as illustrated in the drawing B. In order to equal the picture the machine must lift four times the same shed. The arrangement of the ground binding within the card being impossible, there would not be any binding of the picks—that is to say, the threads could not be connected together, and a formation of web would not be possible. In order to attain this formation of web—that is to say, to lift from the lower shed or to sink from the upper shed threads corresponding to the binding—an arrangement is necessary by means of which this effect can be attained. It is not difficult at all to lift the binding threads from the lower shed, this lifting being executed in known manner by means of the lifting shafts, but the sinking of the threads lifted by the jacquard machine is a difficult problem which can be solved by this invention. As can be seen from the figure, P *h* and P *t* illustrate the figure jacks. T[1], T[2], T[3], etc., are the sinking shafts of the assistant harness. H[1], H[2], H[3] illustrate the lifting shafts H[1], H[1], H[1] are assistant lifting shaft. S *o*, S *u*, S *h* are harness boards, the first two of which are placed opposite to each other and form the principal harness, whilst the latter is arranged aside S *o*, S *u*, and forms the additional harness. *a b* are the lifting threads, and *c* the holding



threads attached to the sinking shafts T[1], T[2], T[3]. The lifting thread *a* passes through the harness board S *o* to the point *o*[1] where it is rigidly attached to the holding thread *c*. At *o*[1], both threads are united, and pass through the lower harness board S *u* to the heddles. The weights *m* exert an equal tension upon all the thread angles, each angle amounting to about 120°. All of the holding threads pass through the harness board S *h* forming the additional harness, thereby being guided in a correct manner; they are attached to the sinking shafts T[1]—T[8]. By means of this additional harness it is possible to lift the threads in order to form a shed, to sink them again and to lift some other threads for binding purposes. Each figure jack of the jacquard machine carries four threads. For the sake of clearness let us follow the movement of one thread only, and suppose that the movement of the jack and that of the different shafts do not take place simultaneously, but one after the other. Then it is evident that when the figure jack P *h* is lifted by the stroke of the jacquard machine, the thread *c* will swing round the point *o* and adopt the position *c*[1], in which the point *o*[1] is brought to *o*[2]. This movement will cause the heddle of the lifting shaft, say H[8], to rise and form an upper shed, whereas the lifting shaft will remain in its position. Now the corresponding sinking shaft T[8] is caused to move downwards, in consequence of which the point *o*[2] will swing round and adopt the position *o*[3], so that the thread angle between the threads *a*[1], *b*[1] will be stretched, and the heddle of the shaft H[8] will be again lowered. Now, since each jack lifts simultaneously several threads by each stroke of the jacquard machine, a corresponding number of threads will be lifted. When the warp threads are led through, a ground binding is necessary in order to form the web. For this purpose one of the lifting shafts belonging to another thread combination, as per example the lifting shaft H[1], is lifted from its normal position by the operation of H[1]₁, being one of the assistant shafts. As it will be understood, this operation is quite independent from the working of the jacquard machine. The movement of the lifting and that of the sinking shafts belonging to one thread combination, as, for example, the lifting shafts H[5]—H[8] and the sinking shafts T[5]—T[8], are not carried out simultaneously, but according to the ground binding in such a manner that one of the lifting shafts of another thread combination, as of H[1]—H[4] and T[1]—T[4], is lifted during the operation of the sinking shafts of the first thread combination.—Nov. 13, 1900.

22,777. Thread spooling machines. Nov. 15. J. Booth, 7, Blythswood-drive, Paisley. Relates to thread spooling machines, and is an improvement upon and development of the thread spooling machine described in Specification 10,729 of 1885. The present invention comprises improved mechanism for traversing the thread guides and for instantaneously reversing their traverse each time the guides reach the ends of the spools, and also for automatically lifting them to allow for the increasing diameter of the spooled thread on the spools.—Nov. 15, 1900.

23,123. Indigo leuco compounds. Nov. 20. J. Y. Johnson, London (communicated by the Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine). It is discovered that the dialkylesters of phenylglycocoll-ortho carboxylic acid can be readily combined with formyl, carbethoxyl, or benzoyl. The new acyl derivatives thus obtained are most readily converted into indoxyl compounds which can easily be oxidised to indigo.—Nov. 20, 1900.

23,123A. Indigo leuco compounds. Nov. 20. J. Y. Johnson, London (communicated by the Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine). It is discovered that the acyl derivatives obtained by combination of the dialkylesters of phenyl-glycocoll-ortho carboxylic acid with acetyl are most readily converted into indoxyl compounds (which can easily be oxidised to indigo) by heating (or by allowing to stand at ordinary temperature) with the alkaline earths, metallic sodium, the alkaline alcoholates, ammonia, hot carbonate of soda solution, and sulphuric acids of various concentrations. The result of the treatment is the production of indoxyl or indoxylic acid, or, when alcoholates are used in the presence of alcohol or benzene, indoxylic acid ester is obtained. If concentrated sulphuric acid be used, the indoxyl compound obtained becomes sulphonated and oxidised so that indigo sulpho acids are obtained.—Nov. 20, 1900.

23,604. Circular boxes. Nov. 27. W. B. White and Sons Limited, Red Scar Spring Works, Colne; W. B. White, and A. Jack. The object is to increase the range and capacity for work of circular box looms, to economise the cards of the pattern chain, and also the dobby lags in various ways; also to move two boxes at once when required, and otherwise to improve the efficiency of this class of loom and to better adapt it to the great variety of work for which it may be employed. The pulling hooks usually employed to change the boxes at the end are replaced by a rack and pinion, at or about the centre of the box frame, the pinion being mounted on a small horizontal shaft at the back of the box, and running to the end of the box, where the shaft carries a small gear wheel, which gears into another small gear wheel on the box shaft, whereby the box is turned by the movement of the pinion. The pattern chain cylinder, which operates the indicating needles, is moved to the top of the cylinder box loom, so that several thousand pattern cards may be out of the way of all machinery.—Nov. 24, 1900.

23,657. Indazol dyestuffs. Nov. 27. R. B. Ransford, Upper Norwood (communicated by L. Cassella and Co., Frankfort-on-Main). It is found that the amidoindazol obtained in the known manner from nitrotoluidine ($NH_2 : CH_3 : NO_2 = 1 : 2 : 5$) can easily be condensed with dinitrochlorbenzene ($NO_2 : NO_2 : Cl = 1 : 3 : 4$) and that the new derivative of indazol so obtained may be used directly, or after further nitration, for the production of very valuable dyestuffs.—Nov. 24, 1900.

23,695. Machine for mercerising. Nov. 28. E. Price, Byron's-lane, Macclesfield. Relates to a machine for mercerising cotton yarns, and apparatus connected therewith, and consists in disposing on a fixed shaft mounted in or upon suitable bearings one or more discs, preferably bolted together, with peripheries of varying distance or radius from the centre, forming an eccentric or cam on either side. On the sides of the discs are rollers firmly fixed thereto, and so disposed as to allow of their being rotated on the shaft carrying the discs. The shaft carrying the rollers is carried round the eccentric or cam by means of slotted brackets disposed in the discs, thus causing the centres to be forced apart, stretching the yarn during the process of mercerising.—Nov. 24, 1900.

24,091. Mules and twiners. Dec. 4. M. Musgrave, J. Walsh, and T. Kitchen, 429, Chorley Old-road, Bolton. Refers to improvements in self-acting mules and twiners, and consists in means to ensure of even and uniform winding, to prevent snicks, snarls, and waste, at the same time producing steady winding during the inward run of the mule carriage during the formation of the cop; prevents undue strain on, and the breaking of, the winding chain, also backing-off too far, and dispenses with the ordinary winding catch and winding catch wheel, the latter being substituted by catch-box wheels or by a friction clutch. This is effected by providing the gun-lever with an incline which works in conjunction with a forked lever mounted on a pin or centre supported from any convenient position. To the fulcrum end of the forked lever is attached another forked lever which slides out of gear a catch box or a friction clutch mounted on the tin-cylinder shaft; the reverse action being effected by means of a spiral spring connected at one end to the forked lever and at the other end to any fixed position.—Nov. 17, 1900.

24,160. Self-acting mules. Dec. 5. R. Slack, Old Falinge, Rochdale. Relates to improvements in self-acting mules, particularly to woollen and waste mules, and the object is to drive the carriage independently of the spindles by employing a rope or band to convey motion from the overhead countershaft to drive the carriage and the backing-off and taking-in motions.—Nov. 17, 1900.

24,388. Testing of weft-closeness. June 7. J. A. Schaufelberger, Pflanzschulstrasse, 20, Winterthur, Switzerland. Relates principally to the co-operation of two rotary bodies, driven independently of each other, one according to the length of the fabric, the other, on the contrary, to the number of the weft threads. If the closeness (thickness) of the weft be as intended, these bodies will rotate with uniform angular velocity; if, on the other hand, there be any deviation in the weft-closeness, an unequal rotation of each body will occur, and this irregularity will become evident, and be rectified by means of a device or contrivance suited to the particular loom. The present arrangement is intended, on the one hand, to prevent unnecessary work and loss of material (in the case of the weft being made too close), and, on the other hand, to prevent the production of too light a fabric; in short, it is intended to enable a fabric to be produced, even in case of the greatest negligence on the part of the loom tenders, with precisely the intended number of weft threads according to the bulk of the whole material, without the necessity of the continuous counting of the wefts and repeated examination of the warp tension on the part of the operatives.—Dec. 1, 1900.

24,839. Dobbies and change box motions. Dec. 14. R. L. Hattersley, North Brook Works, Keighley; and S. Jackson. Refers to shut or centre-shed dobbies. With this class of dobby the healds are raised or lowered according to the indication imparted to the dobby, and are then brought to their central position at each operation. By the improvement this movement is obtained with fewer working parts and less friction than hitherto, also the healds are positively operated. The draw lever to which the heald is connected is designed with a slot to receive a shaft on which it fulcrums, and in such a manner that it can be operated upon by either of two knives. The two knives work horizontally in the same plane as the fixed fulcrum, for the draw lever; one is for the raising of the heald and the other for the lowering of same, and both work back to their starting positions at each operation. The draw lever, of which, as is well understood, there is a series, can be brought into contact with either knife, as indicated from the indicating cards. The point, or points, of connection of the heald to the draw lever and the fulcrum of the latter are in such relative positions that during one part of the operation the weight of the heald holds the draw lever in contact with one or other of the knives—that is, the one by which it is being operated,—and during the other part the draw levers, operated by the knife for lowering the healds, are forced on to the other knife. In box motions the indications are usually transmitted from a set of indicating cards to the box-operating mechanism by a set, consisting of two or more, of levers. The set of cards passes over a cylinder, which is rotated by a catch connected to one of the before-mentioned levers. An additional lever is used, and the set of cards is prepared to indicate on the same; there are also mounted loosely on the cylinder shaft, working together, a catch-wheel and tappit. The former is operated as required from the set of cards by means of the additional lever, and the latter brought into contact with the set of levers and catch. By the aid of this arrangement any one, or more, of the cards of which the set is composed may be made to serve for two or more cards, the catch wheel and tappit being designed, and the connection arranged, in such a manner that the set of levers and catch are out of contact with the cylinder for the time required.—Nov. 24, 1900.

24,954. Blue mordant dyestuffs. Dec. 15. O. Imray, London (communicated by the Farbwerke vormals Meister, Lucius and Brüning, Hoechst-à-Main). The practically valueless products of the void German Patent No. 6526 are transformed according to the process of the German Patent No. 75,490 by heating them with dilute alkalies or with the hydroxides of alkaline earths under moderate pressure into blue-dyeing mordant dyestuffs soluble in water, which possess colouring properties essentially superior to those of the raw materials. It is now found that pure mordant dyestuffs, similar to anthracene blue, may be obtained, if the products obtained according to the void German Patent No. 6526 be heated under pressure according to the method described with dilute alkalies or alkaline earths, or, still better, in form of their lime-lakes, with aqueous alkalies, with or without addition of a suitable oxidising agent—such, for instance, as saltpetre,—till they become insoluble in water. Besides the elimination of sulphonic groups a substitution of amido-groups by the hydroxyl takes place, ammonia being formed.—Nov. 24, 1900.

25,233. New colouring matters. Dec. 20. J. Y. Johnson, London (communicated by the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine). If para-amidophenol be treated with one molecular proportion of dinitrochlorbenzene or dinitrobrombenzene in the presence of suitable reagents for binding acids, such as soda, sodium acetate, and the like, the corresponding parahydroxy, orthoparadinitrodiphenylamine is obtained. (See Nietzki and Simon, "Berichte," 1895, page 2973.) In the same way the corresponding compound can be obtained from para-amidophenolortho sulpho acid. It is now discovered that hydroxy-dinitrodiphenylamine derivative can be combined with a further molecular proportion of dinitrochlorbenzene, so that phenol-ethers are obtained.—Nov. 24, 1900.

25,457. Gill boxes. Dec. 23. R. Hewitson, 22, Sherry-road, Dudley Hill, Bradford; and E. J. Smith. Has for its object the feeding of the slivers to gill boxes at a uniform tension. The slivers are wound upon barrels into balls as hitherto, and the barrels are placed upon creel spindles, upon each of which is a boss free to rotate on the spindle. Each boss is provided with one or more projections which engage with one end of a barrel in such a manner that, on the barrel rotating on the creel spindle, the boss rotates also. Around and in contact with each boss is placed a strap of suitable material, the strap being carried by a stud and so arranged as to bind on the circumference of the boss and thereby act as a brake, the amount of friction between the strap and boss being regulated by a screw which determines the speed at which the fibre under operation is fed from the barrel on the creel to the rollers of the box.—Nov. 17, 1900.

1900.

54. Knitting machines. Jan. 1. C. H. Aldridge, Pinfold Gate, Loughborough (communicated by E. Boessneck, 30, Annabergerstrass, Chemnitz). Relates to a rotary or flat-bar knitting machine for making lace or openwork by the action of lacing points fixed on a lace point rod at any desired distance apart, the combination of a pattern wheel having one, two, or more rows of studs or pegs of varying heights arranged upon its side face in one, two, or more concentric circles, in conjunction with a slide drawn endwise towards the pattern wheel, and having a suitable stud peg or projection to come against one or other of the pegs in one or other of the rows on the pattern wheel, the slide being connected directly or indirectly to the lace point rod so that the varying heights of the studs upon the side face of the wheel regulate the selection of loops by the lace points.—Nov. 17, 1900.

165. Looped or terry fabrics. Jan. 3. R. L. Hattersley, North Brook Works, Keighley; and S. Jackson. In the manufacture of looped or terry towel fabrics it is necessary that the reed is either held rigid or pushed back for a predetermined number of revolutions of the loom—that is, in accord with the design to be woven; and the improvement consists of an arrangement of mechanism for operating the reed in such a manner that it is positively placed and held in one or other of these two positions when and as required. The indication for the movement can be imparted to our arrangement of mechanism in any well-known manner. Use is made of the arrangement of the reed, the two or more fingers for connecting the latter to the fulcrum shaft, and regulation screws all as shown and described in Patent 11,281 of 1896. The finger carrying the regulation screws is projected to the back instead of the front as hitherto, and a bowl connected to it. The traverse of the reed, and thus also the length of the terry loop in the cloth, can be regulated at will by means of the two regulation screws. A segment wheel is mounted on one of the motor shafts of the loom in such a manner that it is operated by and can be slid on same. There is also mounted rigidly on a stud, fixed in a suitable position, to the before-mentioned shaft, two segment wheels, working together, and a lever; the latter is connected by a rod, etc., to an inclined lever which determines the traverse of the before-mentioned bowl, the latter working in connection with the reed. The teeth on the periphery of these wheels are arranged so that when the movable wheel is in contact with one of the two wheels, the latter is revolved half a revolution and the lever is raised, as also the inclined lever to which it is connected, and by this means the bowl traverses on the underside of same and the reed is forced back. When it is in contact with the other of the two wheels it is likewise revolved half a revolution, and thus the lever is brought to its former position, and the inclined lever being lowered, the bowl passes on the top side of same and the reed is held rigid.—Nov. 24, 1900.

890. New black colouring matter. Jan. 15. J. Y. Johnson, London (communicated by the Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine). In Patent No. 3828 of 1894, a process is described for the production of naphthazarine, or alizarin-black, from 1-1[1] dinitronaphthalene. The present invention consists in the production from the same initial material of new black colouring matter differing from naphthazarine.—Nov. 17, 1900.

930. Couplings for rollers. Jan. 16. G. A. Ryder, Turner Bridge Works, Bolton; and A. Parkinson. Relates to improvements in couplings for the rollers employed in textile machinery, and the object is to improve the method of coupling the rollers together and save the loss of time now caused when the rollers break at their couplings. For the ordinary forms of coupling a loose coupling piece is substituted, which serves to couple the ends of two adjoining rollers, and may also serve as a bearing for the rollers. In the case of heavy rollers such as are used in thread doubling machines, in which the rollers are hollow, is secured a block of metal at the ends of each roller to be coupled. These blocks are previously prepared in a special manner to receive the couplings. A hole is bored in the block, and then a groove milled across the face of the block, which groove is not cut so deep as the hole. When thus prepared, the block can be secured in any convenient manner at the end of the hollow roller. The loose coupling piece is formed of a stud with ends of suitable diameter to fit easily into the holes in the blocks, and with two projections or driving pieces, which fit into the grooves in the blocks, and so couple the adjoining ends of two adjacent rollers, the portion of the stud between the driving projections forming the bearing for the rollers in the roller stand.—Nov. 17, 1900.

944. Stop rods. Jan. 16. J. Bowden and J. Morris, 12, Stanley-street, Middleton-road, Chadderton, Oldham. Relates to improvements in stop rods in textile machinery, such rods as are employed, say, in speeds, self-acting mules, and the like, for stopping and starting the machine as may be required. The object is to provide means whereby the stop rod can be readily and securely locked in position when the machine has been stopped, and thereby accidents and injury to the operative prevented.—Nov. 17, 1900.

1095. Tufted fabrics. Jan 17. Brintons Limited, Kidderminster; and T. Greenwood. Relates to looms for the manufacture of tufted or pile fabrics, and more particularly to looms for the manufacture of carpets or fabrics of the kind known as Royal Axminster. In Patent No. 15,680 of 1890 is described a loom of this kind in the operation of which the pile of the carpet is formed of tufts which are severed from the pile yarns in the yarn carriers, and are brought forward by grippers that lay the tufts against the fell of the carpet where the tufts are bound into the carpet by the weft when the latter is beaten up by the slay. Now the chief features of the present invention relate to improved means for connecting the grippers to their shaft; for operating the grippers; for staying the three gripper-operating shafts; for securing a straight selvage, and also an improved construction of the yarn carriers with their yarn checks.—Nov. 17, 1900.

1129. Drying yarn. Jan. 18. J. Lloyd, Fairfield House, Droylsden. Relates to that class of machines for drying hanks of yarn known as the "Cohnen" machines, which comprises a revolving shaft on which are mounted discs which are provided with radial arms carrying inner and outer horizontal staves for supporting the yarn. The invention is intended in the first place to keep the yarn at a certain uniform tension by the aid of a spiral or other spring acting on each of the bearings of the inner poles or stave, which bearings can also be made adjustable by means of a suitable screw nut and bolt, to suit the various lengths of yarn. Another part relates to the outer poles or staves, the ends of which are kept in place in bearings on the ends of the radial arms by means of plate springs or fingers connected thereto.—Nov. 17, 1900.

1227. New azo colouring matters. Jan. 19. J. Y. Johnson, London (communicated by the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine). Consists in the manufacture of a new nitro-meta-phenylene-diamine sulpho acid and the use of this new component in the production of new azo colouring matters. The new nitro-meta-phenylene-diamine sulpho acid is not obtained by direct sulphonation of nitro-meta-phenylene-diamine, but from meta-dichlor-benzene, which is first converted into its sulpho acid (see Beilstein and Kurbatow, "Annalen," vol. 182, page 97). This sulpho acid can be nitrated by treatment with a mixture of sulphuric and nitric acids, and a new nitro-dichlor-benzene sulpho acid results. The sulphonation of the dichlor-benzene, and its conversion into this new nitro component, can be effected in one operation. The next step consists in replacing the chlorine atoms by amido groups, and this can be effected by treating the product with aqueous ammonia, at a temperature of about 150 to 160° C. The new nitro-meta-phenylene-diamine-sulpho acid thus obtained can be used in the manufacture of azo colouring matters by combination with diazo and tetrazo compounds. It yields, for instance, valuable colouring matters when used by combination with primuline and the other components of this group.—Nov. 10, 1900.

1387. Colouring matters. Jan. 22. J. Y. Johnson, London (communicated by the Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine). By the action of certain sulphites, preferably bisulphites, on certain aromatic hydroxy and amido compounds, especially those of the naphthalene series, peculiar, well-characterised products are obtained which appear to be ester-like compounds of hydroxyl bodies with sulphurous acid.—Nov. 24, 1900.

1761. Blue-violet dyestuffs. Jan. 27. O. Imray, London (communicated by the Farbwerke vormals Meister, Lucius and Brüning, Hoechst-a-Main). Dibenzylmetatoluidine has hitherto not been employed for the manufacture of acid dyestuffs of the orthotolyldiphenylmethane series. It is now found that by employing dibenzylmetatoluidine, dyestuffs may be obtained which are distinguished from products obtained by means of dibenzylaniline by their superior fastness to alkali, by an essentially bluer shade, and by a correspondingly greater technical value.—Nov. 24, 1900.

1820. Orange-yellow dyestuffs. Jan. 29. C. D. Abel, London (communicated by Actien-Gesellschaft für Anilin-Fabrikation, Berlin). In the Specification No. 16,474 of 1898 is described a process for producing certain new colouring matters derived from naphthacridine, which dye tannin-mordanted cotton yellow tints. It is now found that by treating these colouring matters under elevated pressure with alkylhalides or with alcohols and mineral acids new orange-coloured dyestuffs of the acridine series are obtained.—Nov. 17, 1900.

3187. Counting. Feb. 17. M. J. Nordmann, Schillerstrasse, Dresden. Provides a device for regulating and limiting working operations and machinery to any desired duration and number. The device comprises a number of revolving counting discs, rings, plates, or the like, each of which is adapted to count and limit the duration or number of working operations, and a regulating or adjusting mechanism placed parallel to the axis of the counting discs.—Nov. 24, 1900.

3444. Cutting wool. Feb. 21. J. W. Newall, Ongar, Essex. Refers to that type of machine in which a vibrating lever carries a cutter to and fro across the face of a comb. In the improved shear the end thrust is taken by a washer or its equivalent. The side thrusts are taken by portions of the pivot pin which are left of full diameter for a short distance above and below the eye of the lever, and which work in bearings in the shear body. The remaining thrust (which is always in one direction) is taken on reduced portions of the pin above and below the parts which take the side thrusts.—Nov. 17, 1900.

7214. Sliver cans. April 18. H. Hoi egger, 20, Dellplatz, Duisburg-on-the-Rhine. Relates to a receptacle or can for the reception of slivers, constructed in such a manner that liquids, steam and air entering under pressure can easily penetrate the slivers from below, upwards, and *vice versa*, and afterwards escape, it being only necessary to remove the lid of the can, in case the can with its contents is returned to the machine for further treatment after the bleaching and dyeing have been completed.—Nov. 17, 1900.

8872. Alkylated colouring matters. May 14. O Imray, London (communicated by The Society of Chemical Industry in Basle, Switzerland). Relates to the manufacture of colouring matters of the acridine series, by first condensing one molecular proportion of a metadiamine, a monoalkylated metadiamine, or a metadiamine asymmetrically dialkylated, with one molecular proportion of a methylenic derivative of a metadiamine like metaphenylenediamine or metatolylenediamine or monoalkylated or dialkylated metadiamine, in presence of an acid, and then treating the tetra-amidomethane base thus obtained at a high temperature, with or without pressure, with agents capable of removing ammonia, such as mineral acids.—Oct. 6, 1900.

9400. Bordered fabrics. May 22. J. H. Cunliffe, Bankside Mills, Rochdale; J. Law, J. Hanson, J. Butterworth, S. Butterworth, J. Makin, and J. H. Pilling. Relates to improvements in looms for weaving textile fabrics, such as dhooties, sarees, also for every description of bordered fabrics in which a coloured or other weft differing from the weft of the body of the cloth is required.—Oct. 13, 1900.

9547. Braiding machine. May 24. C. Schürmann, 80, Stern Strasse, Düsseldorf, Germany. Relates to a braiding machine with two sets of bobbins, wherein one set of bobbins having slide blocks made in two parts, is moved by means of carriages running in grooved tracks, which carriages overlap each other for the purpose of reducing the distance apart of the bobbins.—Nov. 17, 1900.

10,373. Damping or shrinking fabrics. June 6. F. Stiner, 92, Salem-street, Lawrence, Mass., U.S.A. Relates to machines for extracting water from fabrics, in which the fabric is spread or stretched, and subjected to the action of a suction apparatus which draws the water through the back side of the fabric, and carries the water away from the face, so that it is prevented from being clouded or streaked by the bleeding of the dye with which the body and backing of the fabric are impregnated.—Oct. 27, 1900.

10,836. Cutting fabrics. June 14. H. G. Bender, Akron, Summit, Ohio. Relates to a machine for cutting a roll of woven fabrics into pieces of predetermined lengths.—Oct. 27, 1900.

11,102. Knitting machines. June 19. H. A. Klemm, 235, East 95th-street, New York; and J. Kayser. Provides an improved construction of the cam mechanism whereby the stitches may be completed with one drawing cam in both directions, and subsequent drawing and straining of the previously-made stitches is avoided; second, to raise the needles as the cams pass after completing the stitches part of the way preparatory for making the next stitches, to divide the up-movements of the needles into two parts, whereby they work easier with less shocks, make more uniform work, and enable the machine to run faster.—Nov. 24, 1900.

11,253. Spinning can. June 21. J. Tattersall, 30, Oldenzaalsche-straat, Enschede, Holland. Relates to the cans as used in carding engines and drawing frames. At present these cans are either made smooth throughout their whole length or are only channelled at the upper end. As the smooth lower ends are liable to be easily damaged when coming in contact with parts of the machine, the edges of the wall, and such like, in order to increase the strength of the can it has channellings or corrugations extending throughout its entire length.—Oct. 6, 1900.

12,134. Warp-pile carpets. July 5. J. N. Sagnier and the Anglo-Oriental Carpet Manufacturing Company Limited, Longholme Shed, Rawtenstall. Relates to improvements in and in the manufacture of warp-pile carpets. In such carpets as hitherto manufactured the back ground warp or warps run straight from the back beam of the loom to the cloth beam, and in consequence the whole of the loops formed on the threads thereof by the pile-forming mechanism depend largely for their retention in the carpet on the threads of the ground warps remaining intact. If one of the threads becomes damaged in wear and a portion of it is drawn out, all the pile loops formed thereon become loose. The object is to remedy this by using two back ground warps and by intermittently crossing the two ground warps, so that the backs or arches of the loops are alternately on the one and the other ground warp.—Oct. 27, 1900.

12,580. Drying machine. July 12. J. Dolder, Andernach-on-the-Rhine, Germany. Relates to a machine for the drying of mercerised yarn in the hank in a stretched condition. The yarn is wound upon pairs of rollers, of which there may be any convenient number, and provision is made for varying the distance between the rollers, so that the yarn to be dried may be stretched, and thereby become brilliant and regular.—Oct. 13, 1900.

13,084. Fabrics. July 20. E. Marty, Riberac, France. Consists in the manufacture of a textile fabric of camel's hair alone, or of camel's hair mixed with other textile fibres, as wool, cotton, hemp or the like.—Nov. 24, 1900.

13,207. Colouring matters. H. H. Lake, London (communicated by Schoellkopf, Hartford and Hanna Company, Abbott-road, Buffalo, U.S.A.). Relates to the production of a new amido compound which is useful in the manufacture of dyestuffs, and which is called meta-amidotolyloxaminesulpho acid "B." This new amido compound is produced by heating one molecule of meta-tolylenediamine-sulpho acid in a watery solution with an excess of oxalic acid, whereby one of the amido groups takes up the rest of one molecule of oxalic acid and so forms this new meta-amidotolyloxamine-sulpho acid "B."—Aug. 25, 1900.

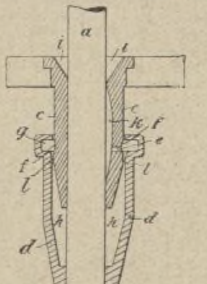
13,457. Winding machines. July 26. A. B. Morse, Easton, Massachusetts, U.S.A. Relates to an improved device for retaining and centring paper or other tubes or quills, such as are used in connection with thread-winding machines.—Oct. 6, 1900.

13,712. Knitting tubular fabrics. July 31. H. H. Lake, London (communicated by the Standard Machine Company, 508, Ludlow-street, Philadelphia, U.S.A.). Consists of a novel tubular fabric shaped by additional loops introduced at intervals without leaving holes in the fabric at the points where the new loops are introduced, and without producing a rib at that point.—Sept. 22, 1900.

13,723. Threading ribbon into lace. July 31. C. W. Dodge, 17, Gardner street, Worcester, Massachusetts. Relates to a machine for threading ribbon into lace, particularly into narrow bands or strips of lace provided with a series of perforations therethrough, and which is commonly used for trimming articles of underwear.—Nov. 24, 1900.

13,744 Treating flax. July 31. J. C. Chapman, London (communicated by W. B. Hutchinson, 52, Broadway, New York). Relates to improvements in apparatus for treating flax, straw, and analogous fibrous matter. In treating flax straw to prepare it for use—that is, to obtain the textile fibres therefrom,—it is desirable to boil the straw, preferably under steam pressure, in a chemical solution such as caustic soda or soda ash or crystals, and, after washing, to again treat the straw with an acid solution and finally wash it. The object of the invention is to produce a very simple but comparatively inexpensive apparatus, by means of which the above process may be easily and rapidly carried out To this end there are provided a steam-tight digester in which the straw may be contained; means for introducing steam, water, or any necessary solution into the digester; and arrangements for maintaining a circulation of water or other liquid in either direction, so that the straw may be conveniently and expeditiously washed or treated. There are arranged also means for introducing steam or heat into the circulation so as to raise the temperature and pressure to the desired extent; simple means for maintaining the water circulation without heating the same when desired: convenient means for circulating steam or the heated solution through the apparatus; arrangements for conveniently disposing of any debris and dirt; also means for conveniently charging and discharging the digester; and, in general, all arrangements for the apparatus to carry out the process in the most economical and beneficial manner.—Oct. 6, 1900.

13,788. Lubrication of spindles. Aug. 1. P. Hofmann, 39/41, Sachse-strasse, Chemnitz. *a* is the spindle of a spinning machine, surrounded by the sleeve *c*, the inside of which is grooved or recessed at *k* for the reception of the lubricant, which is introduced at the top of the sleeve through the cone-shaped recess *i*. A circumferential groove *f* is provided at the outside of the sleeve at about half its height. Within the groove *f* are a number of perforations *e* which communicate with the interior recess *k*. A pear-shaped receptacle *d* is attached, with its lower end to the body of the shaft or spindle *a*, so as to be fast upon it, the upper portion of the said receptacle *d* being enlarged so as to surround the lower half of the sleeve *c* above referred to. To the upper edge of the receptacle *d* is attached an annular channel *g*, of somewhat larger diameter than that of the upper portion of the receptacle, and



open towards the interior of the device, the channel *g* being so arranged as to register with the groove *f* of the sleeve *c*. The lubricant being introduced at *i*, will gradually work down along the shaft or spindle until it accumulates in the cavity *h* of the receptacle *d*. When the spindle is rotated, the lubricant will be thrown to the outside by centrifugal force, and will escape through the annular narrow slot *l* between the sleeve *c* and the receptacle *d* into the channel *g*, where it will accumulate. When the rotation of the shaft is interrupted, or if the movement is reversed, the lubricant, by its momentum, will tend to flow down by gravity, but being forced in the course of the now diminished rotation against the opposite perforations *e* in the walls of the sleeve *c*, it will enter the same, and now flow back into the interior recess *k*, whence it runs into the cavity *h*, then repeating the same circulation over and over again.—Nov. 24, 1900.

14,111 Warp twisting-in machines. Aug. 7, 1900. A. Goss, 297, Trenton-avenue, Lakeview, New Jersey, U.S.A. Relates to twisting machine, and it has reference particularly to that class of twisting machine whereby, when it becomes necessary to replenish the warp in a loom, a new warp is introduced by twisting its ends on to the ends of the old warp.—Nov. 3, 1900.

14,153. Automatic looms. Aug. 7. W. H. Baker, Central Falls, Providence, U.S.A., and F. E. Kip. Relates to the class of stop motions for looms wherein the breaking of a warp thread effects or permits the closure of an electric circuit which acts through suitable magneto-mechanical devices to stop the loom; and particularly to that class of such devices where a circuit-closing gravity drop is suspended on the warp thread and completes the operating electric circuit when the thread breaks or fails, and allows the drop to fall, and wherein a magnet in the circuit, when excited, serves to interpose a part between the knock-off lever and a going or vibrating part of the loom, thus causing the vibrating or going part to free the shipper lever.—Oct. 6, 1900.

14,288. Electromagnetic apparatus for jacquards. Aug. 9. J. Szczepanik, and L. Kleinberg, Ungargasse 12, Vienna III, Austria. Relates to an electromagnetic apparatus for electrical jacquards, which enables the magnets to be easily changed without considering the connections, and consequently enables the connections of the electromagnets to be easily altered The electromagnets are arranged in such a way that in consequence of the formation of a ring of lines of force one armature cannot influence the adjacent armatures. Fig. 1 of the accompanying drawings shows by way of example the complete arrangement of the electromagnets in an electrical jacquard, the electromagnets of which control the locking of the needle as determined by an electrical templet. Fig. 2 is a horizontal section of the magnet box. Fig. 3 shows one of the electromagnets in longitudinal section. The electromagnets *a*, which act in the usual manner on the armatures *d* that lock the needles *b* of the jacquard *c*, and release them when influenced by the magnets, are arranged in holes in an electrically-conducting magnet box *f*, and bear with their outer ends on contact buttons *g*, which are pressed by springs *h* on the ends of the electromagnets. The pins *i* carrying these buttons *g* pass through a contact board *j*, and are connected by means of clamped conducting wires *k* with pins *m* arranged in a second contact board *l*, and provided in a similar manner with spring contact buttons *n*. Each of the contact buttons *n* bears on a projection on one of the conducting bell-crank levers *o* of the selecting device *p*, which rest on the movable templet *q*. This templet comprises, as usual, a metal plate, which conducts at portions left bare, but does not conduct at other places which are covered with an insulating material. Underneath the templet there is arranged the current-supplying lever *r*, which is in contact with it, and is connected to the current-supply wire *s*, whilst the return wire *t* is connected with a terminal *u* on the magnet box. When a contact lever *o* touches a bare or conducting place on the templet the circuit is closed and the current flows from *s* through *r* to the templet *q*, through the corresponding contact lever *o* and the corresponding contact button *n* and wire *k* to the second corresponding contact button *g*, and then through the corresponding electromagnet *a* to the magnet box *f*, thence to the terminal *u*, and back to *t*. By means of the arrangement described, the connections of the electromagnets can be easily altered, since the contact boards can be removed and others substituted therefor. Fig. 3 shows such a tubulated magnet to a larger scale. The conducting magnet core 1 is surrounded by the winding 2 and is enclosed in a conducting tubular casing 3 which is firmly connected to the core by means of a screw 4. The annular space for the winding 2 between the core and the casing is closed at one end by the enlarged end of the core and at the other by a ring 5. To the enlarged end of the core there is secured by means of a screw 7 that passes through an insulating sleeve 6 a hollowed-out contact button 8, which is completely insulated from the core by means of a disc 9 made of non-conducting material. Between the contact button 8 and the insulating disc 9 one end of the winding is clamped, whilst the other end of the winding is soldered or otherwise connected to the core at 10. The current flows therefore from

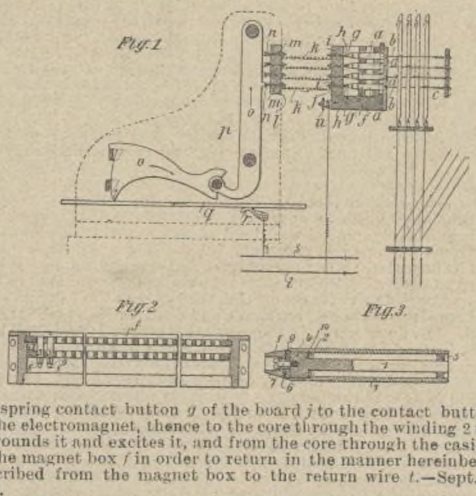


Fig. 1. Fig. 2 Fig. 3.

the spring contact button *g* of the board *j* to the contact button 8 of the electromagnet, thence to the core through the winding 2 that surrounds it and excites it, and from the core through the casing 3 to the magnet box *f* in order to return in the manner hereinbefore described from the magnet box to the return wire *t*.—Sept. 29, 1900.

14,609. Preventing kinking. Aug. 15. J. Knott and J. W. Knott, Middleton-road, Chadderton, Oldham. Relates to a new combined sled or machine for holding rope to prevent kinking while being manufactured, and for stretching the finished rope.—Oct. 20, 1900

14,616. Comb circles. Aug. 15. J. and J. Dunlop, Marshall's Mill, Portland-street, Bradford. Relates to certain improvements in machines for drilling and punching holes in comb circles and the like, and has for its object the combination of certain mechanism with a drilling and punching machine of the ordinary construction, and in such a manner that when a hole has been bored or punched through the comb circle or the like, for the faceplate of the machine supporting the comb circle or the like to be automatically moved the desired distance or pitch from one hole to another when the drill or punch has passed through and been withdrawn clear of the comb circle or the like.—Oct, 13, 1900.

14,951. Card-setting machines. Aug. 21. G. C. Dymond, Liverpool (communicated by O. Arnold, Leicester, Massachusetts, U.S.A.). Relates to that portion of a card-setting machine whereby the holes are formed in the leather or card-backing fabric for receiving the wire teeth, and consists of a perforating mechanism, comprising, in combination, an endwise movable perforator bar carrying the prick-point or needles, a rocking guide upon which the perforator bar is supported, an operating shaft, circular cams eccentrically mounted upon the operating shaft, and suitable connections from the circular eccentric cams, respectively arranged for actuating the guide and perforator bar.—Nov. 17, 1900.

15,182. Holders for thread. Aug. 25. D. Gamble, Northern Warehouse, Ramelton, Donegal. Relates to improvements in or connected with thread-holders or reels, consisting in an indiarubber ring, of circular form in cross-section, adapted to be placed over a reel containing twist thread or the like, to encircle same, the free end of the twist thread being passed first under the ring, then over, and finally drawn under and beyond same.—Nov. 17, 1900.

15,367. Pressing machines. Aug. 29. F. Rudolph and F. Kuhne, 24, Pank-strasse, Berlin. Relates to that class of hydraulic pressing machine in which the fabric to be pressed is passed between a heated rotating cylinder and a curved stationary pressing plate. The object of the invention is to provide increased pressing surface, to reduce the flexural strain on the cylinder shaft, and to facilitate the renewal of the fixed pressing faces.—Oct. 27, 1900.

15,456. Untwisting. Aug. 30. J. V. Eves, Forth River Mills, Falls-road, Belfast, and T. Lucas. In the bundling or putting up of flax for transport or shipment it is customary in some districts to fasten or secure such bundles with ropes made from the flax fibres themselves twisted together. Hitherto it has not been possible to make these ropes into serviceable fibre, either of tow or of line, without a great deal of expensive hand labour being put upon them. The invention relates to an apparatus for opening and preparing fibres, the combination with an opener gill frame or other machine of a rotating appliance provided with grippers to engage the fibre, which is caused to slowly rotate to grip the rope and untwist the same as it is delivered to the feed rollers.—Oct. 27, 1900.

15,629. Finishing fabrics. Sept. 3. H. E. Newton, London (communicated by E. Weiter, 18, Belforter-strasse, Mülhausen). The object is the construction of an apparatus in which the quantity of the treating liquid to be used in the treatment of the goods is smaller than heretofore, and the best results are obtained.—Oct. 6, 1900.

16,140. Humidifying cotton. Sept. 11. G. Brewer, London (communicated by G. Bocciarelli, Pessinetto, Italy). The required humidity is given directly to the fibres during the carding process, and the amount thus given can be mechanically regulated and controlled, and this without treating the whole atmosphere of the workrooms as heretofore.—Oct. 27, 1900.

16,729. Looms. Sept. 19. W Weber-Honegger, Rueti, Zurich. Relates to improved means for severing the weft thread in looms for weaving, wherein are provided appliances which are influenced by the condition of the bobbin of the weft thread, and which effect the automatic exchange of one weft bobbin for another. The accompanying drawings represent side elevations of the improved means in various operative positions. In the face a^1 of the batten or lay *a* of the loom is formed a transverse slot a^3, the latter being furnished with a knife *b* having sharp saw teeth. A similarly-formed knife b^1 is pivotally mounted on a pin in the upper end of a lever *c*; this lever being adapted to vibrate about the pivot *f* carried by the arm *e* pertaining to the batten or lay *a*. a^2 is the lay-cap. The knife b^1 is provided with a slot wherein a stationary pin *o* engages. When the lever *c* is moved rearwardly, the knife b^1 is caused to partake of a forward vibratory movement, and to assume a position where it is close alongside the knife *b*. The regulating spindle d^1 transmits the movements which effect the exchange of the bobbin of the weft thread to the movable elements of the cutting-off device, and not only carries the lever *g* for transmitting motion to the shuttle protector and for causing directly the exchange of the weft bobbin if the shuttle takes up its proper position in the shuttle box, but also carries the lever *h*, which disengages the feeding device from the regulator, and by the action of the spring *i* immediately after this disengagement is performed, causes the regulating spindle d^1 to resume its original position. The lever *k* is also fixed upon the spindle d^1, and serves to actuate the cutter knives anticipatory of the exchange of the bobbin. On the lever *c* is mounted the pin *l* with spring and regulating nut; a spring *m* connecting the said lever with the arm *n* of the batten *a*. Assuming the shuttle to be on one side of the feeler mechanism and the weft thread to be nearly exhausted from the bobbin, while the spindle d^1 is being rotated, by the action of the feeler mechanism, through a small angle to the left, the shuttle moves to the other side of the loom, where the exchange of the bobbin is to take place. The batten *a* is then caused to move from the position shown in Fig. 2 towards the front, so that the pin *l* comes into contact with the lever *k* (see Fig. 3), thus arresting the

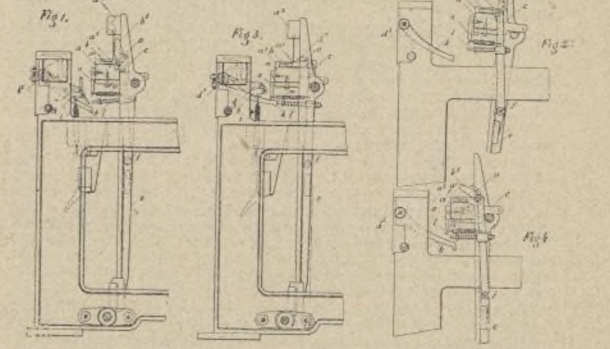


Fig. 1. Fig. 3. Fig. 2. Fig. 4

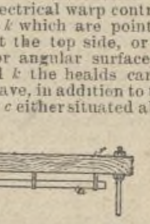
pin *l* and the lever *c*, this latter vibrating on its pivot *f*, and causing the knife b^1 to fall and assume a position beside the knife *b*. The weft thread, which at this moment is between the knives *b* and b^1, is immediately severed owing to the slight longitudinal movement imparted to the said knives when the batten or lay makes a further movement forward. Upon the batten following up its forward movement, the pin *l* escapes from the lever *k* (see Fig. 4), the lever *k* and the spindle d^1 thereupon resuming their original positions under the influence of the spring *i*.—Nov. 24, 1900.

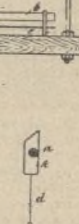
16,976 Double pile fabrics. Sept. 24. H. Müllers and A. Spindler, Dülken, Prussia. Relates to the manufacture of twill plush by a double weaving, with a triple fixing of the plush threads, the ground warps being woven uniformly over and under three wefts. In order to obtain uniform distribution of nap with little of the plush material in the ground one of the two ground warps which embrace the plush warps are separated by a weft thread in advance of the other.—Nov. 24, 1900.

17,433. Drawing in the warp. Oct. 2. E. Hamburger and B. Wagner, 2670, Hilgerstrasse, Görlitz, Germany. For the purpose of drawing the warp through harness and slay, it has hitherto been necessary to employ two persons, one of whom reaches the threads separately to the other, who then by means of a heddle hook seizes the threads and pulls them through the heddle eyes. The same is the case in drawing the threads from the harness into the slay. By means of the present invention the services of a person to reach the warp threads can be dispensed with. The essential feature of the new arrangement consists in an adjustable device for holding and stretching the threads in order, one beside the other. The tension, however, must be exceedingly finely adjusted, as it must yield to the slight pull which the person drawing in imparts to the heddle hook.—Nov. 17, 1900.

18,280. Spinning machine rolls. Oct. 13. D. Ballbé, Tarrasa, Barcelona. Consists in certain new and useful improvements in coverings or facings for spinning machine rolls, and has for its object to provide an improved tubular covering or facing made of wool and cotton, woven in one piece, without longitudinal seam, and intended to cover the drawing rolls as well as the brushing or clearing rolls of the spinning machines. Threads of wool are used for the weft and threads of cotton for the warp, both in the most convenient size and sort. Such tubes are woven on a loom of any system, but the warp is arranged thereon in such a way as to form two half-gangs, one over the other, and rolled on one or on two rollers or beams, as the case may be. Each of these two half-gangs is connected with the necessary heddles for weaving with the suitable cording. The shuttle on its first movement goes forward through the warp of one half-gang and then comes back through the warp of the other half-gang, so that the weft thread is continually turning around the warps, thus forming the tube. The tubes are woven of a larger diameter than that they must finally have, and are felted until their diameter becomes a little smaller than that of the rolls to be covered: thereafter the manufacture of the tubes is finished. The felting of these tubes is performed in exactly the same manner and on the same felting machines as those employed in the manufacture of usual woollen stuffs, but as the diameter of such tubes is very small, the felting machines used in this case are to be proportionately small-sized. In order that the threads on the loom may be perfectly seen by the workman, it may be convenient that the roll coverings or facings be coloured, in which case the green colour seems to be the most efficient one, but it is obvious that any colour should be imparted to said facings for such purpose. The dyeing of the tubes is performed on leaving the loom, before felting, by means of the same processes and apparatus as are usual in the wool-dyeing industry.—Dec. 1, 1900.

18,647. Wire healds. Oct. 18. V. Macku, 113, Neugasse, Brünn, Austria. Provides a new construction of wire heald and heald frame for looms with electrical warp control or stop motion. The wire healds *d* have heads *k* which are pointed or oval-shaped at the ends so as to form at the top side, or otherwise at the bottom, diagonal, straight or angular surfaces *f*. By inserting pieces of metal in the head *k* the healds can be weighted as desired. The heald frames *r* have, in addition to the two usual shaft bars *a* and *b*, an auxiliary bar *c* either situated above the shaft *a* or





below the shaft *b*, and either firmly attached or by a suitable elastic or spring connection. When the shaft frame *r* comes into position in the lower shed, then the shaft bar *b* is brought into contact with one pole and the auxiliary bar *c* with the other pole of a battery in the well-known manner. When the shaft frame leaves its lowest position in the shed, then the above electrical connection is broken so that the bars *b*, *c* have no current. Now if a thread is broken or becomes slack, and the shaft frame carrying it comes into position in the lower shed, then the heald concerned is no longer held up by the warp thread, but drops freely down by its own weight, rests upon the auxiliary bar *c*, and slides down over the latter *c* on its slanting face *f* so that certain contact of the head *k* results with the lower shaft bar *b*. In this way the circuit for the current is closed between *b* or otherwise with *a* and *c*, which suffices to stop the loom.—Nov. 24, 1900.