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IMPORTANT NOTICE.

It having come to our knowledge that subscribers frequently experience difficulty in obtaining copies of "THE TEXTILE MANUFACTURER" through their local newsagents, we would point out that the payment of 12s. per annum will ensure the prompt postal delivery of this journal, together with a copy of the "Annual Diary and Text-Book," at the earliest possible moment after date of publication.

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TABLE OF CONTENTS.

NOTES OF THE MONTH.

Bradford and the Worsted Industry.

THE recent address by Mr. W. E. B. Priestley before the Bradford Textile Society opens up a matter which is periodically broached to Bradfordians by some person farther-sighted than his fellows. There is probably no industry which has seen greater vicissitudes than the Bradford trade in worsteds and still come out on the right side each time; and yet, on the other hand, the district is far behind its Lancashire neighbours in the matter of modern fast-running machinery and appliances. Many of the goods made in the worsted district are of a more or less fancy character, and there is a tendency to give a preferential attention to design or structure, and so forget speed. In Lancashire the looms have to run as fast as it is possible to build a loom to run; and although this was at one time only tried in plain looms, the fancy looms have now, in many cases, to do the same. Mr. Priestley came very near to touching this point when he mentioned the present interest or lack of interest taken by Bradfordians in technical education. He stated that no other city in the trade was in such a backward state in this respect; and he might have gone further, for there are many towns, to say nothing of cities, in Lancashire with better accommodation, machinery, and apparatus for furthering the textile branch of technical education. Bradford has a magnificent pile of buildings for a technical college, but architectural beauty does not make a practical man. Many years ago, Lancashire millowners, factory workers, and municipal authorities, with their wits sharpened by foreign competition, saw that adequately-supplied technical schools were requisite to keep up a regular supply of managers and foremen, while loom tuners and spinning overlookers especially needed the advantages of some technical training if the best was to be got out of them. To-day, most of the towns have a complete cotton spinning and weaving plant which is not used for mere ornament or lecture purposes, but which is put to work on similar lines to those in the adjacent mills. The result is that the average Lancashire tuner or overlooker is quick to grasp the features of any new machine or motion, and is not quite so ready to condemn it simply because it is new, as is the case with his contemporary on the other side of the Pennines. The textile department of the Bradford Technical College has been largely worked on the erroneous supposition that the worsted trade needed designers, and needed them by the gross, quite ignoring the fact that for every designer required there were at least a dozen tuners and many other men with a foreman's responsibility. Then, if a town is to benefit by technical education, the fees must be comparatively low, so that the working classes can attain to them without too much stinting in other directions. More than anything, the directing hand should be that of a practical man—one who has had a mill and business experience. In years to come there will be a need for men with a good knowledge of and clear insight into all kinds of machinery, men who know how to gait and manage the weaving machinery of the future, which, with the advent of automatic looms, will be more intricate and delicate. Then, the men who are expert at combining twills or designing double cloths, or who can calculate everything in the price of a cloth except the most essential portions, will be relegated to some inferior position—one scarcely requiring a technical education. The most noticeable difference between Lancashire and not only Bradford but other Yorkshire technical schools, is the attention paid to spinning. Many of the cotton schools have spinning plants equal to those in the best mills, and these are continually being worked, putting through mixings which have been obtained from some adjacent mill, and in every way working as if for actual profit. In the worsted and woollen districts this branch is greatly neglected, and we find as a result that their machinery has changed but little during recent years, while every week sees some obviously advantageous addition to or change in cotton machinery, these improvements oftener than not springing from the brains of working men. Good yarns are necessary for making good cloths, and cheap yarns for cheap cloths, so that attention paid to the spinning industry reflects later on the weaving branch.

A Year in Cotton.

THE past season's crop of American cotton is computed to have amounted to 10,425,000 bales. This is more than the 1899-1900 crop of 9,444,000 bales, but less than the 1898-1899 crop of 11,235,000 bales. The season just closed has also left 239,324 bales as a stock in hand. Although new spindles are being erected in all parts of the world, it is rather significant that the consumption of cotton—that is, American cotton—is on the decrease. Last year the consumption was 69,000 bales less than that of the preceding year, and 312,000 bales less than that of 1898-1899. This decrease has taken place chiefly in the United States, which consumed 3,729,453 bales in 1900-1901, against 3,792,618 in 1899-1900. It is much to be feared that the States are rather overdoing the spinning industry. They have the advantage of home-grown cotton, and also of protective tariffs; but as their supply of trained operatives is limited, it might be wiser to cultivate a more steady growth, building up every factor required in the industry, and not extending until each of these factors is complete. They have made the most of automatic labour-saving appliances in several industries; the weaving branch has shown itself specially adaptable in this respect as regards the making of coarse fabrics, but in the spinning section American mills are as dependent upon manual attention as the mills in any other country. One great feature in the American cotton industry has been the removal of spinning concerns southwards. The new mills erected in the Southern States, however, do not represent trade expansion, for during the cotton year just closed, while the South took 267,000 bales more than in the preceding year, the North took 215,000 bales less. The decreased amount of cotton consumed may also be attributable to the position taken by many

Continental spinners and manufacturers. Many of these set out a few years ago to compete for the world's supply of cotton cloth. Reports were made of their cutting-out British goods in various markets, and of prices against which Lancashire goods could not possibly compete. The result was seen a few months ago, when many Continental firms, in Germany especially, came down with a crash. They had been selling cheaper than they could afford to, and found in many cases that the bid for the world's markets was a money-losing and not a money-making transaction when conducted on the under-cutting principle. American expansion, on the other hand, although too rapid to ensure a reliable supply of labour, was mainly instigated for the purpose of obtaining full control of the home market, although America also seems very anxious to become the world's workshop. As matters stand at present, it is estimated that Great Britain has 46,400,000 cotton spindles, or nearly half of those in the world. The Continent has 33,000,000, the United States 20,870,000, India and the East 6,700,000, Canada 640,000, and Mexico 460,000. Roughly speaking, there is a bale of American cotton per year for every ten spindles, the remainder spun being made up of Egyptian, Indian, and other cottons. As regards the new crop which is being gathered, it is yet early to estimate its volume. A few weeks ago 9,000,000 bales were predicted, but at the present time 10,000,000 or 10,500,000 seem more probable. Very little importance can be paid to the various estimates, as past years have shown; and it is more than likely that they partake largely of the gambling element which is now so prevalent in the raw-cotton trade. Fortunately, Lancashire buyers are now too wary to be carried away by the constantly repeated shortage warning, which oftener than not originates from brokers holding cotton in quantity.

Steaming in Weaving Sheds.

WE are glad to see, after all the biassed talk against steaming in weaving sheds, that a correspondent in a daily contemporary takes up the cudgels on its behalf. There is an unfortunate tendency for operatives to put the blame for everything upon some detail of mill management, and so look in quite the wrong direction when an evil is to be remedied. There are many wrongs suffered by factory workers of the present day, and great neglect, and still greater indifference, displayed by many masters regarding the workers' welfare; but such employers are much more rare than was once the case. There are millowners who sacrifice everything to money-making; but, on the other hand, there never were more employers anxious to do the best for their operatives than there are to-day. But the breach between employer and worker is to a large extent being widened by trade unionism, a power which, if intelligently applied, should have a reverse effect. There is the tendency to pull down instead of building up, which is really a leaf taken from the book of the more ignorant exponents of what passes for Socialism. Take steaming in weaving sheds, for instance. If this was not resorted to in the sheds where medium and heavily-sized cottons are being woven, it would be impossible to keep the ends up in dry weather, and the weavers themselves would be the first to call out if such was the case. The correspondent mentioned above points out that far from steaming being injurious to health, the increased ventilation necessary when steaming is employed makes the supply of pure air much larger. It is also pointed out that tapers and men employed all day in steam-laden atmospheres, often with the further disadvantage of damp floors to stand upon, are generally men enjoying the best of health. Supposing, if such were possible, steam in weaving sheds were legally forbidden: this would only be a stepping-stone, for those employed in dyehouses, laundries, cloth-finishing rooms, and similar places would have just as much right to enforce their claim. One thing is certain, and can be seen by anyone visiting both the mills and the homes where the operatives live—and that is, that the former are frequently the healthier, better ventilated, and better lighted of the two. We should be the last to say that factory legislation has yet accomplished its work regarding the sanitation of mills, but it is time something of the same kind was extended to dwelling-houses. As it is, the occupants of overcrowded bedrooms, of houses whose windows are religiously sealed against fresh air, whose clothing is perhaps not exactly of the cleanest, and whose diet is suggestive of dyspepsia, proffer themselves as examples of what factory sanitation produces.

Russia as a Factor in the Industrial World.

MANY individuals whose opinions are regarded as authoritative have for some years past been very optimistic as to the industrial future of Russia, and have not hesitated to predict for that country a rapidity of development quite equal to that of, say, Japan. Closer inquiry into the industrial conditions which prevail in the country show that little warranty exists for such conclusions. An important fact to be kept in view is that only about 8 per cent. of the population can at present be regarded as educated, and that this class is mainly composed of the nobility, which, comprising, as it does, the military and governmental aristocracy, affects a contempt for industrial enterprise, or, indeed, for business in any form. There are a few exceptions to this general rule, but although in one or two instances the results have been eminently satisfactory, the attempts of educated Russians to organise and manage new home industries have usually proved little short of disastrous. On the other hand, the masses of the people, though physically robust, are wholly destitute of ambition, and seem to be without either the desire for education or the means to secure it. Hence there is a poor prospect for any industrial development in Russia for the next two or three generations. During the past few years the French have sunk a deal of money in Russian enterprises, and they are reported to have lost half of it, and hence are chary of embarking further in the industrial exploitation of the country. Business men who have had dealings with the principal Continental countries do not hesitate to place the standard of Russian commercial morality as among the lowest in Europe. The acquisition of concessions or contracts (which are not easily obtainable) soon brings the foreigner into contact with the Russian police and other methods, and his experiences are decidedly the reverse of being either pleasant or profitable. Finally, the poverty of a country of such vast dimensions must necessarily retard its development. Greater transportation facilities would have a quickening effect in opening up the country; but until the means to build more railways are forthcoming, the industrial advancement of Russia must inevitably be a very slow process indeed.

A Novel Form of Competition.

A PECULIAR state of affairs exists at present amongst the cotton manufacturers of Fall River, U.S.A., and one which is causing no little unrest amongst both employers and operatives in that district. It seems that a Mr. Borden has spinning, weaving, and print works in Fall River, and only sells the output from the printworks. From all accounts Mr. Borden is not only an experienced business man and an excellent manager, but one who is possessed of a more than ordinary amount of the cuteness which our American cousins so much admire. His business capacity can be judged by the fact that his mills are always busy, even when others are slack, and that he finds a ready market for everything he makes in face of the open competition of his own countrymen. For some reason or other, known only to Mr. Borden himself, a few weeks ago he raised his weavers' wages 5 per cent. without being requested to do so by his employés. Naturally enough, weavers under other employers asked why they did not obtain a similar advance. The labour union took the matter in hand, and it was only by strenuous efforts that a strike was averted. The clergymen and other public, yet disinterested, men in the place overhauled the books and balance-sheets of the different mills and found there was no justification for an advance; and the labour officials, being longer-headed than many of their contemporaries, allowed the trouble to die down—or, more correctly, to smoulder out. Matters had just reached that stage when Mr. Borden posted notices in his weaving mills to the effect that an additional advance of 5 per cent. would be made to his operatives, and the district was again in a commotion. Many of the outside operatives still favour a strike for obtaining a like privilege for themselves, whilst the more sensible ones, backed by the labour union officials, foresee the futility of such at the commencement of the winter months. How matters will end nobody knows, unless it is Mr. Borden himself, for there is no surety that he has not other advances in prospect. This gentleman is credited with many statements, which, however, are as likely as not the concoctions of imaginative journalists, for he is said to be playing his game with reticence. He is stated to have said that all the other mills in Fall River are either able to pay the same advance, or would be if they were properly managed. This latter statement, if true, is a pointed reflection upon his brother-manufacturers, but may have more than a spice of truth in it. It is thought by some that Mr. Borden may have large stocks of cotton cloth at his printworks, and that he is trying to force up values before unloading these goods on the market; and so various reports, usually uncharitable, are floating around. We come across men at times who stand head and shoulders above their fellows in business ability, and these men, like Mr. Borden, usually manage their businesses themselves. There are too many employers nowadays who, on the first appearance of prosperity, consider it unnecessary to take other than a nominal management of their affairs, putting incapable sons or needy relations into posts of responsibility. A similar thing happens in many limited liability companies: large shareholders use their influence to find good positions for themselves or their friends, and so long as these pass some sort of muster they are retained. Both cases are similar; and a company running on such lines stands little chance against a concern managed by a capable, wideawake business man.

Trade With Turkey.

THE recent events which have happened in Europe between France and Turkey only serve as another illustration of the moral code existing in the latter country. However, that is only a secondary consideration when trading enters into the question, for it is not common for a shopkeeper, even the most honest of his kind, to refuse to sell to those whose character he is unacquainted with. Our traders sell our goods to cannibals, heathens, and anybody who will buy, and so the Turkish market, surrounded as it is by fraudulent customs, is still for all that a means of obtaining work for our looms. Some suggestions have recently been made by our Vice-Consul at Adana, and from these it is gathered that there is a great need of British-born commercial travellers who are acquainted with the language and the country. There is at present too much agenting and sub-agenting and trusting to representatives of other nationalities, who, naturally enough, have their own wares to push to the front. A central agent through whom credit could be given would also be a great help to business, for at present it is impossible to trust native merchants or agents. By this means honest traders would eventually be discovered and a direct trade with the interior opened out, so that goods would not have to pass through the hands of the merchants in Constantinople, Smyrna, or Beyrout, who now receive all trade orders and make a profit which is synonymous with robbery. There is another important point—namely, the language. Turks, like ourselves, are disinclined to learn foreign languages. They think their own tongue, like their own religion, is the best in the world. Under such circumstances it is useless issuing catalogues unless printed in the language and in every way conforming to Turkish tastes. Initial orders, even though very small, should not be despised, as all business must have a small beginning, and it must be remembered that the Turk is as doubtful of us as we are of him.

ARTICLES.

Designs for Silk Fabrics.

SPECIALLY CONTRIBUTED.

FIG. 1 is a design for a blouse cloth made with a mercerised cotton warp in a 1600/2, and shot with 96 picks of tram to the inch. The black should be weft with plenty of float left, the grey effect should be a warp and weft storm or oatmeal, and the ground should be 3-and-1 warp twill. Patterns worked up in this way have a good rich effect for this quality of cloth, as the figuring brings plenty of silk to the face.

Fig. 2 is a sketch for a silk brocade made with a good net silk warp about a 2000/6 in quality, and shot with 120 picks to the inch of tram. The figuring should be made from the weft; where black, it should be well floated with the grey, bound down with fast twills, and in some places two-pick should be used. The ground should be 7-and-1 warp satin, and in this quality will have a very rich appearance. The storm or oatmeal should be warp and weft, lying on tabby. Inside the leaves should be two-pick, which will give a dull effect and a great contrast to the ground.

Fig. 3 is a design for dress cloth made with an 1800/3 net silk warp and shot with 100 picks of

FIG. 1.

tram to the inch. The black figuring should be weft, the grey warp, and the ground tabby, except inside the leaves, where 7-and-1 warp satin may be used with a fine weft oatmeal or bird-eye; the grey effect here should be tabby.

Fig. 4 is a sketch for a silk muffler of a good quality. The warp should be of spun silk in a 2000/2, and shot with a ground and tissue shuttle of tram about 90 picks each shuttle. The black

FIG. 3.

figuring should be brought from the tissue shuttle, which should be a bright colour; the grey figuring will be the ground shuttle, and on the large pine bound down with 12-and-1 satin. The ground should be 2 warp and 2 weft twill, which will allow the tissue shuttle to be bound at the back without showing on the face. Inside the outline pine a 7-and-1 warp satin may be used to give a different effect to the ground.

Fig. 5 is a sketch for a cheaper quality of muffler made with a spun silk or mercerised cotton warp in an 1800/2 and shot 100 picks of tram to the inch.

SILK DESIGNS. FIG. 2.

The black should be floating weft and the grey 3-and-1 weft twill. The oatmeal should be of weft lying on a 4-and-1 warp satin ground. The ground of the design should be 3-and-1 warp twill. When drafting patterns for these qualities of mufflers, plenty of tabby should be used to give firmness. It is a good plan to put a tabby thread round all the figuring, as it keeps the figure in its place.

Figs. 6 and 7 are drafts for fancy ground or all-over effects suitable for tie cloths made in shot effects. They would come up well with a 2400/2 net silk warp, shot with 100 picks to the inch of

SILK DESIGNS.—FIG. 4.

tram. There is a demand for these types of patterns just now for gentlemen's neck wear, as they are small and neat in figure.

Designs for Cotton Fabrics.

SPECIALLY CONTRIBUTED.

PATTERN No. 203 is a cloth suitable for blouses and similar garments for winter wear, and is of a style which gives all the colour combinations of a tartan without being so stiff in appearance. The body of the fabric is plain, and the colour checking takes place both in the ground and in the floating threads. The white overcheck is mercerised cotton, which gives a brighter appearance to the pattern generally. Fig. 1 is a small corner of the design showing

FIG. 5.

the plain ground in full squares and the floating threads by dotted squares. Both warping and wefting are as follows :—

Twice	4 threads mercerised white.			2 threads blue.	
	4 threads red.			2 ,,	green.
	2 ,,	floating green		2 ,,	floating green.
	2 ,,	green.		2 ,,	green.
	4 ,,	blue.		14 ,,	blue.
	4 ,,	plum.		2 ,,	green.
	6 ,,	blue.		2 ,,	floating green.
	2 ,,	green.	4 times	4 ,,	red.
	2 ,,	floating green.		2 ,,	floating green.
	2 ,,	green.		4 ,,	red.
3 times	2 ,,	blue.			
	2 ,,	plum.			

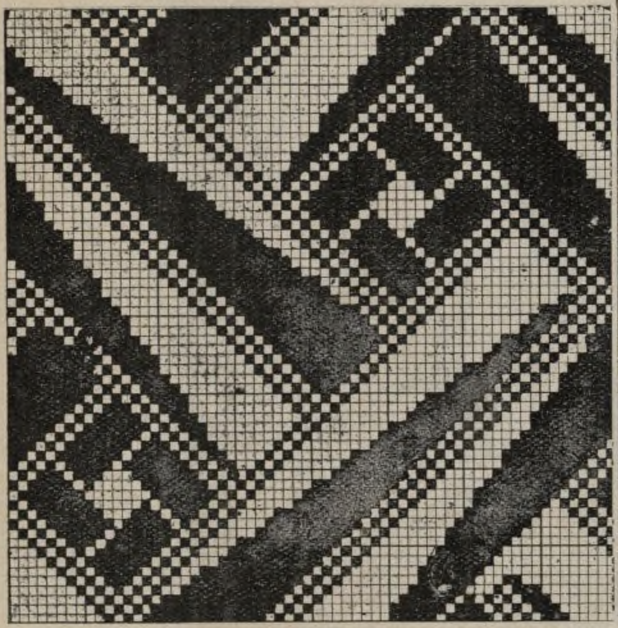
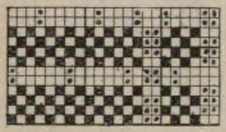


Fig. 6 Silk Designs. Fig. 7.

Cotton Designs.—Fig. 5.

Pattern No. 204 is a still heavier blouse cloth with the back raised. Part of the design is shown in Fig. 2, this representing one of the small red squares with a black dot in the centre. The ground weave may be seen in this design marked by full squares, while the spotting threads, which



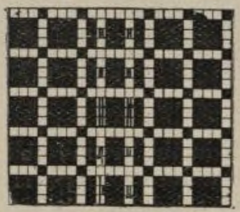


Fig. 1.—Cotton Designs.—Fig. 2.

work two as one, are shown by lines. All the spots are made on this principle and bound down on the back every third pick when not forming a spot. The usual three-end hopsack portions are supplemented by an extra end in the spotting stripe, so as to afford better cover.

Warping.

3 times	9 ends	red.	Twice	5 ends	black.
	2 ,,	spotting black.		2 ,,	spotting white.
	2 ,,	red.		2 ,,	black.
	2 ,,	spotting black.		2 ,,	spotting white.
	10 ,,	red.		6 ,,	black.
	4 ,,	black.		4 ,,	white,
	17 ,,	black.		21 ,,	black.
	2 ,,	spotting white		2 ,,	spotting white.
	2 ,,	black.		2 ,,	black.
	2 ,,	spotting white.		2 ,,	spotting white.
	10 ,,	black.		10 ,,	black.
	4 ,,	white.		4 ,,	white.
	9 ,,	black.		9 ,,	black.
	2 ,,	spotting white.		2 ,,	spotting white.
	2 ,,	black.		2 ,,	black.
	2 ,,	spotting white.		2 ,,	spotting white.
	22 ,,	black.		22 ,,	black.
	4 ,,	white.			

Wefting.

3 times	20 picks	red.	Twice	12 picks	black.
	4 ,,	black.		4 ,,	white.
	28 ,,	black.		32 ,,	black.
	4 ,,	white.		4 ,,	white.
	32 ,,	black.		32 ,,	black.
	4 ,,	white.			

Fig. 3 is a sketch for a cotton all-over made with a 66-reed warp and shot about 80 picks to the inch. The figuring should be made from the weft; where black it should be well floated, and with the grey bound down with 3-and-1 twill, which will give it a shaded appearance. The ground of the pattern should be tabby. The flower inside the grey figure may be 4-and-1 warp satin. As all the figure is made from the weft, a poor warp may be used, as it will only show in the ground.

Fig. 3.

Fig. 4 is a design for a cotton stripe. The warp should be in an 80-reed and shot about 96 picks to the inch. The figuring should be worked up from the weft; where black it should be well floated, and with the grey 4-and-1 weft satin and 3-and-1 weft twill. The white in the figure should be 7-and-1 warp satin. The grey stripe should be 4-and-1 warp satin, with the black figuring weft and the white inside the figure tabby. The ground of the stripe should be tabby.

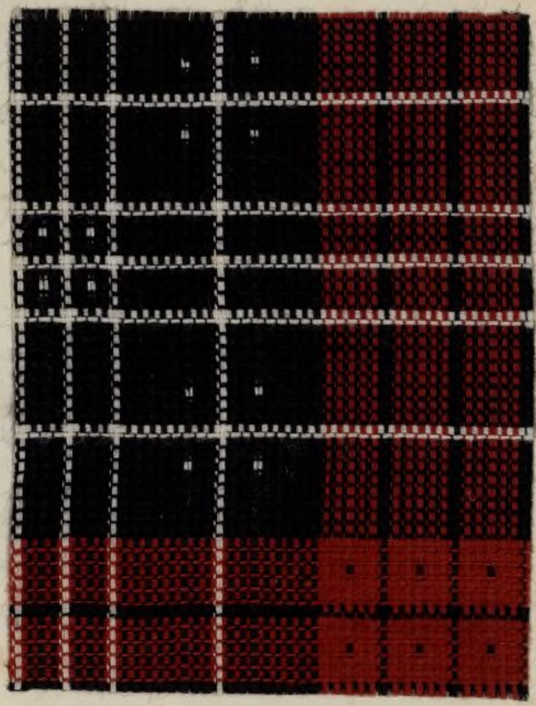
Fig. 4.—Cotton Designs.—Fig. 6.

Fig. 5 is a pattern for a cotton zephyr. The warp should be in an 84-reed and shot with 84 picks to the inch. The black figuring should be weft, with the grey warp, on a tabby ground. The warp may be bound down with 4-and-1 satin, which will give it a smooth appearance. The dropping effect should be about 3 ends of warp, and caught across by a pick in threes. Fig. 6 is a sketch for a cloth made with a 96-reed warp and shot with 108 picks to the inch. The figuring should be worked up with warp and weft,

PATTERN SHEET No. 110.

Samples of Cotton Cloths.

PATTERN No. 203.



PATTERN No. 204.

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. 111.

Samples of Woollen and Worsted Fabrics.

PATTERN No. 205.

PATTERN No. 206.

CANVAS HOSE. SPHINCTER HOSE.

RUBBER-LINED HOSE. COTTON BELTING.

INDIARUBBER GOODS

For MECHANICAL PURPOSES.

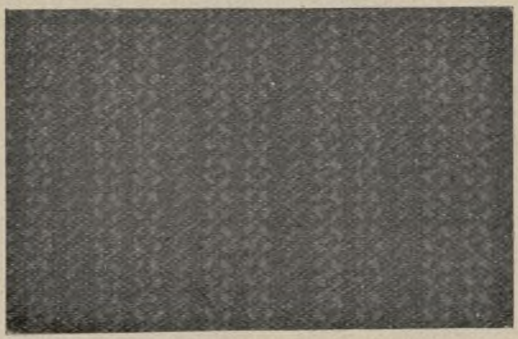
the black weft and the grey warp. The fine black effect should be a small weft oatmeal. The white stripe should be tabby ground, and the grey 4-and-1 warp satin.

Cotton Designs.—Fig. 7.

Fig. 7 is a design for a cotton brocade. The warp should be in a 96-reed and shot with about 120 picks to the inch. The black figuring should be warp floated as much as possible, and the grey 4-and-1 warp satin. The ground should be 4-and-1 weft satin; inside the figure should be 7-and-1 weft satin, and in some places 3-and-1 weft twill.

Designs for Woollens and Worsteds.

PATTERN No. 205 is a suiting which serves as a good illustration of the present tendency of coating designs. During the last two summers, especially the last, suitings with a dark



Designs for Woollens and Worsteds.—Fig. 1.

ground and one ended or two-ended light-coloured stripes have been very much in demand; but as these are now considered too loud, they are being

Designs for Woollens and Worsteds.—Fig. 2.

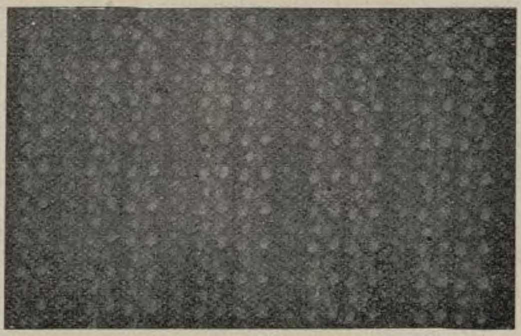
displaced by more subdued stripings, of which the pattern shown is an example. The rough face which it possesses is also a feature of the cloth in requisition for better-class goods. The weft is a single woollen, of dark mixture wool, and the warping is—

10 ends mixture woollen.
4 „ worsted grandrelle.

The whole pattern is 2-and-2 twill, but the 10 ends of woollen twill to the right and the 4 ends of twist to the left, although these latter appear on a superficial examination to twill the other way.

Designs for Woollens and Worsteds.—Fig. 3.

Pattern No. 206 is a very cheap suiting cloth, and is a good example of the fine goods which can be turned out at a phenomenally low price. The yarns are composed of a twist of black cotton and a twist of woollen, this latter being so short-fibred that it would not hold together without the aid of



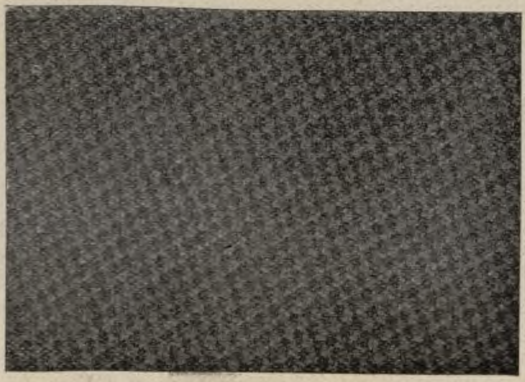
Designs for Woollens and Worsteds.—Fig. 4.

the cotton strand. Being so short and soft, however, it allows the cotton thread to bed well into it, and this latter becomes quite invisible after

Designs for Woollens and Worsteds.—Fig. 5.

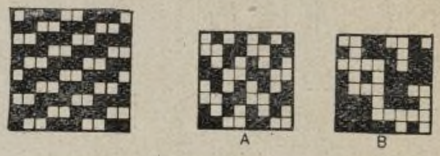
finishing. The pattern is made from a 2-and-2 twill, and both warping and wefting are as follows:—

1 thread red.
3 times { 3 „ light.
3 „ dark. }
6 times { 2 „ light.
1 „ dark.
1 „ light.
2 „ dark. }
Twice { 3 „ light.
3 „ dark. }
3 „ light.
2 „ dark.



Designs for Woollens and Worsteds.—Fig. 6.

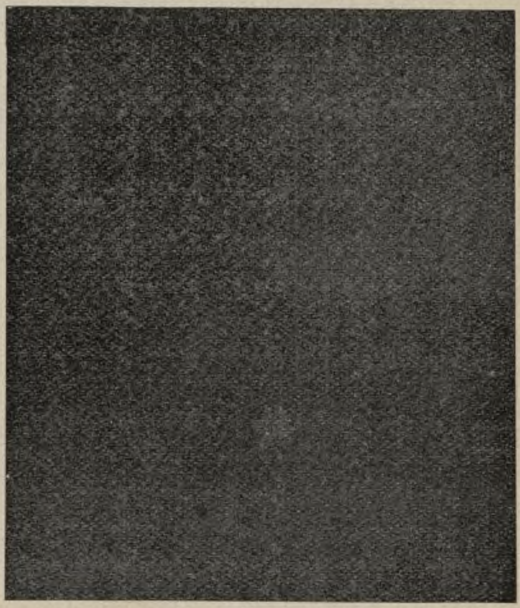
A very neat trousering design is shown in Fig. 1, having the face pattern on a 3-and-3 twill basis. A warp back (2 face to 1 back) adds both softness and weight to the fabric, which is composed of two-fold worsted throughout. The face design is shown in Fig. 2, and the completed design in Fig. 3. In this latter the full squares show the face weave and the dotted squares the extra warp. This extra warp, however, is only noticeable on dissection, and the appearance of the back of the fabric, which is shown in Fig. 4, is such as to suggest a new and pleasing design, with a very slight alteration in the general structure of the cloth. The weft is all black, and the warping (face and back



Designs for Woollens and Worsteds.—Figs. 7 and 9.

combined), beginning at the left-hand corner of Fig. 3, is as follows:—

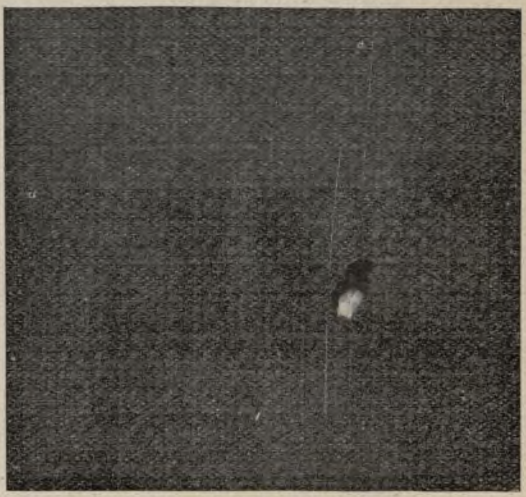
3 ends lavender.	3 ends blue.
1 „ blue.	4 „ lavender.
1 „ lavender.	3 „ black.
3 „ blue.	1 „ twist.
4 „ lavender.	1 „ black.
6 „ black.	1 „ twist.
3 „ lavender.	6 „ blue.
1 „ blue.	6 „ black.
1 „ lavender.	



Designs for Woollens and Worsteds.—Fig. 8.

Figs. 5 and 6 are two worsted suiting designs, both obtained by the five-shaft screw weave shown in Fig. 7. The former is warped—

3 ends black,
3 „ mixture,



Designs for Woollens and Worsteds.—Fig. 10.

and the latter

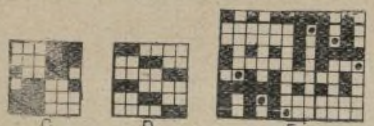
1 end black,
1 „ mixture;

while both are wefted with

1 pick black,
1 „ mixture.

Fig. 8 is a worsted coating or overcoating of heavy weight, made of cross-bred wool. The groundwork is a simple check in very subdued contrasts, overchecked with coloured twist yarns, which are, however, scarcely perceptible. It is a double cloth, both back and face being the small four-shaft design shown at A in Fig. 9, the complete design being shown at B in the same figure.

Fig. 10 is a checked suiting having a fine worsted face and back, but weighted with a thick woollen weft which is not visible on or behind the fabric. The face cloth, which is composed of two-fold worsted in both warp and weft, is woven in the design shown at C in Fig. 11, and the colouring is a simple small check with an overcheck of coloured twist threads. The back cloth is woven in a worsted warp (which is all that is visible) and a thick woollen weft, in the design shown at D in Fig. 11. The complete design is given at E, where the dotted squares show the binding stitches.



DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 11.

Jute and Linen Weaving.—XXIII.

BY THOMAS WOODHOUSE
(Of Dundee Technical Institute)
AND
THOMAS MILNE
(Of Dunfermline Technical School).

PICKING, the technical term invariably applied to the driving of the shuttle from side to side of the loom, is timed or "set" to follow the action of shedding in the sequence of weaving operations. To an untrained and casual observer this generally seems a simple thing to do, but there is probably no part of the mechanism of the loom productive of more trouble to or which requires more attention from mechanic and tenter alike. Nor is this much to be wondered at when one considers closely the varying conditions under which the picking mechanism has to act, the functions it is required to perform, and the many different parts which go to make it up. Conditions such as heavy and light warps vary the friction on the shuttle in its passage through the shed. The shuttle itself is a practically rectangular piece of hard polished wood tapered at the ends and tipped with iron, measuring (in an average case for the ordinary class of jute fabrics) 20in. long by about 2in. square, and weighing about 2lb., but varying in weight for special yarns and fabrics from something under 12oz. to 3lb. and over, with a proportionate variation in its dimensions. Such a body in a 46in. reed-space loom is suddenly shot with a velocity of from 30 to 40ft. per second from a guiding box; it has to travel a distance of 5ft. in about one-sixth of a second, and is then abruptly brought to a dead stop at the end of its journey.

The shuttle when brought to rest is made to do work by pressing out the swell and raising the tongue of the warp protector clear of the "knee" or buffer, thus permitting the loom to run. Consider also the fact that the plane or race board on which the shuttle moves is not stationary during the passage of the latter, but that, on the contrary, it falls backwards with a decreasing velocity, comes to rest, and again moves forward with approximately an equally increasing velocity; also that the plane itself is not smooth, since it is formed by that portion of the warp yarn in the lowest position. Observe also that as the shuttle runs, its load decreases gradually as the cop gives out, or as the pirn empties; and as momentum varies in proportion to weight, it is evident that the force or "pick" must be sufficient to send across the empty shuttle, and will therefore be more than necessary for the shuttle and yarn combined. Note also the fact that as the eye of the shuttle is in the front near one end, there will be a certain pull exerted by the weft thread when travelling in one direction, creating a tendency in the shuttle to leave the shed, and when travelling in the other direction tending to make it bear hard on the reed.

Of the picking mechanisms employed there are only two types which are usually applied to looms for jute and linen weaving, and of these two the one which is by far the more widely adopted is the cone overpick—the term "cone" being taken from the fact that the anti-friction roller upon which the picking wyper acts is conical in shape, while the term "overpick" is applied in all cases where the picking arm proper is wholly above the shuttle box. In the pick under consideration the mechanism consists of a picking wyper or tappet A (Figs. 122 and 123) keyed to the bottom or wyper shaft B, and therefore revolving with it; also of a stud C (carrying a conical anti-friction roller) firmly bolted in a tapered hole in the vertical shaft D, to the head E of which is clamped a wooden picking arm F. The head E is invariably made in two portions, an upper and a lower, the faces of which come together and have radial teeth cast upon them to ensure a rigid grip, while permitting any necessary adjustment in the position of the arm F. As the shaft B revolves, the wyper A, in a rapidly-increasing ratio, drives the cone stud C through a certain arc of movement (the effective value of which depends upon the stroke of A, and also upon the point of contact of A with the cone), the shaft D rotates, and the arm F travels rapidly inwards. From the extremity of the arm F a leather strap is connected to the buffalo-hide picker on the picking spindle (see Fig. 62, page 410, vol. xxvi.), and thus conveys the movement of the arm to the shuttle.

Figs. 122 and 123 show respectively the wyper A, and therefore the arm F, at the beginning and at the end of the stroke. The shaft D is supported by a footstep G at the bottom, and in a bracket H near the top. Both G and H are cast upon or bolted to the outside framework of the loom, so that the wyper A may be brought as close as possible to the bearing of the shaft B in the framework, securing by this arrangement the greatest amount of stability and rigidity in action. On the shaft D a shoulder I is formed, which impinges against the bush in the bracket H, and counteracts the tendency of the wyper A to impart a vertical movement to shaft D. This might be termed the

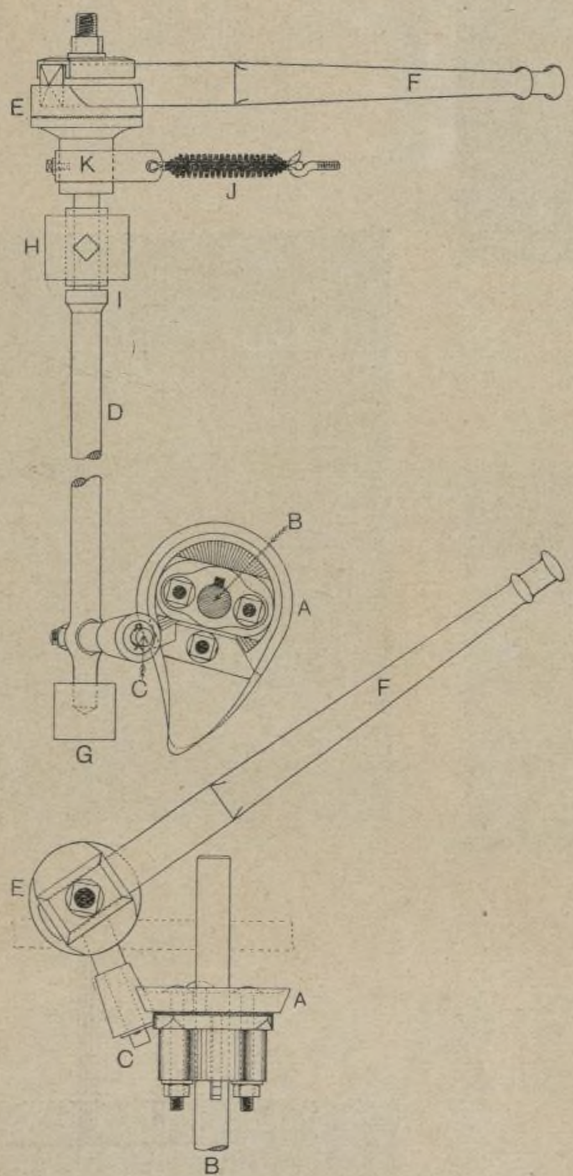


FIG. 122.

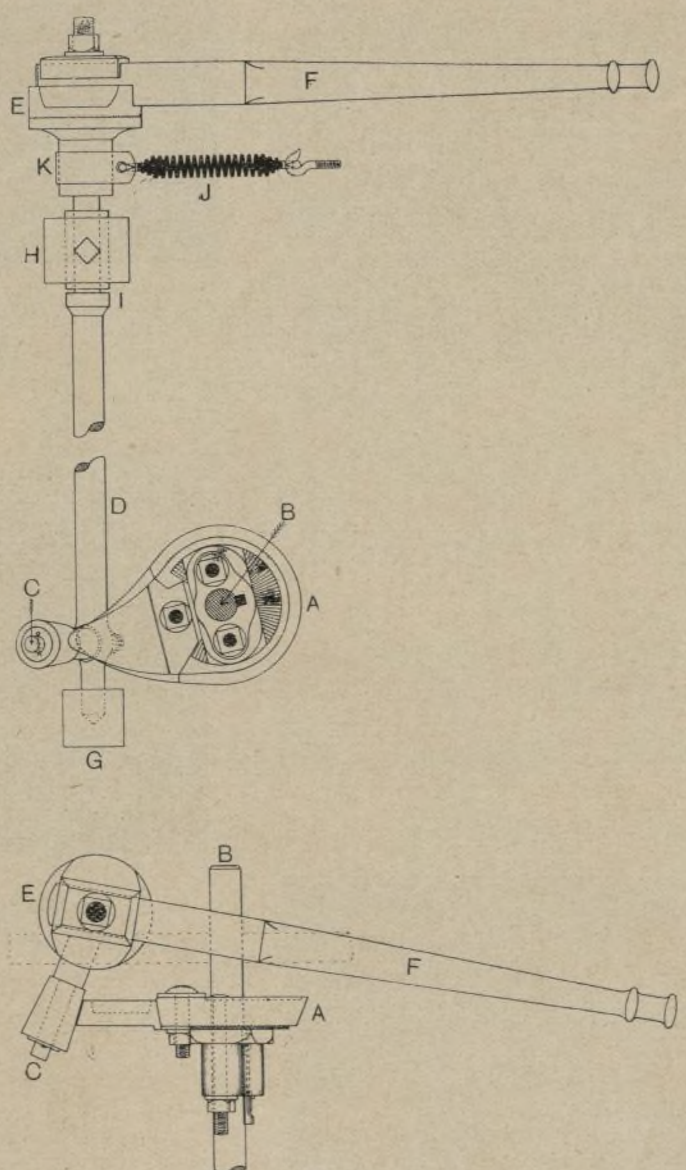


FIG. 123.

JUTE AND LINEN WEAVING.

one objection to revolving the crankshaft in the direction shown in Fig. 37 (page 266, vol. xxvi.). When revolved in this direction the wyper A must always act upwards, and as the bush in the bracket H is simply held in position by a pinching screw countersunk into the bush, it is in time driven upwards by the action of shoulder I enlarging the countersink until a very harsh pick results, producing an exceedingly undesirable vibration in the loom. As things are at present situated, the only remedy is to turn the bush partly round and drill out a fresh countersink; but we think it is worthy the attention of loom makers to try to devise some method of fixing the bush in such a manner that the impact of the shoulder I would be taken up by the bush as a whole, and not by the point of a pinching screw, and that play, if any, could be taken up in a better method than at present.

In looms which revolve in the direction shown in Fig. 38 (page 266, vol. xxvi.), the wyper always acts in the downward direction, the impact here being sent into the footstep G. In many looms where this downward motion obtains the shaft is not provided with a shoulder I, consequently D dances immediately the pressure of the wyper A has left the cone stud C. When acted upon in this direction the cone stud C should be as much above the level of the shaft B as it is shown below that level in Figs. 122 and 123. There is one decided objection, however, to revolving the loom in this downward direction; when the loom is at rest the crank has a tendency to fall to the bottom position, but as this is near the picking point the shed is open and the warp threads are therefore in tension, giving the weaver unnecessary trouble in taking up or mending broken threads. It also follows that in many cases during the whole period of rest the threads are in tension, whereas with the wyper revolving as in Figs. 122 and 123, the leaves in plain cloth are always level and the threads therefore slack when the crank occupies the lowest position. It will be understood that a duplicate set of similar parts to those shown in Figs. 122 and 123 is arranged at the other side of the loom for the purpose of returning the shuttle, the only difference being that the wyper A of the second set is fixed with its point diametrically opposite to that of the first set.

After being acted upon by the wyper, the stud C and the arm F are returned to their original position by the action of the spring J, which is hooked to the top rail of the loom by one end, and secured by the other end to a strap K, set-screwed to a point in the periphery of D. In some cases the cone stud C, instead of being in a fixed position in shaft D, is so arranged that its position or plane with regard to the plane of the wyper shaft B may be changed. When this is so, the shaft D may be partly slotted, and C bolted in the slot, or the inner end of C may be enlarged and bored out to receive the shaft D to which it is keyed; the key being so driven that the action of the wyper will always tend to tighten C on the shaft. Everything considered, we are of opinion that the adjustable stud is not so satisfactory as the fixed one, since, although intended as a ready means of hardening or softening the pick of the loom, and being in some cases necessary, due to badly-designed picking wypers which allow of no lateral adjustment on the wyper shaft, they are often, through ignorance or indifference, found too near the same level as the wyper shaft itself, allowing the wyper A to get too much under the cone, and thus sending the force intended for picking, vibrating through the loom instead.

As the cone stud C traverses a horizontal plane throughout its movement, it follows that the smoothest working pick will be obtained when the force acting upon C acts in the line of its movement, and that any tendency to force it upwards or downwards, as the case may be, is simply energy spent in destroying some portion or other of the loom. It is practically impossible to make the picking wyper act in a perfectly horizontal direction; but as in the construction of any picking wyper the stud C is assumed to be a certain distance above or below the level of the shaft B, this position should always be rigidly adhered to, and on this account it is an advantage to have the stud C a fixture in shaft D.

(To be continued.)

Silk Spinning.—VIII.

By Filsoie.

SILK WASTES (*Continued*).—*China Curlies* are a well-known waste shipped from Shanghai, and the quality and appearance are more allied to steam waste than to any other variety shipped from Canton. It is a greyish white waste, somewhat harsh to the feel. The name "curly" is given to this waste on account of its being so full of little patches of material matted together, which have a certain resemblance to a curl of hair. The waste is much in favour both in this country and on the Continent, and as the crop is somewhat limited, many times the whole of the output is contracted for at the opening of the season. It is a commodity many speculators like to gamble with, the result being that many times, when the whole crop has been cornered, the price is many pence per pound over and above its value as compared with other classes of waste. Like most Shanghai wastes, curlies are to be had in three grades, but the No. 3 is so very inferior that few English spinners can afford to buy it on account of the extra expense necessary in picking out the sticks, string, and refuse, to say nothing of the trouble caused by some of these objects getting through the dressing, etc., having escaped the pickers in the first instance. Generally speaking, English spinners buy only the No. 1's, finding even the No. 2's too much trouble in working; but there are shippers who import the proportions 60 per cent. No. 1, 30 per cent. No. 2, and 10 per cent. No. 3, written 60/30/10. Curlies are generally shipped under a chop mark, the favourite being the "Yellow Pony" (or Peony), whilst such chops as the "Double Fighting Cock" and the "Gold Lion" are fairly well known. It must not be taken that *all* curlies are shipped under a chop mark, nor even that the best curlies have a particular name or trade mark. Some recent arrivals with no chop mark whatever are quite equal to any of the "Yellow Pony" chop shipped this season; but as a general rule, spinners buying "to arrive" wish to have the chop stipulated at the time of purchase, as a kind of semi-guarantee of quality, as the various wastes from the different filatures have a certain reputation.

Shanghai Long Wastes are the most expensive wastes shipped from that port. They are to be had from various inland districts, and are known under the different names of such places, though there is a great similarity in appearance and not much difference in their qualities and yields. They have very much the appearance of knubs, but are tapey and very long. They yield exceedingly well and are of a good light colour. The annual production is comparatively small, and very few spinners can use them to advantage, on account of their high price. For particular special yarns where strength and evenness of thread are absolutely essential, Shanghai long waste is seen to advantage.

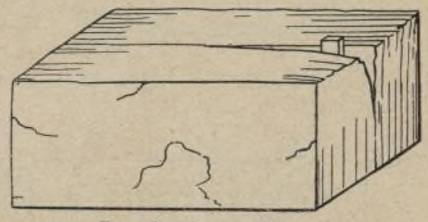
Japan Wastes.—The best known waste shipped from Yokohama is the Kikai Kibizzo, or Japan curlies. In appearance there is not much difference between this waste and China curlies, except that the former is generally of a better colour and contains curls of larger size, longer staple, and consequently yields better. Japan wastes are more in request for Continental spinners than for England, being well suited for the schapping in vogue there. Just like the China curlies, Kikai Kibizzo is shipped in three grades, but the principal buying for this country is for No. 1's alone, although at times parcels 60/30/10 are freely offered.

Iwashiro Noshi is another waste which is fairly well known here by the spinners who use the very best class of wastes. What the Shanghai long waste is to Shanghai, so is Iwashiro Noshi to Japan. They are very similar, except that the latter is a better colour, and just as Kikai Kibizzo will fetch a better price than China curlies, so is Iwashiro Noshi more valuable than Shanghai long waste. The production is very limited.

Noshito Joshiu or Tamas is practically the lowest class of Japan waste which is shipped for consumption in England for the ordinary spinner, but there are many lower varieties from Japan which are well suited for Continental schappe spinners. The reason why the latter can spin lower class wastes will be dealt with in a later article. Tamas are a stringy waste, not very good colour, and are subject to a certain amount of refuse. They are generally shipped in proportion 60/30/10.

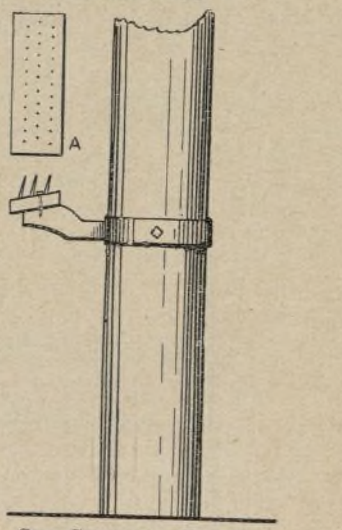
Before passing on to European wastes, some details of the buying, inspecting, shipping, and landing of wastes from the East will not be without interest.

Buying.—As in most textile trades, so in the silk-spinning industry, spinners must anticipate their requirements to a certain extent, and buy "to arrive," or "futures." This latter term is, however, seldom made use of in the silk trade. Comparatively speaking, very little waste is sent over here on account of the shippers, most of them



Silk Spinning.—Fig. 16.

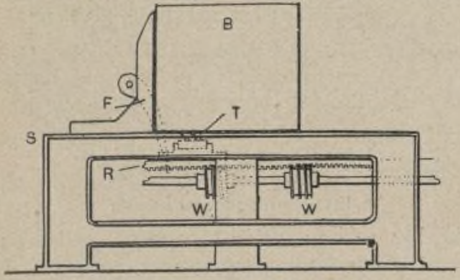
preferring to buy against orders; and on this account, when some spinners had refrained from buying much "to arrive" last season, they found themselves short of material and with nothing much to be had on spot except at exorbitant prices. This was caused more especially, however, by the actual short crop, or possibly the holding back by the natives of all they could afford to do without selling. The buying "to arrive" is done by the spinners through merchants, who transmit the offers to Shanghai, Canton, or Yokohama, according to the kind of waste required, and the matter of quality is either fixed on certain standards which the merchant shows, or the spinner stipulates that it be equal to a certain shipment already had. In the absence of standards, the merchant undertakes to deliver the "season's average"—or, in other words, he contracts that his waste will be as good as the season affords, all due care being taken at the embarkation port that inferior waste is not shipped.



Silk Spinning.—Fig. 17.

Terms.—The spinner buys on the "East India Company's Terms"—generally written "Company's Terms,"—briefly explained under the same heading on page 221 (July number). It is understood, unless otherwise stipulated at the time of purchase, that the waste will be shipped from the port within four or six weeks after the placing of the order.

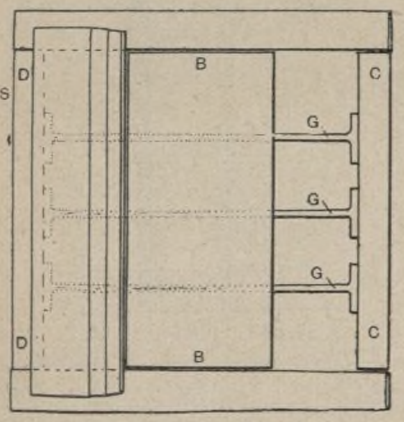
Inspecting.—The systems in vogue for inspecting at Canton, Shanghai, and Yokohama are very different, and much could be done in this respect to ensure better qualities and more uniformity in shipment, particularly so from Canton. In this latter place the shipper buys, say, a parcel of 50 bales of waste from a native dealer, who comes forward and tenders 50 bales already made up. The European inspector then picks out of the lot, wherever he may think fit, 3, 4, or 5 bales, and has them opened, and after examining them passes or rejects the parcel. If the lot is rejected, the Chinaman brings a further 50, which are subject to the same process, and so on until he has satisfied the inspector. It will be at once seen by one in the trade that this is a very lax method, for John Chinaman has these bales to sell, and sell them he will. If they are rejected by one inspector, he will tender them to another, in the hope that he may be lucky or unlucky enough to cause good bales out of the run to be opened, and so pass the lot. There is also another objection to this mode of procedure, for it is generally supposed that at all tricks of deceit and cunning the Chinaman stands in the first rank, and he is certainly very clever at making up bales in such a way that the outer coating of the layers of which the bales are made up are composed of really good silk, whilst the inside is cunningly made up of inferior waste. This is a common fault of Canton wastes of all descriptions. The only remedy seems to be that the waste be delivered in bulk to the shippers' go-downs to be inspected by them in bulk, and packed by them just as is done in



Silk Spinning.—Fig. 18.

Shanghai and Yokohama, from which ports the waste is far more uniform and more reliable. The majority of the shippers at Canton say that it is impossible to do this in the case of Canton wastes; but latterly, on account of the many serious complaints of inferiority sent over from this side, one well-known shipper has adopted this course, with a result that he is the most reliable shipper of steam wastes at the present time. It has only been done so far by way of an experiment, and it remains to be seen if it pays, so compelling other shippers to do likewise. Competitors, of course, report that it is not a success; but anything which would have the effect of raising the present standard of wastes from that market would be welcomed by the trade.

Packing and Shipping.—At Canton the wastes are all packed in small bales of one picul each (a picul is 133⅓lb.), without press-packing, but they are well bound with cane, and the wrapping is matting. Shanghai wastes, which are packed under European supervision, and in the shippers' own go-downs, are made up in three-picul bales, and are press-packed. The Japan bales are very cumbersome, being packed similar to the Canton



Silk Spinning.—Fig. 19.

bales, except that instead of one-picul bales they come over in three-picul bales. Some Japan bales are, however, press-packed like the Shanghai bales. The shipping is, of course, undertaken by the European shippers out in the East, and, generally speaking, the documents covering the shipments are passed through the Eastern banks with a bill at four, five, or six months' sight, to be accepted here by the merchant and returned to the bank, which holds the waste until the bill is retired, when the merchant gets the necessary release order.

Landing.—On arrival in London the waste is at once taken in hand by the Dock Company or wharfingers, and immediately it is landed the gross weights of each bale are carefully taken, and a certain number of each parcel tared, and the average tare of those taken is reckoned on the whole parcel. No. ¼ or ½lb. are reckoned: supposing the average tare is 8¼, 8½, or 8¾lb., the tare allowed is 9lb. per bale, and any bale weighing, say, 129¾lb. gross, even though the average tare were 8¼lb., would only be chargeable 120lb. net. When the bales have been landed, lotted, and examined for damage, dock samples are drawn from every fifth or tenth bale according to request, and sent down to the buyer, and on receipt of these he must decide whether the quality is up to the standard on which he bought. Once having passed these impartial dock samples he is held to have passed the waste, and has no claim for inferiority should he be disappointed with the waste when the bulk is delivered at his mill, unless he can prove some very flagrant case of false packing, and even then he must trust to the merchant from whom he bought. Naturally it will often be in the latter's interest to meet his client when possible, and do as well for him as he can.

European Wastes.—Little need be said about the various qualities of these wastes, as all have very similar characteristics, and are, practically, with the exception of the French and Italian knubs, the products of the silk-throwing mills as described under the heading "Throwing." Knubs, however, are the long wastes produced in the filatures where the raw silk is wound from the cocoon, and have the same appearance and characteristics as the Shanghai long waste, and Iwashiro Noshi, except that they are finer and of a more "classical" nature. These knubs are particularly in request by the Continental spinners.

Of the many varieties of European wastes, the following are the best known:—French China, Swiss China, Italian China, French mixed, Piedmont and Spanish waste. *French China*, as its name implies, is the waste produced in the French throwing mills working China raw silk. *Swiss China* is the same produced in Switzerland; *Italian China* the same produced in Italy. *French mixed* is grey and yellow waste from the throwing mills, and is composed of Bengal, Canton, and Japan, as well as Italian and French wastes. It is somewhat subject to cotton, but is quite a favourite gum waste. *Piedmont waste*, as the name implies, is the fine Italian yellow waste made in the throwing mills producing organzines and trams from Piedmont raw silk. It is one of the most expensive yellow wastes, yielding very well, and producing a strong lustrous yarn.

These European wastes are not bought on what are known as "Company's Terms," but in the ordinary way of trade, the spinner getting credit, or at least getting the silk delivered before he pays for it, contrary to the custom with Eastern wastes. In this way he can ascertain, on the arrival of the bulk, whether it is up to sample or not. There are faults, however, which cannot easily be detected until the waste has been boiled or otherwise treated, so if he has any doubts about it at all, the spinner, immediately on arrival, takes steps to ascertain if it is free from twist or crape—*i.e.*, hard twisted threads.

Given these brief notes on a few of the many varieties of silk waste, from which it will have been noted that the colour, the diameter of thread, and the packing are so varied as delivered to the spinner, and being also a much tangled mass of all lengths of fibre, some bales hard press-packed and other qualities loosely packed, it will be understood that preparatory to boiling or schapping—*i.e.*, degumming—a certain amount of opening, sorting, and mixing will be absolutely necessary.

Opening Bales.—All French, Swiss, Italian, and English silks are loosely packed, fine and coarse generally separate, so that in an ordinary way one would empty all the bags of the same quality and make a stack of waste of the same. Should it be necessary to mix white and yellow together, then a layer of white would be spread on the floor, and then a layer of yellow spread over this, in whatever proportion the spinner had decided the mixing should contain. The whiter the yarn required, the more white waste would be necessary in the mixing, and *vice versâ*. This process would be repeated until the whole of the waste required to complete the mixing had been added to the stack. In taking from this stack for boiling, care would have to be taken to see that the silk was most carefully drawn from the face of the bulk in even proportions from top to bottom, to ensure uniformity of colour in the subsequent processes. There is an alternative method to the above, which is adopted by some spinners. Instead of mixing the white and yellow wastes whilst in the gum state, each colour is boiled off separately, and then the boiled silk waste is put into the layers as described.

Steam wastes and most filature-produced wastes are fairly loose, and one-picul bales can either be taken singly and boiled entire, or a certain weight boiled, taking each bale just as it comes; or the waste can be sorted—that is, each layer of silk can be separated, the good waste taken off and put on one side, and the inside of the layer or bad waste put in another place, so that each quality can be boiled separately.

Press-packed bales of gum waste from Shanghai and wastes from Japan are very troublesome, Shanghai wastes particularly so. After taring these bales they are laid on the floor edge up (Fig. 16), wooden wedges are driven betwixt the layers of silk, and they are thus split asunder. The most difficult task now is to break up the layers, pickaxes being resorted to; and when by this means the operator has loosened some portion of silk, he pulls it asunder with his hands, but even those portions taken off are very often so hard and clotted together that they have to be heckled open. A number of strong, coarse pins, each, say, 3in. long and ¼in. thick at the root, are fixed into a metal strip, say, 12in. long and 4in. broad, the pins being set diagonally as in Fig. 17, in which A shows them in plan. This strip is securely fastened to a pillar or projected from the wall as shown.

The attendant picks up a portion of waste in his hands and hits it forcibly on the pins, which hold it, and he then pulls from the pins or heckles in a slightly downward direction, so loosening the matted portions of silk. The whole process is a primitive and tedious one; but as only a few spinners use such wastes, it is not usual to employ a machine for the purpose. Still, the one illustrated in Figs. 18 and 19 is worth consideration. The machine consists of a raised grid, shown in plan in Fig. 19, composed of cross bars C and D, with strong plates G fixed to each at right angles. A whole bale B is put upon this grid. Underneath and between each pair of plates or bars G a series of strong teeth T (Fig. 18) are affixed, sliding on racks R, which are propelled from side to side of the bale by means of worms W. These teeth scrape a portion of silk from the bale and carry it to the side S, when, before the bar recedes, a fork F descends between each pair of bars G behind the waste which is adhering to the pins, and when the bars recede the fork prevents this waste returning and clears the pins, which recede preparatory for another forward motion.

(To be continued.)

The Mechanism of Spinning.—XVIII.

By H. R. Carter.

The winding mechanism of the roving frame for stalk fibres, such as flax and hemp, is as interesting and important as is that of the cotton frame last described. It requires even more exactitude, since the fibres themselves are not nearly so elastic as is the cotton fibre, and consequently, if the rove is subjected to any strain, it is drawn and spoiled. The very fact that the fibres are long and strong necessitates that the rove be very slackly twisted, in order that it may be drawn out or drafted in the spinning frame. The rove should only be sufficiently strong to enable it to be drawn off the bobbin, and for this reason it is absolutely necessary that it should be wound upon the bobbin under a like tension. In roving frames other than those for cotton, the bobbin almost always lags behind the flyer, and as it is constantly increasing in diameter, its speed must increase as the bobbin fills. Here, again, a differential motion is required, and the one almost universally employed is Houldsworth's. It is to be noted, however, that one maker of this class of machinery has adopted the differential gear which Messrs. Brooks and Doxey employ in their cotton frame (Fig. 19), while in the cotton frame two cones are employed to regulate the speed of the differential wheel. Each maker of flax and hemp machinery has his own special method. Two use the cones, one the expansion pulley A (Fig. 48), and one the disc and scroll mechanism (Fig. 49). All of these have the same object—namely, to *increase* the speed of the bobbin as it fills by *diminishing* the speed of the differential wheel B, which turns in the same direction as the frame shaft C in a manner and in a proportion described previously. With regard to the cone drive, at one time a single cone and a flanged belt pulley sliding upon a feather upon the upper shaft were employed; then two superposed cones with a friction bowl upon a feathered shaft between them. Both of these types have been superseded by a pair of parabolic cones connected by a strap. The face of one of the cones is rounded, while the other is correspondingly hollowed, the nature of the curves being such that the sum of corresponding diameters is constant, and the belt consequently under a uniform tension, while a constant increase or decrease of speed is obtained for the driven pulley for any given shift of belt. The diameter of a properly-shaped cone at any point may be found by multiplying the length of the cone in inches by the greater diameter, and dividing by the length of the cone in inches plus the distance of the given point from the large end of the cone. Thus the diameter of a cone 36in. long at a distance of 12in. from the larger end, which is 6in. in diameter, is $\frac{36 \times 6}{36 + 12} = \frac{216}{48} = 4\frac{1}{2}$in. The diameter of the complementary cone at a similar distance from the small end, which is 3in. in diameter, is $(6 + 3) - 4\frac{1}{2} = 9 - 4\frac{1}{2} = 4\frac{1}{2}$in., from which it may be seen that it is not in the centre of the cones where the diameters are equal, as might be imagined. The bottom or driven cone communicates a variable motion to the builder and to the crown or differential wheel B in a similar manner, as does the expansion pulley A (Fig. 48).

The expansion pulley is in two halves, A and A^1. The former is fast upon its shaft, while the latter is free to move inwards and intersect the former as it is constrained to do so by being gradually raised and at the same time pressed against a triangular slide. The raising of the expansion pulley around the shaft D as a centre compensates exactly for its increase in diameter, and keeps the driving band E at a constant tension. F is a grooved rim or rope pulley fast upon the boss or drawing roller of the frame. The pulley is raised by means of a quadrant, the arm of which supports the end A. The angle plate which controls the intersection of the two sides of the pulley is generally made with a bevel of 1in. per inch perpendicular. The angle of the sides of the pulley is generally such that for every inch the pulley is pushed in, its diameter is increased by $1\frac{1}{4}$in. Each shift of the quadrant and of the pulley is effected when the builder has reached the extremity of its travel at either end by the escapement of a ratchet wheel, the catch retaining which is released by the motion of the builder. The speed of the bobbin and builder is thus regulated for the succeeding layer of rove. Fig. 48 also shows the most important parts of the roving frame. G and G^1 are the feed rollers, and H the boss or drawing roller. The space between these two sets of rollers is occupied by the fallers and gills, which are driven forward by screws actuated by bevel gearing similar to O. The draft gearing is also shown, P being the draft pinion, by increasing or reducing the size of which the speed of the feed rollers is diminished or augmented, and the draft lengthened or shortened. The twist gearing is shown between the boss roller and the spindle. The speed of the spindles is constant for any given speed wheel K, being usually between 300 and 500 revolutions per minute, according to the coarseness of the frame. More or less twist is given to the rove by diminishing or increasing respectively the speed of the boss roller H by putting on a smaller or larger twist change wheel L. The gearing for driving the bobbin from the socket wheel N, through the bobbin shaft Q, bevels and carrier R, are also clearly shown. S is the builder shaft upon which pinions T drive the builder up and down by means of racks, the reciprocating motion being obtained in the case of Combe's frame by the use of the "mangle" wheel V and change motion shown in detail in Fig. 50. In that figure, A is a wheel which has a pinion fixed upon its pap, and gearing internally with the mangle wheel V. The wheel A is driven alternately by one or other of the two small pinions E and C, which gear into each other and alternately with the wheel A. The pinion E is upon the end of a movable shaft driven from the differential motion. The pinion C works loose upon a stud fixed in the arm D. This arm D is moved backwards and forwards, putting the pinions E and C in and out of gear by means of the connecting rod G communicating motion from the piece F, which is turned upon its centre by the up-and-down motion of the builder. A quick and effective change is effected by means of the wedge-shaped pieces H, the upper one forming part of a weighted lever centred in J. The apex of the upper wedge should be vertically

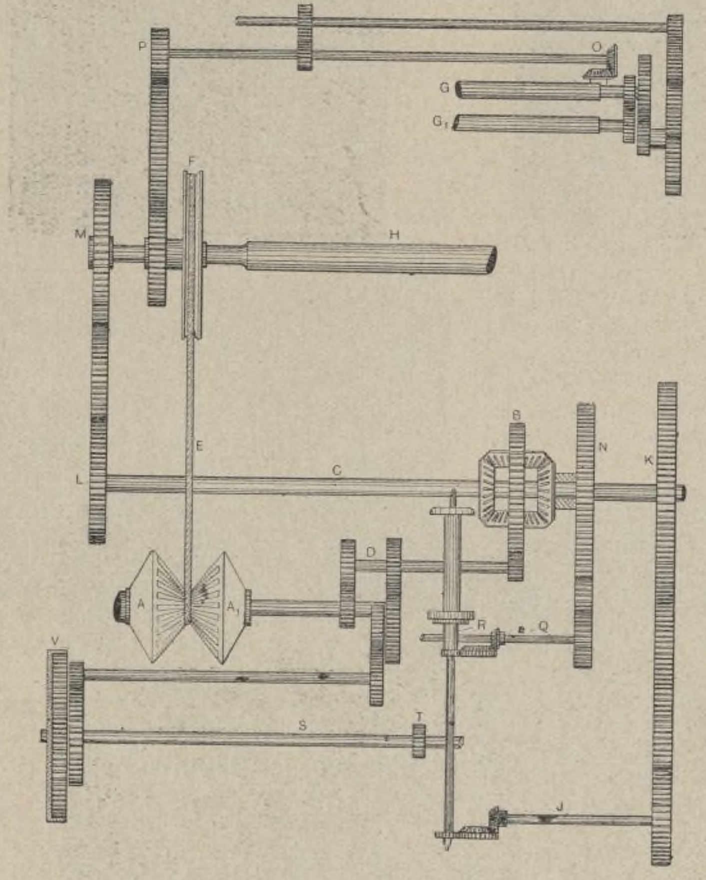
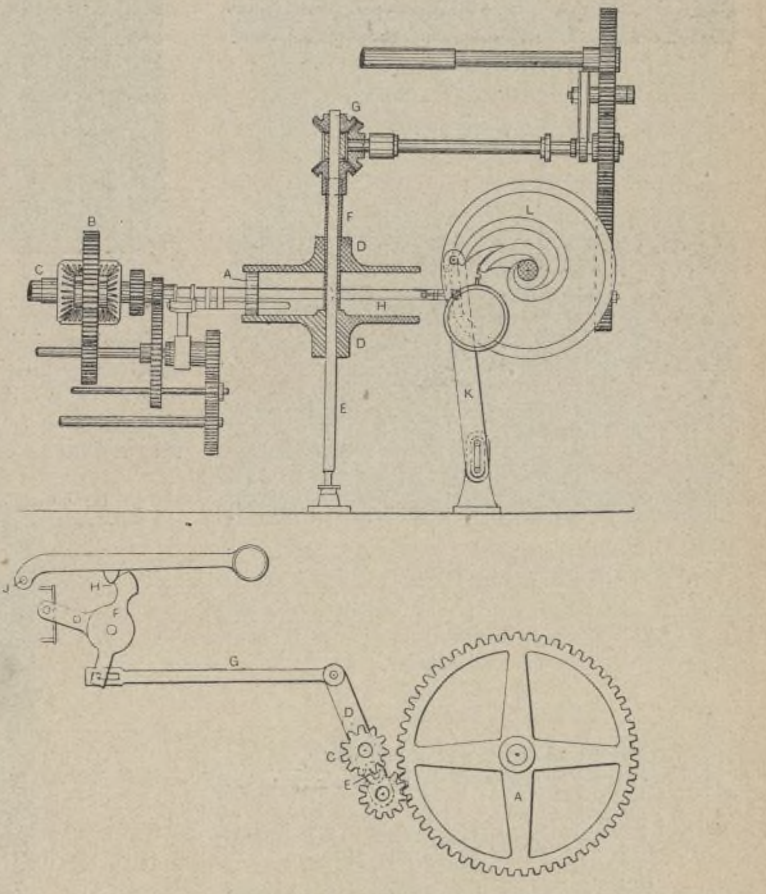


FIG. 48.

THE MECHANISM OF SPINNING.

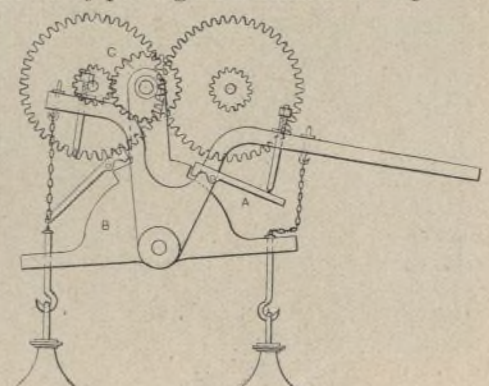


FIGS. 49 AND 50.

above the centre of F, so that the piece F, being symmetrically designed and turned in a negative sense by the falling builder, quickly escapes as the apices pass, and the pinion C is forced into gear with the wheel A while the pinion E is disengaged, and the wheel A and the builder are driven in the opposite direction.

Fairbairne's disc and scroll mechanism are shown in Fig. 49. A is a friction bowl sliding upon a feather on a shaft, which through the gearing shown regulates the speed of the differential wheel B. The bowl A and the shaft upon which it slides receive motion by frictional contact with two horizontal discs D, D upon a vertical shaft E. The diameter of the discs is usually 20in. The lower one only is keyed upon the shaft E. The upper one works on a long sleeve which carries a mitre wheel on its upper end. The vertical shaft or spindle E projects through the sleeve F, and has another mitre wheel G keyed upon its upper extremity. The vertical shaft E and discs D, D receive their motion through intermediate gearing from the twist wheel. This motion is a regular one, and the change in speed of the crown wheel is effected by shifting the friction bowl from the periphery towards the centre of the discs by means of the guide rods H, the lever K centred at its base, and the scroll L. The other parts of the mechanism are similar to those already described.

In the roving frame for vegetable stalk fibres the rove is almost invariably built upon bobbins with flanged ends, and each layer is of equal length or traverse. For this reason the change motion for the builder is much more simple than in the cotton frame, where the ends of the bobbins are made taper by gradually reducing, at both extremities, the length of the traverse. Fig. 51 is a "rat-trap" or strike motion often employed with the cone frame, and is not dissimilar to that in Fig. 20, without the round rack for varying the length of traverse. The catch A to the right is shown holding the tumbler bracket B, with the



THE MECHANISM OF SPINNING.—FIG. 51.

pinion on the end of the movable shaft C in gear with the wheels to the left. When this catch is

TEXTILE DESIGNS IN AMERICA.—FIG. 1.

relieved by the descending builder depressing the arm of the catch bracket D, the bracket B turns on its centre, bringing the wheel and shaft C into

TEXTILE DESIGNS IN AMERICA.—FIG. 2.

gear with the wheel to the right, and in this way changes the direction of rotation of the wheel C and of the motion of the builder.

(To be continued.)

Textile Designs in America.

THE rapid growth of manufacturing in the United States during recent years can find few parallels in history, and amongst

TEXTILE DESIGNS IN AMERICA.—FIG. 3.

many classes of industry the textile section is one of the most noticeable. The import tariffs which

TEXTILE DESIGNS IN AMERICA.—FIG. 4.

shut out our goods to a large extent, and which we on this side of the Atlantic look upon as mistaken policy, have been largely instrumental in giving American industries a firm foothold in their own country, and manufacturers have undoubtedly had their work made easier, whatever the hardship which falls upon the American consumer may be. The progress in cotton manufacturing is noticeable, especially in the Southern States, whilst a silk industry is being built up which threatens to eclipse even that of Lyons in importance.

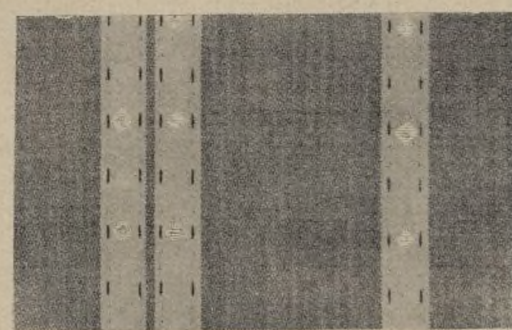


FIG. 5. TEXTILE DESIGNS IN AMERICA. FIG. 7.

Americans follow Paris in their fashions, although not by any means slavishly. American are very much like English manufacturers in this respect, although they have not had as much experience in the originating of novelties. However, the designs shown by American manufacturers suggest undoubted taste and ingenuity, even in the modifications of suggestions obtained from European styles. A few recent American patterns for the coming spring season are illustrated herewith, for which we are indebted to our contemporary, the "Dry Goods Economist."

Fig. 1 is a mousseline all-over design in silk, appliqued with taffeta.

Fig. 2 is an all-over design in black and white silk on a plain ground. The chief feature is what is called the new briar stitch.

Fig. 3 is a chêne print combined with a small broché design in a silk cloth.

Fig. 4 is an embroidered mousseline de soie shown in black and white. Although the outline of the design is not done in the loom, the effect obtained could be well imitated, either by extra weft or lappet work.

TEXTILE DESIGNS IN AMERICA.—FIG. 6.

Fig. 5 is a neat mohair stripe woven in stuff goods and shown in pastel shades.

Fig. 6 is a beautiful rose and foliage combination, and one which could be well adapted for tapestry cloths in addition to its present form as a fancy silk fabric.

TEXTILE DESIGNS IN AMERICA.—FIG. 8.

The following are American suggestions for patterns for the same season (spring, 1902):—

TEXTILE DESIGNS IN AMERICA.—FIG. 9.

Fig. 7 is a neat check suitable for making in either silk or cotton, and in various colour combinations.

Fig. 8 is a fancy cotton design for blouse cloths, and is a combination of open gauze and a figured stripe on a plain ground.

Fig. 9 is a pretty jacquard effect for weaving in a mercerised cotton warp on a satin ground. The floral portions are weft floats, and the trailing ribbon portions are worked in repp. This design would also look well as a print.

Figs. 10 and 11 are print suggestions, the former being suitable for a mercerised weft satin cloth and the latter as a foulard. The delicate pattern and fine lines of this last pattern are of a class of design which is very popular in white on dark-blue grounds.

FIG. 10. TEXTILE DESIGNS IN AMERICA. FIG. 11.

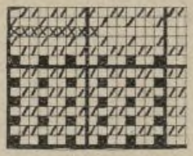
Fancy Dress Fabrics.—XXII.

BY G. WASHINGTON.

THE principal feature of interest in the fancy repp illustrated in Figs. 216 and 217 is the small weft spots, marked by crosses in Fig. 217, which ornament every sixth cord. These spots are formed by 4 picks of 50's silk (working together and shown as one in the design), which are not incorporated into the cord, but show alternately on the face and back of the fabric. The cords ornamented by the spots do not stand up so prominently as the others, and only contain

FANCY DRESS FABRICS.—FIG. 216.

two small cotton picks. The weft for the thick cords consists of three threads of 2/24's cotton twisted together. 19in. of worsted warp and 13in. of cotton warp are required to make 12in. of fabric.



FANCY DRESS FABRICS.—FIG. 217.

Warp.

1 end 2/100's cotton.
2 „ 2/70's worsted.
90 ends per inch.

Weft.

5 times { 1 pick cotton twist.
          1 „ 2/100's cotton.
1 „ 2/100's cotton.
1 „ silk.
2 „ 2/100's cotton.
54 picks per inch.

The fabric shown in Figs. 218 and 219 is similar in construction to the last example, but the weft spots are larger and farther apart; also, the silk weft, when not forming the spots, is utilised in the structure of the fabric, taking the place of the small cotton pick in the repp portion, floating over all the worsted and under the cotton warp, and giving a lustrous appearance to this part of the fabric. The cotton picks pass over the cotton and under the worsted warp. This example illustrates what a great influence the thickness of the yarn has upon the structure and appearance of a fabric. The first 9 picks of the design give a repp structure, with prominent cords, and the weft scarcely discernible on the face; the next 9 picks, with exactly the same weave, give a level fabric showing more weft than warp on the surface.

Warp.

1 end 2/100's cotton.
2 „ 2/70's cotton.
90 ends per inch.

Weft.

4 times { 1 pick 2/100's cotton.
          1 „ cotton twist.
2 „ 2/100's cotton.
4 times { 1 „ silk.
          1 „ 2/100's cotton.
54 picks per inch.

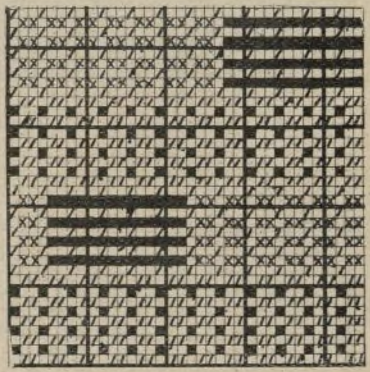
The waved appearance of the cords in the black silk fabric illustrated by Figs. 220 and 221 is caused by stitching down the silk warp at varying distances from the thick wadding picks. This not only draws the wadding pick out of a straight line, but also presents an uneven surface to the light, each

FANCY DRESS FABRICS.—FIG. 218

cord having a flat and round side which gradually change places with each other. The first and fifth picks are fine cotton, because they pass over so many of the silk threads and would be too conspicuous if made of worsted like the remainder. Firmness is imparted to the fabric by causing the cotton and worsted picks to weave plain with the cotton warp.

Warp.

1 end 2/80's cotton.
2 „ 70/2 silk.
192 ends per inch.



FANCY DRESS FABRICS.—FIG. 219.

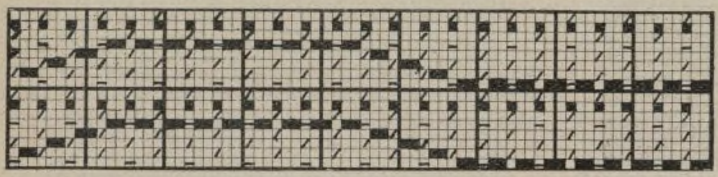
Weft.

1 pick 2/80's cotton.
3 „ 28's worsted.
1 „ 2/80's cotton.
1 „ 28's worsted.
1 „ 8 skeins woollen, soft twisted.
1 „ 28's worsted.
60 picks per inch.

Fig. 222 shows the appearance of a figured black silk; Fig. 223 is taken from the centre of one of

FANCY DRESS FABRICS.—FIG. 220.

the flowers, and shows a portion of the stem as well as some of the petals. The centre of the flower is formed by a fine silk pick, which interweaves plain with five pairs of silk threads. The sixth pair of silk threads is used to form a plain back with the worsted weft, as shown by strokes in the design. The leaves are formed in the same manner, excepting that as they are not so large, the silk picks interweave plain with the whole of the warp, and the worsted weft is loose on the back. The petals and stems are solid warp floats; when the stems are very straight up, extra long floats are prevented by twilling them with weft at intervals. Each cord in the ground contains both a silk and worsted pick.



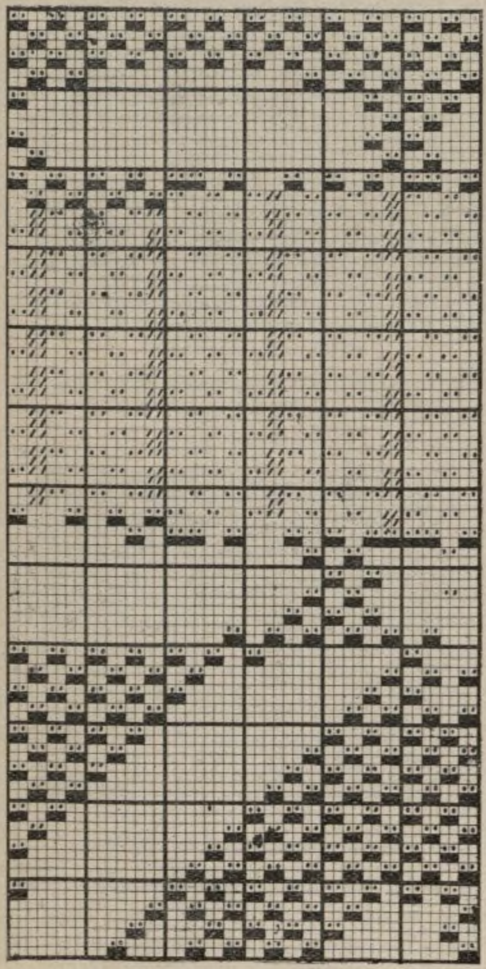
Fancy Dress Fabrics.—Fig. 221.

Warp.
80/2 silk.
288 ends per inch.

Weft.
1 pick, 2/40's worsted.
1 „ 80/2 silk.
88 picks per inch.

Fancy Dress Fabrics.—Fig. 222.

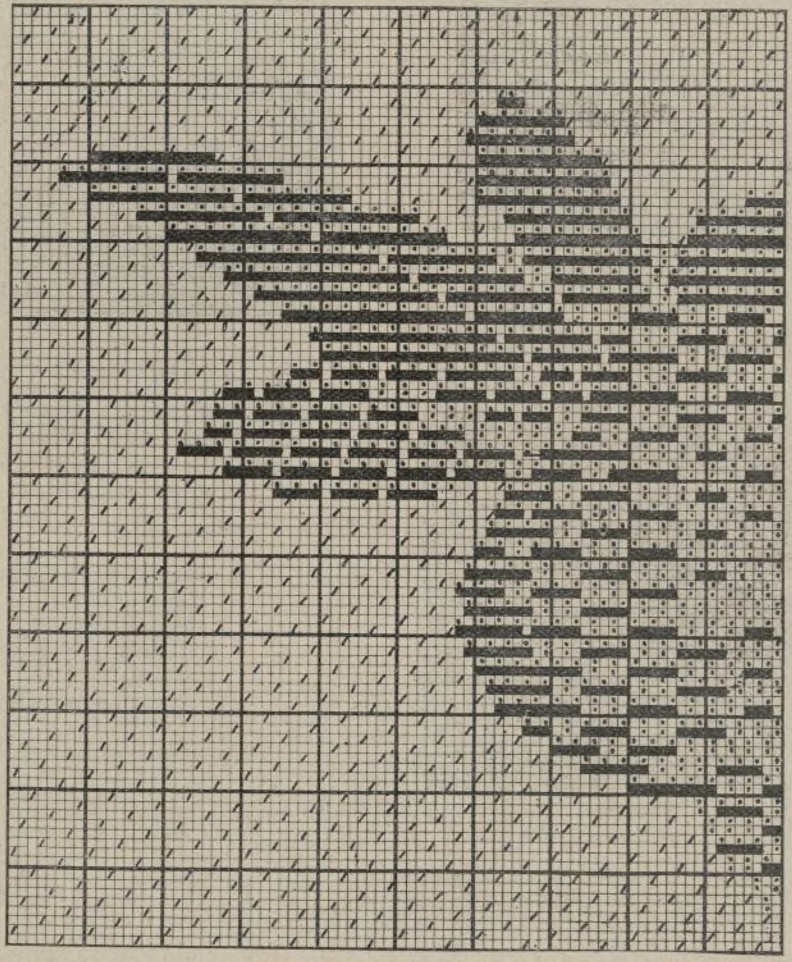
An example of figured broché is shown in Fig. 224. The flowers and stems are well worked out in weft floats and cord effect. The portion



Fancy Dress Fabrics.—Fig. 223.

chosen for illustration in Fig. 225 is the small leaf-like effect projecting from the cloudy scroll near the bottom left-hand corner, and shows another method of shading. The weft floats are arranged in rows instead of twills at this particular place.

Warp.
Black silk, 5500yds. per ounce
204 ends per inch.



Fancy Dress Fabrics.—Fig. 225.

Weft.
Black silk, 2000yds. per ounce.
144 picks per inch.

The black silk illustrated in Figs. 226 and 227 is ornamented with a combination of solid warp and double plain effects. The difference between this and Fig. 222 is in the structure of the ground weave, which is repp instead of cord. It is interesting to notice the influence this change of weave has upon the structure of the ornamental figures. Where the silk warp is on the surface, forming solid warp figures, the cotton picks act as wadding, while the silk weft weaves plain on the back with the cotton warp. In the double plain portions the whole of the silk warp and weft is utilised for the face, and the cotton warp and weft for the back.

Warp.
1 end 2/100's cotton.
4 „ 80/2 silk.
160 ends per inch.

Weft.
2 picks silk, 9000yds. per ounce.
1 „ 15's cotton, soft twisted.
69 picks per inch.

A crêpon effect is imitated in Figs. 228 and 229. The fabric is double plain in structure; the thick spiral weft weaves plain with every fifth thread, while the fine silk weft makes a second plain fabric with the remaining threads. The pattern is formed by the two fabrics changing places. The spiral weft is about 3½ hanks per pound, and consists of six threads of 24's twisted round a thread of 48's worsted, which is very tightly tensioned.

Warp.
70/2 silk.
140 ends per inch.

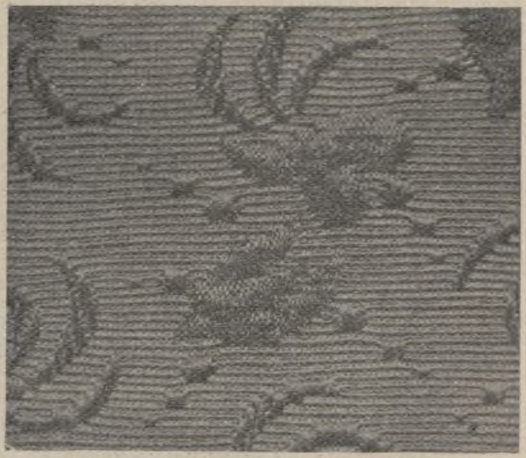


Fig. 224. Fancy Dress Fabrics. Fig. 226.

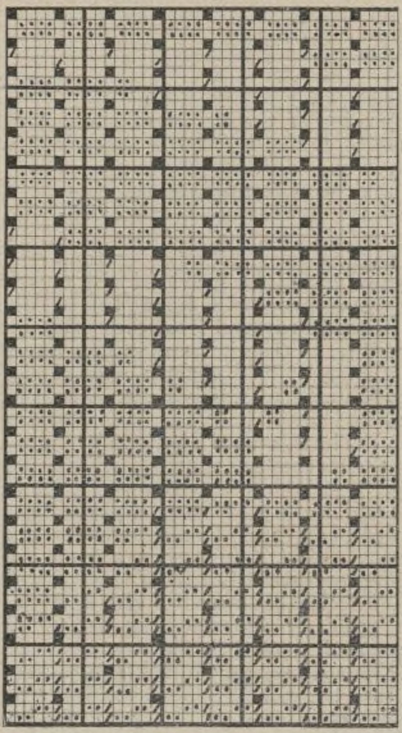
Weft.
4 picks silk, 18,000yds. per ounce.
1 „ spiral worsted.
55 picks per inch.

(To be continued.)

REVIEWS OF BOOKS.

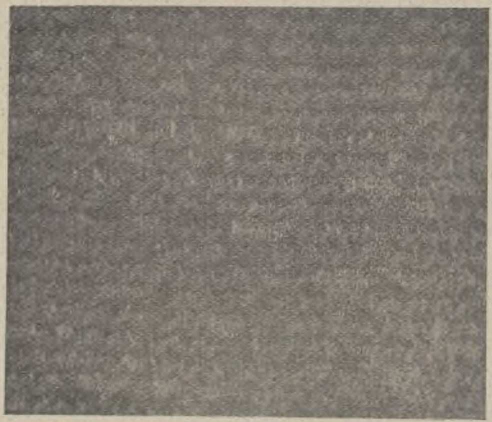
Theorie der Schaft-und Jacquard-gewebe. By Anton Gruner. Vienna: A. Hartleben. 6 marks.

This book, unfortunately for the majority of English readers, is written in German. It takes in detail every stage of the work of a textile designer, and illustrates the various descriptions by a profusion of coloured plates, the various colours being specially serviceable when complicated weaves like, say, some of the double cloths are being explained. The work begins at the plain weave, and passes through twills on to drafting, which latter comprises the calculations necessary for arranging healds for complex drafts. From that



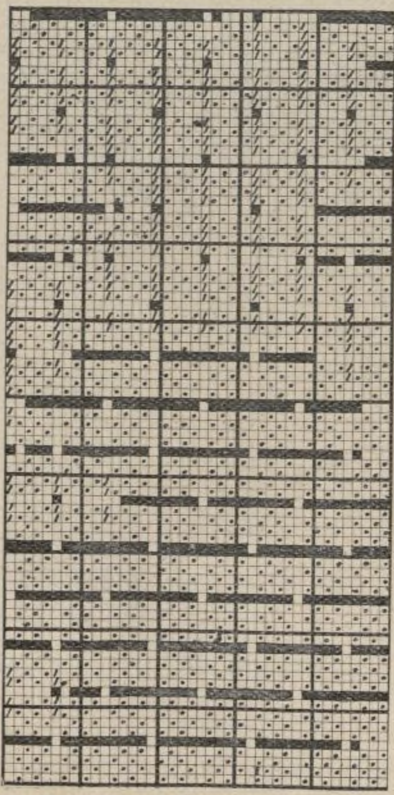
FANCY DRESS FABRICS.—FIG. 227.

point onwards through all the dobby designs each design is supplied with its pegging plan and draft, and the various changes of weave in each design



FANCY DRESS FABRICS.—FIG. 228.

are more readily seen by their different colourings. Stripes, checks, diagonals, and small fancy weaves are treated in turn, gradually developing into



FANCY DRESS FABRICS.—FIG. 229.

intricate weaves requiring more careful drafting. The colouring of the fabric and the effects obtained by various thread arrangements in different designs are simply explained and well illustrated, after which the writer passes on to weft and warp backed cloths, and then to double cloths. From this point designs requiring a jacquard come into evidence, but in the illustrative types of fabrics which follow it is often necessary to return to dobby weaves and their drafting arrangements. Matelasse cloths, figures formed by extra weft, warp, or both, are illustrated, and a portion is devoted to the making of three-fold cloths. The more complicated mantle cloths and the most fancy types of upholstery, dress and trimming cloths are specially well explained, and the work concludes with a comprehensive treatment of gauze and plush weaving, the former of which receives special attention, especially in the more complicated combinations which sometimes occur.

A DICTIONARY OF DYES, MORDANTS, ETC. By C. RAWSON, W. M. GARDNER, and W. F. LAYCOCK. London: C. Griffin and Co. Limited. 16s. net.

As a dictionary this work appears to fulfil all that can possibly be required of it, while in the way of general textile information its title far from covers its capabilities. To dyers it presents the known dyestuffs, mordants, and other chemicals connected with the trade in an easily-referable form, giving the makers of dyestuffs and all the necessary chemical particulars connected with dyes and dyers' drugs. Arranged alphabetically, it enables any of these to be rapidly referred to by the busy business man. As regards general information, the book contains much which will make it valuable to the manufacturer and merchant; for instance, a few pages are devoted to the analysis of cloth, and similar subjects, all more or less allied to the textile industries, are tersely, yet fully, treated under their various headings. Many useful data and tables are also given, which, presented in this form, enable them to be turned to at short notice, saving considerable time and perhaps disappointment. The work was compiled with a view to its forming a companion volume to "The Manual of Dyeing," by two of the same authors, and treated in such a light it makes a treatise of no slight value.

DYEING AND CLEANING. By G. H. HURST. London: C. Griffin and Co. Limited. 4s. 6d.

THIS is the second edition of the above book, issued in a revised and enlarged form. As the name indicates, it has been compiled chiefly for the garment re-dyeing and cleaning trade, although in many ways it will be found useful to the ordinary dyer. After treating on the structure and properties of the different textile fibres, the various cleaning methods are described, both by water and the different so-called dry processes. The dyeing section describes the different dyestuffs, processes, and dyeing machinery in a very exhaustive manner, discussing the treatment of goods made from different and mixed materials. The bleaching, finishing, and getting-up of garments are treated, along with such goods as lace curtains, ribbons, velvets, and similar materials. There are also chapters devoted to the cleaning and dyeing of feathers, gloves, and straw goods, while an appendix contains a small dictionary of dyers' drugs, many useful tables, comparative weights and measures, etc.

THE "MECHANICAL WORLD" POCKET DIARY AND YEAR BOOK FOR 1902. Manchester: Emmott and Co. Limited. 6d.

THE fifteenth annual issue of this handy pocket companion for engineers shows a still further increase in the number of pages, and now embodies some useful notes on the care and management of dynamos and motors, which, in view of the widening use of electrical plant, will still further increase the value of the book to engineers in charge of, and others interested in, such machinery. Additional notes on air pumps, friction clutches, and on hydraulic presses are among the other most noteworthy additions. Bound in a neat cloth cover and comprising some 350 pages, including a diary, the book is a most remarkable production for the low price charged.

WARP-RECKONING TABLE. By A. G. WOODHEAD, Halliwell Cotton Works, Bolton. 10s. 6d.

THE old and well known type of ready-reckoner, with its hundreds of closely-figured pages, has been found by many—especially those not possessing a taste for arithmetic—a much preferable way of arriving at a desired result than by working out on the usual lines. The time taken in turning over the many pages, however, does not effect much economy in time compared with the paper-and-pencil method, although where many calculations are done per day there is a great saving of mental effort. The new ready-reckoner does away with all the pages of the old one, and consists simply of two backs, inside which are printed logarithmic equivalents of the number of ends, of the yards, and of the counts, while the resultant weight is read off by means of the antilogarithmic equivalent. This is the theoretical description, but it need not trouble those who do not understand it, for absolutely no knowledge of logarithms is required to work the table, simple addition being all that is necessary. In plain language, each number of ends is given a representative number, and the same is done for the yards and counts. The three representative numbers are added, and the sum gives a representative number, which, read off another table, gives the weight.

WE have also received:—"Judges' Report of the Third Liverpool Trials of Motor Vehicles for Heavy Traffic," giving detailed information relating to the vehicles used and the routes travelled. (Liverpool: Winstanley and Watkins. 10s.)—"Sprinkler Bulletin" (September, 1901), describing, amongst other matter, two recent large Manchester fires, a new mill at Bolton, and some cotton mills in Switzerland.—"Report of the Inquiry into the Working of Compulsory Conciliation of Arbitration Laws." (Sydney: William A. Gullick, Government Printer. 1s. 9d.)——Messrs. Hudson and Kearns, Southwark-street, London, send samples of their handy blotting-pad diaries, of which a number of different designs have been introduced. We have long used the form known as No. 8A, and find it a most convenient desk companion. It is provided with engagement and date slips, space for standing memos., pad of writing paper, and a ledger-edged diary, thus fully meeting a business man's requirements.—The diaries, calendars, cards and booklets which have this year been issued by Messrs. Raphael Tuck and Sons Limited, Moorfields, London, very plainly show that successful as their previous efforts have been, it is still possible to effect improvements, not only in the design and execution of those artistic productions for which this firm has become so deservedly famous, but also in the devising of novelties, in many of which no inconsiderable amount of ingenuity is displayed. It is pleasing to note that mere prettiness has given place to really artistic compositions, in which it may be well said that both design and colouring leave nothing to be desired. Not the least noteworthy feature of these productions is the immense variety of designs which have been introduced; while a good word should also be said for the very tasteful and at the same time serviceable calendars which emanate from this well-known publishing house.—The Memorandum by the Chief Engineer presented to the Manchester Steam Users' Association contains, as usual, a deal to interest steam users and boiler owners generally. Some notes on steampipe arrangement are not without interest, but a more important subject—the treatment of boiler feed water prior to its use in the boiler—is dealt with in a full and practical manner, the figures given bearing on the cost of purifying and softening plants being of special value.

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. G. (Laisterdyke).—"Spinning Woollen and Worsted" (McLaren), 4s. 6d. There is not a cheap book on top dyeing.

LOOM (Nottingham).—Messrs. Robert Hall and Sons (Bury) Limited, Bury; and W. Smith and Brothers, Heywood.

J. GIEDION (Vienna).—Messrs. Hahlo and Liebreich Bradford; and Thomas Larmuth, Todleben Ironworks, Salford.

CO-OPERATIVE MANUFACTURING SOCIETY (Paisley).—Employers do not as a rule divulge their wage lists. You might obtain the information from trade-union officials.

E. W. (Cleckheaton).—Messrs. Joh. Jacob Rieter and Co., Winterthur, Switzerland. The apparatus is described on page 52 of the February number of THE TEXTILE MANUFACTURER.

C. D. H. (Renaix).—See articles on "The Sizing of Cotton Goods" which ran during 1899 and 1900 in THE TEXTILE MANUFACTURER. They will give you all the information you require.

ING. VITTORIO CALDERARA (Milan).—Mr. D. Halstead, Crow Oaks, Whitefield, Lancashire. The roller is described on page 300 of the August, 1897, issue of THE TEXTILE MANUFACTURER.

CERTIFIED ENGINEER.—No, there is no examination of the kind either by the Board of Trade or other authority. It is always a matter of experience, the conditions of which vary with different employers.

R. B. (St. Petersburg).—You probably mean the "Designograph," described on page 194 of our June issue. This does all you mention. Write the Designograph Company Limited, 23, Bank-street, Bradford, Yorks.

W. T. (Farsley).—If you turn to page 211 of the June issue of THE TEXTILE MANUFACTURER, you will find an interesting article on waterproofing, in which the use of alum is condemned. That is probably your weak point.

W. STEWART AND SON (Twynholm).—No book is devoted to the subject, but help may be got from "Dyeing of Textile Fabrics" (Hummel), 5s.; and to a less degree from "Woollen and Worsted Manufacture" (Beaumont), 7s. 6d.

THE TEXTILE MACHINIST:

Devoted to Machinery, Apparatus, Tools, Etc.

Improved Hopper Bale Opener.

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

THE last two or three years have been noticeable for the large amount of attention paid to the machinery used in the preparatory processes of cotton spinning. Whether this is the result of modern competition, or whether the labour once concentrated on the mule and spinning frame has enlarged its sphere, it is hard to say; but wherever

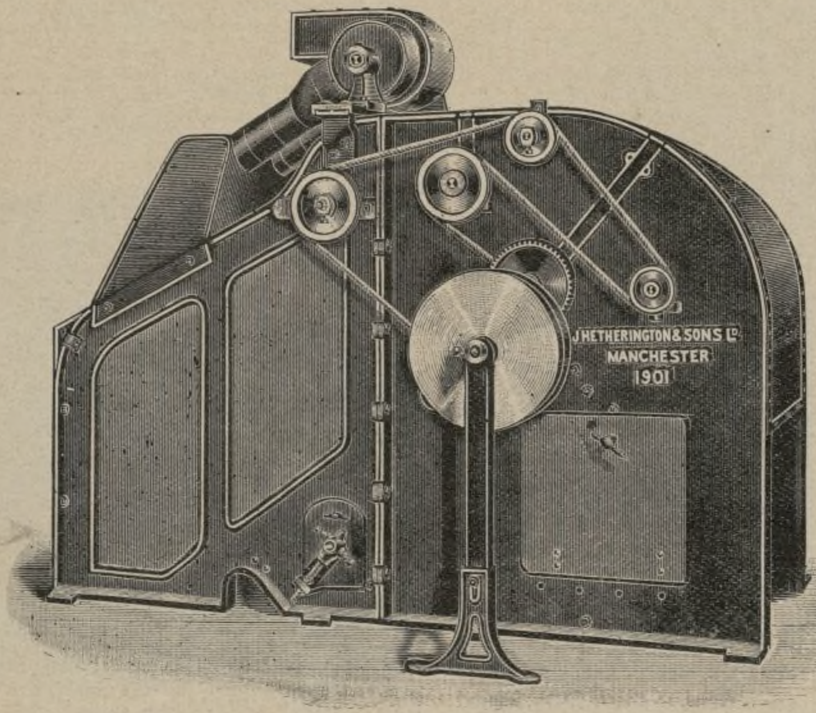


FIG. 1.

a weak point is noticed in any machine, in any stage of the process, it invariably follows that improvements are, sooner or later, devised to bring the machine up to what is considered the standard of perfection. To-day this standard is very high, and every machine is being constantly overhauled with the aim to bringing it up to it.

Although the hopper bale breaker made by the above firm has hitherto given every satisfaction, the new type contains quite a number of

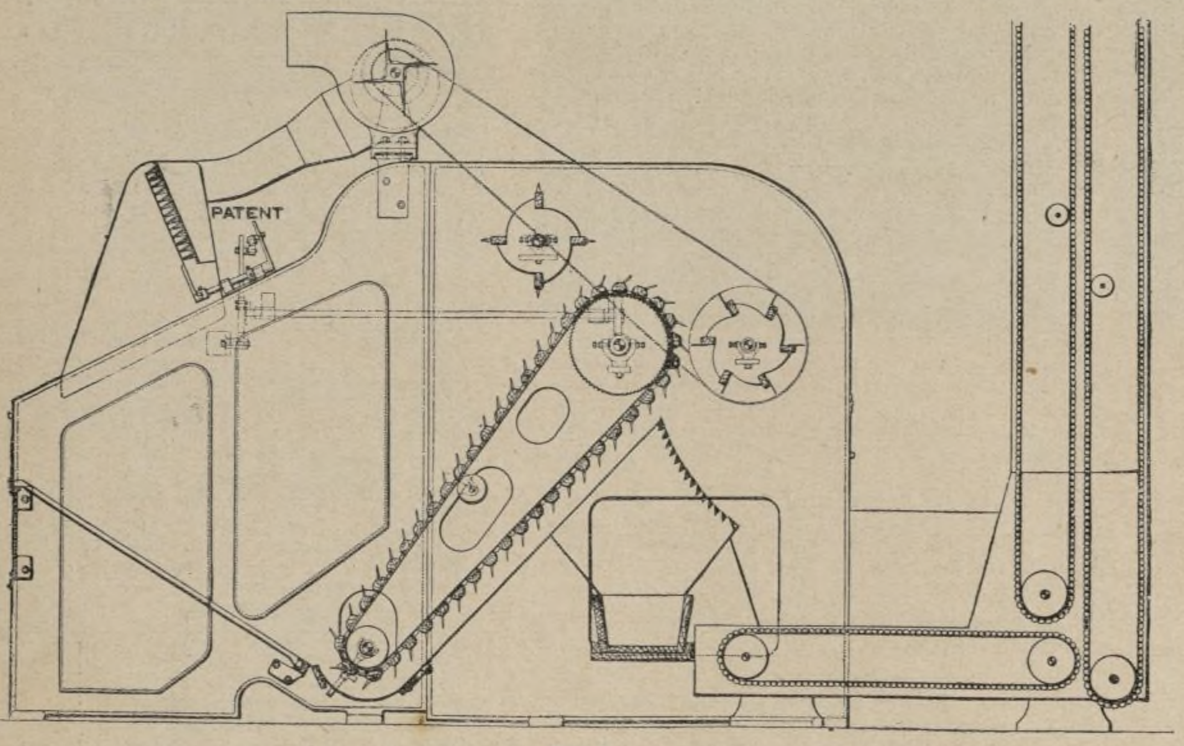


FIG. 2.

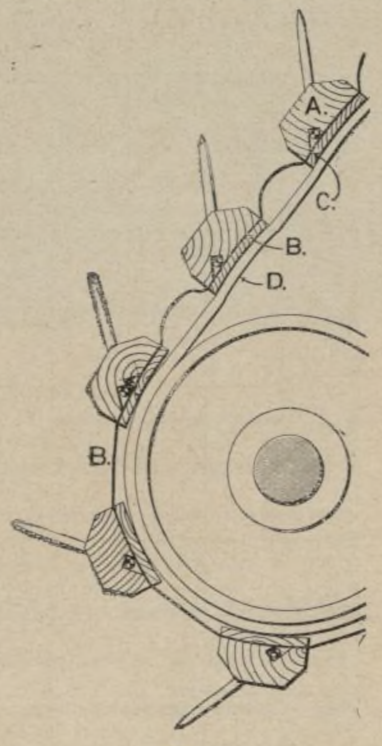


FIG. 3.

essential improvements which greatly facilitate attendance upon the machine, and which ensure the cotton being cleaned as much as is possible in a bale opener. In addition, at least one of the new features of the machine means a great reduction in the expenses of repairs. The new bale opener is shown in Fig. 1, but it is in Fig. 2—which shows the machine in section—that the improvements are best seen.

The cotton is fed in the usual way into the hopper shown to the left of the illustrations. The floor of this hopper is an inclined grid through which the loose dirt can fall and be periodically removed. The cotton is then taken up by the teeth of the spiked lattice, and the amount regulated by the adjustable revolving evener roller, which is made of a size large enough to do its work without requiring a stripper. The treatment so far has opened out the cotton to a considerable degree and loosened a large amount of dirt and straw, a good proportion of which, under ordinary circumstances, would be carried forward with the cotton. To prevent this, an exhaust fan and pipe are placed over the hopper and draw away the dirt through a perforated cover protruding from the top of the bin. This method of cleaning is not in itself exactly new, but is made much more efficient by a new arrangement for cleaning the perforations in the cover of the exhaust pipe. Without this cleaner there is a tendency for straws and fibres to be drawn across, instead of through, the perforations, and the accumulation of lint on the top of these greatly reduces the efficiency of the process. The accumulation must be periodically cleared away to prevent a stoppage of the perforations.

This cleaning of the mouth of the exhaust pipe has hitherto fallen upon the attendant of the machine, who naturally does not relish extra labour, and who frequently neglects it. When neglected, the power necessary for driving the fan is running to waste, and a quantity of the loose dirt is passing over with the cotton. To avoid this, the new machine is provided with a mechanical cleaner consisting of a light brush, which is slowly passed to and fro over the perforations leading to the pipe of the exhaust fan. The arrangement is distinctly shown in Fig. 2, as is also the method of driving it. A worm placed on the main lattice shaft slowly rotates a toothed wheel on the inner end of a horizontal shaft. This, through the mechanism shown, oscillates the brush on the pivot at its lower extremity. This arrangement, as will readily be seen, requires no appreciable power to drive, and ensures the entrance to the exhaust pipe being always open, without demanding any attention from the attendant.

Another noticeable improvement, and one which will be specially welcomed as saving trouble, stoppages, and repairs, is the new form of spiked lattice. This is best shown in Fig. 3, where it will be seen that the spiked laths A are first secured to an endless sheet of canvas B, by fixing them to a strip of wood or other material C on the other side of the canvas sheet. The combination is then fastened to the endless leather sheet D in such a manner that the canvas sheet hangs slightly slack between each lath. It is well known that trouble results from bits of cotton, grit, or dirt getting between the laths and their carrier apron, when the sheet, in turning round the drums, slightly separates from the edges of the rigid laths, and so allows bits of cotton to get between the lath and the band. These bits are compressed when the band again straightens itself, and a constant accumulation of hard-pressed cotton and dirt between the lath and the sheet finally results in a breakage of some part of the former.

With the new arrangement this old trouble is impossible. The bending takes place on the leather apron or under endless sheet D, and the upper canvas sheet B prevents any cotton getting to this. Then the slackness of the outer canvas sheet itself prevents it becoming too tight on going round the drum and separating from the laths at the edges any more at this stage than when the lattice is travelling in a straight line, so that any cotton getting between the laths and the outer canvas sheet will not be compressed, and will be eventually shaken out as work proceeds. The outer canvas sheet never requires tightening up, and the lattice as a whole only requires to be tight enough for the leather under sheet to get sufficient grip on its driving roller. The canvas sheet also prevents cotton getting through between the leather sheet and this driving roller, so that the drive becomes as positive as a leather belt. The new method of building-up the lattice makes it much stronger, and effectually prevents the spikes being forced through their laths from the front. Following the progress of the cotton through the machine, it passes over the spiked lattice, and is then thrown down by a beater on to a grid, and so passes into a delivery lattice and forward to the next machine. The grid just mentioned is provided to take the dirt which has been loosened from the cotton since leaving the front portion of the machine, and underneath this is placed a long wooden box the full width of the machine, into which the dirt falls. This box can be pulled out and emptied at any time—a much simpler way of getting rid of the accumulated dirt than is at present customary.

Referring back to the method of taking dust from the hopper by an exhaust fan, Messrs. Hetherington and Sons have an alternative method from that just described. This consists of a perforated revolving cage connected with the exhaust fan and provided inside with a damper, and also with arrangements for automatically cleaning the perforations by a brush. Sometimes either the last-mentioned revolving cage or the perforated cover explained earlier is supplied to the back portion, in addition to the front of the bale opener, and so draws off by means of an exhaust fan the dust from that part of the machine. By adopting this latter arrangement, however, the value of the grids beneath the beater cylinder is minimised, as the draught has a tendency to take the particles of dirt upwards.

These machines are made in all widths from 2½ to 4ft., and, it is needless to say, are of the best workmanship and material. The arrangement in Fig. 2 shows the cotton delivered on to lattices for transit to a room above for mixing, but the machines are also made so as to connect directly to the hopper feed of the opener if required. One arrangement is specially adapted for regular feeding, and consists of a combination with the automatic hopper feed made by the same firm (described on page 334 of THE TEXTILE MANUFACTURER, September, 1899), which shifts the driving belt of the bale opener when too much cotton is being forwarded to the opener, and so continually regulates the supply passing through the various machines.

New German Weaving Machinery.

THE ROTHWELL MACHINE COMPANY LIMITED, LEICESTER.

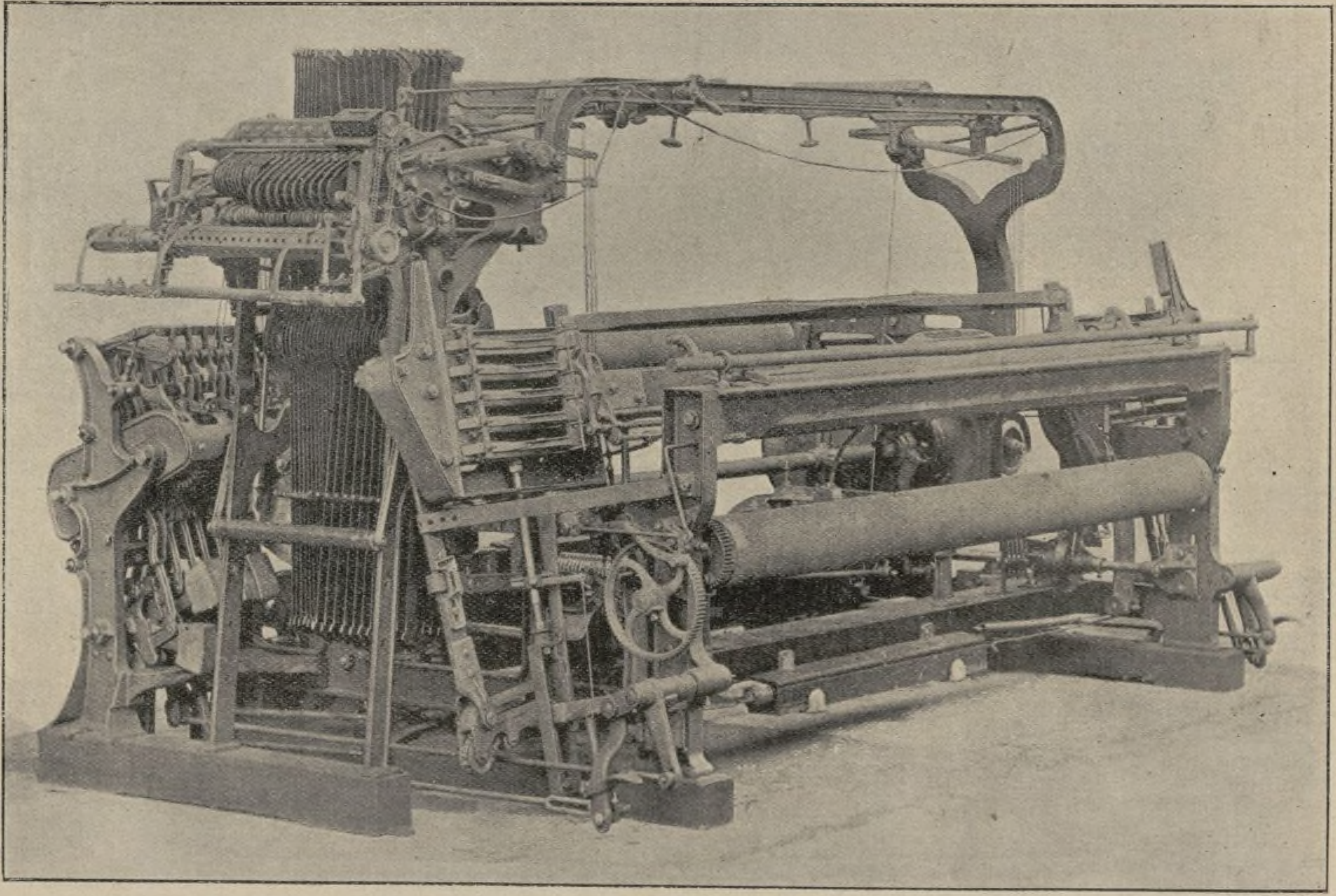
IT is only a very few years since English makers built power looms for the world at large, and when all the latest improvements sprang from English workshops. Now things are slightly changed, for although this country still holds the premier position in the building of looms, as also in the making of almost all classes of textile machinery, there are many instances where foreign ingenuity has got slightly ahead of us. This is more true of some other branches of industry than of the textile trade, but the fact must be thoroughly recognised if we are to hold our present position in any class of manufacture. It should be remembered that the world has become very small during recent years: rapid transit now brings Continental goods to our doors in a few hours; letters can be interchanged with all parts of the world in a very short time; while messages and news can be flashed round the world itself in a few minutes. Information is rapidly distributed by papers and periodicals, and the full particulars of any new English machine or patent are known on the Continent in a few hours after we ourselves have access to them. Under these conditions it is only to be expected that foreign competitors, being possessed of the necessary intelligence, have equal chances of discussing, considering, and improving upon the latest improvements which we produce. On the other hand, we are more conservative in our ideas, are disinclined to learn foreign languages, and therefore, knowing little of foreign progress, are liable to belittle it.

The results of American progress have been roughly forced upon us, for our common language enables us to keep better in touch with all their proceedings. In addition, the many virtues of our American cousins have the counteracting disadvantage of exaggeration, which has tended to magnify many of their smaller successes, and to further impress us by their ingenuity and push. On the other hand, many Continental countries have been making progress of an almost similar nature—perhaps not quite so rapidly, as might be expected of countries having less political freedom and greater military taxation,—and have kept in touch with almost everything which England and America have done. This has taken place in a quiet though determined manner, and at the present day there are many commodities which we can manufacture neither so cheaply nor so well as they can on the Continent.

There is no humiliation in thoroughly recognising these facts. The loom makers, for instance, throughout the world have learnt the groundwork of their business from us, and in addition a large proportion of what is known to day of such machinery. But these foreign competitors are not automatic machines, reproducing looms from our old models: they are thinking, planning, intelligent men, having inventive faculties developed to a high degree, and they are working abreast of us—not behind us. They have learnt much from us; but we can learn much from them by recognising their ability, watching the results of their ingenuity, and keeping pace with them in all they do. In fact, in a few years mechanical progress will be international, and the purely national element will be more of historical than of real interest.

The position of German loom makers is very forcibly exemplified by the appearance of some looms which we have recently seen. These looms have been made by Mr. Louis Schönherr at his works in Chemnitz—works which cover nearly 60 acres of ground and find employment for about 3000 people. The looms, the type of which is only one of many made in Chemnitz, are designed for weaving heavy worsteds and woollens, especially those using shoddy or other weak yarns, such as are common in Dewsbury, Batley, and even in the better-class woollen districts. The looms are not what are generally known as automatic in the self-shuttling sense of the word, but the various motions are, like many of our best English looms, of a decidedly automatic nature; the protection of the cloth has been studied in almost every light, and arrangements made for such being as effectual as possible. With the various attachments the looms undoubtedly look complicated at the first glance, but a careful examination shows the suitability of all the different motions, and also the advantages which they provide in accelerating production and relieving the weaver of everything except the really necessary human attention.

One make of the type of loom in question is shown in Figs. 1 and 2, which are half-front views taken from the left and right-hand sides respectively. This is a loom with five boxes at each end, each set being operated independently of each other, and as each set can skip when either rising or falling, it is possible, with certain designs, to use up to nine shuttles by judicious planning. The box mechanism is somewhat like the Knowles in principle, as may be seen in Fig 1. The motion is placed at the back of the loom, is nicely balanced by weights, and controls the boxes through the bell crank lever shown immediately under the take-up ratchet wheel. As will be seen by the illustration, there is a small foot lever near the bell-crank lever, by pressing which the connection between the boxes and box motion is broken, and by which the boxes can be moved and changed at the will of the operator for starting at the proper pick. The picker spindle is placed at the back of the boxes, and is thus entirely out of the way, leaving the box swells directly under the eye of the weaver. These swells are supplied with the necessary fingers by which the loom is stopped if any shuttle is out of its box or not properly in its place at the beat-up. These fingers are also operated by a small tappet which releases the tension at the time of picking, relieving the shuttle of the pressure exerted on it by the swell and so ensuring an easy pick, which goes far towards obtaining a steadily



NEW GERMAN WEAVING MACHINERY.—FIG. 1.

running shuttle, in addition to saving power. The dobby is single lift, with a positive action. The loom shown in the illustration is worked by perforated cards, but the other looms we saw, although on the same principle, were operated by chains and varied in size up to 40 shafts. The dobby will be recognised as belonging to a class which appears to be a favourite on the Continent, and possesses two knives—one for lifting the healds and the other for depressing them. It is supplied with the usual reversing mechanism, and appears in every way suitable for performing reliable work. In addition to lifting the healds (which are not shown in either Fig. 1 or 2) the dobby operates the mails for the catch ends, the levers for which are shown with bands attached in the drawings. These catch ends, which are dummy threads or wires, are raised and lowered according to the shuttling, lifting the various coloured weft threads out of the way so as to prevent their getting entangled at the box entrance and forming unsightly selvages.

The picking sticks are both operated by one tappet and roller cone placed at one end of the loom, a method which is not only simple, but reliable. An emergency arrangement is also provided for preventing the breakage of the picking sticks or other portions of the motion. This consists of a very powerful spring, which is enclosed in the long, narrow box shown just under the cloth beam in the illustrations, and which holds the pivot pins of the picking sticks in position during normal working. Under ordinary conditions this spring is rigid, but in case of an obstruction falling amongst the working parts, or of the boxes sticking and preventing the proper play of the stick, this spring becomes distended in place of something else breaking, which under ordinary circumstances would be the natural course of events. All the motions of the loom are driven from one central shaft—the crankshaft,—the picking shaft being dispensed with, as would be seen when reading the picking arrangements mentioned above. This crankshaft is placed well below the shuttle race, and by means of very short connecting rods gives the lay a maximum speed when beating up, and a minimum one when picking is taking place. The loom-driving arrangements are very distinctly shown in Fig. 2, where the belt pulley is always rotating, and the loom thrown in and out of gear by a disc friction clutch. The speed is at once geared down by two bevel wheels, the smaller of which acts as a change wheel, enabling different speeds to be used for different classes of work. Wheels for three speeds are usually supplied, which cover all ordinary requirements.

A variety of let-off motions have been adopted, and the looms that we saw had each a different type. One was a modification of the rope-brake system, but a number of small ropes were used instead of one thick one, giving more surface grip, and each rope being cheaper to replace. A special positive let-off motion was on one of the looms, and

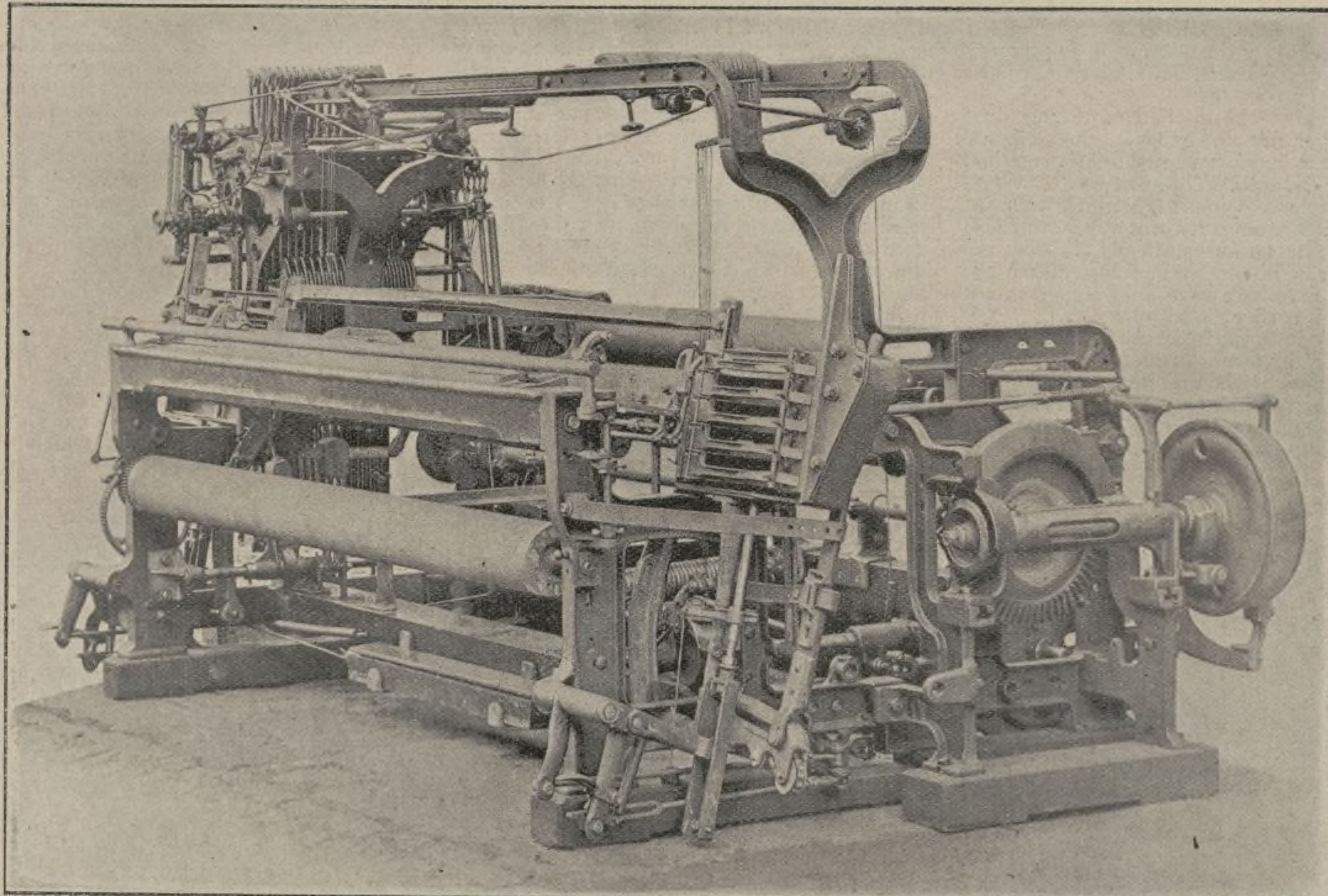


Fig. 2.

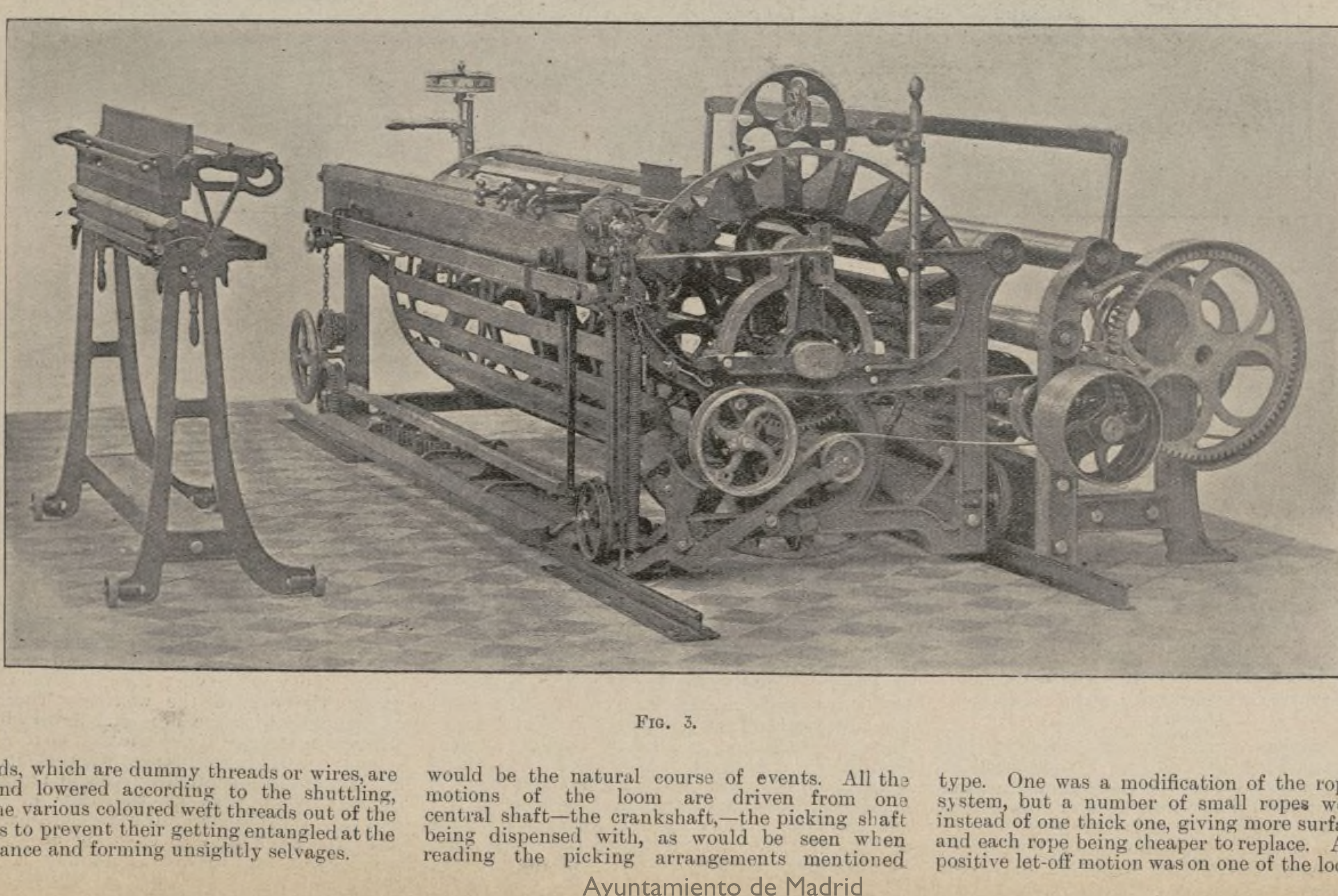
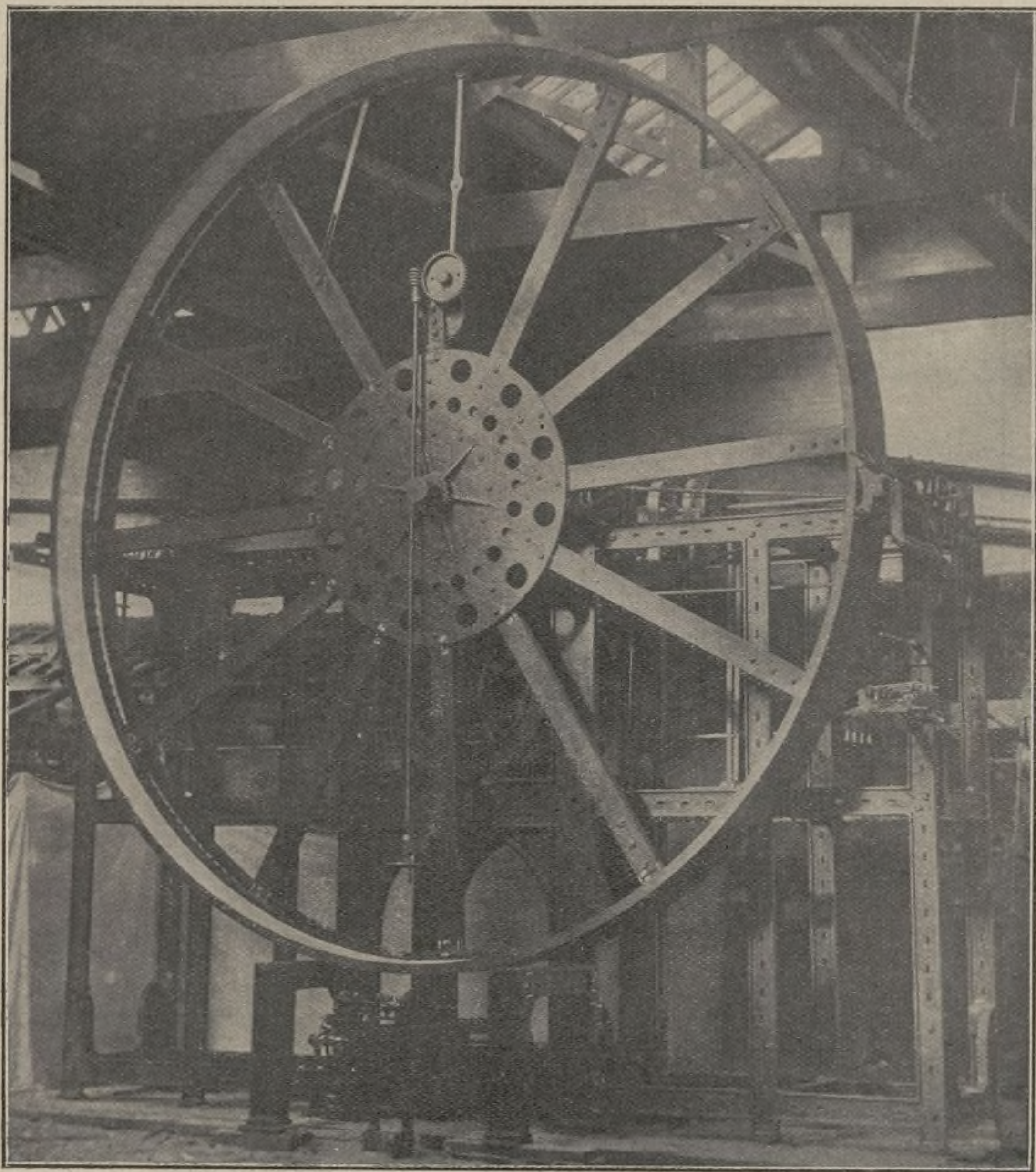


Fig. 3.

this is looked upon as an important feature of the new loom. Movement is derived from the reciprocation of the lay sword, and by a link and roller motion is transferred to a ratchet wheel through a number of pawls, each being a slight fraction of an inch in advance of the other. This motion can be reversed for pulling back, or thrown out of gear altogether



THE LARGEST PRINTING DRUM IN THE WORLD.

The warp is eased at the time of shedding by a slackening motion which comes into play as the lay goes back—a very important adjunct when weaving short-fibred or brittle yarns, and one which enables much cheaper material being utilised than is possible when the warp threads are rigidly let off their beam. The loom has a fast reed and the usual stop-rod motion to minimise the damage done by shuttle traps, and an attachment is also supplied which prevents the picking stick operating unless there is an empty shuttle box at the opposite end of the lay. This is a check upon the weaver, and prevents any damage being done by a wrong arrangement of the shuttles, many shuttle collisions and traps being caused by carelessness or incompetency of the weavers tending fancy looms with intricate shuttling.

The same firm also makes a handy warping machine for supplying warps to the looms just described. It is lightly yet rigidly built, and although having a swift of comparatively small diameter it builds a warp in sections in a regular and evenly-tensioned manner. It is shown in Fig. 3, where its measuring, marking, selvage, and other motions can be easily distinguished. It is perhaps unnecessary to say that every part of the looms and other machinery carries a stamped number, and that arrangements are being made for duplicates of every part being always in stock at the Leicester branch, so that broken castings or other parts can be replaced in the English factory districts at a few hours' notice.

THE British Thomson-Houston Company Limited, electrical engineers and contractors, who have recently moved their head office to their works at Rugby, on the 1st inst. moved their showrooms from 26 and 27, Bush-lane, to 83, Cannon-street, London, E.C.

The Largest Printing Drum in the World.

MESSRS. WILLIAM SMITH AND BROS. LIMITED, HEYWOOD.

WHAT is claimed to be the largest carpet-yarn printing machine in the world has recently been completed at the above works to the order of an English firm of carpet manufacturers. The drum of this huge machine is 60ft. in circumference by 20in. wide, being 6ft. more than the next known in size, and is intended for large tapestry and Wilton squares. The large drum is mounted on a mild-steel centre shaft 6in. in diameter. The arms and outer ring are of mild steel, and the centre of cast iron. The machine is arranged on the overhanging principle, the framework being massive and strong.

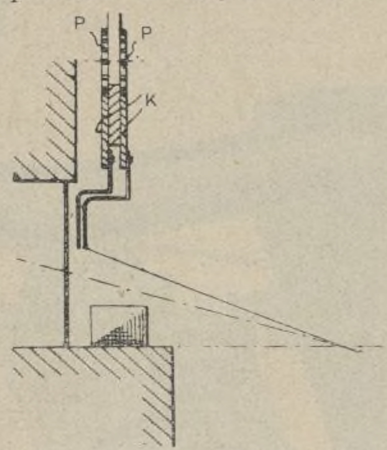
Except for its phenomenal size, the machine is constructed on similar lines to the smaller ones made by the same firm. The yarn bobbins, guides, and tension arrangements are shown in the accompanying illustration at the right-hand side, halfway up the wheel, while the operator is stationed at the opposite side of the wheel on a raised platform. The machine is provided with three metal indices. The breakdown is operated from the floor by means of the hand wheel shown just above the colour-box carriage, which through a worm, pinion, and knuckle lever turns the top section of the drum inwards, and so releases the tension on the yarn sufficiently to allow of it being taken off. In fact, the machine is just as easy to manipulate as a smaller drum, for the filling, measuring, and printing arrangements are all worked automatically.

We may add that Messrs. Smith and Brothers make a speciality of this class of machinery, and in addition to the leviathan described above, make drums of all sizes.

Loom Attachment for Embroidery Effects.

MR. C. F. KOBES, WETTINERSTRASSE, GLAUCHAU, GERMANY.

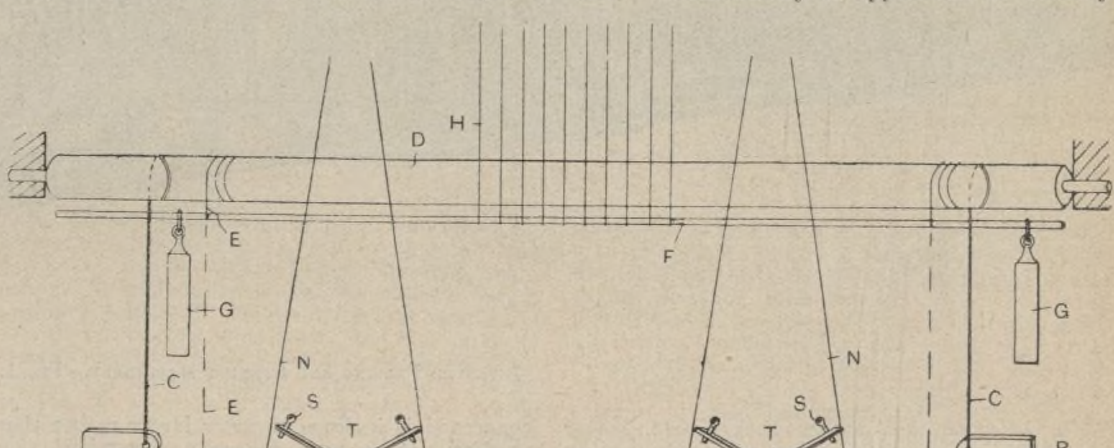
THE present demands of fashion show an extreme partiality for lace or embroidery effects in combination with the ordinary woven fabrics. For the best markets, where price is a secondary matter, these designs



LOOM ATTACHMENT FOR EMBROIDERY EFFECTS.—FIG. 2.

are obtained by inserting lace tissue in the ground fabric after the latter has come from the loom, or by embroidering by hand or machine. The cheapest imitations of this method are obtained by doup or gauze combinations, and also by lappet and swivel weaving; and although easily recognisable, some of these loom designs are very elegant and strictly in line with the demands of fashion. To further extend the usefulness of the loom and its scope for making completed embroidery designs, an attachment has been lately devised which, although coming really under the category of lappets, forms an additional means of extending the range of the loom for the purpose under discussion. Unfortunately it appears to be scarcely adapted for fast-running looms, but it is a good idea in embryo.

The device is shown in Fig. 1 in front view, the apparatus being suspended just over the lay of the



LOOM ATTACHMENT FOR EMBROIDERY EFFECTS.—FIG. 1.

loom. It is hung from a roller D by means of the cords C, which, being fastened to brackets B at either end of the crosspiece A, make it possible to raise or lower the whole apparatus. The roller D also carries cords E to which are suspended the weights G. These weights, which are slightly heavier than the weight carried by the cords C, are connected by a horizontal rod F, and to this rod a few cords H of the jacquard harness are attached. It is found advisable to use a plurality of cords so as to distribute the work over a number of jacquard hooks. When these jacquard hooks are raised, the rod F is held in the position shown by full lines in the illustration, the weights G are in their highest position, and the crosspiece A carrying the embroidering apparatus in its lowest or weaving position. When the harness cords H are lowered the weights G fall with their cross rod F to the position shown by dotted lines, and in doing so unwind their cords E, which revolve the roller D, causing it to wind up the cords C (which are wound in the opposite direction) and so raise the crosspiece A and the apparatus attached. The brackets B slide in guides J fastened to the lay of the loom, so that the device is always suspended directly over the warp shed.

On the crosspiece A are two racks K (seen better in Fig. 2), one behind the other, and to these racks the needles L through which the embroidery threads pass are attached. These needles dip into the warp shed when the apparatus is in its lowered position, carrying their threads to the bottom of the shed; when the apparatus is raised the needles are clear and can be operated horizontally as desired. The racks K—which determine the position of the needles—are operated horizontally through the arms M, to which are attached harness cords N. These arms are pivoted in a stand T, and the screws S are provided as adjustable stops. The arms M carry catch hooks O guided by side supports Q, and engaging with the toothed wheels P which gear into and operate the rack K.

In the instance illustrated the needles have only two positions each, one harness cord N moving the rack to one extreme limit, and the other to the opposite side. It is obvious, however, that if, instead of the present arrangement, two opposite ratchet wheels were attached to the inner side of the toothed wheels P, and these operated by their respective pawls (which would replace the catch hooks O), then the needles could be brought to any position (so long as the changes were not required to be too sudden) by operating one harness cord the required number of times. The more times one cord was lifted, the further the needles would be traversed in one direction, and *vice versâ*. This would give a wide range of figuring power, although its advantage over modern Lancashire-made lappet looms would be a debatable point.

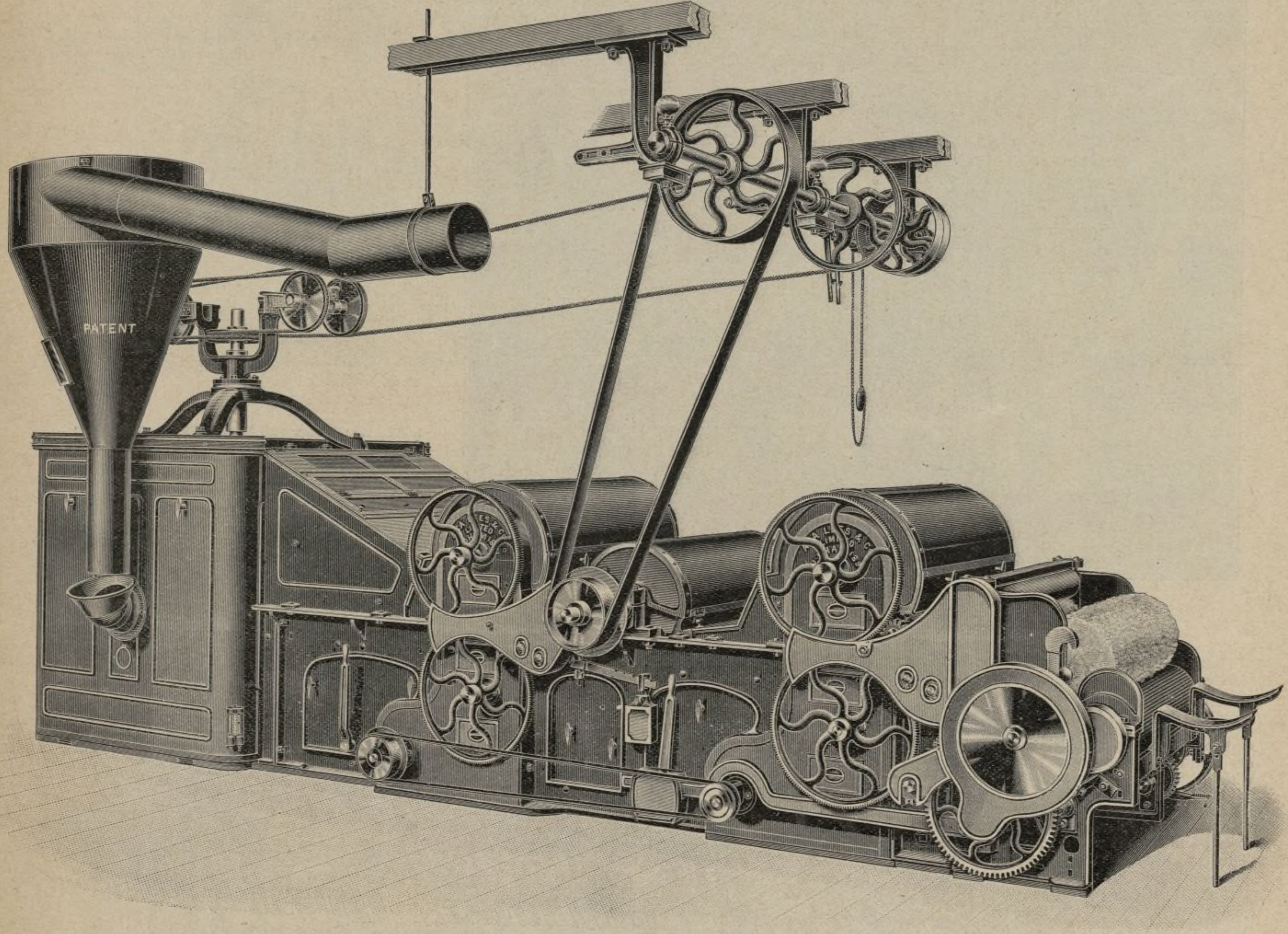
Improved Feeding and Opening Machinery.

MESSRS. ASA LEES AND CO. LIMITED, OLDHAM.

THE difference in price between raw cotton and the spun yarn or completed cloth is very largely made up by wages paid for various kinds of labour in the different processes. Machinery generally means a heavy first cost, only a small outlay being afterwards required for repairs; but labour is a heavy weekly expense, which, so far as each individual worker is concerned, is inclined to grow larger rather than smaller. It is now generally recognised that the best way to cheapen production is to adopt labour-saving appliances, and in that manner to not only cut down continually-running expenses, but to free some of the workers for the new industries which are continually springing into existence.

The Crighton opener has hitherto been generally fed by hand, or what often amounts to the same thing, by lattice, for its method of working does not make it practicable to feed by an exhaust fan. If this be done, the machine must be run slowly and the output restricted, and there is also the risk of choking, in case any of the cover panels happen to be momentarily opened. On account of these disadvantages the Crighton opener, one of the most useful types of its class, has had to depend largely on hand feeding. This, however, will now no longer be necessary, for a method recently adopted has been found to fulfil every function of feeding the openers the same as, or even better than, by hand.

The apparatus is shown to the left of Fig. 1 attached to the Crighton opener portion of the combined opener and lap machine illustrated. It is simplicity itself, and as the exhaust fan (not shown) is the only mechanism connected with it, there is nothing which can get out of order. The apparatus, which is known as a "Cyclone," consists of the funnel-shaped arrangement shown, which is simply a hollow sheet-metal shell containing an observation window, and connected by a pipe with an exhaust fan, and so back to the dust trunk and porcupine opener or hopper feed. There is an outlet at its top end for the air and dust, and one at its lower end through which the cotton falls into the funnel of the opener. When working, the cotton enters the cyclone through its delivery trunk in a tangential direction, and is, by the force received from the current of air which has brought it, taken round and round inside the cylone, where a centrifugal action separates it from the accompanying dust and air. These latter, owing to the shape of the apparatus, find their exit at the top, while the cotton, still being carried round inside the cyclone with a gradually diminishing



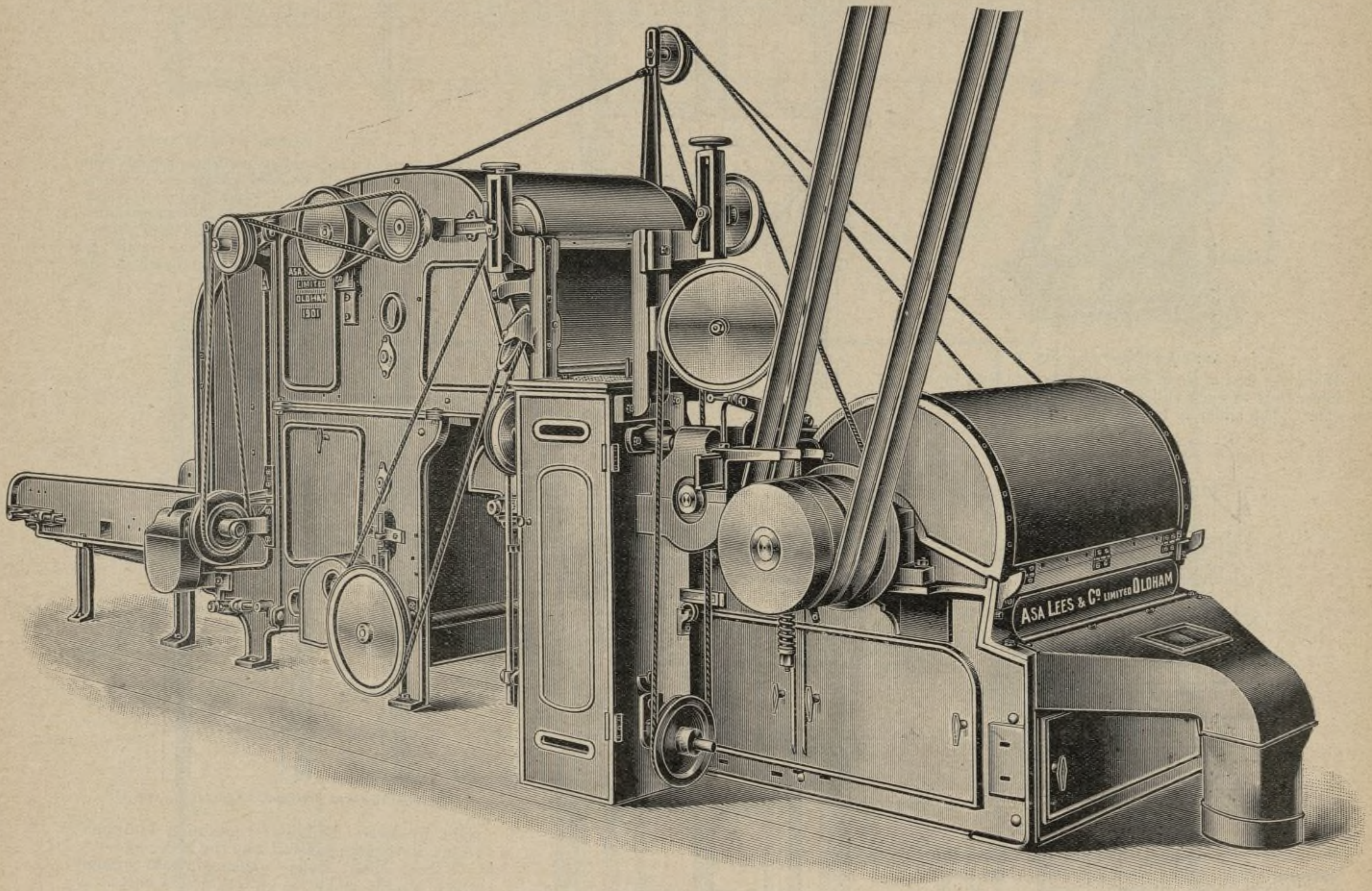
IMPROVED FEEDING AND OPENING MACHINERY.—FIG. 1.

force, eventually falls by its own weight through the lower pipe of the cyclone and into the funnel of the opener, from whence it is drawn into the machine. No part of the current of air which has brought the cotton to the cyclone can be felt if the hand be placed under its lower end.

The method of feeding which is introduced by the cyclone is perhaps more adapted to the Crighton opener than to any other cotton-working machine, but it places a useful method at disposal which will probably be eventually found very useful for other machines. The machine shown in Fig. 1 is essentially of a labour-saving character, for not only is the cotton fed by the cyclone, but the Crighton opener is connected directly to the lap machine, the two working as one, and requiring very little attention.

The machine just explained is usually fed from the one shown in Fig. 2, which is another useful combination comprising an automatic hopper feeder and a small porcupine opener. The feeder portion has a special filling apparatus which controls the quantity of cotton passing into the machines, and the opener is provided with an improved feed regulator for regulating the quantity of cotton passing through. This latter regulates the speed of the rollers from the pedal arrangement in the usual way, but is provided with a belt tightener by which the tension of the belt on the cones can be easily tightened. The bearings of the lower cone lie in vertical slides, and small cams carried on the same spindle can be turned so as to put pressure on the bearings to a greater or less degree. By this means the lower cone can be pressed down until the belt is at the required tension; and it can also be further regulated when necessary without interfering with the belt itself in any way, and even without stopping the machine. One of these cams is shown to the right of the regulator in Fig. 2, acting on the bearing of the lower cone.

The cotton, after leaving the porcupine opener, passes through the trunk shown to the right of Fig. 2, is carried through suitable dust trunks and further cleaned, and is then fed to the Crighton opener by the cyclone shown in Fig. 1.



IMPROVED FEEDING AND OPENING MACHINERY.—FIG. 2.

New Automatic Knitter.

MESSRS. SPIERS AND GRIEVE, LEICESTER.

ALTHOUGH modern knitting machinery takes a position with which the old hand-knitting process can scarcely be compared, the machines commonly in use are only adapted for making a continuous tubular fabric, so far as their automatic action is concerned, and all changes of rib have to be effected by hand—a process which is both slow and monotonous. For instance, when knitting a ribbed stocking or sock with a 1/1 top, the present machines knit the 1/1 portion without attention, but when the rib part in the body of the sock is required, it is necessary in, say, a 3/1 rib for the operator to change every alternate needle. Again, when narrowing for the heel portion of the foot it is necessary to throw out or take in needles by hand; and although the operators are very deft in manipulating these changes, the latter necessitate a great waste of time, in which no production is being turned out.

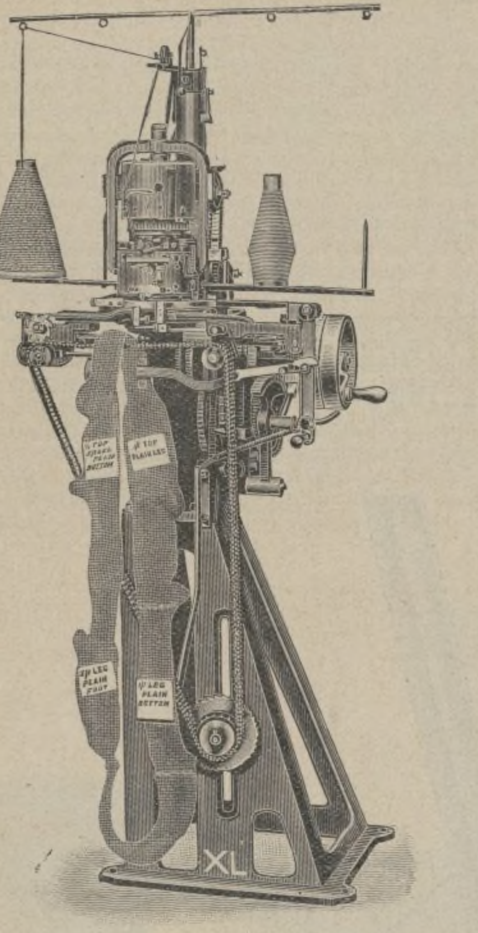
To overcome this shortcoming in knitting machines generally—a failing which is very evident in a hosiery factory, where power is running to waste for a good portion of the day,—an ingeniously-constructed type of automatic knitter has recently been built, which performs all changes automatically, and which, with the exception of adding the usual extra thread to strengthen the heel portion, requires no manual attention throughout the entire stocking, or series of stockings, for these follow each other continuously, toe to top and top to toe, only requiring separating afterwards. The inventors of the machine are Messrs. S. D. Stretton and Sons, of Leicester, and we recently had the pleasure of inspecting a couple of machines at work in their factory. The machines ran continuously all the time we were there, the automatic changes taking place in a few seconds, during which time the machines slackened speed, although the driving pulley ran at the same rate throughout.

The machine is shown in Fig. 1, but its working will be better understood from the line drawings of the various parts. Figs. 2 and 3 show the top portion of the machine in front and side elevation respectively, from which it will be seen that the bedplate, needle cylinder, and revolving cam carrier N are similar to the same parts in an ordinary machine. The revolving cam carrier has a bridge A fixed to it by screws, and this supports the top needle cylinder B and its cam carrier C by means of a central spindle. This spindle (shown in Fig. 4, which is a section of the two needle cylinders with the cam carriers removed, taken vertically down the centre; and in Fig. 5, which is a still further enlarged section and plan of the upper part of the machine) passes downwards through the boss in the top of the bridge A, and is kept in position by the collar and set-screw shown in Fig. 5. The top needle cylinder B is supported on this central spindle by two discs let into its upper and lower shouldered ends, and secured by a nut which, when tightened, presses the plates against the shoulders of the cylinder B and effectually prevents any vertical play. The central spindle fits loosely in its upper boss, but the needles D, projecting from the grooves in the lower cylinder to those in the upper cylinder, prevent any circular motion of the cylinders. The cam carrier C is held loosely by the central spindle, overhangs the needle cylinder B, and is rotated by a bent horizontal lever E (Fig. 5), which, pivoted at its bend, can be put in or out of gear with a lug on the cam carrier C, and when in gear carries the latter round.

The main feature of the new machine, and the part which revolutionises the system of knitting, is comparatively insignificant in size, being the double-ended needles, one of which is shown in Fig. 6 at D. These needles are used in conjunction with sliders F, which have two butts (an upper and a lower one), a hook, a bevelled end (above the hook in a bottom cylinder slider), and a shoulder (facing the hook). When knitting, one hook of needle D engages with the hook of the slider just as shown in Fig. 6, and in this manner the two receive the usual vertical motion for forming the loop by means of the usual knitting cams operating on the upper butts of F. For transferring purposes there are specially-designed cams which act upon the lower butts of the sliders.

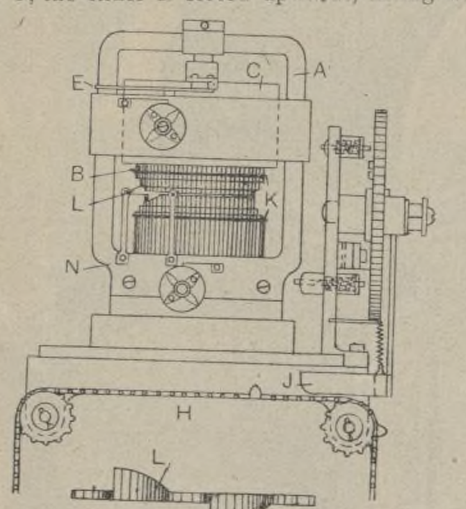
Supposing, for instance, that a 1/1 rib is being made, and that it is necessary to change to plain during the knitting operations. In this case the needles will have to be arranged with a double ended needle and slider in every alternate groove of both needle cylinders, the remaining grooves having sliders only, the grooves containing needles in one cylinder being opposite those containing only sliders in the other. With this arrangement a 1/1 rib is knitted, and by sliding all the needles in one cylinder into the grooves in the other, it is found that one cylinder then contains a needle in every groove, and the other cylinder carries nothing but sliders. This is the arrangement required for plain knitting, and has been obtained merely by passing half of the double-ended needles from one cylinder to the other, and using the opposite hook, the loop of yarn requiring no transference.

This sliding or needle-transferring action is caused by means of a cam G (Fig. 7) which is placed in each of the cam carriers. The position of the cam is changed by projections attached to the chain H acting through intermediate mechanism, and it will readily be seen that, taking a chain H of proportionate length to the work in hand, the change can be effected automatically at any predetermined place by the proper arrangement of these projections. The chain H is slowly rotated by a pawl and ratchet wheel as the work progresses, and when the projection on the chain H has passed the lever J (through which the cam operating mechanism is controlled), a spring returns the cam to its original position, and at the same time changes back the type of stitch being knitted.



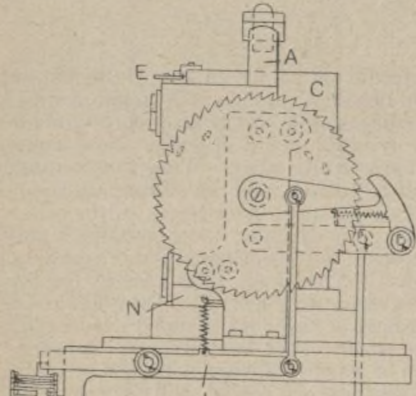
New Automatic Knitter.—Fig. 1.

When the first of these changes is taking place, the lower butt of each slider F is acted upon by the cam G, the slider is forced upwards, lifting with



New Automatic Knitter.—Fig. 2.

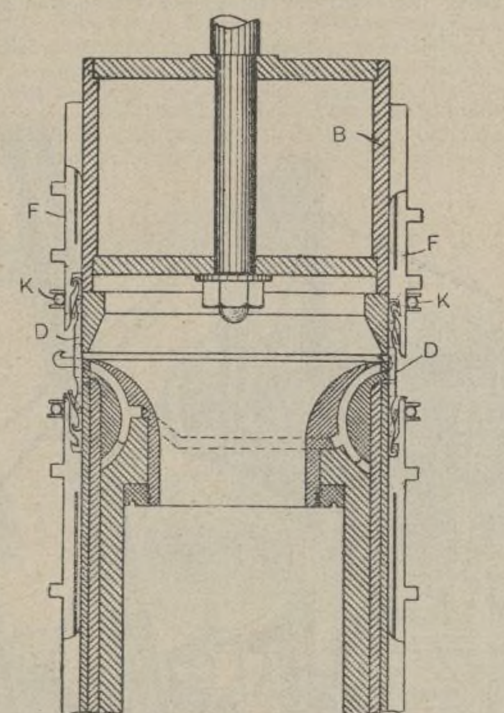
its shoulder the needle D and pushing it into the opposite groove of the other cylinder, where there is a similar slider waiting to receive it. As the



New Automatic Knitter.—Fig. 3.

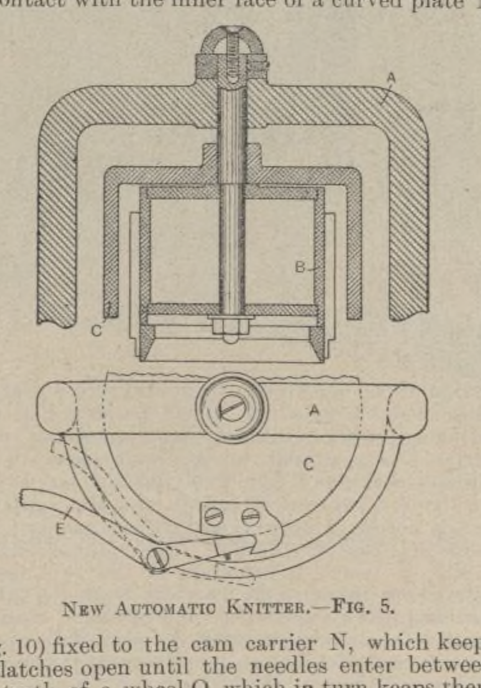
free hook of the needle bears against the hook of the new slider, this latter moves slightly outwards to allow the hooks to engage with one another (as shown at the right-hand side of Fig. 4), and a coiled spring K which encircles each needle cylinder, although allowing of this movement, immediately presses the slider back again and interlocks the two hooks.

Both hooks of the needle are now engaged, one with a slider in the top cylinder, and the other with a slider in the bottom cylinder, and it is at this point that the cam L comes into work. This cam is shown in Fig. 2 both in position and on an enlarged scale. It is supported on two pillars screwed to the cam carrier, and is so shaped as to release the slider from one needle hook immediately the other needle hook becomes engaged. As the slider rises (or descends) in its groove to project its needle into a groove of the other cylinder, the bevelled end of the slider passes over the edge of the cam L, which gradually draws the slider away from the needle hook, as shown by the top slider in Fig. 8, and when the two are disengaged another cam acts upon the butt of the



New Automatic Knitter.—Fig. 4.

disengaged slider and draws it away clear of the needle, as shown in Fig. 9. It may also be noted that the upper bevelled end of each slider F acts as a latch guard and keeps the latch of the needle open while the needles in, say, the top cylinder are descending. This is illustrated to the left of Fig. 4 by the bottom hook of the needle; but immediately the needles begin to rise, the latches would fall by their own weight, and so close, if it were not for the fact that they move in contact with the inner face of a curved plate M



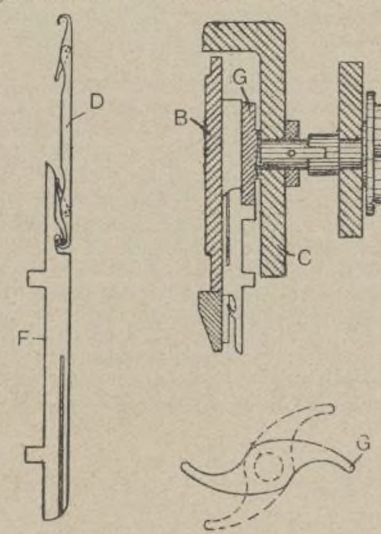
New Automatic Knitter.—Fig. 5.

(Fig. 10) fixed to the cam carrier N, which keeps the latches open until the needles enter between the teeth of a wheel O, which in turn keeps them open until they reach the yarn guide P, where they receive the yarn.

Of course, the change from 1/1 to plain, as explained above, is only one of the many changes which are possible on this machine. Ordinary needles, as shown in Fig. 11, may be alternated or otherwise disposed amongst the two-ended needles, and many types of work produced by this means, apart from those made on the principle explained. For heel-forming purposes the narrowing is done on similar lines, the carrier reciprocating instead of revolving, and the end hooks being thrown out or into work as required.

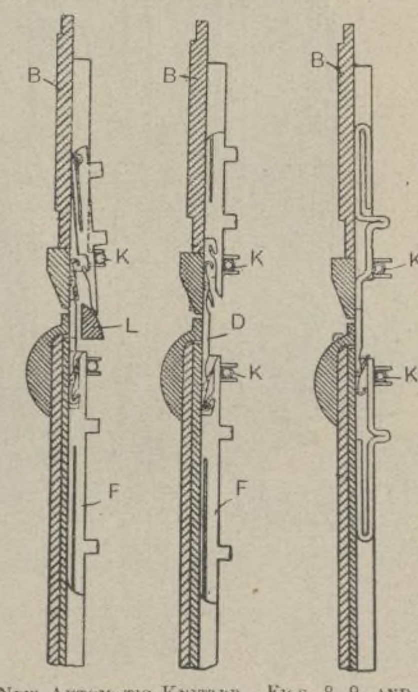
Power Transmission in a Continental Weaving Shed.

The accompanying illustrations show the driving arrangements of a weaving shed for cotton and mixed woollen cloth, erected in Northern Bohemia by the Erste Brünner Maschinenfabriks Gesellschaft, of Brünn. The arrangement of the rooms is favourable to the



New Automatic Knitter.—Figs. 6 and 7.

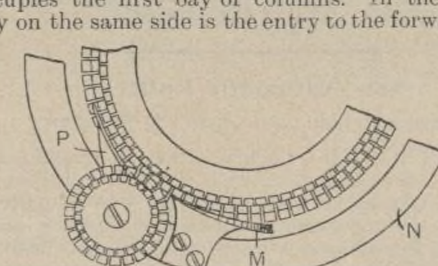
carrying out of a continuous working process, and answers all technical requirements of textile manufacture as regards economical and rational working. The building is a simple shed construction, as shown in Fig. 3, divided into the weaving shed proper and the preparing shed, which can easily be enlarged towards the rear. It is flanked on the



New Automatic Knitter.—Figs. 8, 9, and 11.

right by lateral buildings containing additional rooms, the engine-house B, and the boiler-house A.

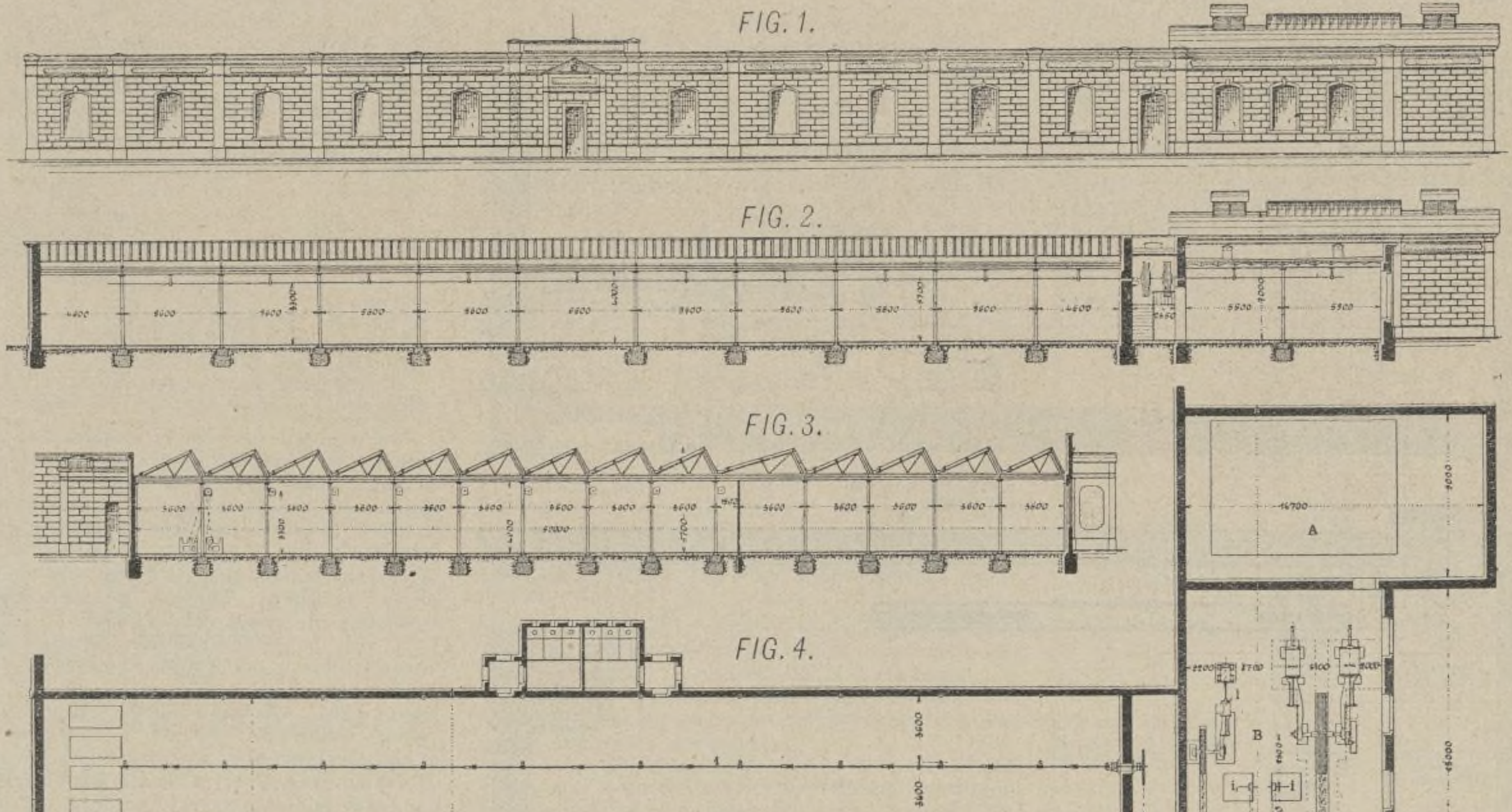
A front square leads to the main gate through which all the employés of the factory enter. A main corridor leads straight to the weaving shed, while on the left a door leads to the counting-house I, and to a storeroom for accessories, which occupies the first bay of columns. In the third bay on the same side is the entry to the forwarding



New Automatic Knitter.—Fig. 10.

room, from which a door leads to the warehouse K, where the goods are examined, measured, and folded on measuring machines. On the right of the main corridor a door in the third bay first leads to a room H intended for the storage of warp cops, and after this comes the warping and winding room G. The loom shed L contains 360 looms of various widths, arranged in two squares surrounded by wide aisles. At the end wall two separate sets of W.C.'s for men and women respectively are built out.

The main building is flanked on the right side by a rope race 2·35m. wide, which can easily be prolonged if the loom shed is extended. The rope race, covered by a wood-cement roof (Fig. 2), is lit by separate roof lights. On the other side of the rope race is a long building 11m. wide, likewise covered by a wood cement roof, and having side windows. This building contains in succession the warp, twisting, and drawing-in rooms, a warehouse for finished cloth, a storeroom F for loom harness, etc., the sizing-room E with four sizing machines and size boilers, a joiners' shop D, a mechanics' shop C, and the engine-house B, containing the steam engines and dynamo. A separate compound one, with Sulzer valve gear, having a high-pressure cylinder of 440mm. bore, and a low pressure cylinder of 650mm. bore. The piston stroke is 900mm. long, and the number of revolutions of the crankshaft 84 per minute. The engine *a*—of which Figs. 5 to 8 give a clear representation– will normally develop 250 I.H.P., and a maximum of 315 I.H.P. For driving an electric - lighting plant a reserve engine *l* is arranged for, which, however, has not been put down at present. The steam passes from the boiler through a pipe 125mm. diameter to a steam collector a_2, in communication also with the receiver pipe b_1. From the steam collector the On the crankshaft, of 240mm. diameter, a flywheel rope pulley with seven grooves is fixed between the two engines ; this transmits the power to the second motion shaft for driving the shed line shafts. The diameter of the rope flywheel is 4·40m. The ropes are 50mm. diameter. The second motion shaft is mounted upon massive concrete pillars, which rise 2·850m. above the floor of the engine-house. Corresponding with the flywheel a seven-grooved rope pulley of 2·464m. diameter is fixed on this shaft, which thus makes 150 revolutions a minute, assuming the ropes to be very well tightened so that slipping need not be taken into account. It will, nevertheless,



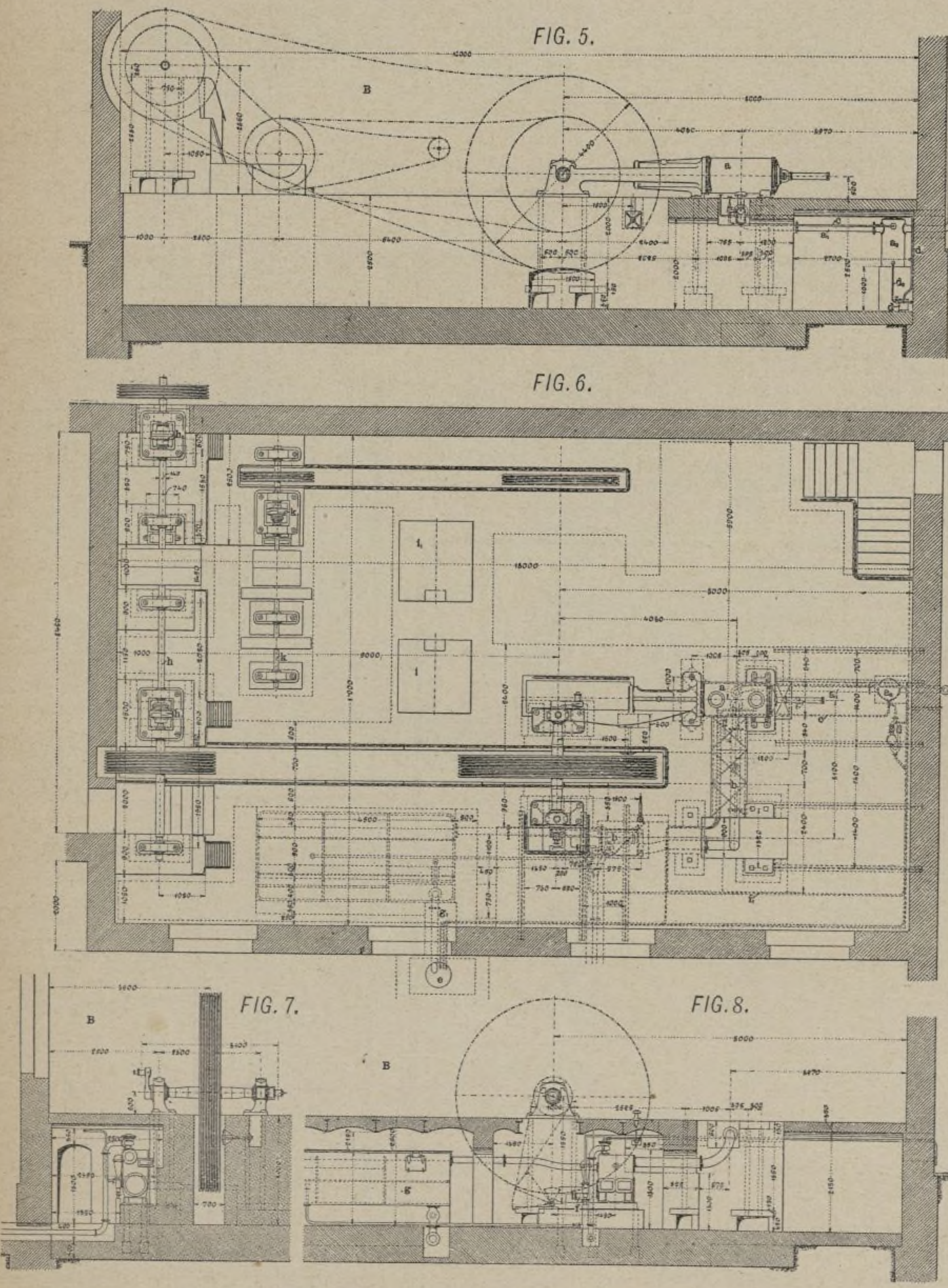
POWER TRANSMISSION IN A CONTINENTAL WEAVING SHED.

building A, next to the engine-house, contains the boiler-house and coal sheds.

Referring to the special subject of this article, the transmission of the driving power in the weaving shed is effected by means of hemp ropes. As is known, rope driving has the advantage of being noiseless and assuring a high degree of reliability of the continuance of working, by multiplying the number of ropes to any required extent. Moreover, rope driving allows the power to be distributed in all directions, whereby frictional losses are reduced. The steam engine has been placed in such a position that the greatest transmission of energy takes place in its immediate neighbourhood, and when the factory is enlarged this advantage can be preserved. The engine is a

condensed water is separated and conducted to a steam trap, whence it flows to the tank *e*. The steampipe a_1 leads from the steam collector to the high-pressure cylinder, the exhaust from this passing to the receiver b_1, which is connected by a pipe *c* of 25mm. diameter with the steam collector, and is thus heated from it. The receiver passes the heated steam to the low - pressure cylinder, from which, after doing its work, it is conducted by an exhaust pipe of 180mm. diameter to the jet condenser *h*. This condenser is placed underground beneath the engine-room and upon a separate foundation (Fig. 8). The bucket of the air pump is actuated from the prolonged crankpin of the low - pressure cylinder by means of a connecting rod and triangular beam.

be advisable to deduct 2 per cent. from the number of revolutions. On the left-side end pillar a single pedestal is fixed; and on the right middle pillar a wall plate with two pedestals, between which there is a toothed clutch of ordinary construction. The latter allows the stopping of the entire line shafting, including that for the dynamo, which latter can be driven from the shafting as well as from the separate steam engine it is proposed to erect in the engine-house. Between the first and second pillar on the right a belt pulley is fixed on the shaft for this purpose, which will be hereafter referred to. On a wall frame on the left end pillar, and in the wall of the rope race, there are two pedestals, and between them a second clutch h_2, Fig. 6, by which the shafting of the weaving shed can be stopped, so that when required the steam engine can drive the dynamo only. The secondary shaft h_1, Fig. 4, extends across the rope race and the entire weaving-room, and forms one of the nine lines of shafting driving the looms. The plan Fig. 4 shows in which way the power is transmitted to the line shafts. The driving power is distributed from the shaft h_1 by means of hemp ropes of 45mm. diameter. Next to the wall of the rope race and engine-house the shaft—which up to this point has a diameter of 140mm.—carries a pulley with four rope grooves, having a diameter of 2m., from which four ropes of 45mm. diameter drive the line shaft 7, the latter also extending two-thirds the length of the sizing room.



Power Transmission in a Continental Weaving Shed.

From the secondary shaft four ropes drive alternately to the right and left four lines of shafting 1, 2, 3, and 4. In the same way, from the second line shaft 7—which, as stated above, is driven by four ropes of 45mm. diameter—two lines of shafting in the weaving shed are driven on the right hand, and one on the left, as well as two lines of shafting on the left in the warping and winding room. The shaft for the mechanics' shop is driven by a belt. For this purpose a pulley 120mm. diameter and 200mm. wide is fixed on the secondary shaft in the engine-house, which corresponds with a pulley of the same size on the shaft in the mechanics' shop. Consequently this shaft, like all the shafts in the weaving shed, makes 150 revolutions per minute, from which, after a careful calculation of the speeds, the slip of the belt and ropes must be deducted. — "Praktischen Maschinen-Constructeur."

The Treatment of Boiler Feed Water.*

A VERY general request is for information as to how scale can be got rid of entirely, and how the expense of scaling can be obviated, to which there is, of course, only one reply—viz., that the water should be treated before it is fed into the boiler,—and, not unnaturally, further inquiries are then made as to the relative costs of working feed-water purifiers. Information on the subject is rather conflicting, and it was therefore decided to send our chemist on a tour of inspection of works where various purifiers could be seen in operation, and a brief summary of his report follows :—

Cost of Working Boilers without Purifiers.—In order fully to understand the nature of the inquiry, it has been thought desirable to make a rough estimate as to the annual cost of installations with from one to seven boilers of 8ft. diameter, costing £800 with setting, and using, in one case, pure water, and in the other cases, sedimentary water. The interest on the first outlay is taken at 3 per cent., and the interest on the sums set aside for depreciation is also taken to be 3 per cent. On account of the assumed rapid wear of the hard-worked boilers, their lives are supposed to be relatively short. The best-worked boiler without scale is supposed to last fifty years, requiring no scaling. The worst case is of a boiler worked, say, for stretches of three months, because there is no spare boiler, and this is supposed to last only fifteen years. Even in six weeks the scale is supposed to have grown thicker than is desirable. This would reduce the life of six and one spare boiler to twenty years. In the next best lot, having one spare boiler for every five, each gets cleaned every five weeks, lasting, say, thirty years, while all the others are scaled every four weeks, lasting, say, forty years.

* Abstracted from the Memorandum by the Chief Engineer (Mr. C. E. Stromeyer) to the Manchester Steam Users' Association.

THE TREATMENT OF BOILER FEED WATER.

Nature of Feed.	Pure.	Very Sedimentary Water.						
Boilers at work	1	1	1	2	3	4	5	6
Spare boilers	0	0	1	1	1	1	1	1
Assumed life of boilers years	50	15	40	40	40	40	30	20
Interest on first cost. .£	24	24	48	72	96	120	144	168
Depreciation £	7	43	21	32	42	52	100	209
Scaling and cleaning at 30s. £	2	6	31	47	62	78	78	78
Chemicals £	2	10	10	20	30	40	50	60
Totals £	35	83	110	161	230	290	372	515
Totals per working boiler £	35	83†	110	80·5	76 7	72·5	74·4	85·8

† Note.—The actual cost would be much greater, as the works would be closed down for four weeks per annum.

The probable ages which boilers may attain are based on the assumption that the gradual accumulation of scale during the time that each of these boilers will be allowed to run will increase the wear and tear, and will have the effect of shortening the life of a boiler; and also that those installations where the boilers get little rest will not be scaled so well as others. The cost of scaling includes the operation of laying off the boiler.

It will be seen that the annual cost (chiefly interest) for a boiler using pure water with only such chemicals as prevent corrosion would be about £35, whereas boilers using sedimentary waters would cost from £37 to £75 more. If, then, it can be shown that the interest, depreciation, and working expenses of a water-softening apparatus per boiler amounts to less than these extra expenses, its advantage in connection with very sedimentary water is demonstrated.

A charge of 30s. for cleaning boilers is fairly high, but even in works where it is less the extra cost of boilers using sedimentary water is not much reduced. The table will be useful as showing that where the question arises as to whether a spare boiler or a water softener is to be put down, the latter would seem to be the more advantageous.

SUMMARY OF REPORT ON FIFTEEN WATER SOFTENERS.

Except where the installations were practically new, or where they were under the eye of a chemist, the manufacturers' instructions were rarely adhered to. In one case the quantity of added lime had been doubled, making the water harder than it was before treatment; in another case the settling tanks had never been emptied, with the result that the sediment had filled the tanks, and was as hard as a rock. These experiences are to be regretted, because the water softeners are designed so as to be worked by the fireman, who, if he only receive proper instructions, is quite capable of carrying out the necessary manipulations.

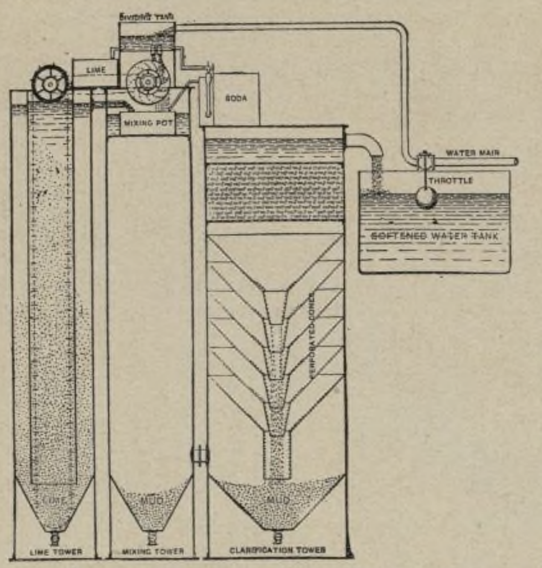
The principle of water softening is a simple one. To remove the temporary hardness caused by dissolved carbonate of lime and magnesia, a certain quantity of burnt lime has to be added to the water, when precipitation should occur. To remove permanent hardness, carbonate of soda should be added, and further precipitation should occur. In practice it is found that this precipitation is slow, so that the settling tanks have to be made large, or filters have to be used, which are, of course, inconveniences, and the various patentees have tried to overcome them as follows :—

1. The treated waters are mixed with old sediment.
2. They are mechanically stirred.
3. They are stirred by air jets.
4. They are heated.
5. After having settled, the nearly clear fluid is treated with carbonic acid, which dissolves the sediment.

The treatments under 1 and 2 are fairly satisfactory, and, particularly if filters are also used, lead to a very important reduction in the height and size of the settling towers. These are generally fitted with baffle plates, etc., though by increasing the velocity and changing the courses they cannot be looked upon as tending to expedite clarification of the water.

The treatment under 3 is effective as regards clearing the feed, but as the water thereby gets impregnated with air, the water is made more corrosive than it would otherwise be.

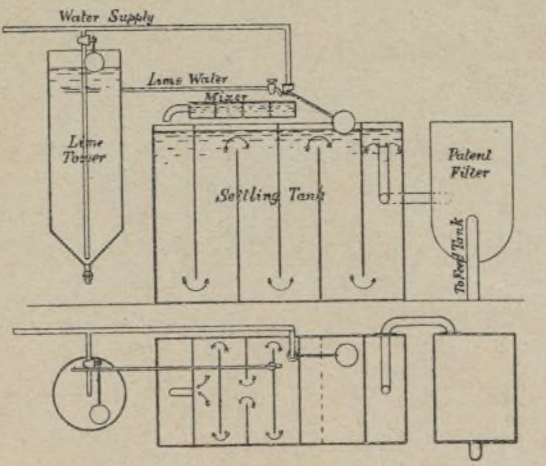
If, as in 4, the water is heated, the chemical reaction is rapidly completed, and the scale deposited. If the heating takes place in an economiser, the tubes rapidly get choked with soft scale, and have to be cleaned frequently, but little or no scale gets into the boiler. If the water is passed through tubular heaters, these take the deposit, and, unless special provisions are made, its removal is troublesome. To heat newly-purified water by live steam from the engine is an objectionable practice, for the cylinder grease combines with the final precipitate, and forms a light pasty substance which adheres to the heating surfaces and causes bulges or collapses. If, as in the case of the Stanhope and the Wollaston purifier, the feed is heated by live steam before treatment, the cylinder grease and all the sediment appear to get removed. There must, however, be a considerable loss of heat by radiation, which makes it appear desirable to cover the tanks, or otherwise keep them warm.



THE TREATMENT OF BOILER FEED WATER.—FIG. 1.

The treatment 5 is open to the same objection as that of 3.

Some water softeners work continuously; others are so arranged that a tankful is prepared at a time. Then, of course, the measuring of the chemicals is a simple matter, whereas if the process is continuous the devices for obtaining a steady supply of chemicals are numerous and ingenious. The lime is either in the form of milk-of-lime or lime-water, the latter being very bulky. In some softeners the flow depends on the size of nozzles; in others on the difference of density; and in others, again, small measured quantities are tipped into the feed by mechanical means. Probably the old arrangement of using adjustable pumps is the cheapest and most reliable.



THE TREATMENT OF BOILER FEED WATER.—FIG. 2.

Porter-Clark Continuous Water Softener.—This is the oldest and best known for treating only temporary hardness. Three installations (*A.*, *B.*, and *C.*) were visited.

A. This installation is capable of dealing with about 3000gals. per day, but is only used for 2000. It consists of (*a*) a lime mixer, in which two paddles are worked by an engine, constantly stirring up milk-of-lime, which is prepared by adding burnt lime to water. No definite information could be obtained as to the quantity of lime, except that 1cwt. was used at a time. The milk-of-lime is pumped into the water-supply pipe, and the mixture is delivered into (*b*) two mixing cylinders 4ft. diameter, which are also agitated by engine power so as to ensure thorough mixing. From these cylinders the water passed through (*c*) four 2ft. filters, whose preparation entails much labour, and then into two tanks (*d*), each occupying a floor space of 36 by 20ft. In the second of these tanks caustic soda is added, which converts the clear water into a turbid one. The object of this last proceeding was not very clear, and may have been necessary for trade purposes; but if it was intended to remove any permanent hardness, it would have been better and cheaper to add soda ash, not caustic soda, to the milk-of-lime. The cost of this installation was £400, without the two large tanks which constitute the roof. The total floor space covered is 1526 sq. ft. The following is the analysis of two samples before and after treatment, but they must have been taken on different days, for the process could not diminish the amount of sulphuric acid and hydrochloric acid, which, as will be seen, are much diluted:—

Composition of Water.	Before Softening.	After Softening.	Change.
	Grains.	Grains.	Grains.
Calcium carbonate	11·512	1·034	10·478 loss
Calcium silicate	0·836	2·407	1·571 gain
Calcium sulphate	1·556	2·124	0·568 gain
Magnesium carbonate.	5·876	4·831	1·045 loss
Ferric oxide, etc.	0·472	0·199	0·273 loss
Scale-forming minerals	20·252	10·595	9·657 loss
Sodium chloride	5·703	5·562	0·141 loss
Sodium sulphate.........	10·500	8·440	2·060 loss
Total soluble salts	16·203	14·002	2·201 loss
Total mineral matter...	36·455	24·597	11·858 loss
Carbonic-acid gas	6·94	5·98	0·96 loss
Oxygen gas	0·66	0·66	0·0

Treatment required per 1000gals.: Pure lime, 1·5lb.; pure soda ash, 0·2lb. The actual treatment could not be determined.

As will be seen, in spite of the addition of lime, the free carbonic acid has not been much reduced. This is doubtless due to the large open tanks, the water being thus in contact with the air, and absorbing almost as much carbonic acid as was taken out in the process.

B. In this installation there were no filters. Lime and soda for twenty-four hours' treatment were mixed in a cylinder 4ft. diameter and 15ft. high, and kept agitated by paddles, driven by an engine, which also worked the pump that delivered the above mixture into the water supply. This water entered the mixing tower at the top, and was drawn off at the bottom and delivered into the bottom of a settling tower 13ft. diameter and 22ft. high. It then overflowed into a feed well. No information as to cost or quantity treated was obtained, and nobody seemed to take an interest in the working. The boilers were said to have more scale than when no softener was used, which is quite possible if too much lime was added.

C. This installation is capable of treating 13,000gals. per hour, and includes filtration, which, of course, involves a fair amount of labour. The tank for preparing the milk-of-lime is 5ft. 10in. by 5ft. 4in. and 6ft. high. It is provided with engine-driven paddles and a pump. The water and milk-of-lime pass into the top of the mixing tower 5ft. diameter and 23ft. high, and from the bottom they pass into the bottom of another tower of the same size, and overflow to four filters 2ft. square. About 2cwt of lime is added per 80,000gals.

The Stanhope Continuous Water Softener is illustrated in Fig. 1, for which the block has been kindly lent by the company. Two installation (*D.* and *E.*) were visited, but one was not at work, and the other had been adapted for special purposes.

D. is capable of treating 3000gals. per hour, and covers a floor space of 13ft. by 11ft. 6in. The water supply enters a distributing tank (*a*), the inflow being regulated by a ball valve actuated by the height of the water in the feed tank. The distributing tank has three outlets, whose areas are all carefully adjusted so that relatively the right proportions shall flow into (*b*), the lime tower into (*c*) the soda tank, and into (*d*) the mixing pot, the overflow from (*b*) and (*c*) joining (*d*). Lime is placed in (*b*) and is agitated, but in such a manner that the top of this tank is undisturbed, and only clear lime-water, not milk-of-lime, overflows into (*d*) the mixing pot. The amount of soda from (*c*) also depends on the amount of water flowing into it. From (*d*) the mixed water passes into the first settling tank (*e*), where most of the sediment is deposited, and it then passes into a tower (*f*) fitted with baffles and a filter, from which it overflows into the feed tank.

E. The other installation was similar but larger, and need not be described.

The Stanhope Company have also a combined feed softener and heater, but no installation was visited. The combined action of chemicals and heat ought to be very efficient.

The Atkins Continuous Water Softener is illustrated in Fig. 2. It only removes temporary hardness. Two installations (*F.* and *G.*) were visited, but in neither case were the patent filters in use, their tanks being filled with wood shavings.

It would appear that the baffles in the settling tank effectively prevent a settlement, and also that in case of the water supply being checked, the lime-water would still flow on at its original rate, and the result would be very irregular and unsatisfactory.

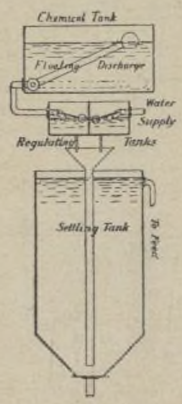
F. This installation treats 500gals. per hour. The lime tower (*a*) is 2ft. diameter and 6ft. high. The clear lime-water as well as the supply flow into the mixer (*b*), and thence into the settling tank (*c*), which is 7ft. long, 3ft. wide, and 5ft. high, and then into the filter tank, which measures 2ft. 3in. by 3ft. 3in. and 4ft. high. The floor space covered is about 35 sq. ft. It was stated that the hardness was reduced from 15 to 7grs. per gallon. Ten pounds of lime are used for 60,000gals. per week.

G. This installation was slightly larger than the above, and is said to have cost £115.

It was found choked with lime deposits, but was apparently got into working order after the inspection, and the two following samples were submitted for analysis. As will be seen, the hardness was not decreased, but increased from about 18 to 60, this being doubtless due to the ball tap on the lime tower being too full open, or the tap on the settling tank too much closed, or perhaps the lime-water was not clear.

Composition of Water.	Before Treatment.	After Treatment.	Change.
	Grains.	Grains.	Grains.
Calcium carbonate	13·863	38·920	25·057 gain
Calcium oxide (lime) ...	0·0	14·300	14·300 gain
Calcium silicate	2·062	3·591	1·529 gain
Calcium sulphate	1·625	2·121	0·496 gain
Magnesia	0·0	0·266	0·266 gain
Ferric oxide, etc.........	0·447	0·987	0·540 gain
Scale-forming minerals	17·997	60·185	42·188 gain
Calcium chloride.........	1·331	2·114	0·783 gain
Magnesium chloride ...	0·672	0·0	0·672 loss
Sodium chloride	0·479	0·476	0·003 loss
Soluble salts	2·482	2·590	0·108 gain
Total mineral matter...	20·479	62·776	42·297 gain
Carbonic-acid gas	9·71	0·0	9·71 loss
Oxygen gas	0·66	0·66	0·0

Treatment required: 1·8lb. lime, 0·2 soda ash per 1000gals. Apparently 5½lb. of lime were added, and no soda.



THE TREATMENT OF BOILER FEED WATER.—FIG. 3.

The Tyacke Continuous Water Softener is illustrated in Fig. 3. Only one installation (*H.*), and that a small one, was visited. It occupies a floor space of 3ft. 8in. diameter, and treats about 200gals. per hour, but only for temporary hardness.

H. There are only two chemical tanks (*a*) 2ft. by 4ft. by 2ft., which are alternately filled with water and a little lime. This lime-water is clear. A connection is open which allows a floating discharge pipe to deliver this water into the regulating tank (b_1), in which the water level is kept constant by a ball valve, and the outflow, through a carefully-gauged nozzle, is also constant. The water supply enters the adjoining regulating tank (b_2), and also flows out through a gauged nozzle. These waters are then carried to the bottom of the settling tank (*c*), 3ft. 6in. diameter and 6ft. high, and pass upwards and through a bed of shavings, overflowing to the feed tank. This apparatus could be used for treating permanent hardness by adding soda to the lime-water.

The fireman attended to the apparatus, which worked all right, reducing the hardness down to 6 grains per gallon.

(*To be continued.*)

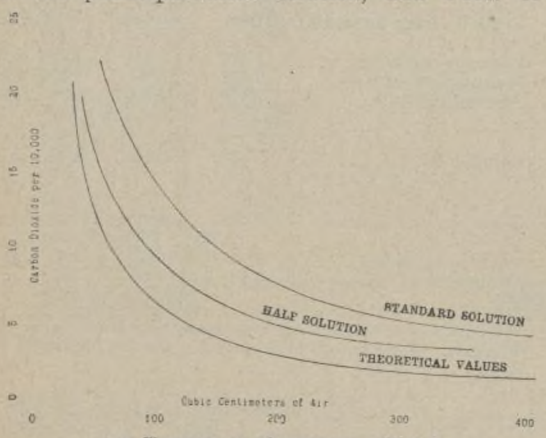
RAW MATERIALS, PROCESSES, FABRICS, &c.

Air Testing in Factories.

By A. G. Woodman and E. H. Richards.

(Concluded from page 348.)

PREPARATION OF THE TEST SOLUTION.—The solution used is a dilute solution of lime-water coloured with phenolphthaleïn. To freshly-slaked lime add twenty times its weight of water in a bottle of such size that it is not more than two-thirds full. Shake the mixture continuously for twenty minutes, and then allow it to settle overnight or until perfectly clear. The resulting solution is the stock lime solution, or saturated lime-water. If made in the manner indicated, each cubic centimetre of it ought to be very nearly equivalent to 1 milligramme of carbon dioxide. If, however, it is desired to know the strength of it more exactly, it may be determined by standard acid. To prepare the test solution, pour into the one-litre bottle of the testing apparatus 1 measured litre of distilled water, and add 5cc. of solution of phenolphthaleïn (made by dissolving 0·7grm. of phenolphthaleïn in 50cc. of alcohol, and adding an equal volume of water). Stand the bottle on a sheet of white paper and add the saturated lime-water, drop by drop, from a pipette, shaking the bottle thoroughly after each addition, until a faint pink colour is produced which is permanent for one minute. Now add 12·6cc. of the saturated lime-water, shake, and immediately connect the bottle again to the apparatus. To shorten the time required in testing air which is low in carbon dioxide, it may be found advantageous to use a solution only half as strong as the above. This half solution is prepared in precisely the same way, using 2·5cc. of the phenolphthaleïn solution, and 6·3cc. of



Air Testing in Factories.—Fig. 4.

the saturated lime-water. While this procedure does not give an exact volume of solution, it is believed to be the best for the preparation of this dilute-test solution, since it obviates the necessity for pouring the prepared solution from the measuring flask into the bottle in which it is kept; 12·6cc. of the stock lime solution is added rather than 10cc., in order to keep the values obtained with the resulting solution more nearly comparable with the older values calculated on the supposition that 10cc. of saturated lime-water was equivalent to 12·6 milligrammes of carbon dioxide.

TABLE A.

Standard Test Solution, CO_2 in 10,000.	Cubic Centimetres Air.	"Half-solution," CO_2 in 10,000.
22·2	50	15·6
18·0	70	12·4
15·1	90	10·2
13·0	110	8·7
11·3	130	7·5
9·9	150	6·6
8·8	170	5·8
8·0	190	5·2
7·3	210	4·8
6·8	230	4·5
6·3	250	4·3
5·9	270	4·1
5·6	290	3·95
5·4	310	3·8
5·1	330	3·7
4·8	350	3·6
4·7	370	—
4·5	390	—
4·4	410	—
4·2	450	—
4·0	490	—
3·9	530	—

Method of Making the Test.—See that the inner tube of the shaker slides readily in the outer one, moistening the rubber collar slightly if necessary. Have the inner tube pressed down to the bottom of the larger one, and measure into the apparatus 10cc. of the test solution from the automatic pipette. Pull the inner tube up to the 5cc. mark (the bottom of the inner tube serving as the index), and close the end of the tube with the finger. Hold the apparatus horizontally, and shake it vigorously for exactly 30 seconds. The amount of air which is thus brought in contact with the solution is equivalent to 30cc., as there are 25cc. of air above the liquid when the small tube is forced to the bottom of the larger. Remove the finger, press down the small tube again to the bottom of the larger, and draw it up to the 20cc. mark. Shake the apparatus again for 30 seconds. The amount of air brought in contact with the solution is now 30 + 20 = 50cc. Repeat the shaking, using 20cc. of fresh air each time, until the pink colour is discharged. The amount of carbon dioxide corresponding to the number of cubic centimetres of air used will be found in Table A.

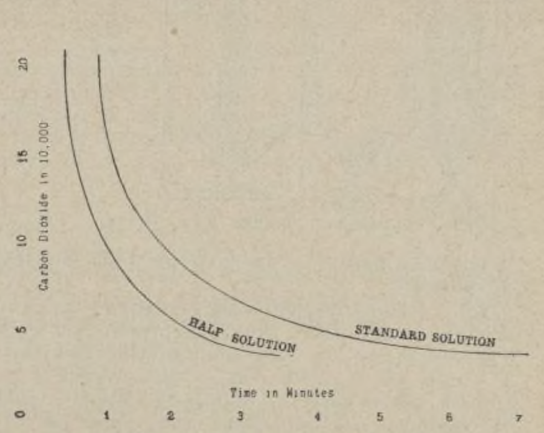
Notes and Precautions.—Care should be taken that the finger used to close the end of the tube is perfectly clean, since on a warm day the free acid in the perspiration might easily vitiate the results. If greater accuracy is desired, the shaker should be filled with the air to be tested before running in the test solution. This may be done readily by filling the shaker with water and emptying it, or by forcing air into the tube by means of a small rubber bulb. The apparatus should be shaken vigorously and continuously during the 30 seconds in order to absorb practically all of the carbon dioxide in 20cc. of air. The number of shakings ought not to be less than 100 during this time. Care should be taken not to contaminate the air while the sample is being taken. The breath should be held momentarily while the air in the apparatus is being replaced, and the sample should be collected as far to one side of the body as possible. It ought not to require more than 10 seconds to replace the air, and the entire test, with air containing, say, 8 parts of carbon dioxide per 10,000, should not require more than 6 minutes. If less than 90cc. of air is required to discharge the pink colour, the test should be repeated, using 10cc. of air each time after the first 30cc. It is not necessary to rinse out the shaker after each test, but it should be carefully washed and dried after using, and the parts kept separate when not in use. The half-solution is used in exactly the same manner and amount as the regular test solution, reference being made to the appropriate portion of the table.

For the Cohen method the same solutions may be used and measured from the same apparatus. The samples are collected in white glass-stoppered bottles of 1 litre capacity. This may be done by aspirating the air with a bellows as directed in the original method, or the bottles may be completely filled with water, which is then emptied at the place where the air is to be tested. Ten cubic centimetres of the test solution are run in from the automatic pipette, the time noted, and the bottle shaken continuously and vigorously with both hands until the pink colour vanishes. It will aid materially in determining the exact point of disappearance of the colour if a piece of white paper, about 1½ by 3in., is pasted on the side of the bottle near its lower edge, a similar piece joining it on the bottom of the bottle. In observing the colour, the solution is held in the angle formed by the pieces of paper, and the disappearance of the colour is more readily apparent. From the time required the amount of carbon dioxide in the air may be found by referring to Table B:—

TABLE B.

CO_2 in 10,000. Standard Solution.	Time. Minutes and Seconds.	CO_2 in 10,000. Half-solution.	CO_2 in 10,000. Standard Solution.	Time. Minutes and Seconds.
—	0·15	—	4·0	5·45
—	0·30	15·6	—	6·00
—	0·45	12·1	3·9	6·15
16·0	1·00	9·9	—	6·30
13·1	1·15	8·4	3·8	6·45
11·4	1·30	7·2	—	7·00
10·1	1·45	6·3	—	7·15
9·1	2·00	5·5	3·7	7·30
8·3	2·15	4·9	—	—
7·6	2·30	4·4	—	—
7·0	2·45	4·0	—	—
6·5	3·00	3·8	—	—
6·1	3·15	3·7	—	—
5·7	3·30	3·6	—	—
5·4	3·45	—	—	—
5·1	4·00	—	—	—
4·9	4·15	—	—	—
4·7	4·30	—	—	—
4·5	4·45	—	—	—
4·3	5·00	—	—	—
4·2	5·15	—	—	—
4·1	5·30	—	—	—

Having found by experiment the best mode of procedure in each case, a number of determinations have been carried out by both methods, using both the standard and half-solutions, in order to determine the correct values to be assigned in Tables A and B. Tests have been made exactly as just prescribed in air containing varying amounts of carbon dioxide, the results being compared with samples taken at the same time, in which the exact amount of carbon dioxide was determined by the Pettenkofer method. The greater part of the tests were made in duplicate, and by two independent observers, in order to eliminate the personal equation. Over 150 determinations were made by the Pettenkofer method, and many more by the others, the average results of a number of tests being taken as a basis for calculation. The samples below from 10 to 12 parts of carbon dioxide were taken directly in rooms under normal conditions. For the samples showing more than this, use was made of an air-tight chamber constructed for another purpose, in which the test could be carried out and samples taken for the Pettenkofer method simultaneously. When the air contained more than 15 parts of carbon dioxide the test was made by using 10cc. of air each time instead of 20, as suggested above. From the comparison of the results obtained, curves have been plotted from the Fitz shaker and Cohen method respectively, which



Air Testing in Factories.—Fig. 5.

are shown in Figs. 4 and 5, each point plotted being the mean of a number of determinations. The values given in Tables A and B have been obtained by interpolation in these curves. It will be observed in Fig. 4 that the values obtained by actual experiment are quite divergent in some parts of the curve from the theoretical values, especially in the case of the lower values, the last traces of carbon dioxide being always much more difficult of absorption by dilute alkalies.—"Technology Quarterly."

Cotton Manufacturers and Trade Expansion.

DURING recent years we have become so accustomed to hearing that we are old-fashioned and conservative, and that our indifference is losing us our foreign trade, that it is interesting to have another view of the matter, especially by an American, who shows us that our foreign competitors do not believe all that our papers tell them. It seems that the go-ahead American manufacturers, aided by automatic looms, find English competition hard to withstand. The following is what Mr. William Whittam, jun., recently read before the New England Cotton Manufacturers' Association, and which will be interesting to many English readers, even if they do not entirely agree with all that he says:—

The first question that would occur to a manufacturer contemplating taking up the production of goods for foreign consumption would be, "What are the general characteristics of the goods in greatest demand in these exterior markets, and in what particular feature do they depart most radically from our standard makes?" This inquiry covers a wide field, and is much too involved a question to be covered in any but very general terms in a paper of this kind.

Speaking broadly, the standard makes of cotton fabrics may be sold to a limited extent in most foreign countries, and in some few markets they can be disposed of in considerable volume—notably China and Mexico. However, it can be positively stated that in the greater number of foreign trade centres American goods are too high in price, due principally to the fact that they are *pure sized*—

i.e., they are only given such treatment in the slashing process as will enable them to be easily woven, no attention being given to the addition of adulterants as such. I am now speaking specifically of brown goods, the aggregate trade in this class of merchandise being very large.

The difference in cost between 6 and 100 per cent. of size in the warp will probably strike you most forcibly as a reason for our inability to compete more successfully than we do with our heavier goods, if you remember that if this difference in weight were made up with 32's yarn it would mean just about 1 cent per yard on the cost price of goods. Thousands of looms in European mills are producing cloths containing in the warp 100 per cent. size and over, and these fabrics are all exported.

As an example of the regrettable condition of the American export trade, in a country where we might have expected to make some impression, during the past year we only participated in the trade of Cuba in cottons to the extent of 5 per cent., the average price paid for American goods being ½ cent per yard higher than that paid for fabrics of European manufacture. This difference in price against us was doubtless one reason for such a condition of affairs, although other reasons equally potent will, I am sure, occur to you.

We will not now consider the proper printing of fabrics, nor the bleaching and finishing of white goods to meet outside requirements, as these involve processes not generally found in our cotton-manufacturing establishments. Nevertheless the converting of cotton fabrics to meet the requirements of the trade abroad will surely have to be seriously taken up at no distant date if we are to take the position of an exporting nation which, by our natural advantages, properly belongs to us. Favourable banking and freight facilities with this market are now ours, constant intercommunication and mutual interests bind us together, and yet, with all these advantages, our proportion of the trade is so meagre as to be disagreeable to the cotton manufacturers and distributors of this country.

The goods sold most freely in the foreign markets outside those of the markets of the manufacturing centres of Europe may be conveniently divided into three classes—namely :—1. Heavy sized. 2. Medium sized. 3. Light sized. Classes 1 and 2 are exported in the grey, while class 3 —goods sized lightly—are usually bleached or printed after leaving the mill. In a general way, class 1 may be said to include such fabrics as contain 75 per cent. and over ; class 2 would include those containing from 20 to 75 per cent. ; while cloths containing less than 20 per cent. are usually known as lightly sized.

Before such fabrics can be produced satisfactorily by us it is obviously necessary for us to have some detailed knowledge of sizing materials and their application to and retention by the warp. There are many sizing compounds of more or less value offered to us ; but neglecting these, it may be said that sizing materials can be classified as weighting, binding, softening, antiseptic, and colouring materials. Without entering in detail into the properties of the many materials applicable in the sizing process, I would direct your attention to the weighting material of chief value and in most general use, kaolin, or China clay.

The natural condition in which kaolin deposits are found, and the facility with which such impurities as may destroy the value of the clay as a sizing ingredient may be eradicated, are vital matters to be taken into consideration in determining the suitability of any such deposit for the purposes under consideration. The proper treatment of the crude material to bring it into the condition of a good sizing ingredient is thoroughly understood in England. But little, if anything, in this direction has been done here ; it is, however, a fact that many beds of this are altogether unfit for sizing purposes. Kaolin is found very extensively in different localities in the United States ; many large deposits are known in the South. Some years ago I sent several specimens from deposits in South Carolina to England for examination as to their fitness for weighting purposes. Only one sample was reported as being of value for such use.

I would suggest that this association collect samples of as many as is practicable of these clays, and have their sizing value determined by some competent authority, for I am convinced that the information which would be derived from such an analysis would sooner or later be of great value to many of our members. Many practical matters bearing on the sizing question in general, such as size mixing ; the duration, character, and effect of the fermentation of the size on itself and on the goods to which it is applied ; the most suitable ingredient for giving any desired quality to the mixture, as well as the action of each ingredient on the several components of the batch of size, are of much interest and importance, but cannot be inquired into at this time.

For obtaining the results necessary for successful heavy or medium sizing, the ultimate mixture must be composed of such ingredients as will give the desired proportion of adulterant, without much loss of material from the friction of the harness and reed in weaving ; it should be so antiseptic as not to readily allow the formation of mildew in the finished fabric ; it must also be so applied as to be thoroughly incorporated into the body of the threads, firmly distributed, and impart to the finished fabric a nice clothy feel. Many contiguous countries consume goods which are analogous in construction, length, width, weight, colour, and design, similar packages being quite often equally well adapted for several markets. It is important when local peculiarities are once known that they be rigidly adhered to at all times.

Having the data which, as manufacturers, we should need in order to produce the goods, one would naturally carefully examine the particulars to discover if any radical changes would have to be made in the machinery or equipment of the mill to enable one to produce them. Having in mind many of the Northern mills and the large proportion of the factories of the Southern States that are organised and equipped to manufacture coarse, heavy fabrics, it can be said that with a few inexpensive additions to the apparatus for mixing and storing the size, the heavy and medium-sized grey goods so largely purchased by non-manufacturing nations can be made satisfactorily and profitably and at competitive cost.

Such fabrics contain a maximum of raw material (cotton and size), and a minimum of labour is required in their production. Present conditions in the industrial centres of the South are more favourable for their remunerative manufacture than in any other manufacturing country in the world with which we shall have to compete immediately we step outside our domestic market to dispose of the products of our looms. For the warp of such goods as we are now considering, a hard twisted, solid thread is not at all suitable. A yarn with little twist, of an oozy character, made from a comparatively harsh cotton, will give much more satisfactory results as a carrier of adulterants, the size being better able to permeate the body of the thread. It is therefore retained much more tenaciously during the unavoidable chafing to which the warp is subjected throughout the weaving process.

An advantage which the Lancashire spinner has over us is found in the larger number of different varieties of cotton from which he can select. This also gives him a greater latitude in price, and in this way one can often lay down a mixing which is exceptionally well adapted for the particular kind of goods one has to make, as well as possibly being able to reduce the cost of the cotton mixing, by the incorporation of cottons which we do not have in this country. Exceptionally hard-twisted warp yarns are the rule in our American mills, although every unnecessary turn of twist put into yarn means an avoidable expenditure and loss of production. It is also surely known to many of you that no small quota of our mills use a much better grade of cotton than is really necessary to produce a good, merchantable fabric, which will compare favourably with similar goods made by our European competitors. That this wasteful practice is not so common as it used to be, the change in the grade of stock used in the production of American print cloths during the past decade may be cited. A passing reference should be made to the present advantage we have in the Northrop loom, by which the weaving labour cost is so much reduced.

I have in previous papers prepared for this association and for the National Association of Manufacturers dealt with the commercial aspect of this exterior trade, and shall possibly repeat to-day some of my previous observations on the distribution and disposal of our merchandise. But it is only by the constant repetition and reiteration of the importance of this matter to us, as well as to our dependent industries, that we shall finally move along the only avenue leading to permanent prosperity. The inertia of an industry of such magnitude as ours is difficult to overcome, and when once in motion it will, unless under intelligent guidance, move along the path of least resistance, and I assure you that the road to successful trading in the marts of the world will be anything but an easy one. Our competitors take care that this will be so. To one who has closely watched the development and progress of our cotton-manufacturing industry during the past few years, it is palpably obvious that we must very soon enlarge the present outlets for our goods, or, with our rapidly-expanding productive capacity, have our business periodically suffer from disastrous over-production and trade stagnation ; and, gentlemen, it must never be forgotten that the vital interests of almost every member of this body are involved in the prosperity of the cotton industry.

During the past twelve months the State of South Carolina reached the second position as a cotton-manufacturing commonwealth, Massachusetts being the only State having more spindles and looms, there having been installed in the former State during the year more than *1,300,000 spindles*. During the same period *Alabama increased the number of her spindles by 61 per cent.*, and an approximately corresponding increment is found in most of the other Southern States. During a recent trip I made in the South, I found on a short branch railroad in Mississippi three new mills and three additional ones projected. Need more be said of the importance of making the hundreds of millions of cotton-clad foreigners our customers? Curtailment of production in Fall River has become almost chronic, and no effort is apparently being made to avoid these shutdowns in the future.

In a paper on "Latin American Trade in Cotton Fabrics," which I recently presented to you, the construction of the standard English print cloth was given. Comparison will show that it differs in the two very essential particulars of width and weight from the standard American fabric. If our printers had similar goods, their export trade could be very considerably augmented, especially if their colours and designs met the tastes of the export trade. The cotton trade of the world is as yet practically untouched by us, while we keep on building new mills and enlarging existing ones at a great rate, and meanwhile we are doing practically nothing at all to enlarge our market for the goods made by these additions to our industry. Travelling Americans are frequently amused at the crude agricultural implements used by the peons of South America and the agriculturists of the Orient, although the business acumen displayed by us up to the present, in the way of protecting ourselves from over-production, is not one iota more advanced than are the crude appliances I have mentioned. Ability to produce the goods profitably at level prices, natural advantages, reciprocity treaties, the construction of a canal connecting the Atlantic with the Pacific, ocean shipping under our own flag, international expositions, banking facilities abroad—are all of much importance and would be materially helpful to us, and we may have all these advantages in the not distant future. But in so far as our own particular welfare is concerned, they will profit us but little unless the man who buys the goods is reached and our wares insistently brought to his notice. Competent salesmen we must have : men with a practical and technical knowledge of the goods they carry, capable also of collecting information bearing upon the peculiar needs of each market visited.

The trade cannot be reached without expense and systematic effort. Should, however, several corporations syndicate their interests and send out such a man as I have described, the expense would not be heavy for the several members of the combination, and the benefits that would ultimately accrue to them would most assuredly warrant the outlay. The South compelled our products of iron and steel to seek an outlet abroad, and this experience will most surely be repeated in our case. Perhaps we shall move slowly along, suffering our expensive equipments to remain idle for gradually lengthening periods, and in fancied impotency wait for another "boom" ; or on the other hand we may, by having our attention forcibly and frequently directed to the "way out," adopt the only means of ridding ourselves of the continual and growing menace of over-production and ruinous competition in the home market.

Calculating Average Production.

MILL managers are not quite unanimous with regard to the mode of arriving at the average count spun. For instance, one will say that his average is 15's, inasmuch as half the number of spindles run on 10's, while the other half spin 20's. Another will say that he has an average of 13's, although the same conditions obtain in his mill with regard to the disposition of spindles on the two counts. Evidently the latter is deducing the average from the outturn, the former from the number of spindles employed on different counts. Now, which is the system to be adopted? It would have been quite immaterial to make any distinction if there had been a shade of difference on the two averages, which are found by experience to converge in case of spindles run on various coarse counts, and to diverge in proportion to the fineness of the various counts spun. This divergence will be totally misleading when the question comes to comparison between different mills as regards production and economical working, when a common standard is established, say, on 20's average, which can be arrived at by both ways—*e.g.*, the former mill manager will find his production of 20's average better, because he has converted 15's average into 20's, whereas the latter will be suffering by comparison, as he has to convert 13's into 20's, although the conditions of spinning are identical in both cases. Hence the necessity of a common standard is quite apparent.

To come to another question (says a writer in the "Indian Textile Journal"), as I have shown above the practice has been with most mills to base their calculations on 20's average. This system must be considered obsolete; nowadays, when 20's through one cause or another has been decreasing in production, so far as the coarse count mills go, the majority of spindles are taken up by 10's or 12's. Under this circumstance I would advocate the establishment of 10's average for purposes of comparison. In the first paragraph I have merely pointed out the two systems, without expressing my judgment as to their merits or demerits. Of course, it would be immaterial if one were to follow any system, if he were merely engaged on finding out the average count only, and not further, although in this case, too, as I have said, there would be some difference. But supposing he wants to go further, and fixes a certain average (say 20's), and bases on this standard the total production and the rate of expenditure, then certainly I make bold to say that if he follows the practice hitherto adopted by most of the mills for computing on a certain standard, he is sure to go wrong. Up till now the method of simple proportion has been employed for reaching a certain standard—*e.g.*, if I spin 16oz. of 10's in 12 hours, my average on 20's is 8oz. Again, if I spin 4oz. of 30's, my average on 20's is 6oz. In the case of spinning 2oz. of 40's, the average on 20's dwindles down to 4oz. Then look at the disparity in figures reduced on the same average — viz, 8 : 6 : 4. Any correct calculation on this basis would be impossible.

Let us then adopt another system which aims more at the equalising of the averages of different counts reduced to a common standard. The production, as everybody knows, is calculated from the speed of the front roller. The spindles revolve at a constant speed. Hence the speed of the front roller requires to be reduced in the case of fine spinning in order to give the necessary turns per inch. Now the twist varies as the square root of count, and the speed of the front roller requires to be reduced in the same proportion. The formula in the first case would be $p' = \frac{x \times p}{y}$, where x is the given count p, its given production, and y is a certain count the production of which (p') is to be ascertained. The new formula that I suggest would be $p' = \frac{x \times \sqrt{x \times p}}{y \times \sqrt{y}}$.

Now let us mark the difference. We assume that we are spinning fairly good yarn on rings, and the different counts are 10's, 20's, 30's, and 40's, with a production of 16, 7, 4, and 2oz. respectively, in twelve hours. Now let us reduce the production to 20's average according to both formulæ, and see the result:—

(1.) $p' = \frac{x p}{y}$

(*a*) 10's on 20's average would be $\frac{10 \times 16}{20} = 8$oz.

(*b*) 20's " " " $\frac{20 \times 7}{20} = 7$oz.

(*c*) 30's " " " $\frac{30 \times 4}{20} = 6$oz.

(*d*) 40's " " " $\frac{40 \times 2}{20} = 4$oz.

(2.) $p' = \frac{x \times \sqrt{x \times p}}{y \times \sqrt{y}}$

(*a*) 10's on 20's average would be $\frac{10 \times \sqrt{10 \times 16}}{20 \times \sqrt{20}} = 6$oz.

(*b*) 20's on 20's average would be $\frac{20 \times \sqrt{20 \times 7}}{20 \times \sqrt{20}} = 7$oz.

(*c*) 30's on 20's average $\frac{30 \times \sqrt{30 \times 4}}{20 \times \sqrt{20}} = 7$oz.

(*d*) 40's on 20's average $\frac{40 \times \sqrt{40 \times 2}}{20 \times \sqrt{20}} = 7$oz.

The figures evidently speak in favour of the adoption of the latter formula. The results given are approximately correct, but there is not much variation. Even the totals of monthly production could be worked in this manner on a definite standard.

Twist in Silk Goods.

It often happens that two pieces of goods made of the same number of threads per inch, and with yarn of the same size and quality, will be very unlike in appearance. This may be due to various causes, and can be illustrated best by citing a particular example. Take the case of a half-silk umbrella cloth, woven with a five-leaf satin weave, two-ply fine cotton weft, one pick in the shade. If the twist of this weft is changed, a marked difference in the appearance of the goods at once follows. A change of twist in the weft of umbrella stuff may result in converting a fabric which resists the light into that which the light easily passes through. An analysis of two pieces of goods showing this difference indicated that in one fabric the weft had ten turns per inch, while in the other one there were fourteen turns. This was the only difference discovered, and was the sole cause for the difference of light-resisting power in the two pieces.

It is an old rule, adopted in the manufacture of half-silk goods, to use a harder-twisted weft for satin weaves than for plain weaves. This rule, however, applies only when the goods are to be used for dress trimmings or linings—fabrics which must possess a high lustre, but which need not be thick and bulky. The number of shafts used and the threads per inch have much influence upon the twist that should be put into the weft of satin weaves. A much softer weft can be used on a twelve-shaft satin weave than on one with five shafts. In the first instance the yarn floats much farther on the face, and consequently there is more opportunity for it to expand. The irregularities in the yarn also come out plainer when the yarn floats for a greater distance. This difficulty with loose satin weaves can be lessened if the selling price of the goods allows the use of a better quality of yarn.

The weave also has an influence upon the number of threads per inch. Seventy-five picks per inch of 2/40 cotton yarn gives very good results on an eight-shaft satin, whereas ten-shaft satin requires at least 88, and a twelve-shaft 100 picks per inch. To return to the cloth already mentioned: the quality of the cotton as well as the twist in the yarn has an important influence upon the closeness of the fabric. A long-staple Egyptian or Sea Island cotton gives very good results. In this particular much depends also upon whether the goods are finished with a high lustre or not. A soft-twisted yarn is to be preferred if this finish is to be given to the goods. The manner of handling cotton yarn in dyeing and finishing has likewise an influence upon the cover of the goods. The cotton threads should expand during the colouring in order to produce a cloth that will resist the passage of the light. The superior light-resisting power of a fabric is frequently due merely to the materials used in finishing.

We will now consider silk goods. When raw silk comes from the spinner it can be used only for piece-dyed goods, since it is impossible to give raw silk a uniform twist. The solution of this problem would mark an important advance in the art of silk manufacturing, as it would enable raw silk to be used for many fabrics that now can be made only with organzine or tram. In order that the silk thread may stand the necessary boiling and colouring, before weaving several raw silk threads are twisted together. This twisting begins with the winding off and spooling of the raw silk from the skein; then follow twisting and doubling. The doubling is in the opposite direction from the first twisting, the first being to the right, and the second to the left. The grenadine silk fabric forms a striking example of the great influence of the twist on the appearance of the fabric; while the ordinary organzine has but from 12 to 16 turns per inch, the silk yarn used for grenadines has from 38 to 40 turns per inch, and gives the fabric a sparkling appearance which can be likened only to fine tinsel thrown on a dull surface.

When we turn to the particular weaves employed, we find that it is an old rule that the production of a well-rounded twill on the right side of the goods requires that the direction of the twill should be opposite to the twist in the weft. We have two conditions to take into consideration: First, the direction of the twist in relation to the twill; second, the amount of twist in the yarn as compared with the slope of the twill in the goods. These conditions have much more influence with satin fabrics than with twills, as the warp in the first named comes almost entirely on the face. If a satin twill runs to the left, it produces a smoother appearance, and the weft seems more open; while a twill to the right stands out stronger, and the weft seems to be twisted harder. A twill running to the right with right twist weft causes the twill to stand out boldly; on the other hand, the twill to the left gives the better appearance. If it is desired to bring the twill out boldly with a weft twisted to the right, the twill should run to the right.

It cannot, however, be stated that as a rule the direction of the twill should always be contrary to the twist of the weft, says the "Zeitschrift für die gesamte Textil-Industrie." It is not sufficient that the direction of the twill should be opposite that of the yarn, but this twist in the yarn must be harder or softer according as the twill is nearer a vertical or horizontal line. In order to bring the twill out plainly, the twist of the weft must be softer according as the twill approaches a horizontal line. In goods made from all silk there are a series of fabrics which are made with the same weave and differ only in respect to the amount of twist in the yarn. Good examples of these are the three fabrics gauze, crape, and mousseline. All three are made with a taffeta weave; nevertheless each differs greatly in appearance from the others. For gauze, a raw silk double twist is used for warp as well as weft. In mousseline the warp and weft are made from yarn composed of two raw silk threads without twist, and subsequently twisted harder together. Crape is made from two or three threads doubled before dyeing, and then twisted hard after colouring.

The Cotton Industry in Japan.

(Concluded from page 349.)

SINCE the Chino-Japanese war, the attention of all civilised nations has centred upon "commercial China." Especially in the cotton manufacturing countries has a great deal been said and written about the value of North China as well as "China proper." If we look over the list of China's imports, we find that the imports of cotton goods were £13,941,000. This would make the total of cotton goods imported into China about 1,000,000 bales. Besides this, we must consider the production of cotton in China to decide the true demand of the Chinese market. Since China began to make extensive use of the cotton fibre, many centuries ago, the growth of cotton has reached immense proportions in the valley of the Yang-tze-Kiang, where the soil is very fertile. Although there are no official statistics of the cotton crops in that country, the closest estimate is 1,300,000 bales of 500lb. net, consumed in that country, exporting only 10 per cent. to other countries. If we add this crop to the total amount of import, there are about two millions and a quarter bales consumed in the Chinese Empire. What is the consumption of Japan? Japan produces about 100,000 bales of 500lb. yearly, and imports about 700,000 bales, but they do not consume all in the domestic market. What is the possibility of development, and what kind of goods does China need in the future? It is a universally known fact that the Chinese Empire has the largest population in the world, and that if this country could be thoroughly opened up by railroads—which are the most pressing need of the Empire—her demand for cotton goods would undoubtedly be increased to a considerable extent. I venture, however, to predict that China's demand will not exceed 4lb. per head in the next ten years.

From the list of imports in China I would say that cotton yarn ranks first, heavy goods second, and the lighter goods third. The cotton yarns are chiefly imported from India and Japan, and the heavy-goods trade is a monopoly of the United States, and lighter goods come from Manchester. In other words, cotton yarn is made by Asiatic mills; the heavy goods are a production of America; and the finer yarns and lighter goods are made in Europe. The chief market for American cotton goods in China is North China, where heavy fabrics are in great demand from the climatic condition. But if you want to expand your market, you must invade the great Yang-tze-Kiang valley. There the English have the markets. It will be well therefore to forecast that in the near future America will have severe competition with England in the middle as well as in the south of the Celestial Empire.

The Manchurian problem still remains a question of absorbing interest to all commercial powers, even after Russia has given up her Oriental programme for the administration of that vast and fertile province. Of course Russia cannot be expected to abandon her ambitious programmes for ever, just on account of that timely intervention of the Powers—in other words, the tact and astuteness that characterise her diplomacy may one day bring the matter to a conclusive issue. What attitude should all cotton-manufacturing nations take on this important question? Suppose the Northern Power declares her sovereignty over Manchuria: all foreign goods are excluded from that province by the high tariff wall. If such unfortunate events occur, all cotton-manufacturing countries must suffer to a more or less degree. Especially the Southern mills of America, which practically depend upon the markets of Manchuria, will be compelled to find another outlet in "China proper" or South America, where comparatively higher grades of cotton goods are in demand.

Since the Chino-Japanese War, Japan has made gigantic strides in both commerce and industry. She used every yen of capital for the various enterprises, which caused a stringency in the money market. A great deal is said and written about the introduction of foreign capital into the country, and it is now gradually beginning to assume a practical form. In the line of cotton industry a Frenchman who is engaged in some business in Siberia proposed to a director of a muslin factory at Osaka last year to establish a calico and cotton-velvet factory in Japan, with a capital of £500,000 or £600,000. There are about 2437 banking institutions in Japan at present, with a total capital of about £52,350,000, but they are not enough to finance the entire industries, which develope like mushrooms. It is true that the Japanese cotton industry is especially suffering from the scarcity of money, because they must pay high interest—over 10 per cent.—to the bank, and they cannot issue bonds without a guarantee of 9 per cent. at the present money market. The dividends of Japanese mills run from 20 to 30 per cent. under normal conditions. Lately, however, the over-production cut off their profits to a considerable extent.

I have often been told that the growth of the Japanese cotton industry offers a real menace to the American industry. It is, however, conceded by Japanese manufacturers, especially those who have visited America, that they have no special advantages over those of the United States, and the prosperity of the Japanese mills is not a barrier to that of America. Americans who never step on the "Island Empire of the East" imagine that the wages of millworkers in Japan are very low and the hours of labour are unusually long, which is a real ground to fear Japan as a sharp competitor in textile manufacture, and especially in cotton. It is true that the Japanese millworkers are satisfied with the average daily wages for men of less than 7½d., and for women about 4¾d.; and all mills in Japan run day and night, changing hands at noon and midnight, and the vast majority of millworkers are children who work eleven long hours with low wages. But remember, low wages do not always ensure cheap production. An example to testify to this is one of the cotton mills in Osaka, which employs 2600 workers—children under fifteen years constituting about 50 per cent.—to operate only 3700 spindles. In this country 300 persons can operate the same number.

I have been through the cotton mill towns in the North as well as in the South of the States to investigate the textile industry. When I was informed of their wages I was surprised at the high rate; but the labour cost when computed per spindle did not show so wide a disparity. Besides, the low wages of Japan is only temporary, for the standard of living is getting higher and higher in Japan, and the wages are increasing. If you compare the wages at the end of 1897 with those in the spring of 1894, you can easily see that the wages of males has increased 45 per cent., and of females 83 per cent. during four years. I predict, therefore, that the time will surely come when Japan will have no special advantages over the United States in the lines of wages. When I was travelling in the South, I heard that some Southern manufacturers intend to try Chinese labour in the cotton mills. It is true that Chinese labourers are cheaper than Japanese, but they have less efficiency and want more overseers, as they are not born as factory workers.

Japan is also farther away from the source whence machinery and supplies can be obtained. As you know, all Japanese mills are equipped with English machinery. But now Americans are showing us the latest mechanical devices; hereafter our cotton mills should turn their faces to the country where highly-perfected machinery is made. There is no need to say that Japan pays the highest freight for machinery. I have been told by a manufacturer of machinery that the freight of one loom from a North American city to Japan is about £3, while the freight to the South is only £1. It is the universal opinion that any nation which has a remarkable faculty of imitation might win other nations temporarily; but in the long run the originator alone can enjoy the last and permanent victory. I think Japan is not an exception to this rule. It is, however, a great disadvantage to import machinery from foreign countries, especially from a country of long distance.

From the preceding statements you should be convinced that the advantages of Japanese cotton mills are very slight, as well as temporary, when we compare with a country which has vast stores of raw material, skilful and intelligent labour, cheap capital, and perfect machinery. Before concluding this short sketch of the Japanese cotton industry, I would say that cotton manufacture in Japan will be improved in many ways if both the Government and the leading men of the country encourage the trade. But there is no promise of a rapid growth in the future, as they have just experienced over-production in the line of coarse yarn. I predict therefore that the future development of the Japanese industry will be slow, but sure, and that the number of establishments will decrease for the purpose of forming combinations for controlling products and prices and reducing the expenses of management.

Mildew in Woollen Goods.

THE formation of mildew in woollen goods, as in those of cotton, is due to the development of fungoid growths in the presence of air and moisture at a certain temperature. The most favourable time for the appearance of these fungi is in the summer, and especially in the month of August they occur very frequently. Certain dyes, like vat blue, are particularly liable to this growth, probably on account of the alkaline reaction of the dye liquors. The danger can only be avoided by not allowing the goods to lie in a heap for any considerable length of time. One of the primary causes of mildew can frequently be observed in the process of weaving moist cloth. Two different kinds of fungi may appear at this stage, according as to whether the fabrics remain cold or become hot. In the first place the fibre is not attacked or disintegrated, and also the fungoid growth often extends over a considerable area. Dark shades are hardly ever affected. The mildew can easily be brushed off.

Much more serious is the second kind, which appears in the form of smaller or larger patches, generally disintegrating the fibre. Mildew stains of this kind show after the milling as bare patches, and the fibre appears quite rotten. The same stains are often caused through the cloth, after the milling, being left to lie unwashed. Undoubtedly the highly alkaline reaction of the cloth at this state is very favourable to the growth of the fungus. There occur, however, other stains in woollen cloth, which in their appearance are very much like mildew stains, but are due to quite different causes, and only a microscopical examination can reveal the true nature of the stains. Under the microscope the fibre of mildewed wool is found to have lost its characteristic scales almost entirely, and to be split or dissolved into numerous cells so that the ends of the fibres possess the appearance of a brush. Such mildew stains are in dyeing quite indifferent to colouring matters, so that according to the degree to which the fibre has been affected the stains appear after dyeing of a higher colour than the rest of the cloth, or they may remain altogether undyed. The behaviour of mildew stains towards various dyes was found to be as follows:—

Scarlet, dyed in one bath with cochineal, tin crystals, and oxalic acid: white spots of varying sizes.

Billiard-cloth green, dyed with acid green, sulphuric acid, and Glauber's salt: white spots, fibre very rotten.

Moss green, dyed with indigo carmine, fustics, and alum in one bath: light greenish-yellow, stains, the pile of which is entirely destroyed.

Vat blue, topped with logwood: large and small stains, dyed an uneven light blue.

Vat blue, medium shade: irregular white spots.

Dove grey, dyed with alizarin blue S W: pale-blue spots.

Dark brown, dyed in one bath with fustic and camwood, with copper and iron sulphate: large and small light-brown stains.

Logwood black, with ferrous sulphate: light-bluish stains.

The mildew stains on the logwood black, says the "Färber Zeitung," are very similar to the stains caused by soap remaining in the cloth in the washing. In all cases the microscopical examination of the above samples showed the scaleless and split fibres.

Sisal Fibre Cultivation in India.

IT appears that there is now every prospect of the production of sisal fibre having a trial in Assam, and as very little appears to be known about it, a few facts with regard to the industry may be of interest. The average price realised for the fibre on the London market during the last fourteen years was £28 per ton, the period including times both of depressed and of booming prices. The fluctuations were due to the general inferiority of the machinery, which caused fibre of variable quality to be turned out; and to the intermittent supply of the fibre, which caused it to be influenced by the Manila market. Large areas, however, have lately been opened up in Yucatan and the Bahamas, and it is now the general opinion of fibre experts at home that with a constant supply and the enormously-increased demand for this fibre all over the world, and especially in the United States of America, the price will remain firm between £25 and £30 a ton for many years to come.

Until very lately the extraction of the fibre was effected by crude and wasteful methods, which broke the fibre and usually turned it out in a weak and discoloured state. Within the last few years, however, Spain and America have produced new automatic machinery which turns it out uninjured and in beautiful condition. In Yucatan the fibre is produced for about a penny a pound, or less than £10 a ton, so there is very little to wonder at in the fact that some 300 square miles have been taken up for its cultivation, and that the export last year was nearly half-a-million bales, and is increasing year by year. In the Bahamas the cost appears to be greater, and properly-cleaned fibre cannot at present be placed on the London market from these Islands for less than £15 per ton. It is probable that the prices of labour in the two countries account for this difference. The Germans in East Africa have several million agave plants put out, but they appear to be using the Mauritius variety (*fourcroyea gigantia*) more than the sisal. This is probably the case only by reason of the reluctance of the Central American and British Colonial Governments to allow the sale of sisal bulbils for export.

A larger proportion of fibre is found in the leaf of the sisal plant than in that of any other agave, and it also commands a higher price than the Mauritius or any other variety. In the Bahamas and in Yucatan the plants are usually spaced 5½ft. apart, giving 840 plants and yielding half-a-ton of the cleaned fibre to the acre. As the weight of the dry fibre after decortication is only 3½ to 4 per cent. of the weight of the green leaf, very efficient transport arrangements are a feature of these plantations, and ropeways, mono-rails, and light railroads are very generally utilised. The plants appear to require very little attention, they luxuriate in the very poorest of soils, are absolutely impervious to drought, and two hoeings in the year is the sum of the attention they require. The leaves are ready for cutting when the plant reaches its third year, and each plant yields sufficient ripe leaves for the production of about 1¼lb. of dry fibre yearly, for about five years, after which it throws up a pole, produces it seeds, and then dies, yielding up its place to a sucker or secondary plant, of which a large number appear around the parent plant during its career. The cultivation of agaves on a large scale has been started in Mysore and in Bombay, but the superiority of the sisal over all the other varieties has unfortunately not been fully appreciated, and the inferior varieties have been utilised.

There is a small plantation of the sisal agave on the Dauracherra estate in the Sylhet district of Assam, from which a consignment which was recently sent to England realised over £36 per ton. This fibre was cleaned by one of the old-fashioned rough scutching machines, so that the sale should give every encouragement to those who propose opening-out with modern machinery on a large scale. With the cheapest land and labour in the world, and the increasing demand for all classes of fibres in this country and elsewhere, it seems, says the Calcutta "Capital," more than probable that this industry will command serious attention in the near future.

Sericulture in Mysore.

THE first trial of rearing silkworms by the Japanese experts who were specially brought over from Japan was started in April, 1898, in Bangalore, says Mr. T. Odzu in the "Mysore Gazette," on a small plot which was kindly placed at my disposal for the purpose by the superintendent of the Government Gardens. In March, 1899, a plot of land extending over 17 acres, situated in the vicinity of the village of Nagasandra, near the Basavangudi extension, was granted to Mr. Tata for the use of his experimental mulberry plantation. There an ample structure provided a number of rooms for rearing silkworms, reeling silk, and other requirements. Two storehouses were afterwards erected on the upper portion of the land in rear of the main building. At the same time a garden well of the diameter of 18¾ft. was sunk there for the purpose of irrigating the mulberry plants. During the interval an extreme scarcity of water was felt in the plantation owing to the intense dryness of the season, and a request was made to the Revenue Commissioner to kindly allow the use of the Yedur tank water, which was available at a very short distance, to irrigate our field. This was granted, and the anxiety about the plantation was relieved also by a further extension of the land by 14 acres below the Yedur tank, with an absolute right of drawing the tank water. The mulberry plantation was started with 400 mulberry plants of one to two years' growth, and in the first year numerous plants have been propagated. In the succeeding years, under various new ways of planting, an approximate number of 6000 plants of two to four years have been reared. Besides those, there are now no less than 20,000 cuttings of new growth on the plantation, and Japanese mulberry grafts amounting to 1500, in three varieties, were also recently imported and are found to be growing in a very healthy condition. The whole area under the mulberry plantation was officially surveyed, and it was ascertained to be 7 acres 38 guntas—viz., 4 acres 28 guntas with fully-grown plants, 1 acre 15 guntas with smaller plants, and 1 acre 35 guntas of land which is being carefully tilled preparatory to receiving those young plants in the nursery by the next rainy season. About 10 acres of wet land have been utilised for cultivating the kind of paddy which requires no irrigation, also some Japanese rice. In this country paddy straw is sold at very high rates, and we require it for the worms to build their cocoons on; the paddy husk also being used for rearing silk-worms. The experimental rearing of silkworms of various species has been conducted in the field. A new method of reeling silk has been started, and a number of young native girls employed with a view to ascertaining if they can be trained to reel silk after the Japanese fashion. In conclusion, I beg leave to state that although the undertaking is of an extremely trying nature, a good deal has been accomplished at considerable outlay. But the experiment is still in the initial stage. Progress of work (during last year) was hindered by my unavoidable absence from India for over half the year. However, newly-ordered reeling machinery and other equipment of the factory will soon be arriving from Japan, promising good results, when another report showing the extent of successes achieved in improving the industry in detail will be submitted.

Gleanings from Consular Reports.

ZANZIBAR.—The total value of piece goods imported into Zanzibar in 1900 was £255,720, and the extent to which the principal manufacturing countries participated in this trade was as follows :—British India, £104,937; Belgium, £42,550; the United Kingdom, £37,155; America, £22,807; Germany, £18,233; Holland, £4500; and France, £3934. The imports from Belgium and France were practically the same as in 1899, but with respect to all the other countries mentioned there was a decided decrease, amounting in the case of the United Kingdom to 23 per cent.; India, 24; Germany, 40; Holland, 56; and America to no less than 67 per cent. of the goods imported during the previous year. In the case of the United States this decrease is explained by the introduction of the rupee into Uganda, and the consequent reduction in the demand for "Americani," an unbleached cloth which until recently formed the only currency in that part of the country. In other directions it is due to a bad financial year in consequence of a poor clove crop, and as regards British products to the fact that, with large stocks on hand, the merchant did not see his way to pay the higher prices to which, as a result of the South African war, many of the home manufacturers had risen. With the exception of the better kinds of "grey cloths," the trade in this particular class of piece goods has not shown much variation; the inferior qualities of whites and greys come almost entirely from India, which enjoys great advantages in the matter of labour and freight. The Indian samples of "gumpty" and "hindessa," two varieties of a grey cloth known as "membai," are also more popular than those manufactured in the United Kingdom on account of the absence of size or its presence in very small quantities.

In white shirtings and the finer grades of muslin Manchester holds its own, but this class of goods has only a limited sale among the Arabs and Indians. Woven cloth also comes from the United Kingdom, and indigo-dyed cottons ("kaniki") from Bombay. For "bandera," or dyed Turkey red, there is a considerable demand; it is shipped from Austria-Hungary and other European countries, and is sold in two qualities, known as "cambric" and "twill." Loin cloths, or "vikoi," are worn by all Arabs and natives; the ordinary kind is made in the United Kingdom, and a better quality in Muscat. Similarly the latter country supplies the hand-made cloths, of which the best turbans are composed, a cheaper sample coming from Manchester. Thin cotton vests, which are universally worn, are shipped from several European countries.

Another important branch of the piece-goods trade is in connection with "kangas," or printed cotton handkerchiefs, some 72 by 50in., two of which, together with a scarf round the head, constitute the everyday attire of native women. These are mostly imported from Holland, where the block-printing process is not only cheaper than the roller printing in the United Kingdom, but permits of a great variety of patterns at a comparatively slight increase of cost. A British firm has, however, recently succeeded in placing on the market a "kanga" which, while it is sold at the same price as the Dutch imported article—namely, 12rs. 12a. per korj of 20,—is much superior to it in point of quality and finish. An order for 2000 of these handkerchiefs of the same pattern is the lowest that the manufacturer can accept, but in view of the manifest advantages which they possess over those of foreign make, there should be no difficulty in disposing of that number so long as the pattern and colour strike the public fancy.

Kieff (Russia).—In order to control the jute sack trade the Russian manufacturers have formed a syndicate to keep up prices, and by allotting to each factory certain districts to keep down the cost of transport to the lowest minimum. The immediate result of this formation was an advance of about 30 per cent in prices. Naturally the consumers are greatly incensed at the object of the syndicate, and have not been placing their orders to anything like the extent they formerly did. The sugar trade alone uses about 9,000,000 sacks per annum, the size being 28 by 42in., weighing 37½ poods (1354lb.) per 1000, or, say, 21⅔oz. each, and the price was raised from 23¼c. (5·85d.) to 30c. (7·58d.) each, and there now being no competition between the home manufacturers the consumer has no alternative but to pay the increased price. There is a faint hope that the syndicate may break up, or that the Minister of Finance may see fit to counteract the object of the syndicate by reducing the import duty upon jute sacks of 3r. 90c. per pood, or £1 5s. 5d. per cwt., or to grant a drawback upon all Russian made sacks used for the exportation of sugar equal to the import duty upon the raw jute. About fifteen years ago most of the jute goods used in Russia were of British manufacture although largely supplied through Hamburg firms; and providing the prices in Dundee and other jute centres can stand the import duty above mentioned, the present state of the trade in Russia might enable them to come within the lines of competition. It must be kept in view that in addition to the quantity of sacks used for sugar the flour and grain trades annually require an immeuse quantity of sacks.

Some 30,000 to 35,000 poods (484 to 564 tons) of merino wool were despatched during the year 1900 to factories in Poland and Moscow. There was formerly an active trade between this part of Russia and the United Kingdom, but it has been suddenly abandoned for no apparent reason. Merino wool was at that time exported to Bradford and Hull, and though inferior in appearance to Astrachan wool, it was appreciated for its strength and durability. The demand, however, seems to have ceased.

Soochow (China).—The proximity of Soochow to Shanghai is responsible for its waning trade, and will prevent the city from ever regaining its former importance as the silk emporium of China. The province of Kiangsu is intersected with canals, which enable the neighbouring towns and villages to send their goods direct to Shanghai, and the only silk now exported in any quantity through the Soochow Customs is the produce of the three foreign filatures. Two of these filatures are Chinese-owned and under Chinese management, and one, the Chino European filature, is a foreign concern. The silk produced by the latter is said to be the best in China, and though no profit was made last year, owing to the commercial crisis which prevailed, the filature is expected to pay handsomely in the future. The water at Soochow has certain qualities which give a lustre to the silk which is lacking in the Shanghai article. In spite of this advantage, however, and the fact that wages are slightly lower at Soochow than at Shanghai, the other two filatures have not been a success, the silk produced being considerably below standard. This is said to be entirely due to the lack of proper supervision, which can only be obtained by having foreigners in charge. The cocoons for the Chino-European filature are purchased up country by the manager—an Italian—during the silk season, and it is remarkable as showing how completely Shanghai has superseded Soochow as the silk trade centre that if the quantity purchased should happen to be insufficient, fresh stocks can only be obtained at other seasons of the year in Shanghai. As the Customs duty on cocoons sent from Shanghai to Soochow amounts in all to over 5 per cent. *ad valorem*, in addition to the 10 per cent. likin charged at the place of production, the question is a serious one for Soochow filatures.

The silk produced at Soochow is exported to France and Italy viâ Shanghai, the full export duty of 10 taels per picul (133⅓lb.) being paid in Soochow, and a half or coast-trade duty of 5 taels at Shanghai. The latter duty is refunded on the goods being re-exported to Europe. Last year 796cwt. of filature silk, valued at £70,000, were exported from Soochow.

The import trade of Soochow, particularly in foreign goods, has been more and more disappointing every year. The foreign imports have dropped from £142,000 in 1897 to £27,000 in 1900. The decline is, of course, only so far as the foreign Customs are concerned. It may be presumed that the trade which comes under the cognisance of the likin office only has increased to a proportionate extent. Yet when it is remembered that the immediate advantage expected from the opening of Soochow was that foreign goods would be laid down there as a terminus, free from all internal duties, it is a great disillusionment to find that it pays merchants better to come to an arrangement with the likin officials as to the amount they shall pay them as duty than to fight them. Any advantage they may gain by passing their goods through the foreign Customs is more than balanced by the increased likin tax such goods are made to pay subsequently, either at the gates of the city or wherever they happen to be taken.

The result is that no foreign piece goods figure in the Customs returns, though the import is a large and increasing one. The value of the trade is estimated at about £130,000 a year, but it is impossible to obtain any reliable statistics on the subject. Judging from the quantity of Manchester goods exposed for sale in all the drapers' shops, a very large proportion of the trade must be British.

San Francisco.—The heavy advance noted in the price of linen goods caused a decline in the importations into this district in 1900, but large supplies were drawn from the stocks that had accumulated in the big cities of the Eastern States, as local buyers found it to their advantage to procure goods in this way. German manufacturers make a speciality of fancy cloths and damask towels with open-work borders, which are sold in this market. If the British manufacturers would turn out similar articles they could secure a substantial share of the trade. British manufacturers should pay much more attention to designs, as they are too conservative in sticking to old patterns. Continental makers excel in this particular, and produce a more showy article at the same price, which is frequently taken in preference.

Importations of British cloth have materially declined since the present tariff came into effect. At first it was taken advantage of by domestic manufacturers to advance the price of their goods, but for the last two years they have made a reduction, and at the same time greatly improved the quality of their product. These advantages have stimulated the sale of the domestic article to such an extent that imported cloth is now only worn by those persons to whom price is no object.

The wool growers of California had a fair clip in 1900, estimated at 22,500,000lb., but the prices were affected by the general depression of the industry, which was unquestionably caused by the undue competition of cotton. It is not so much the increased use of cotton goods, sold as such, but of woollen goods which are largely made up of cotton. The ingenuity of manufacturers has devised processes of making cotton goods take the dye and look of wool when they are new, and the public, which is always on the look out for cheap articles of wearing apparel, etc., readily buys them.

The cultivation of hemp in this State continues with satisfactory results. Experiments made at Gridley, in Butte County, and along the rich river bottom lands of the Sacramento River, have demonstrated the fact that the plant thrives well in this climste under favourable conditions.

THE GAZETTE.

ENGLAND.

Partnerships Dissolved.

F. Crossley and G. Armitage, mohair merchants, Commercial-street, Bradford.

K. Newbery and H. W. Newbery, upholsterers' trimmings and embroidery manufacturers, Percy-street, Tottenham Court-road, London.

W. Tatham and A. F. S. Tatham, lace and needle manufacturers, Nottingham and Ilkeston, trading as Amos Tatham and Son.

James Atkinson and Bannister Wilkinson (as Snowdon and Atkinson), cotton manufacturers, Vale-street Mills, Nelson.

G. V. Sunderland and F. A. Pennington, wool, top, and noil merchants, 6, Clarence-street, Bradford, as V. Sunderland and Co.

S. Briggs, J. M. Briggs, and J. H. Briggs, worsted spinners, Highgate Mills, Clayton Heights, near Bradford, and stuff manufacturers, Shelf Mills, near Halifax, as Henry Briggs and Co.

William Hartley, Robert Hartley, and James Hartley, worsted spinners and manufacturers, Bingley, as J. and J. Hartley; as regards W. Hartley.

Alexander Glen Park and John Clayton, yarn merchants, reelers, and doublers, Lark-street Mill, Bolton, as John Clayton and Son.

Voluntary Windings-up.

Shaw Heath Mills Company Limited. Meeting held in Manchester. Mr. E. Crowdson, liquidator.

Wingates Spinning Company Limited. Meeting held at Bolton. Mr. W. Kevan, liquidator.

Great Lever Spinning Company Limited, Grecian New Mill, Great Lever, Bolton. Mr. W. Kevan, 12, Acresfield, Bolton, liquidator.

The Bankruptcy Acts, 1883 and 1890.

Receiving Order.

Ernest Hague (as Ernest Hague and Co.), grey-cloth agent and merchant, 12, Lloyd street, Albert-square, Manchester.

Adjudications.

James Walter Clarke, hosiery manufacturer, Middlegate-street, Great Yarmouth.

Frederick Walter Hadwen and Alfred Ingham (as John Hadwen and Sons), silk spinners, Triangle, near Halifax.

Joseph Atwell (as Joseph Atwell and Co.), silk manufacturer, Union-street Mill, Macclesfield.

Ernest Hague (as Ernest Hague and Co.), grey-cloth agent and merchant, Lloyd-street, Albert-square, Manchester.

NEW COMPANIES.

Edmund Nuttall and Co. Limited.

REGISTERED October 12, with a capital of £2000, in £1 shares, to acquire the business carried on by E. Nuttall and Co., at Whitefield-street, Nelson, Lancashire, with their interest as tenants of a portion of Whitefield Shed, at Nelson aforesaid, and to carry on the business of cloth manufacturers, spinners, weavers, and manufacturers of and dealers in cotton, woollen, and other fibrous substances, etc. No initial public issue. The number of directors is not to be less than three nor more than five; the first are E. Nuttall, W. H. Hall, and J. Hall, jun.; qualification, 50 shares. Registered office, Whitefield Shed, Nelson, Lancashire.

George Tinker and Co. Limited.

Registered October 12, with a capital of £5500, in £1 shares, to acquire the business and properties described in an agreement with Josiah Wade, to adopt and carry into effect the said agreement and to carry on the business of worsted coating manufacturers, manufacturers of worsted stuff of every description, woollen stuff manufacturers, wool merchants, wool combers, worsted and woollen spinners, yarn merchants, cotton spinners and doublers, flax, hemp, and jute spinners, linen manufacturers, bleachers, dyers, finishers, etc. No initial public issue. The number of directors is not to be less than two nor more than five; the first are G. Tinker and J. Wade, each of whom may retain office so long as he holds 500 fully-paid shares; remuneration, as fixed by the company. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Fenton-road Works, Fenton-road, Halifax, Yorkshire.

J. and G. Walthew Limited.

Registered October 8, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of John and George Walthew Limited (incorporated in 1891), and to carry on the same for the benefit and under the control of the Fine Cotton Spinners' and Doublers' Association Limited. No initial public issue. The Fine Cotton Spinners' and Doublers' Association Limited are the permanent managers. Registered office, Temple Chambers, St. James's-square, Manchester.

Melland and Coward Limited.

Registered October 11, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the businesses lately carried on by Melland and Coward Limited (in liquidation), at Heaton Mersey and at Ardwick, both in Lancashire (save and except the business of dyers carried on by them at Ardwick aforesaid), to adopt two agreements with the Bleachers' Association Limited, and to carry on the business of bleachers, dyers, finishers, dressers, printers and manufacturers of and dealers in cotton, linen, silk, worsted, woollen, and other textile goods, etc. No initial public issue. The first directors are to be appointed by the managers. Registered by Paterson and Co., 25, Lincoln's Inn Fields, London, W.C.

Tutbury Mill Company Limited.

Registered October 8, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of the Tutbury Mill Company Limited (incorporated in 1896), and to carry on the same for the benefit and under the control of the Fine Cotton Spinners' and Doublers' Association Limited. No initial public issue. The Fine Cotton Spinners' and Doublers' Association Limited are the permanent managers. Registered office, Temple Chambers, St. James's-square, Manchester.

Norcroft Dyeing Company Limited.

Registered October 12, with a capital of £1000, in £1 shares, to adopt two agreements with the Bradford Dyers' Association Limited, and to carry on the business of dyers, finishers, bleachers, printers, and manufacturers of and dealers in textile fabrics, etc. No initial public issue. The Bradford Dyers' Association Limited are the controllers of the company. Registered office, 39, Well-street, Bradford.

Bennett and Jackson Limited.

Registered October 16, with a capital of £10,000, in £5 shares, to acquire the business of bleachers, carried on by Frances A. Bennett and J. Bennett under the style of C. E. Bennett and Co., at Birch Vale, Derbyshire, to adopt an agreement between the said F. A. Bennett and J. Bennett of the first part, J. J. Jackson of the second part, and J. M. Hampson (for the company) of the third part, and an agreement between the said J. J. Jackson of the one part, and the said J. M. Hampson (for the company) of the other part, and to carry on the business of bleachers, dyers, finishers, etc. No initial public issue. The first directors are J. J. Jackson (governing director), J. G. Munro, and J. Coakley; qualification, £150; remuneration of governing director while managing the company's business, not less than £500 per annum; of others, as fixed by the company. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Shallcross Mill, near Whaley Bridge.

Mayall and Massey Limited.

Registered October 21, with a capital of £10,000, in £1 shares, to acquire the business now carried on as Edward Mayall and Massey Limited, and the lease of the Further Hey Mill, Lees, near Oldham, Lancashire, to adopt an agreement between R. J. Riley and W. Ferguson of the first part, J. Ferguson, J. T. Fletcher, J. Pownall, H. R. Sassen, H. Ellison, and W. Westall of the second part, and this company of the third part, and to carry on the business of manufacturing and doubling cotton, silk, woollen and other yarns, and the making of any goods and fabrics. No initial public issue. The number of directors is not to be less than two nor more than seven; the first are R. J. Riley, W. Ferguson, and J. Ferguson (permanent governing directors); special qualification, 1000 shares); ordinary qualification, 200 shares. Registered by Kerr and Lanham, 13, Chichester Rents, Chancery-lane, London, W.C.

Parker and Cocks Limited.

Registered October 28, with a capital of £10,000, in £1 shares, to acquire the business of manufacturers of and dealers in cotton goods now carried on at 1, Chain-street, Manchester, by J. H. Parker and J. C. Cocks, and to carry on the business of manufacturers or merchants of and agents for cotton goods, wool combers, worsted spinners, yarn merchants, bleachers, dyers, and textile manufacturers generally. No initial public issue. The number of directors is not to be less than two nor more than five; the first are J. H. Parker and J. C. Cocks; remuneration, as fixed by the company. Registered by Waterlow Bros. and Layton Limited, Birchin-lane, London, E.C.

Alexander Jamieson and Co. Limited.

Registered at Edinburgh, October 31, with a capital of £100,000, in £1 shares, to purchase or otherwise acquire the business carried on under the name of Alexander Jamieson and Co., at Darvel, Ayrshire, and the whole property and assets thereof, and to carry on the business of manufacturers of and dealers in lace, lace curtains, madras, plain net, chenille, and tapestry, etc. The number of directors is not to be less than two nor more than seven; A. Jamieson is one of the first; qualification, £100; remuneration of A. Jamieson, £650 per annum; of other directors, as fixed by the company. Registered office, Donington-street, Darvel, Ayrshire.

JOTTINGS.

PUSCHER, a German chemist, has met with great success in using glycerine mixed with glue to increase the adhesive power of glue. If mixed in the proportion of one part glycerine to three parts of glue, all brittleness will disappear. This mixture is also made use of for lining leather, etc.

WE regret to notice the death of Mr. James Birtles on the 4th inst. The deceased gentleman, who was born in 1850, had been connected with the firm of Messrs. Wilson and Co., Barnsley, bobbin makers, ever since he was nine years old. He was a traveller for thirty years, and became a director when the concern was converted into a limited liability company about nine years ago.

A WAY of protecting iron in warm steaming places is to paint the clean and dry iron with a solution got by boiling 10lb. of unbleached shellac and 3lb. of borax in 10gals. of water, and mixed just before use with twice its volume of ordinary paint, having a vehicle of boiled oil and turps. Graphite and boiled linseed oil make a very good paint, too; this will stand heat, cold, and acids perfectly well.

A COMPOUND for removing rust from and brightening the appearance of soiled fabrics is made as follows:—Ten parts of oxalic acid and two parts of borax are thoroughly pulverised and mixed together. This compound is spread upon the cloth to be treated, and enough boiling water applied to dissolve the acid and borax. It is said that the rust will be entirely removed and the cloth or fabric perfectly cleansed, and that the compound may be used with equally good results for bleaching.

MESSRS. TURNER BROTHERS LIMITED, Rochdale, who have for many years in succession been favoured with the Admiralty contract for asbestos goods, have again been awarded the contract for the current year, consisting of the following articles:—Asbestos fibre, asbestos cord, asbestos metallic and indiarubber woven sheeting, asbestos metallic joint rings, asbestos packing for stuffing boxes, asbestos sheeting, asbestos mattresses, and asbestos core rope.

THE Board of Trade returns for October show that the imports for the month amounted to £44,351,403, against £48,495,608 in the corresponding month of last year, or a decrease of £4,444,205. The exports for the month totalled £23,985,636, against £24,742,930 in October, 1900, or a decrease of £759,294. The imports for the ten months ended October 31 amounted to £428,745,972, against £427,646,786 in the same period last year, or an increase of £1,099,186. The exports for the ten months were £233,342,676, against £243,214,685 for the corresponding period last year, or a decrease of £9,872,009.

MR. B. F. STONE, American Consul at Huddersfield, has issued his returns of the monthly exports to the United States, showing a total of £17,383 15s. 2d., against £10,939 17s. 8d. last year, and £15,241 19s. 1d. in October, 1899. Last month's worsted goods accounted for £5040 12s. 4d., or £2670 5s. 3d. more than last year; and woollens £3699 16s. 10d., or £2302 16s. 1d. more than last year. The other principal increases were £1466 7s. 1d. for chemicals and dyes, £421 2s. 3d. for rugs and shawls, and £483 13s. for wool. The only serious decreases were £1144 1s. 11d. in card clothing and £707 1s. 6d. in sewing cotton.

THE silk crop in Murcia, Spain, is said to have yielded this year some 1,322,760lb., or about the same as last year. This at 3·50 pesetas per kilogramme would mean about 2,000,000 pesetas (about £56,250) for the whole crop of Murcia, which is in effect the crop of Spain, as virtually no silk is produced in the other provinces. It is estimated that each ounce of seed produced 4 arrobas (100lb.) of raw silk, and it is believed that this yield would be increased to 5 arrobas (125lb.) per ounce of seed if the mulberry trees were more carefully cultivated and the silkworms treated according to modern methods. The silk industry is much overtaxed by the Government, and some of the industrial journals are predicting its complete ruin unless the taxes are reduced.

SCROOP can be imparted to mercerised cotton by passing the material several times through a solution of Marseilles soap and acetic or tartaric acid. The goods are not rinsed, but simply extracted and dried, so that the acid evaporates from the fibre. The greater the evaporation of acid, the more durable is the scroop or rustle of the goods. The strength of the bath for any particular case can be determined best by experiment. Recently boracic acid has been recommended for this purpose. The bleached and mercerised cotton is treated in a bath containing Marseilles soap and boracic acid. From 16 to 20lb. boracic acid is used for 100lb. cotton. It is claimed that this process does not affect even the colours that are especially sensitive to acids, such as Congo red.

WE regret to notice the death of Alderman George Keighley, J.P., of Woodfield, Burnley, at the age of 70 years. Beginning life as an apprentice mechanic, he started in business for himself when quite a young man, and from small beginnings built up the large and well-known loom-making and engineering business bearing his name, and known since 1876 as Bankhouse Ironworks. For many years he exported large quantities of looms to South America, India, China, Japan, Russia, Germany, and France. Alderman Keighley was the oldest public servant in Burnley, and one of its most public-spirited citizens. For many years he was the "father" of the Burnley Town Council, having an unbroken record of service since 1868. He was made an alderman in 1882, and was Mayor for two years—1895-7.

IN dyehouses, bleachworks, etc., where iron is constantly exposed to steam, it requires special protection. The cleansing of the iron should always be done by mechanical means—*i.e.*, by scraping and glass-papering, when possible, and it must be dry as well as clean when the paint is applied, and further, no coat must be covered with another until it is quite dry. The iron is best primed merely with hot drying linseed oil. This is followed, when dry, by a coat of red lead and boiled oil. When this is quite dry, any other colour may be laid on. All coats must be skilfully applied with a proper brush, and no bubbles or uncovered places left. All holes and cracks in the iron should be well stopped and levelled up with red lead, made to a paste with boiled oil, as soon as the iron is clean and dry, and the stoppings must be dry when the priming is laid on. The coats should never contain volatile solvents or driers.

THE carpet industry of Bulgaria is at the present time only in a flourishing condition in the villages of Tchiprowtzi, Kopilowtzi, Glavanowtzi, Vlachko-Sélo, and Chelesna. It employs 959 women and 726 girls. It is said that lack of credit and want of proper organisation prevent the carpet industry from developing in this mountainous region, another drawback being the absence of good means of communication. On the other hand, the more modern production of Panagourichte, Kotel, etc., makes very satisfactory progress. In 1898 the imports of carpets into Bulgaria amounted to 7351kilos., valued at 30,529frs., whilst in 1899 the imports fell to 5079kilos., valued at 19,574frs. Exports also showed a decrease in 1899, being 9184kilos., valued at 45,333frs., in 1899, as against 11,174kilos., valued at 56,693frs., in 1898. It is said that Bulgarian carpets are already known and appreciated in England, France, Belgium, Germany, etc.

FOR the third month in succession the Consular returns as to exports from Bradford to the United States show an increase as compared with the corresponding month of last year. The total for October was £113,517, as against £79,131 in October last year, or an increase of £34,386. The increases for September and August were only £3255 and £1837 respectively. The satisfactory feature of the returns for the month of October is that the increase has not been chiefly in wool or in any other of the raw materials which fluctuate very much, but in finished articles, which are the most heavily taxed on the other side. The value of the dress goods and linings exported was £44,639, as compared with £16,926 in October, 1900, or an increase of £27,712. Cotton cloths have advanced from £13,829 to £17,332, and worsted coatings from £3558 to £5561. There are also slight increases in wool and machinery, and decreases in silk and cotton yarns.

THE directors of Messrs. J. and P. Coats Limited have submitted to the shareholders the report and statement of accounts for the year to June 30, 1901. The net profit for the year, after carrying the sum of £35,003 to depreciation account, amounts to £2,613,038. This, with £272,105 brought from last year, makes a total of £2,885,143, and after deducting interest and interim dividends there remains a balance of £1,870,196, which the directors recommend should be dealt with as follows:—To reserve fund, £605,440; to payment of a final dividend for the year ended June 30, 1901, of 2 per cent., making 6 per cent. for the year, on preference shares—£49,974; to payment of a final dividend for the year ended June 30, 1901, of 15 per cent., making 20 per cent. for the year, on the ordinary shares—£675,000; to underwriting fund, £40,000; to suspense account (provision against depreciation of investments), £100,000; to premium account (providing for redemption of debentures), £93,000 — £1,561,414; leaving a balance to be carried forward of £308,781, which is subject to auditors' fees and bonus to employés.

A MARKING-INK PENCIL, specially suitable for marking linen, cotton, and silk fabrics, is, according to a recent patent, made from a salt of one of the following metals—viz., iron, copper, aluminium, or chromium, preference being given to the latter, four parts of which are ground to a powder and heated in a crucible, with two parts of carbonate and one part of nitrate of potass, crystallised, mixed with gum and water, and formed into pencils, to be used in wooden holders or metal cases. With the pencil a suitable mordant is necessary, composed of a salt of one or more of the following reagents—viz., iron, copper, potassium, alizarin, or aniline, preference being given to the latter, of which are taken equal parts of the nitrate, hydrochlorate, sulphate, and oxalate of the same, together or separate, and made into a saturated solution with water or spirit, or into a solid cake. A piece of glass or other tubing is closed at one end by melting, and drawn out at the other end to a point, leaving a small hole, which will only allow as much moisture as is required to escape—by tapping upon and into the fabric—by means of capillary attraction.

A PROCESS for producing openwork or perforated patterns in fabrics has recently been patented in this country by a Spaniard, although speaking from memory only, we are afraid he is not the first in the field. The openwork is produced by means of substances which chemically destroy the fabric at the parts where they come into contact with the latter. To obtain the desired result, the destructive substances are, needless to say, applied to exactly those parts of the fabric at which the holes or perforations forming the desired pattern or design have to be made. This local destruction of the fibres of the fabrics is obtained in a very great number of cases by the carbonisation of the fibres by treating them with or by applying to them by means of stamps an acid, or an acid salt in the case of vegetable fibre, or an alkali or alkaline salt in the case of animal fibre. In fabric made of both vegetable and animal fibre the destruction of both kinds of fibre can be easily effected by stamping on the pattern in acids or acid salts and alkali or alkaline salts. After the stamping, the fabrics are subjected to a high temperature in order to further the carbonisation or destruction of the fibre, either by applying hot surfaces or by means of steam, or by any other suitable means.

THE TEXTILE COLOURIST:

DEVOTED TO

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

Bleaching Vegetable Fibres.

By E. Tassel.

(Continued from page 353.)

ACTION OF GRASS BLEACHING.—After the third lye boiling, and several times during the bleaching process, the goods are spread on the grass and left there several days. This is a very expensive operation in all respects, first on account of the labour involved, then through the spotting and damage suffered by the goods, and finally by the large area occupied by the bleaching ground. Unfortunately, however, no method has yet been devised capable of superseding grass bleaching, and the numerous endeavours made with this object have not furnished any hope of success. True, it is not because bleaching is impossible without grassing—for, as we have seen, perfect bleaching can be secured in the laboratory by the aid of alkalies alone, without any oxidation by exposure to the air; but from a practical standpoint, and, above all, when it is not necessary to completely eliminate the colouring matters, but only to decolourise a large portion of same, grassing is essential.

The chemical reactions occurring whilst the goods are on the grass are of two kinds, one set being concerned directly with the bleaching of the fabric and modifying its colour, whilst those of the other series convert the sparingly soluble matters into a more soluble form during the subsequent operations. In both cases it is a question of oxidation, though by a different process and of different materials. The oxidation is effected by atmospheric oxygen, more especially ozone—*i.e.*, oxygen in a special state of condensation, whereby its powers are considerably augmented. Ozone is present in the open atmosphere, as may be seen by exposing to the country air a piece of litmus paper, one portion of which has been dipped in potassium iodine solution. This portion will turn blue under the influence of atmospheric ozone, the time occupied in the colour change varying according to the prevailing atmospheric conditions; and it is just such conditions as produce a rapid change in the colour of this test paper that have been shown by experience to be those most favourable for bleaching. Hence atmospheric ozone is the most efficacious agent in grass bleaching.

The action of grassing is most energetic in the morning, at a time when the ground is impregnated with dew, which the heat of the sun causes to evaporate. This dew carries with it the atmospheric oxygen and ozone, and impregnates the grassed fabric therewith, so that these gases are brought into direct contact with the fibres at the moment of evaporation. For the same reasons mist is also favourable to bleaching, especially when accompanied by warmth and sunshine; and it is solely to mists that the prosperity of the bleaching industry in Ireland is due. Whilst moderate warmth facilitates bleaching, excessive heat is just as dangerous, if not of itself at least by its results; since it may happen that the fabric still contains a little of the agents employed in the bleaching, and in such event the concentration of these latter by heat alters the cloth. Chemically the action of light on fabrics is still as little elucidated as is the decoloration of dyes under the influence of strong isolation; it is, however, clearly ascertained that light does act favourably on bleaching, and that the result produced in the night, for instance, is quite different when the moon is bright to that obtained on dark nights. Whether this effect of light is attributable to an increased production of ozone is unknown—probably it is; but there is no evidence in favour of the hypothesis.

As for the reactions occurring between the ozone and the different colouring matters, as they are identical with those concerned in the action of chlorine on flax, we will consider them more fully in dealing with that process, and will now merely observe that grassing is injurious instead of beneficial when the goods are put out too soon—*i.e.*, after insufficient lye boiling. As a matter of fact it is recognised that insufficient oxidation, whether due to the presence of an excessive proportion of colouring matters or more particularly to the presence of certain adipocelluloses, renders the colouring matters almost completely insoluble, and thus fixes them on the fibre. The same inconvenience results when the goods are chemicked too soon.

The action of the grass itself has been largely discussed, some having asserted that bleaching progresses better when the goods are in direct contact with the herbage than when they are suspended on rods, the action being ascribed to a special property of the plant, proceeding from the carbonic acid and ozone contained therein. The author does not believe it possible to admit this view, it seeming to him more probable that the grass acts mechanically by reason of the greater surface exposed to the condensation of dew. The goods should not be left too long on the grass; neither should they be grassed before the bleaching process is commenced, since a single decayed blade of grass is sufficient to attack the fibre and produce a hole. In winter the goods should be removed from the grass when there is a fall of snow. An instance has been reported to the author wherein a parcel of goods left under the snow for four days had suffered fermentation and become entirely changed. Probably this fermentation, assisted by the absence of air, was due to the direct contact between the goods and decaying blades of grass.

Action of Chlorine and Hypochlorites.—Up to now we have dealt solely with lye boiling and the series of operations effecting the solution of the colouring matters, showing why the bleacher should not attempt to completely dissolve these matters, but rather regulate the progress of solution according to the kind of fabric and the degree of whiteness in view, the remaining portions being decolourised afterwards. Many attempts have been made to find a perfect bleaching agent, and trials have been essayed with gaseous chlorine, potassium bichromate, potassium permanganate, sulphuric acid, hydrogen peroxide, and, more recently, ozone. None of these agents, however, has furnished better results than the derivatives of chloride of lime.

Before studying the effects of this substance, a brief review of its properties, taken from Kolb's description, may be of interest. The theories on the constitution of chloride of lime (bleaching powder) are numerous. For example, Mertens, among others, considers the bleaching chlorides as analogous to chlorine hydrate, according to which view bleaching powder would be an oxychloride of the formula CaOCl. Millon regards $Ca<^{O}_{Cl}$ as similar to $Ca<^{O}_{O}$, whilst other chemists imagine the presence of hydrogen peroxide, $CaOHO + Cl = H_2O_2 + CaCl$; and, finally, the presence of ozone has been alleged. The two hypotheses however, that have the air of greatest probability are those of Balard and Kolb respectively. Balard regards bleaching powder as a mixture of one equivalent of calcium chloride and an equal quantity of calcium hypochlorite—

$$2CaOCl = CaOClO + CaCl,$$

so that the action of acids on bleaching powder might be represented by the equation—

$$2CO_2 + (CaOClO + CaCl) = 2Cl + 2CaOCO_2.$$

According to Kolb, the formula CaOClO is totally inadequate to represent bleaching powder, and he supports his argument by stating that he has never been able to produce bleaching powder without moisture, from which circumstance he infers water to be an essential constituent of this compound. On the basis of his analyses, he adopted the formula 2Cl3(CaOHO), as representing chloride of lime in the solid state. On treating this with water only a portion is dissolved—

$$2Cl3(CaOHO) = CaOHO + 2(CaOHOCl),$$

the substance CaOHOCl being soluble and the CaOHO insoluble.

Since bleaching powder is always employed in the state of solution for bleaching, it is evident that the portion CaOHOCl has alone any interest for us. On the basis of experiments resting on the fact that only active chlorine is detected by the ordinary methods of chlorimetry, the inactive chlorine being ignored, Kolb succeeded in proving that the true combination of the various elements in bleaching powder can be represented by the formula—

$$CaOClO + CaCl + 2H_2O.$$
$$2(CaOHOCl) = CaOClO + CaCl + 2HO.$$

Though the question has not yet been properly threshed out, it is probable that this formula may be the true one, since it conforms to all the suppositions that can be raised; and, moreover, the following experiment seems to afford proof of this probability. On immersing a dark-coloured linen thread in water that has been deprived of air, and then gradually replacing this water by a weak solution of bleaching powder, the thread will bleach thoroughly without any disengagement of gas, and the solution will contain nothing but calcium chloride.

From this it follows, in the first place, that the chlorine of bleaching powder is not the true bleaching agent, that rôle being played by the oxygen, since the latter has been completely absorbed; furthermore, that the presence of an acid is not essential, since the oxidation proceeds as though the colouring matter were a metallic oxide. The formula expressing the disengagement of gas is therefore $CaCl + CaOClO = 2CaCl + O_2$. The most interesting fact to be inferred from this experiment is that the bleaching of flax by hypochlorites is an oxidising reaction, the oxygen playing the sole part, and the chlorine acting merely as a carrier of oxygen.

It is, however, noteworthy that when the bleaching powder is in great excess as compared with the substances to be oxidised, a different set of the reactions may ensue. It will be remembered that in the section dealing with flax, mention was made of a reaction tending to prove that chlorine in excess is able to enter into combination with the colouring matter. On the other hand, it is known that the colouring matters of jute in particular do enter into combination with chlorine (Cross and Bevan). However that may be, it is certain that oxygen is the sole agent, and the method is one of oxidation under the ordinary condition of bleaching, *i.e.*, working with dilute baths. The composition of the other hypochlorites, that of sodium in particular, is exactly the same, and the description of the process with bleaching powder applies to these as well.

(To be continued.)

A New Cotton Bleaching Process.

A VERY interesting bleaching process has been worked on a commercial scale at a bleachworks at Armentières. The invention of the process is due to M. Henri Lagache, and the principle of it is to set free the hypochlorous acid from the bleach by means of carbonic acid. In its present form the invention is said to be a great success. Every bleacher has noticed that between the morning and evening of a day's work a gradual diminution takes place in the amount of bleach required for every pound of the same sort of yarn. This, it has been discovered, is due to a gradual acidification of the bath by carbonic acid formed by the oxidation of the colouring matters. But each day when operations are resumed this favourable state of affairs is destroyed by the making up of the bath with more bleach. Moreover, the carbonic acid escapes to a large extent during the night. These facts inspired Lagache with the idea of using neutralised bleach containing no free alkali. Then all the carbonic acid formed during the bleaching operation remains free to act from the first beginning of the day's work. The next point to be considered was what would be the best substance to use to do the neutralisation. The mineral acids and the usual soluble organic acids are unsuitable, first because it is impossible to regulate their action, and secondly because when the acid is added chlorine is evolved, causing waste and injury to the lungs of the workpeople. The use of dilute acid would thin the bleaching liquid too much, and so waste time and labour.

These drawbacks would not be felt so much if a solid acid was used, such as boric or oxalic, but the use of these is found to be troublesome in practice. The best neutraliser to employ is carbonic acid, the same substance which gradually neutralises the bleach during the bleaching operation when that is conducted in the usual way. Its action can be perfectly regulated, and it cannot set free chlorine from the bleach, but hypochlorous acid only. It further has the advantage of forming an insoluble compound with the lime, which precipitates out of the way. The neutralisation may be done in a special vessel or in the bleaching baths themselves. The former is the better plan, because the other necessitates piping from a number of vessels instead of one. It must also be remarked that the neutralisation makes the bath less caustic, so that tendering of the fibre is to a great extent or even altogether avoided. To test the comparative value of the new process, identical pieces of calico were bleached by it and the old method. In working the former 132lb. of bleach were used, and with the latter 153lb., a saving of 14 and 15 per cent. The process finds great favour with the workmen, as, their work being piecework, and it being quicker than the ordinary method, their wages are increased. At the works alluded to at the beginning of this article, says the "Bulletin de la Société Industrielle du Nord de la France," it is estimated that the process will save a ton of bleaching powder per week. The process works with mathematical regularity, and nothing unforeseen has as yet been known to occur.

The Estimation of Carbonic Acid in Water.

THE estimation of carbonic acid is of considerable importance in the chemical analysis of water. In the softening of water for manufacturing purposes, and in the purification of public water supplies, where certain processes are employed, an accurate knowledge of the amount of this constituent is essential to a proper treatment of the water. Moreover, in the sanitary analysis of sewage, of effluents from sewage purification plants, and of polluted waters generally, a determination of the amount of carbonic acid present may throw considerable light on the nature and extent of the chemical and bacterial changes which are taking place.

Conditions in which Carbonic Acid Exists in Natural Waters.—The carbonates which are found in natural waters are those of calcium and magnesium. The normal carbonates of these bases are, relatively speaking, but sparingly soluble in water. If, however, more than enough carbon dioxide be present to unite with the oxides of calcium and magnesium to form the compounds $CaCO_3$ and $MgCO_3$, the solubility of these salts is much increased. It is generally assumed that when there is one extra molecule of carbon dioxide for each molecule of calcium carbonate or of magnesium carbonate, compounds of the character of sodium bicarbonate exist, although such salts have never been isolated. These salts are presumed to have the composition represented by the formulæ $Ca(HCO_3)_2$ and $Mg(HCO_3)_2$ respectively.

The gas, carbon dioxide, is quite soluble in water, and therefore may exist in natural waters in amounts greater than is required to form the bicarbonates of the alkaline earth bases which may be present. It is usually considered that carbon dioxide thus dissolved in the water exists as a true acid, having the formula H_2CO_3. From the above it is evident that there are three conditions in which carbon dioxide may be present in natural water. If the carbon dioxide is not combined with any base, it is spoken of as "free carbonic acid"; if it is combined indirectly with the base, as in the form of bicarbonates, it is termed "half-bound carbonic acid"; and if directly united to the bases, as in calcium and magnesium carbonates, it is called "fixed carbonic acid." The sum of the amount of carbonic acid found in these three forms is usually spoken of as the "total carbonic acid." The carbonic acid that is expelled on heating aqueous solutions, containing either "free" or "half-bound carbonic acid," or both, is sometimes spoken of as "volatile carbonic acid."

Natural waters carry varying amounts of carbonic acid, depending on the character of the geological formations with which they have come in contact. Ground waters, having probably been under greater pressure, usually contain more carbonic acid than surface water. Moreover, ground waters which become exposed to the air lose the larger proportion of their free carbonic acid, and may even part with some of their half-bound and fixed carbonic acid. The loss of the latter results, of course, from a precipitation of carbonates (calcium carbonate principally), as a result of the loss of some of the half-bound carbonic acid. Magnesium bicarbonate is much more soluble in water than calcium bicarbonate, but strong solutions show the same tendency to give up their half-bound carbonic acid as do strong solutions of calcium bicarbonate. This occurs, however, without any precipitation of magnesium carbonate ($MgCO_3$), because the latter itself is quite soluble in water.

Methods for the Estimation of Carbonic Acid.—The principle upon which Pettenkofer bases his determination depends upon the action which barium or calcium hydroxide has upon free and half-bound carbonic acid, whereby insoluble calcium and barium carbonates are formed which precipitate out of solution. Either calcium or barium hydroxide may be used, the reactions involved being of similar character. As an excess of the precipitant is used, the portion unacted upon is determined volumetrically with a standard acid solution, and the amount of the barium or calcium hydroxide which has reacted with the free and half-bound carbonic acid can thus be determined by difference. The reaction is as follows:—$Ca(HCO_3)_2 + CO_2 + 2Ba(OH)_2 = CaCO_3 + 2BaCO_3 + 2H_2O$. As the calcium carbonate present has been held in solution by the assistance of the half-bound molecule of carbon dioxide, it also precipitates on the latter's removal by the barium hydroxide.

In so far as that a portion of the half-bound carbonic acid which may be present in a natural water is combined with the magnesium carbonate to form the bicarbonate, the reaction between it and the calcium or barium hydroxide is the same as shown by the above reaction. But magnesium carbonate ($MgCO_3$), instead of precipitating out as such, reacts with the calcium or barium hydroxide, and produces calcium or barium carbonate, which latter, being insoluble, precipitates. The presence, therefore, of magnesium carbonate—or, in fact, any magnesium salt—causes the calcium or barium oxide to be used up. Pettenkofer avoids the precipitation of magnesium by the introduction of ammonium chloride, which, by forming a soluble salt of ammonium and magnesium chloride, prevents any loss of calcium or barium hydroxide. The reaction is as follows:—$MgCO_3 + 4NH_4Cl + Ba(OH)_2 = MgCl_2(NH_4Cl)_2 + BaCO_3 + 2NH_4OH$.

Trillich's modification of Pettenkofer's method consists in not attempting to prevent the reaction between the magnesium salts and the caustic alkali by the addition of ammonium chloride, but allowing the precipitation to take place. From a direct gravimetric determination of the amount of the magnesium present in another portion of the sample, he is enabled to apply the proper correction to the result obtained volumetrically. In order to differentiate between the free, half-bound, and fixed carbonic acid, Trillich uses that portion of his solution which contains the precipated carbonates, and titrates it with hydrochloric acid and cochineal. From this he obtains "total carbonic acid." By subtracting "free and half-bound carbonic acid" from this, he obtains the "fixed carbonic acid," and by finding the difference between the "free and half-bound acid" and the "fixed" (equivalent to the half-bound), he estimates the "free carbonic acid."

The Lunge-Trillich or Seyler method depends on the action of phenol-phthaleïn as indicator in the presence of free carbonic acid, and of carbonates and bicarbonates of the alkaline earth bases, and on the assumption that in the bicarbonates of these bases there is one molecule of half-bound carbon dioxide for each molecule of fixed carbon dioxide.

Leeds and Trillich proposed, at about the same time, the determination of the free carbonic acid in water by titrating the sample with a solution of sodium carbonate, using phenol phthaleïn as indicator. The sodium carbonate reacts with the free carbonic acid to form bicarbonate as soon as the free acid is neutralised; any further addition of sodium carbonate produces a pink colour. This forms a direct means for estimating the free carbonic acid without involving the half-bound. With waters which are acid to phenol phthaleïn, the determination of the fixed carbonic acid by Hehner's method gives at once the half-bound carbonic acid according to the assumption stated in the preceding paragraph. With waters which are alkaline to phenol phthaleïn, by the determination of this "phenol phthaleïn alkinity," and the "total alkinity" obtained with lacmoid as the indicator, the amount of half-bound carbonic acid can easily be estimated. In the latter case, of course, free carbonic acid is absent. Seyler, who has made a study of this method, considers it one which gives accurate results, and one which is free from many of the difficulties involved in Pettenkofer's and Trillich's methods.

Waters Containing Known and Unknown Amounts of Carbonic Acid.—From a consideration of the data obtained, it appears that the Lunge-Trillich or Seyler method is the most accurate of the three volumetric methods. The "free and half-bound carbonic acid," as determined on known amounts by this method, is, on an average, less than 1 per cent. too low, and shows a possible range of less than ± 3 per cent. The accuracy of the determination of the "free carbonic acid" is somewhat less, and although the percentage error for low amounts is rather high, the variation from the actual amount is not more than from 2 to 3 parts per million. These results are always too low, and introduce into the determination of the "volatile carbonic acid" the larger proportion of error. Trillich's modification of Pettenkofer's method is less accurate than the Seyler method, but more accurate than the Pettenkofer. Results obtained with either Pettenkofer's or Trillich's method are almost always too low. They probably give figures which are on the average between 5 and 10 per cent. too low. While Trillich's method gives more uniform results than Pettenkofer's, the figures appear to be about 5 per cent. too low, and they may be as much as 10 or 12 per cent. too low.

Pettenkofer's method is inclined to give still lower results, and although those obtained seemed to be only from 1 to 2 per cent. lower than those obtained with Trillich's method, yet it appears somewhat unreliable, and one in which, under some conditions, extremely erratic results are likely to occur. With very low amounts of carbonic acid the percentage error in both Pettenkofer's and Trillich's methods are much greater than those stated above, although it may only represent an actual difference of from three to four parts per million. For ease and rapidity of manipulation, for avoidance of difficulties arising from the presence of magnesium salts, and for its greater accuracy, the Lunge-Trillich or Seyler method is, in the opinion of two writers in the "Chemical News," to be prefered to either of the two volumetric methods.

Bleaching Woollens.

IT has been established beyond doubt that peroxide bleaching for woollens is the method *par excellence*. The resulting evils of the use of sulphur stoving have been pointed out time after time by various writers with commendable patience and perseverance, and it is unnecessary here to enlarge on the fugitiveness of the whites, the evil smell, and the trouble in the dyebath that ensues on the employment of the cheap old-fashioned sulphur, which from its very nature cannot be looked upon as a gift from heaven. Our object will be, in a general way, to give useful hints to aid those who from want of knowledge of the subject have hesitated to adopt the really simple use of peroxides in bleaching woollens. In the first place it should be borne in mind that there are certain colouring matters, dirt, grease and what not, in wool which can be removed by the ordinary methods of scouring, and in giving peroxides a test it is neither fair nor reasonable to expect a satisfactory result if this preliminary scouring is neglected. Methods of scouring wool are various and well known to all handlers of woollens, but the next thing to be borne in mind is that the scouring material used, whether it be ammonia, soda, or potash or soap, should be thoroughly eliminated from the goods before they enter the bleaching vat. When this has been accomplished, the colouring matter in the wool is ready to be dealt with by the nascent oxygen of the peroxides, as only nascent oxygen can, by entirely removing them from the goods.

The process of bleaching by peroxides is most successfully accomplished when the bleach bath is slightly alkaline, although good results can be obtained in baths first neutralised with an alkali, and then made acid with an organic acid such as oxalic acid; this fact, however, can be left out of consideration here, and only the baths considered which are worked alkaline. First and foremost, hydrogen peroxide claims consideration on account of its simplicity. This product is put on the market in the form of a solution, its strength being indicated as so many "volumes." Although this designation has been sometimes misunderstood, it may be taken as correct that a solution of hydrogen peroxide of 10-volume strength contains ten times its volume of bleaching oxygen—that is to say, 1cc. of the solution can liberate 10cc. of oxygen gas. For bleaching purposes, a solution of 1 volume strength is very convenient, and is formed by taking 1 part by measure of hydrogen peroxide (10 volumes) and 9 parts by measure of water. It may be said roughly that 100lb. of wool takes 700lb. or 70gals. of water thoroughly to soak it; therefore one should allow somewhat more, or, say, 100gals. of bleach bath for the treatment of 100lb. of wool. Then for the treatment of 100lb. scoured wool the procedure would be as follows:—In a wooden or earthenware or enamelled vessel, provided with a means of heating—a steam jacket or leaden steam coil, as the case may require,—place 10gals. hydrogen peroxide (10 volumes) and 90gals. water free from iron. This solution, which will show an acid reaction to litmus paper, should be made alkaline by the addition of liquid ammonia; slight alkalinity is all that is required, and excess should be avoided. The wool should be entered and the temperature raised from 110 to 120°F., and maintained at this from eight to twenty-four hours, according to the thoroughness of the bleach required. The goods should be turned from time to time, and the bath may require the further addition of ammonia to maintain its alkaline condition, the necessity for which can be ascertained by the use of red litmus paper. When sufficiently bleached the wool should be lifted and allowed to drain into the bath—squeezed if practicable,—and then thoroughly rinsed and finished in the ordinary way. The bleach bath should then be tested for active oxygen in the following way:—Dissolve a crystal of copperas (ferrous sulphate) in water; add to this a solution of potassium ferrocyanide until a whity-blue precipitate is obtained; take about 10cc. of the bleach bath liquor, and add a little of the pale-blue precipitate. If there is a strong intensification of the blue colour, the bath is not exhausted, and should be used for the preliminary bleaching of a further lot of goods. The points to be noted in performing the operation, says the "Dyer and Calico Printer," are as follows:—(*a*) Avoid the presence of iron in the bleach bath; (*b*) maintain the alkaline state of the bleaching liquor by the further addition of ammonia when necessary; (*c*) avoid excessive alkalinity; and (*d*) keep the temperature of the bath well within the limits stated.

We next come to the apparently more complicated but certainly more economical bleaching of wool by means of sodium peroxide, and of all the processes which have been suggested, certainly not one is more serviceable or more ingenious than the one using the peroxide in conjunction with ammonium phosphate, recommended by Messrs. William Burton and Sons, of Bethnal Green, London, which is as follows:—For from 100 to 150lb. of wool, prepare a solution in a white wood, teak wood, earthenware, stone, or enamelled vessel, of 100gals. cold water (free from iron), 8lb. sulphuric acid, S.G. 1840 (free from iron), 3lb. phosphate of ammonia, and 7¾lb. sodium peroxide. The ingredients should be put together in the order stated, and the sodium peroxide added very slowly with constant stirring. When the bath has been properly prepared it will have an alkaline reaction due to ammonia; it is now allowed to stand for about twenty minutes, and the scum that rises is removed by a wooden scoop or other suitable utensil. It is then ready to receive the scoured and properly-rinsed goods. The temperature and conditions should be the same as those observed in the use of the hydrogen peroxide bath.

When the first batch of goods has been bleached and lifted, the bath may be strengthened for the reception of the next, with the addition of 8gals. cold water (free from iron), 2½lb. sulphuric acid, S.G. 1840 (free from iron), and 1lb. 14oz. sodium peroxide, the latter added slowly with constant stirring. If the bath thus strengthened shows an acid reaction, it should be made slightly alkaline by the addition of liquid ammonia, when it is ready for the reception of the second batch of wool, to be worked similarly to the first. The bleach baths can always be tested for exhaustion by the copperas and yellow prussiate method described above, and made use of for a third and even fourth batch of material at discretion.

In this article we have not attempted to give detailed practical recipes for the bleaching of woollens: the object has been more to indicate the line on which an intelligent worker can look for gaining success. Different qualities of wool would necessarily require modified treatment, but by bearing in mind the following facts some indication of the line to pursue should always be easily obtained. A cold bath of peroxides is slower and gentler in its action than a hot one. Ammonia disengages the bleaching oxygen faster than any other alkali used in equivalent proportion. Purity in all chemicals used is essential. Colouring matters of mineral origin cannot be bleached by peroxides or any other non-destructive agent. It is only necessary to add, in conclusion, that those manufacturers who make an early study of the possibilities of peroxides in woollen bleaching will be prepared with the best methods when the public demand for bleached goods free from sulphur grows, as it surely will grow, ensuring in the field of woollen bleaching, as it has done in other fields, the best and most rational methods of manufacture.

Sulphur Colours for Cotton Printing.

THE sulphurised substantive colouring matters, such as Vidal Black, Katigen Black, Immedial Black, and others, have acquired in a short time a great technical value in dyeing cotton, but they have been employed for printing only in a limited degree. This result is due to the fact that these dyestuffs contain inorganic sulphuretted compounds, such as sodium sulphide or the like, which strongly affect the metals, and therefore blacken the copper printing rollers. Messrs. Friedrich Bayer and Co. have, however, now succeeded in finding that the affinity to the cotton fibre of the sulphur-containing colouring matters does not depend on the presence of these inorganic sulphuretted compounds, and that the disadvantage mentioned can be removed perfectly if, before printing, the inorganic bodies are eliminated from the dyestuffs, and the latter themselves brought into a reduced state. This reduction is profitably effected in the printing paste itself by means of alkaline reducing agents, such as zinc dust and caustic soda lye, or glucose and sodium carbonate or caustic soda lye.

The elimination of the inorganic sulphur compounds can be performed by dissolving the sulphur-containing dyestuffs in water, and reprecipitating the same by the addition of common salt or mineral acids. It may, however, be pointed out that it is not necessary to perform the elimination of the inorganic sulphuretted bodies by means of a separate operation, but that it can be combined with the reduction in one operation—that is to say, the dyestuffs of commerce can profitably be used directly for the production of the printing pastes. In this case the procedure is as follows:—The commercial dye is boiled with zinc dust and soda lye. By means of this operation on the one hand the dyestuff is reduced; on the other hand, the sulphuretted compounds are transformed into insoluble zinc sulphide, which can easily be removed from the paste by pressing the same through a cotton cloth or the like. If, instead of zinc, glucose or other suitable reducing agent which contains no metal is employed, it is necessary to add a suitable metallic salt, such as sulphate of copper or pyrolignate of iron, in order to precipitate the inorganic sulphuretted compounds. The pastes which are prepared in this manner do not in the least attack the printing rollers.

After printing it is advisable to steam the fabric for a short time in order to fix the dyestuff completely on the fibre. By these means even fast and brilliant shades are obtained. According to this process, for instance, it is said that the shades obtained from Katigen Black or Immedial Black will rival, in every respect, the best shades produced by means of aniline black. By the addition of a small quantity of glucose the stability of the pastes is very much increased. In order to illustrate the new process more fully, the following examples are given, the parts being by weight:—Boil a mixture of 15grms. of Katigen Black S W, 20grms. of water, 10grms. of zinc dust, and 18grms. of caustic soda lye (of 48° Bé.) for from two to three minutes until the reduction is completed, which can be determined by the fact that the original dark-blue colour of the liquid turns greenish-yellow. Subsequently add 35grms. of tragacanth mucilage (65 : 1000) and 2grms of glucose (in order to increase the stability of the paste). After cooling, the reaction mass is pressed through a cotton cloth and the prepared paste is ready for printing. The printed fabric is dried, steamed for ten minutes without pressure, rinsed and soaped. In this manner a good fast black is produced.

Boil a mixture of 5grms. of Katigen Olive, 31grms. of water, 10grms. of glucose, and 18grms. of caustic soda lye (of 48° Bé.), until a change of colour takes place. Subsequently the reaction mass is mixed with 30grms. of tragacanth mucilage (65 : 1000), and afterwards at a temperature of from 25 to 30° C. with 2grms. of pyrolignate of iron. The further treatment of the paste is effected as is described in the previous example. A brilliant fast olive colour is thus obtained. The process proceeds in an analogous manner if other of the hereinbefore described sulphur-containing dyestuffs are employed.

Printing With Indigo.

IT has usually been considered difficult or, perhaps, more correctly, impracticable to print on wool or silk with indigo. The processes which have been tried necessitate the use of a large quantity of alkali in such a concentrated form that the fibres are attacked and weakened, if not destroyed. This difficulty, of course, is not present when printing cotton goods, for vegetable material stands the alkali, and so the use of glucose for printing purposes came into use. But as all practical men know, this process is somewhat difficult to carry out, and unless every detail is carefully watched, imperfect printing is the result, light shades being specially precarious in this respect.

Recently, however, the Badische Anilin and Soda Fabrik, the well-known makers of artificial indigo, have discovered a new method of utilising this dyestuff—a method which makes it possible to use it for printing any kind of fibre, whether animal or vegetable, and one which is therefore necessarily free from the disadvantages accompanying the older processes. In the printing mixture is used a solid hydrosulphite, and, in particular, the very stable double salts of hydrosulphurous acid; for instance, the zinc sodium hydrosulphite, or the zinc calcium hydrosulphite. It is not then necessary to work with a strong alkali, for the reduction of the indigo takes place readily in the presence of weakly alkaline substances such as borax, magnesia, sodium silicate, sodium phosphate, soda, bicarbonate of soda, or soap. When working in this way it is possible to print indigo upon wool, silk, or cotton in a simple manner, and the shades obtained are of satisfactory purity and fastness. The process may be carried out in such a way that the mixture of indigo with the hydrosulphite chosen (say, for instance, zinc sodium or zinc calcium hydrosulphite, suitably thickened) can be printed upon the material prepared with a substance acting as a weak alkali, such as those mentioned. Or the material may be directly printed with a thickened mixture of indigo, the hydrosulphite chosen, and a substance of which the alkaline and dissolving action only begins to take effect at a higher temperature, such, for instance, as magnesia or sodium bicarbonate. In both cases the material is next steamed, the reduction of the indigo takes place, and the indigo white fixes itself upon the fibre, and is subsequently oxidised and converted into indigo-blue during the treatment with air and water.

Wool or silk, it is said, can be printed with indigo in shades from the palest pearl-blue to the darkest blue-black, and the fastness of the colour is greater than has been before achieved by printing, and the fibre is not weakened. The colourations on silk have the valuable property that whilst appearing of a greenish tinge of blue by daylight, they appear pure blue by artificial light. When applied to cotton, the process offers the advantage that the indigo can be printed without any exceptional care being necessary upon steaming and in the other operations.

A further advantage, as compared with the glucose process, is that the hydrosulphites mentioned can be mixed with bodies such as potassium or sodium bicarbonate, which do not act as alkalies until heated, and the printing colour thus obtained is fairly stable, so that the preparation of the material with the reducing agent which is necessary in the glucose process is unnecessary in the process according to this invention. The following examples will serve to further illustrate the process, the parts being by weight:—

Printing Wool with Indigo.—Pad the goods with a 5-per-cent. borax solution, and then print with the following mixture:—5 to 50 parts of indigo pure in powder, 25 to 150 parts of zinc sodium hydrosulphite or the equivalent quantity of zinc calcium hydrosulphite, 170 to 200 parts of water, and 600 to 800 parts of gum thickening (1 : 1). After printing, steam the goods for about three minutes in a Mather-Platt apparatus, and oxidise the indigo white in the usual way.

Without previous preparation print the goods directly with a printing colour consisting of 5 to 50 parts of indigo pure in the form of powder, 25 to 150 parts of zinc sodium hydrosulphite, 50 to 200 parts of magnesia finely ground, 100 to 220 parts of water, and 500 to 700 parts of gum thickening (1 : 1). The further treatment is as described in the foregoing example.

Printing Indigo upon Silk.—Pad the silk goods with a 5-per-cent. solution of borax, and then print it with the following printing colour:—5 to 50 parts of indigo pure in the form of powder, 25 to 150 parts of zinc sodium hydrosulphite, 170 to 200 parts of water, and 600 to 800 parts of gum thickening (1 : 1). Steam for a few minutes in a Mather-Platt apparatus, and oxidise by washing in water whilst permitting access of air.

Printing Indigo on Cotton Goods.—Pad the cotton goods with a solution of sodium silicate of 6° Bé., and print upon the goods so prepared the following mixture:—5 to 50 parts of indigo pure in the form of powder, 25 to 150 parts of zinc sodium hydrosulphite, 170 to 200 parts of water, and 600 to 800 parts of gum thickening (1 : 1). After printing, steam the material for three or four minutes in a Mather-Platt apparatus, and oxidise in the usual way.

Without previous preparation print the cotton goods directly with the following printing colour:—5 to 50 parts of indigo pure in the form of powder, 30 to 200 parts of zinc sodium hydrosulphite, 50 to 200 parts of bicarbonate of soda, 150 to 215 parts of water, and 400 to 700 parts of gum thickening (1 : 1). The further procedure is the same as in the preceding example.

White Woollens.

IT is impossible, even with the most energetic bleaching agents, to remove from wool a slightly yellow tinge, which is readily seen if bleached wool is compared with bleached cotton or silk. When attempts are made to hide this shade by means of a complementary blue—as is done on cottons, curtains, paper, etc.,—bad results are obtained. Many attempts have been made to give the wool a brilliant white by covering it with white substances such as carbonate of magnesia, and this was used for some time for this purpose. But its use has been abandoned on account of the dust which comes from the wool when the goods are in store. It has also been proposed to cover the wool with cotton by dissolving the cotton in ammoniacal copper solution, impregnating the wool with the solution, and then fixing the cotton on the wool by means of acid. An ether bath has been finally applied to render the cellulose opaque.

Hallab reaches the desired result by the use of hydrosulphite of soda and indigo. The effect is a double one: the hydrosulphite acts as an energetic bleaching agent, and on the other hand it renders the indigo which is deposited mechanically upon the fibre soluble and causes it to penetrate the fibre. By subsequent oxidation in the air the indigo comes out with a complementary blue shade which neutralises the yellow of the wool. It is doubtful, however, if an absolutely perfect neutralisation of the yellow can be reached with a blue pigment in this way. The numerous experiments with different colouring matters, such as ultramarine, sulphindigotic acid, aniline blues, etc., have failed to give satisfaction.

The hydrosulphite of soda should be made just before it is to be used. Digest 7 parts of zinc powder, or 20 to 30 parts of feathered zinc or sheet zinc, with a concentrated solution of bisulphite of soda, representing 100 parts of the dry salt. This must be done in a closed vessel, and the mixture must be stirred from time to time for an hour. Decant the clear liquor, which contains the hydrosulphites of soda and zinc. The goods must be carefully purified, washed, and scoured, and then worked in a bath of cold water containing indigo in suspension in a very finely-divided state. The best indigo to use, says the "Moniteur Scientifique," is that which furnishes reddish-blue shades in an ordinary vat. The wool should come from the bath evenly covered upon the surface with particles of indigo, and it is then plunged into the bleaching bath. This bath is composed of water and of the hydrosulphite liquor described above, prepared so that the bath will stand from 1 to 4° Bé. While the wool is passing through the bath, add a quantity of acetic acid equivalent to the hydrosulphite present. The goods must be properly worked in the bath so that there may be no unevenness in the reduction of the indigo.

Fulling Heavy Woollens.

In the fulling of all woollen textiles there are certain conditions which have the effect, to a greater or less degree, of retarding the process, and of keeping it from bringing about the desired results in the quickest time possible, and with the least expense as to labour and time, and preserving the value and wearing qualities of the material. A soap which is not right in its constituents or in its make-up, or which is not applied correctly or at the right time, or cloths that are not correctly prepared for the process, or are peculiar in some measure as to the stock of which they are made or the conditions in which they are brought to the mill, are some of the conditions which will lead to the retarding of the process. It is especially in connection with the latter that we wish to deal in the present article. Heavy goods, and goods that are thickly woven, and such as carry in their body a considerable amount of grease and dirt and natural materials, will always be found to full with great difficulty. Something special must be done in order to counteract these conditions and make the process such that in its action upon the textile it will increase its value rather than diminish it. One of the things which is constantly done in order to help the fulling process in working on these kinds of cloth is to wash the goods previous to their being put in the mill. This washing does not necessarily have to be very thorough—nothing like, in fact, that which succeeds the fulling; but it has to be sufficiently vigorous to loosen all the foreign materials in the fabric, and give the fibres an opportunity to come into contact with the soap, and to get all the benefit which is to be derived from friction and heat, which are the working elements in the process. It may seem as though this washing were unnecessary and simply an added expense, but experiment undoubtedly will testify to the fact that in most cases it is a distinct advantage.

In order to show the actual facts of the case, if a quantity of pure wool be taken and washed before it is fulled, it will lose about 5 per cent. of weight as compared with wool that has not been washed. The explanation of this loss is probably the fact that a larger amount of dirt and grease has been removed. If a quantity of pure wool be taken and fulled without washing, it will be found that it will be much more difficult to cleanse it afterwards; and this would seem to indicate that the removal of the foreign materials previous to the fulling is a distinct help, so far as the strength and quality of the wool fibre are concerned. A woollen not washed until after fulling will yield two or three times as much of the foreign material as goods that are washed previous to fulling. It might be thought that the washing before fulling would make the fulling operation shorter, so far as time is concerned; but the fact of the matter is, the time consumed is about the same. While this, however, is true, the distinct advantage comes, not in the question of time, but in the question of the appearance of goods, together with their handle or feel. The colours and shades always show up better where the goods have been previously washed, and the whole appearance of the fabric is so superior that while perhaps expense has been incurred, and the time of operation has not been shortened, nevertheless, taking it all in all, the additional process has easily paid its way.

In fulling, one of the things that we have to look after is the crowding up of the goods to the required limit. It is noted in connection with this previous washing that it distinctly aids in this particular in some cases. We have observed that where carbonised wools of low grades are employed, it is sometimes very hard to get them up to the point desired unless they are previously washed. In working on this description of fabrics, it is almost fatal to attempt to force the operation, since it cannot be done without detriment to the life and strength of the goods. If goods of this description are treated with benzine, they will always give up a certain amount of grease and fat, and this seems to indicate that soap is present, or, in other words, the goods are not properly washed. The only way to be sure of a clean fabric under these conditions is to wash before fulling. There is a considerable difference in the amount of time required for fulling these goods when they are washed previously and when they are not. If they have been thoroughly washed for three or four hours with a good supply of soda alkali, the time will be reduced nearly 30 per cent. This is true, it must be remembered, with the low-grade stocks of which we have been speaking. If shoddy be used in these low-grade woollens to any liberal extent, the washing before fulling will in many instances give the fabric the appearance of woollen cloth, and pretty nearly cover up the presence of the adulterant; but the shoddy has to be in right condition, and if it is carbonised, as it usually is, it must be washed free of sulphuric acid. If you boil the woollen in water, and find that it gives an acid reaction, you may know that it is not free of the acid, and will not work to the best advantage. Where this free acid is present, and the goods are brought into contact with a soda alkali, the tendency is for the formation of a new kind of material upon the surface of the fibres. This material will act injuriously in connection with the fulling, since it is insoluble in water, unless the water is considerably heated.

Some may say, perhaps, that washing keeps the goods from fulling up to the right width and length, and indeed this may be the experience under certain conditions; but, says the "American Wool and Cotton Reporter," we may rest assured that where it does occur, the fault does not consist in the fact that the operation has been undergone, but that it has been improperly manipulated. If the washing previous to fulling has been thoroughly done, and the fibres left perfectly free to be acted upon by the fulling elements, without at the same time having their natural properties impaired or destroyed, the fulling process simply cannot help but be expedited thereby. If, however, it is impossible to get the goods quite up to the point, this is somewhat atoned for by the very much superior appearance and feel of the fabric in question.

NOTES ON DYEING, BLEACHING, FINISHING, &c.

Specially compiled for THE TEXTILE MANUFACTURER.

Single-bath Dyeing Composition. — In our September issue we described a method of dyeing under the above heading, but inadvertently neglected to state that the process was the patent of Mr. Louis Aloy, of Breedene, Ostend, to whom all inquiries should be addressed, or to Mr. W. Gordon, Aubrey Villa, Torrington Park, North Finchley, London, N.

Diamine Fast Blue C.—This new dyestuff (Cassella) is said to dye cotton with a fastness to light better than indigo, and fastness to washing equal to Diamineral Blue dyed direct. It is dyed with the addition of ½ to 1 per cent. of soda ash and 5 to 20 per cent. desiccated Glauber's salt.

Katigen Indigo B and B Extra.—The B brand of this dyestuff (Bayer) is now being made of a higher concentration. Sixty-five parts of the present make are equal to 100 parts of the older quality—a change which has been made without altering the price. A new brand, the B Extra, is also being made, which is twice the strength of the new B brand.

New Shade Cards.—Two new and interesting shade cards have been issued by Messrs. Bayer and Co. One shows a wide range of colourings obtained from the Benzidine colours and applied to flannelette goods. The other shows a range of fashionable shades applied on various kinds of gentlemen's suitings—shades which are expected to be in vogue during next winter (1902-3), and which appear to be both useful and effective.

Dyeing Yarn.—We have received the following letter from Messrs. W. E. Heys and Son, Manchester, which further illustrates the weak points of our present patent laws:—"Our attention has been called to the fact that there have appeared in the technical press details of an invention for dyeing yarn by the aid of the foam or lather of a dyebath, for which a patent—No. 12,976 of 1900—appears to have been issued. This appears to be another proof of the desirability of a system of examination for novelty in our Patent Office, for the same invention was patented through a member of our firm about twelve months previously, and has from that date been in successful operation at the works of our clients, the Manchester Cop Dyeing Company Limited. In both cases the invention has been communicated from abroad. It may interest those of your readers who may have taken note of the more recent patent to know that the process has been so long in use here."

Dyeing Wool with Nitrosulphide of Iron.—Nitrosulphide of iron, discovered by Roussin in 1860, forms black crystals of the formula $Fe_3S_5K_2(NO)_4$. It is a substantive dye for wool, giving a black with a brownish reflection. On wool mordanted with iron, or better with copper, a nearly dead black is produced. The best method of preparing the dye, says the "Bulletin de la Société Industrielle de Mulhouse," is to dissolve 14lb. of green vitriol in 15gals. of boiling water. The solution is stirred into a mixture of 7lb. of sulphide and 6lb. of nitrite of sodium dissolved in 20gals. of boiling water. The whole is kept boiling for a few minutes, filtered and washed on the filter with hot water, making up the filtrate to 50gals. This filtrate will then dye 25lb. of wool. The wool turns first brown, but after an hour at the boil becomes black. The bath exhausts perfectly. If a dead black is required more nitrite of soda must be used than above directed, say 8lb., or the wool must undergo a preliminary dyeing with logwood, indigo, aniline violet, or Induline Blue. A still better dead black is got on Prussian Blue by the following process:—For 100lb. of wool prepare a bath with ferricyanide of potash, 10lb.; sulphuric acid, 20lb.; water, 500gals.; and dye forty-five minutes at 200° F. Then rinse thoroughly, and dye with nitrosulphide (56lb. ferrous sulphate, 32lb. sodium sulphide, and 20lb. of sodium nitrite in 200gals. of water) for from forty-five to sixty minutes at 200° F. The resulting colour is very fast to sulphurous acid and alkalies, but is browned by boiling water, and is not fast to wet rubbing. It stands light well. The cost of dyeing it is about 16s. per hundredweight of wool.

Gelatine and Albumen.—Some important researches have been made in the substitution of gelatine for albumen in the preparation of colours, and are reported on in the "Bulletin de la Société Industrielle de Mulhouse." The gelatine used was in the form of ordinary glue of average quality, and many metallic salts were experimented with. It was found that compounds of copper, iron, and manganese, as well as tannate of zinc, dulled the shades, while carbonate of magnesia gradually thickened the printing colour and ended by coagulating it. Caustic alkalies, on the other hand, had no fixing action. The best results were obtained with acetate of zinc. Printing colours prepared with gelatine and this salt kept very well in a cool place, and could be fixed completely by a stay of four minutes in the Mather and Platt. This circumstance enabled the production of reserves on aniline black, which are generally obtained with the use of albumen. The reserve thickening used had the following composition:—Glue, 25lb. acetate; crystallised zinc acetate, 10lb.; crystallised sodium, 15lb.; and oleine, 20lb. The use of oleine, or indeed of any vegetable or mineral oil, much improves the vividness and fastness of the colours. The glue above mentioned is made by boiling dry gelatine with its own weight of 12 per cent. tragacanth mucilage for six hours. The colours are got much more cheaply with gelatine than with albumen, but unfortunately the colours got with the latter are decidedly the faster.

Colloid Gold as a Reagent.—A colloid gold solution can be obtained by reducing a faintly alkaline and strongly diluted solution of gold chloride at a boiling temperature by means of formaldehyde. The solution thus obtained, and containing 0·005 to 0·006 per cent. gold, is of a pure red colour, and can be boiled without the gold being precipitated. The addition of salts, acids, or bases almost instantaneously destroys the red colour, and the gold is precipitated. If, however, a small quantity of gelatine (one-thirtieth of the amount of gold) is added to the red colloid solution, the precipitation does not take place. Many other colloids act like gelatine; some are less effective, and others, again, have no action at all. According to their effectiveness in preventing the precipitation of the colloid gold, the author has classed the colloids under four different headings. A most interesting fact is that colloid gold yields lakes with alumina, etc., and that it will dye mordanted wool. The products obtained by the reaction of colloids on each other are at the present time frequently regarded as chemical compounds. This view is no longer tenable. The designation "compound" is, however, better fitted to characterise the nature of such substances than the expression "colloid mixture," which might produce the erroneous impression that the components had not acted upon each other.

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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.)

1901.

7th October.

19,933 W. E. HEYS, Manchester. Underpick power looms.* (*A. Brumant, France.*)
19,938 J. H. MELLODEW, Oldham. Discharging motion for regulating the yarn beams on looms from a full beam to being empty
19,949 T. A. BOYD and J. AND T. BOYD LIMITED, Shettleston. Preparing and spinning fibrous materials.
19,959 B. J. B. MILLS, London. The manufacture of embroidery, (*F. Roche-Gonin, France.*)
20,029 F. BARLET, London. Looms.*

8th October.

20,040 J. SCAIFE, Burnley. Winding motions of slubbing, roving, and intermediate spinning frames.
20,076 J. R. and A. E. RAPER, London. Apparatus for freeing or cleansing filamentous substances from burrs and other impurities.
20,118 R. HACKING and OTHERS, London. Machines for the manufacture of textile fabrics.
20,120 H. PANITSCHEK and J. AHORN, London. The manufacture of carpets.
20,126 J. B. WHITNEY, London. Warping machines.*
20,129 H. G. OSBURN, London. Loom for forming flexible conduits.*

9th October.

20,181 A. W. PLAYNE and L. W. MACDONALD, London. Preparation of substances for indigo vat dyeing.
20,250 J. Y. JOHNSON, London. Azo colouring matters, and intermediate products relating thereto. (*The Badische Anilin and Soda Fabrik, Germany.*)

10th October.

20,211 I. L. BERRIDGE and B. KERR, Leicester. Circular knitting machines.
20,266 W. A. E. CROMBIE, London. Process for the manufacture of artificial threads or fibres.
20,267 W. A. E. CROMBIE and W. P. DREAPER, London. Manufacture of fibreless threads from cellulose.
20,269 R. ZIMPEL, London Vertical winding machine.
20,270 F. MERELLE, London. Means for extracting straws and other foreign substances from wool or other textile materials.
20,306 G. WYLDE and J. DERBYSHIRE, Blackburn. Loom pickers.

11th October.

20,316 F. MOSS, Manchester. Guards for the travelling carriage wheels of self-acting mules and other machines.
20,317 W. H. RHODES, Manchester. Mules and twiners for spinning.
20,323 J. H. HENDERSON, Manchester. Automatic counts determining textile yarn balance.*
20,330 J. SHAW, Bradford. Tables or scrays for feeding dyeing and like machines.
20,335 C. G. THOMAS, Germany. Method of manufacturing scouring or scrubbing rags.*

12th October.

20,394 J. T. PEARSON, Burnley. Lustre-mercerising, drying, dyeing, and conditioning fibrous substances and fabrics.
20,397 A. FIELDING, Manchester. The manufacture of viscose.
20,398 A. FIELDING, Manchester. Process of mordanting and dyeing textile fabrics or yarns.
20,399 H. B. BARLOW, Manchester. Woven driving belts.
20,401 A. and H. BARRACLOUGH, Manchester. Improvements in the manufacture of textile fabrics.
20,443 J. KILLARS, London. Double-pile fabrics.

14th October.

20,537 O. LECLOUX, London. Printing machines for textile materials.*
20,540 H. CLARKE, London. Circular knitting machines.
20,551 J. Y. JOHNSON, London. Azo colouring matters, and intermediate products relating thereto. (*The Badische Anilin and Soda Fabrik, Germany.*)
20,552 J. Y. JOHNSON, London. Derivatives of indigo, and of intermediate products relating thereto. (*The Badische Anilin and Soda Fabrik, Germany.*)
20,553 J. Y. JOHNSON, London. New colouring matter. (*The Badische Anilin and Soda Fabrik, Germany.*)

15th October.

20,589 J. SENIOR, Bradford. Machinery for winding yarn on to spools.
20,594 G. BELL and J. H. WHITEHEAD, Leeds. Ball traversing mechanism of gill boxes.*
20,605 J. H. VAN EEGHEN and I. DA COSTA, Barmen. Method of making loom laces.*
20,621 W. H. BUSHELL and L. R. S. TOMALIN, London. Combination for cooling and heating liquids in tuns, vats, or other vessels by compressed air.
20,656 E. JARDINE and E. WATCHORN, London. Combs and bearer bars of lace machines.
20,672 W. H. WHEATLEY, London. Looms.* (*O. S. Greenleaf, United States.*)

16th October.

20,693 W. B. MCGREGOR and R. COUSIN, Glasgow. Weaving patterns on piece goods.
20,694 W. G. BROWN and S. A. C. TODD, Glasgow. Embossing and printing machine.
20,714 J. B. SUTTON, Manchester. Yarn or thread guides for spinning and winding machines.
20,741 R. B. RANSFORD, London. Manufacture of purified sulphur dyestuffs from dialkylamidooxydiphenylamines and new intermediate products. (*L. Cassella and Co., Germany.*)

17th October.

20,765 H. H. HACKING, Bury. Shuttle-changing motions of looms.
20,774 THE FRASER AUTOMATIC ROVE STOP COMPANY LIMITED and OTHERS, Glasgow. Automatic broken-end or rove stock mechanism for spinning machines.
20,775 W. HENDERSON and J. DALLAS, Dundee. Doffing arrangements for roving frames.
20,782 A. SOWDEN, Halifax. Automatic-change shuttle looms.

18th October.

20,930 P. MUTHMANN, London. Mohair velvet and similar pile fabrics.*

19th October.

20,962 A. SOWDEN, Halifax. Automatic-change shuttle looms.
20,984 B. KOHN, London. Machine for measuring ribbon and the like into lengths.*

21st October.

21,033 G. NUTTER, Burnley. Self-acting brushing machine with automatic stop motion for warp-dressing machines.
21,050 D. WALKER and J. WOOD, Nottingham. Jacks or bobbin stands for yarn warping and winding machines.*

22nd October.

21,130 A. LODGE, Bradford. Tentering machines.
21,139 J. T. PEARSON, Burnley. Humidifying or conditioning vegetable or fibrous substances and fabrics.
21,156 H. WILSON and F. DE COURCY, Bradford Brush for preventing the accumulation of laps on drawing-off leathers.
21,174 H. B. ASHTON, London. Spinning frames.*
21,200 G. C. MARKS, London. Circular knitting machines. (*McMichael and Wildman Manufacturing Company, United States.*)

23rd October.

21,240 J. DRUMMOND, Glasgow. Apparatus for printing both surfaces of pieces of cloth or handkerchief or such like simultaneously.
21,271 L. DUGAUQUIER, London.* Hemp-spinning machines.
21,272 H. E. NEWTON, London. Printing with the aid of dyestuffs containing sulphur. (*The Farbenfabriken vormals F. Bayer and Co., Germany.*)

24th October.

21,302 G. H. MELLOR, Macclesfield. Calenders for embossing and crimping any textile fabrics.
21,357 A. E. HILL and G BLACKBURN AND SONS LIMITED, London. Circular knitting machines.
21,258 G. STIBBE, London. Stockings and the like with lace and printed designs or effects.

25th October.

21,395 THE CALICO PRINTERS' ASSOCIATION LIMITED and OTHERS, Manchester. Calender rollers and similar steam-heated rollers.
21,405 W. RIGG, Bradford. Weaving looms.
21,444 E. KIRKPATRICK, Belfast. Combing machines for flax and like fibres.
21,457 W. W. MARSHALL and OTHERS, London. Method of attaching lace and the like to fabric.

26th October.

21,490 L. BOOTH, Nottingham. Machine for unwinding threads from lace machine brass bobbins.
21,527 J. B. WHARTON and S. MAY AND CO., London. Twist lace curtains.
21,539 C. S. MCCONNAN, Liverpool. Spinning machines.
21,564 O. ZERKOWITZ, London. Jacquard card punching machines.

28th October.

21,573 W. BRIGG, Bradford. Letting-off motions for looms.
21,574 A. T. KAY, Rochdale. Collars or cylindrical tubes of the spindles of slubbing, intermediate, and roving frames
21,583 E JONES and D. WHITE, Cleckheaton. Mounting or covering card clothing on metal drums or rollers used in carding machines.
21,590 E. RICHARDSON, Manchester. A tucker for use on a special cording machine (Singer's) known as 32-4.
21,595 T. BURNLEY and R. J. MIDGLEY, London. Means for treating ramie or rhea fibre, china-grass, or other similar vegetable fibre.
21,631 W. BILLS, London. Coiler for wire-weaving machines.*
21,637 F. HOUGET, London. Spinning of yarns or threads on self-acting mules.
21,645 P. BOURCART, London. Apparatus for the mercerisation of vegetable fibres.*

29th October.

21,657 T. PARLOUR, Stockton-on-Tees. Apparatus for washing sheep or wool previous to shearing.
21,668 R. MASON and OTHERS, Manchester. Drawing motion of cotton-combing machines.
21,675 T. REEDER and OTHERS, Manchester. Flanges for warp beams.
21,678 J. FRASER and OTHERS, Glasgow. Roving frames or similar machines for preparing flax, jute, and other fibres for spinning.
21,690 C. E. BRASHER, London. Lace finish.
21,751 W. P. THOMPSON, Liverpool. Device for oiling or paraffining yarns. (*The firm of W. Achtnich and Co, Switzerland.*)
21,772 C. H. ALDRIDGE, London. Rotary or straight-bar knitting machines.
21,773 R. B. RANSFORD, London. Acridine dyestuffs. (*L. Cassella and Co., Germany.*)

30th October.

21,788 H. S. GOLLAND, Manchester. Yarn-winding machines.*
21,793 C. BEDFORD, Shipley. Fast selvage motion for looms.
21,799 S. BRADBURY, Manchester. Machines for brushing batching, and plaiting fabrics.
21,804 S. BROGDEN and J. DUXBURY, Halifax. Loose reed motions of looms.
21,825 S. J. PEGG and OTHERS, London. Washing, scouring, and like machines.
21,830 J. T. LISTER, London. Apparatus for the steaming or finishing of textile fabrics.*
21,864 T. S. JAMES and OTHERS, London. The impregnation of various materials, and machinery therefor.
21,869 J. F. LECLERCQ, London. Rotary rubbers for machines for the preparation of rovings or slivers of textile material.*
21,879 G. W. JOHNSON, London. Production of blank colouring matters containing sulphur. (*Kalle and Co., Germany.*)
21,881 H. L. OFFERMANN, London. Process for washing wool.

31st October.

21,894 E. SMITH, Bradford. Method of producing water marks on fabrics.
21,911 H. LAWTON, Huddersfield. Healds of looms.
21,975 N. KRAUTHEIMER and G. REIS, London. Embroidery frames.

1st November.

22,053 B. SALZER and G. WALTHER, London. Circular knitting machines.*
22,076 W. SCHMITZ, London. Process of making non-shrinkable, porous, foraminous textile fabrics.*

2nd November.

22,100 H. MITCHELL, Huddersfield. Rollers for milling or fulling, washing, and like machines.
22,115 J. C. RICHMOND, London. Machine for emptying, filling, and threading lace machine carriages.

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:—

1900.

13,354. Self-acting mules. July 24. L. Hanhart, Fraize, Vogesen, France. The object is to improve the work of the winding-on in automatic spinning, by making the motion of the winding faller necessary for this purpose, and operated by the backing-off chain dependent on the revolutions of the spindles.—July 24, 1901.

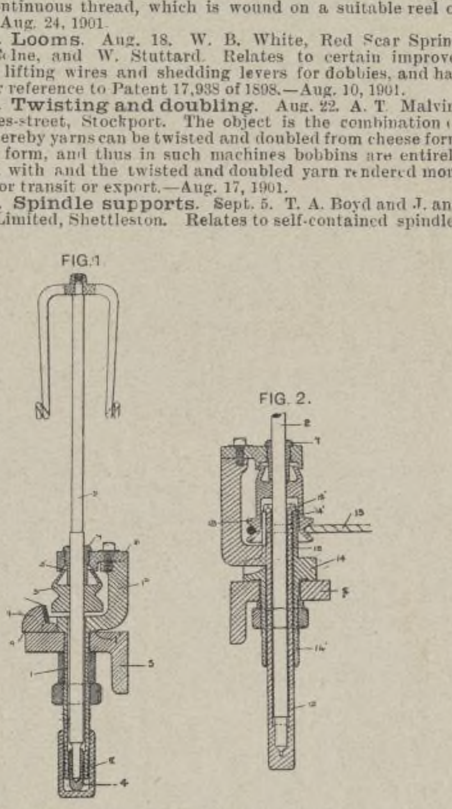
13,402. Spinning. July 25. W. A. Phillips, 12, Euston Buildings London. Relates to a method of and apparatus for spinning cotton or other fibres after they have been carded. There is used a spinning appliance which consists of a hollow cylindrical boss, having its interior in communication with a vessel in which a partial vacuum is maintained, and having a set of fine holes through its circular walls; also a conical end with an eye in the line of its axis. When cotton or other fibres have been carded in the usual way, and formed into a light continuous roving, the spinning appliance is caused to revolve rapidly in close proximity to the end of the continuous roving, fed forward uniformly by means of rolls or other suitable apparatus. The fibres at the end of the roving presented to the spinning appliance are drawn by the vacuum on to the circumference of the rapidly-revolving boss, and once a line of fibres is drawn through the eye the successive fibres are spun into a continuous thread, which is wound on a suitable reel or bobbin.—Aug. 24, 1901.

14,807. Looms. Aug. 18. W. B. White, Red Scar Spring Works, Colne, and W. Stuttard. Relates to certain improvements in lifting wires and shedding levers for dobbies, and has particular reference to Patent 17,938 of 1898.—Aug. 10, 1901.

14,991. Twisting and doubling. Aug. 22. A. T. Malvin, 45, Charles-street, Stockport. The object is the combination of means whereby yarns can be twisted and doubled from cheese form to cheese form, and thus in such machines bobbins are entirely dispensed with and the twisted and doubled yarn rendered more suitable for transit or export.—Aug. 17, 1901.

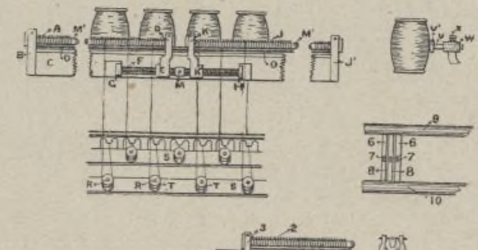
15,761. Spindle supports. Sept. 5. T. A. Boyd and J. and T. Boyd Limited, Shettleston. Relates to self-contained spindles

FIG. 1. FIG. 2.



for spinning and twisting, having the combination of a spindle bush and an oil cup to lubricate it above the wharve, as shown in Fig. 1, and a self-balancing spindle support having a bearing for the spindle above and below the spindle wharve, as shown in Fig. 2.—Sept. 6, 1901.

16,451. Warps. Sept 15. W. B. White, Red Scar Spring Works, Colne, and S. Hargreaves, Burnley. Relates to a winding frame with spiral spring guides A and J, whose ends are secured to bearings or supports B and J[1] and D and K respectively, the two latter mounted on right and left hand screw-threaded shaft F, by which a sliding movement is imparted to them to bring them closer together or farther apart, and by that means to open or close the coils. Also an improved device for preventing the overfilling of winders bobbins, or their running to waste, which consists of an adjustable feeder V, formed with rounded headpiece V[1], which is set in position to stop the revolution of the bobbin when full, and thereby break the thread and prevent waste. The feeler is adjustable in the socket W and regulated by set-screw X, by which means it may be brought nearer to or farther away from the bobbin. Instead of being arranged to slide in the socket W, the feeler may be screwed into the box side of the cop frame, and be retained firmly in its set position by a lock nut. Also a spring guide, where the ends of the coil spring 2 are connected to the movable bearings or supports 3 and 4. The coils of the spring 2 are opened or closed by turning the hand-wheel or handle 5 fixed to the right and left hand screw-threaded shaft 6, and



upon which the bearings or supports 3 and 4 are respectively mounted. The said bearings or supports 3 and 4 are thus moved inwardly or outwardly according to which direction the handle is turned, and by this means open and close the coils of the spring. Also an improved construction of heck, with dents 6in. reed fashion, but put the flat way and formed with a central eye 7, which is punched, stamped, or drilled out. The dents are mounted on stout ribs 9 and 10, and may be about 6in. in depth, about $\frac{3}{16}$in. wide, with an intervening space 8 between each. One section of the warp threads are passed through the eyes 7 of the dents, while the other section are passed through the intervening spaces 8 to make a shed.—Sept. 14, 1901.

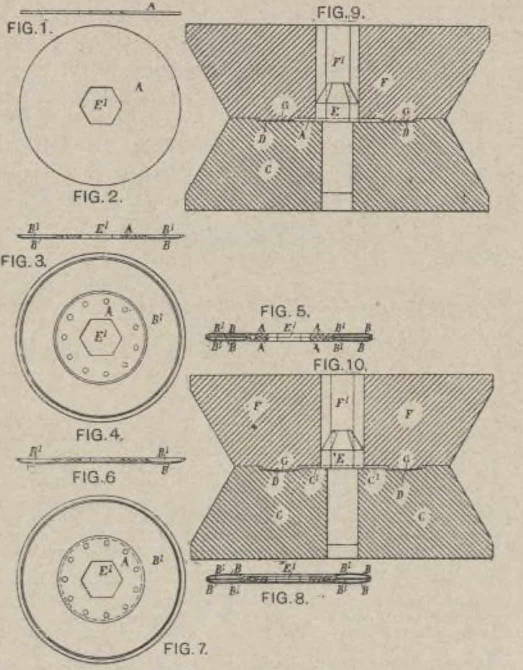
16,800. Looms Sept. 20. J. C. Fell, London (communicated by La Société Chaize Frères, 19, Rue Cambon, Paris). Is a modification in the driver mechanism of a loom for weaving ribands. Between each band of riband there exists an empty space upon the breast beam of the loom, which is utilised in the following manner: A small shaft is fitted on the vertical face of the bench, receiving movement by band and pulleys from a main motion shaft. The shaft is provided with indiarubber rollers between each band of riband. Spindles provided with small rollers and carrying the cop are fixed on suitable bearings on the bench between each riband, the rollers of the cop being in contact with the indiarubber rollers of the aforesaid shaft, which gives the necessary rotation to the cop spindles. The guiding of the thread to be wound on the cop from an adjacent bobbin is effected thus: The shaft operates by an endless worm upon it and a worm-wheel a cam fixed on the worm-wheel shaft, which cam reciprocates a rack by two rollers on said rack. The rack rotates a pinion which has upon its axle a larger wheel operating a second rack at a multiplied speed and travel, this latter rack carrying the thread guide between the supply bobbin and cop spindle, so as to regulate the laying of the thread on the cop spindle as it fills.—Sept. 14, 1901.

17,091. Dobbies. Sept. 26. M. Sowden, Sowden's Loom Works, Shipley. Relates to dobbies having extra or duplicate sets of levers, and consists of improved means of bringing the levers into position for and operating same as when the pattern being woven requires the additional lever.—Aug. 3, 1901.

17,354. Finishing machinery. Oct. 1. J. Kershaw, Railway Ironworks, Hebden Bridge. Is applicable to treadle-dressing and cross-finishing machinery used in finishing fustians, velvets, and similar pile fabrics. Upon a suitable framework is mounted a travelling carriage, upon which are mounted a series of shafts carrying brushes; this carriage moves upon a slide, and is given a to-and-fro motion preferably by connecting rod and disc mounted and operated in any suitable manner. At each end of these shafts are mounted pulleys or drums, driven by half crossed belts from drums or cylinders mounted upon a crosshead above the machine, operated from the main driving shaft. Brushes are mounted upon each shaft, and they revolve at great speed; these brushes rest upon the fabric, and are formed to correspond with the periphery of the rollers as the fabric passes over the latter. These rollers are mounted as ordinarily, and are for presenting the fabric to the revolving brushes and passing the same through the machine.—Sept. 7, 1901.

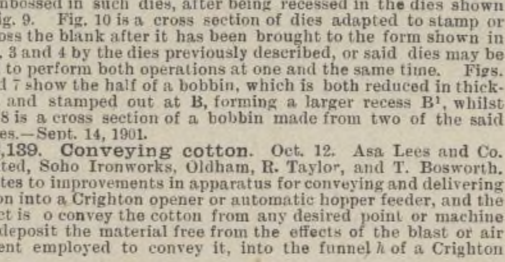
17,508. Dyeing patterns. Oct. 3. J. Bolland, Oak Villa, Glebelands-road, Ashton-on-Mersey. Relates to a method of preserving cloth from dye (in process of printing) by means of leaden or other soft-metal appliances. The cloth is first drawn through openings in metal forms, then the metal forms are compressed on to the cloth, thus preventing the dye from soaking into the fabric, at the points of compression. After dyeing, the metal forms are removed from the cloth, leaving a pattern preserved thereon.—Oct. 3, 1901.

17,906. Bobbins for twist lace. Oct. 9. E Jardine, Deering-street, Nottingham. Relates to improvements in the manufacture of bobbins for twist lace machine carriages, and has for its object the production of such bobbins by a more economical and expeditious process, which also gives greater strength and yarn-holding capacity in the finished article. A circular sheet-metal blank A (see Figs. 1 and 2) of the requisite thickness is used to produce a disc or half of a bobbin by either the second or third processes, but instead of reducing its thickness at B (see Figs. 3 and 4) in order to form an annular recess B^1, by cutting or turning away the substance of the metal in a lathe as heretofore, the thickness of the blank A is reduced by stamping or squeezing in between suitable dies. The dies employed for this purpose are shown in cross section in Fig 9. The blank A (see Figs. 1 and 2) is of less diameter than the finished half of the bobbin (see Figs. 3 and 4), the blank being expanded by the action of the upper die F. A cross section of a complete bobbin, comprised of two halves A, recessed at B^1 in the manner described is shown in Fig. 5. In addition to reducing the thickness of the blank A at B as described, the dies may, if desirable, be so formed



as to stamp or emboss the blank at the same time—that is, force or stamp outward the thin wall of the recess, as shown at B in Fig. 6, so as to enlarge the recess, or if preferred they may be stamped or embossed in such dies, after being recessed in the dies shown in Fig. 9. Fig. 10 is a cross section of dies adapted to stamp or emboss the blank after it has been brought to the form shown in Figs. 3 and 4 by the dies previously described, or said dies may be used to perform both operations at one and the same time. Figs. 6 and 7 show the half of a bobbin, which is both reduced in thickness and stamped out at B, forming a larger recess B^1, whilst Fig. 8 is a cross section of a bobbin made from two of the said halves.—Sept. 14, 1901.

18,139. Conveying cotton. Oct. 12. Asa Lees and Co. Limited, Soho Ironworks, Oldham, R. Taylor, and T. Bosworth. Relates to improvements in apparatus for conveying and delivering cotton into a Crighton opener or automatic hopper feeder, and the object is to convey the cotton from any desired point or machine and deposit the material free from the effects of the blast or air current employed to convey it, into the funnel *h* of a Crighton



opener *g*, and also in some cases to remove fly, leaf and seeds from the cotton before it enters the aforesaid opener or hopper feeder. A fan *e* draws the cotton from a bale breaker *a* through pipes or trunks *d*, preferably containing grids *c*, and delivers it into a funnel-shaped apparatus *f* known as a cyclone, in which the cotton is carried rapidly round and round and beaten against its conical sides by the air which eventually escapes at the top of the cyclone while the cotton settles to the bottom of the cone, which is connected by a trunk to the mouth of the Crighton opener.—Sept. 21, 1901.

18,628. Jacquard looms. Oct. 18. J. Lawrance, Edgewick-road, Paradise, Foleshill, Coventry. Relates to a method of

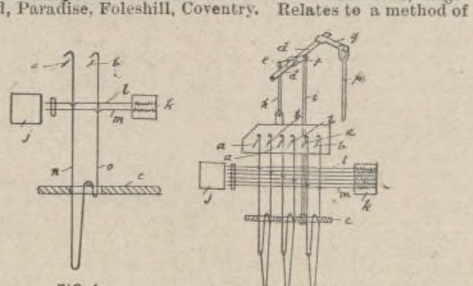
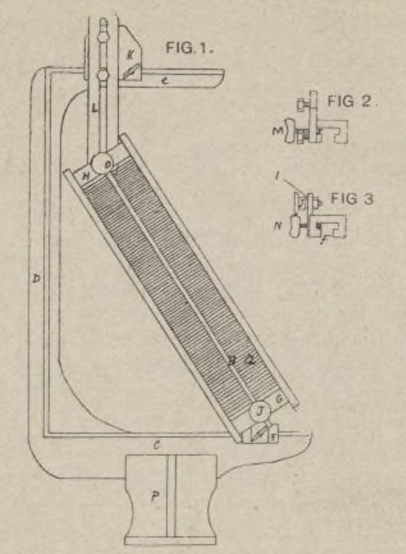


FIG. 1. FIG. 2.

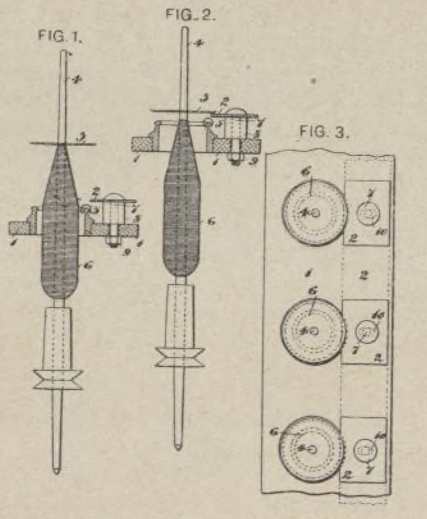
forming two sheds by a single motion from the driving wheel of a jacquard machine. The moving griffe is of the usual construction. The fixed griffe has the knives fixed in a skeleton frame, which is secured to the frame of the apparatus in such a manner as to allow the moving griffe to rise and fall without touching the knives of the fixed griffe. The hook board is of the usual construction, but instead of being fixed to the apparatus it moves up and down in suitable guides. As shown, each leash and each heddle is controlled by two hooks and two needles, of which the needle *l* controls the movement of the hook *n*, and the needle *m* controls the movement of the hook *o*. The two hooks which operate each leash or heddle are made in one piece to enable each leash or heddle to be raised by the moving griffe held suspended by the fixed griffe, or lowered by the hook board. This is effected by punching the cards as follows: If the hooks are to be raised, two holes are punched in the card, one for each needle. To hold the hooks suspended from the fixed griffe a hole is punched in the card opposite the needle *m*. To allow the hooks to fall with the hook board the card is blank opposite both needles. It will be seen from the construction of the apparatus that as the griffe *a* rises, the hook board *c* falls; and as the griffe descends, the hook board rises.—Sept. 21, 1901.

18,555. Warping machines. Oct. 18 W. E. Hill, 9, Ellenroyd Range Bank, Halifax, and J. Tomlinson. Relates to an improved section regulator. The ends coming from an ordinary creel pass through a slay *a* threaded one end through each reed and then over a roller on to the swift. The width of the section is regulated by moving the slay *a* with a straight rod *b* attached across the middle of the slay in a vertical plane; thus when the slay with rod attached is moved towards a perpendicular position, the ends run over the roller and on to the swift in a narrow section, and when it is moved towards a horizontal position the ends run over the roller and on to the swift in a wider section. The bottom



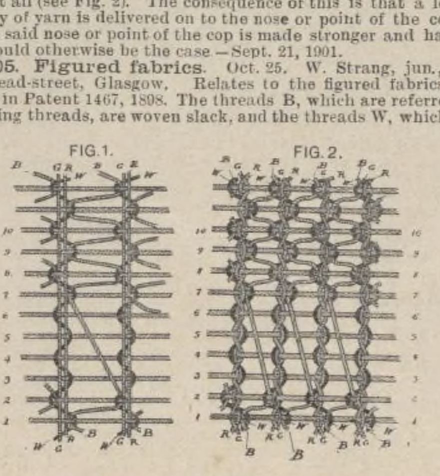
bracket *f* slides on to the rail *c* holding the bottom end of the slay *a*, which has a piece of plate iron ⅛in. thick, *g* and *h*, at each end, and allows the slay to hinge on the reduced part *i* of stud *j*, the rod being hinged on to the stud *j*, Fig. 3. The top bracket *k* slides on the top rail *e*, and *l* is a slide to allow the top end of the slay to rise or fall when moving the slay *a* to a different angle. When the slay is in position for a particular section it is held there by the two thumbscrews.—Sept. 21, 1901.

18,591. Ring spinning. Oct. 18. P. P. Craven, 16, Devonshire-street, Ardwick, Manchester. Relates to improvements connected with the discs employed on the spindles of ring spinning machines for the purpose of facilitating or assisting the motion of the traveller on the ring when the cops are being formed on the bare spindles. To the ring rail 1 a piece of metal 2 is fastened, which may be called the disc lifter, of such a form and so placed that as the ring rail 1 rises, the said disc lifter 2 comes in contact



with the disc 3 on the spindle 4 sooner than the traveller 5 would do if the disc lifter 2 were not present, and therefore lifts the disc 3 so that the traveller 5 does not come into contact with the latter at all (see Fig. 2). The consequence of this is that a lesser quantity of yarn is delivered on to the nose or point of the cop 6, and the said nose or point of the cop is made stronger and harder than would otherwise be the case.—Sept. 21, 1901.

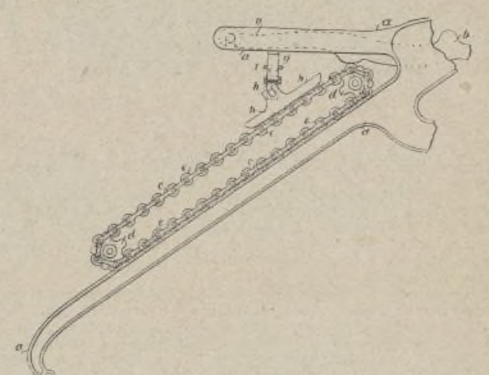
19,105. Figured fabrics. Oct. 25. W. Strang, jun., 201, Greenhead-street, Glasgow. Relates to the figured fabrics described in Patent 1467, 1898. The threads B, which are referred to as binding threads, are woven slack, and the threads W, which are



referred to as whip threads, are woven tightly, and act as binding threads to form part of the ground stripes, so that instead of the said whip threads W being stretched from binding thread or threads to binding thread or threads B, the binding thread is, or threads are, stretched from ground stripe to ground stripe, and forms, or form, the figuring thread or threads.—Oct. 5, 1901.

18,756. New colouring matters. Oct 20. I. Levinstein, C. Mensching, and Levinstein Limited, Minshull-street, Manchester. It is discovered that ortho-nitrophenol and homologues thereof combine with diazo-nitranilines, forming true azo colouring matters.—Sept. 14, 1901.

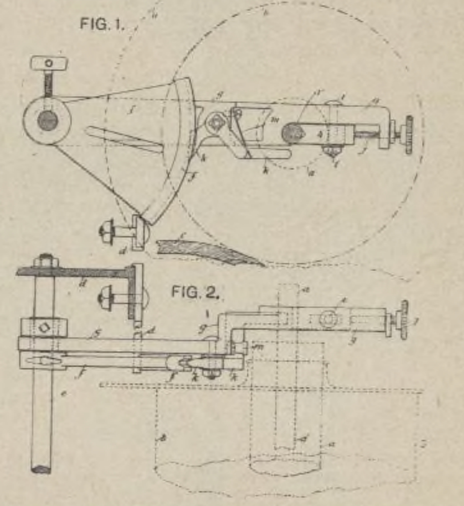
19,314. Looms. Oct. 29. J. L. and B. F. Byrom, Slackcote Mills, Delph, Oldham, and F Winterbottom. Relates to that class of looms for weaving shawls and like goods, and is designed to enable the endless chain pulleys or rollers on the "heading motion" of such looms, which actuate the "jacks" and "jack levers" for forming the pattern, to be readily shifted from one side to the other



on the supporting rods or bars. *a* is part of the frame, *b* the "jack" levers, *c* the chain, and *d* the sprocket wheels for actuating the same. The pulleys or rollers *e*, which are strung loosely on the cross bars or rods forming the chain (with tubes or ferrules *f* between them), have a little more "play" given to them, so that they can be caused to slide a few inches towards one side or the other of the chain by means of a sliding forked bracket.—Aug. 10, 1901.

19,332. Feeding carding machines. Oct. 29. J. Decock, 15, Rue Balzac, Tourcoing (Nord), France. Relates to the feeding of carding machines in such a way that the carding and cleansing are rendered more effective on the textile material by acting on it in a divided condition. For this purpose the material to be treated is fed in several portions on two or more continuously travelling aprons by which each portion is led to suitable feed rollers, and thence to the usual drawing-in, clearing, brushing, and communicating rollers, and finally all the portions are delivered together to the first of the main card rollers, from which the whole passes through the rest of the machine, which is of the usual construction.—Sept. 21, 1901.

19,722. Warp beams. Nov. 3. J. Kay, of the Blackburn Loom and Weaving Machinery Making Company Limited, Phœnix Foundry, Blackburn, and W. Rossetter. Relates to improvements in connection with the warp beams of warping and beaming machines, and the object is to prevent the warp beam from bumping back after springing or jumping whilst in frictional contact with its driving drum. *a* designates the warp beam, *b* the yarn wound thereon, a^1 the axle or beam pike, *c* the driving drum, *d* the machine framing, and *e* a shaft supported in the framing parallel to the axis of the warp beam. On the shaft *e* is a pair of quadrants *f*, one beyond and outside the flange of the warp beam *a* at each end. On the shaft *e* is mounted loosely an arm *g*, which is notched



where it takes over the pivot or pike a^1 of the warp beam, which is retained in the notch of the arm by a sliding block *h*, having a V-shaped face and held in place by a retaining bolt *i* and an adjusting screw *j*, or the beam pike may be secured in the arm by any other convenient and suitable device. On each arm *g* is pivoted a catch or pawl or wedge piece *k*, which is caused, in this case by its own weight and a plate spring *m*, to engage a V groove formed on the face of the quadrant. The pawls *k* or equivalents are so mounted as to allow the warp beam *a* to rise freely at all times, but their weights or springs *m* cause them to lock in the grooves on the quadrants *f*, and so hold up the warp beam in any position to which it may jump or spring.—Sept. 21, 1901.

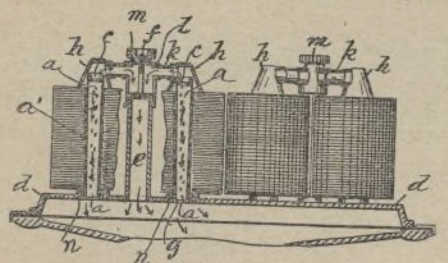
19,756. Textile dissecting apparatus. Nov. 3. H. Mackintosh, Moorhead House, Shipley. Relates to a textile dissecting or testing apparatus, in which a lens is so arranged as to throw a magnified image of the desired area of pattern upon a translucent screen.—Sept. 28, 1901.

19,779. Sizing machines. Nov. 5. R. Ratcliffe and J. Ratcliffe, 213, Whalley Old-road, Blackburn. Relates to improvements in yarn-sizing machines, and has for its object the prevention of the yarn from overrunning itself when the machine is started or put on slow motion, etc.—Sept. 7, 1901.

20,084. Shedding motions. Nov. 8. W. Paton, Kenmuir, St. James'-road, Carlisle. Relates to a two-cylinder harness jacquard or head motion, with a double catch or sneck lever pivotally connected to and carried by the cylinder rod or equivalent piece of mechanism and adapted to be engaged with either of the cylinder operating levers as and when called for by the measuring or cylinder controlling mechanism for automatically controlling the changing of the pattern cylinders.—Oct. 5, 1901.

20,158. Treating yarn in cop. Nov. 9. C. Hartley, 19, Derg-street, Seedley. Provides an improved construction of apparatus for dyeing and otherwise treating yarn in cop and other similar compact form in larger quantities and in a more expeditious and uniform manner than heretofore has been the case.—Oct. 5, 1901.

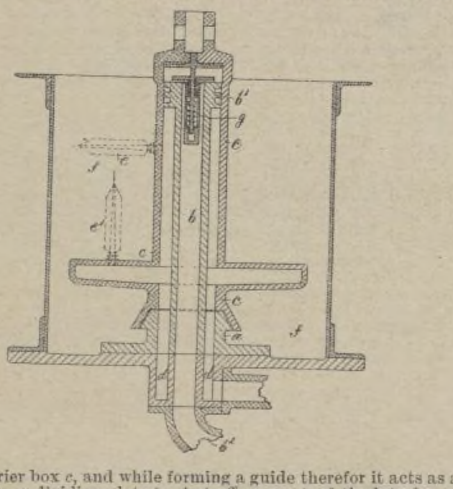
20,159. Dyeing. Nov. 9. C. Hartley, 19, Derg-street, Seedley. In practice it has been found very difficult to withdraw metal tubes after dyeing yarn in "cheese," and consequently they were left in the "cheese," which necessitated a large stock of such tubes. To obviate this difficulty, perforated metal tubes are made so that they are capable of being expanded and contracted in the perforated paper tubes. One or both ends of the perforated metal tube *a* has slits *b*, and in connection with each of these slit ends is used a ring *c*, slightly taper, so as to allow of being inserted into and thereby expand the metal tube *a* against the perforated paper tube a^1, and when removed cause the metal tube *a* to collapse, and thus permit of being easily withdrawn. The plate *d*, upon which the "cheeses" or the like are treated, has a number of tubular pillars *e* projecting from the face thereof, each being perforated at the upper end and having a screw-threaded bolt *f*. Around each of these pillars are formed at suitable distances apart from each other a number of holes *g*, each adapted to receive one of the perforated



metal tubes *a*, whilst upon the upper end of each of the latter is placed a conical cap *h*. These caps are formed on hollow radial arms *k* branching from the hollow boss *l*, placed on to and communicating with the upper end of the pillar *e* and secured thereto by means of a cap-like nut *m* screwed upon the said bolt *f*, whereby the "cheeses" are clamped to the said plate *d*, and both ends thereof subjected to the suction action of the pump.—Sept. 21, 1901.

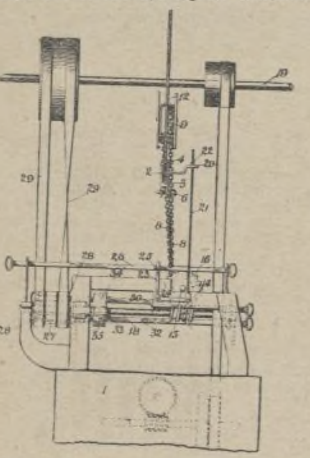
20,292. Nets. Nov. 10. C. Zang, 51, Rue de la Santé, Paris. Relates to machines for the manufacture of nets, and has for its object the application to such machines, constructed on what is known as Jouannin's system, of a variable motion combined therewith in such a manner that there shall be a decrease of speed at each half-revolution of the cam wheel– that is to say, at the point where the hooks deposit the threads and at the point where the comb or reed leaves the jaw, but that the degree of slowness shall be communicated as required and altered according to the size of the me-h to be produced.—Oct. 5, 1901.

20,332. Dyeing yarn. Nov. 12. W. Coventry, 295, Liverpool-street, Salford. Relates to improvements in machines for dyeing and otherwise treating yarn in the form of eops or bobbins, and is more particularly applicable to the type of machine described in Patent No. 26,602 of A.D. 1898. The sleeve *a* no longer slides, but is a fixture. The upper part b^1 of the central pillar *b* is enlarged or formed as a piston or head closely fitting the interior



of the carrier box *c*, and while forming a guide therefor it acts as a diaphragm or dividing plate to shut off so much of the interior of the carrier box as is at any moment beneath the piston and below the level of the dye liquor (when the carrier box is being lifted) from the action of the air. Thus any risk of dye liquor passing into the air pipe and being wasted is avoided. The air passes along the air pipe b^2. The surrounding annular chamber *d* communicates with the dye-circulating apparatus in the usual manner. —Sept 14, 1901

20,595. Dyeing machines. Nov. 15. A. B. Burrows, Spen Valley Carpet Works, Liversedge. Relates to hank-dyeing machines, and is specially applicable to such machines of the class wherein swifts holding the hanks are revolved in the dye liquor, and the invention consists of improved apparatus for lifting or raising the swifts out of the dye liquor. Extending above and



across the middle of the dyevat 1 is a horizontal rail 2, and free to slide on such rail are two brackets or hangers 3 provided with anti-friction runners or bowls 4 working in contact with the rail 1. The brackets 3 are slotted at their lower ends, and provided with holes for the reception of pins 6, which support the swift. The rail 2 is suspended from each end by chains 8, which pass over grooved guide pulleys 9 carried by hangers 10 fixed to any convenient part of the dyehouse.—Sept. 28, 1901.

21,077. Stopping a loom. Nov. 21. J. J. Zubler, Brombach, Germany. Consists of a device to be applied to a power loom for automatically stopping the loom before the shuttle spool has run quite empty, and that just at the moment when the material remaining thereon is so small as not to be taken into consideration.—Oct. 5, 1901.

21,130. Producing blue shades on wool. Nov. 22. H. E. Newton, London (communicated by The Farbenfabriken vormals Friedrich Bayer and Co., Elberfeld, Germany). Relates to a new process for producing on wool blue shades which are distinguished for their fastness to light with the aid of certain mono-azo dyestuffs, which can be prepared by combining the diazo derivative of para-nitro-ortho-amido-salicic acid with such amido naphthol sulphonic acids as contain the amido and the hydroxy group in the so-called peri-position.—Sept. 14, 1901.

21,359. Embossing. Nov. 26. C. D. Abel, London (communicated by C. Huber and Co., 38, Beiertheimer Allee, Karlsruhe, Baden). Relates to a method of pressing, stamping, embossing, or printing, and in apparatus therefor, and consists essentialy in the use of a water chamber having flexible walls.—Sept. 14, 1901.

21,542. Dyeing machines. Nov. 28. E. Preston, 19, Park-lane, Kidderminster. Consists of improvements in power dyeing machines used in the dyeing of hanks of yarn and the like, the improvements having for their object to facilitate and expedite the dyeing of the yarns.—Sept. 14, 1901.

21,756. Spinning frames May 2 S. Berard, 18, Maynard-street, Fail River, Mass., U S A. The object is to dispense with the use of the ordinary ring and traveller in the spinning and twisting of yarns, and the invention consists in novel arrangements for spinning or twisting, including a ro'ating ring provided with a novel form of yarn guide, the ring being driven by band and drum or other means, and supported in an improved manner. 1 designates a spindle, and 2 the support containing the bearings for the spindle. 3 is the spindle rail, to which the support 2 is applied. 4 is the ring rail. 5 is the ring applied to the ring rail, and employed in connection with the spindle 1. The ring 5 is grooved in its exterior, as at 6, to receive a driving band 7, Fig. 1. 8 is a thread

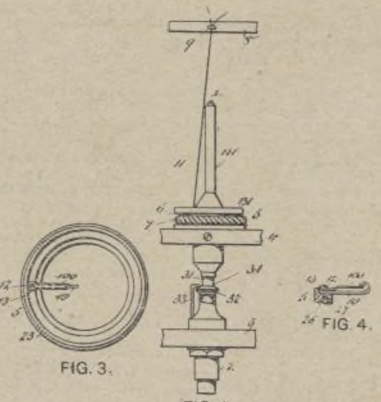


FIG. 3. FIG. 1. FIG. 4.

FIG. 2.

board above the upper end of the spindle, and 9 is a guide eye carried by the thread board in line with said spindle. 10 is a yarn guide which is applied to the ring 5. The yarn is indicated at 11, it being represented as passing in customary manner through the guide eye 9, thence down to and through the thread passage of yarn guide 10, and thence towards the spindle 1. The yarn guide is connected movably with the upper end of the ring 5, as by means of a pin or screw 12 fitting an eye 13 in one end of yarn guide. The yarn guide is free to swing upon this pin or screw as upon a pivot, and as the ring rotates is caused to move thereupon by the pull of the yarn as it winds upon the spindle, and by the centrifugal force that is generated by the rotation of the ring.—Sept. 21, 1901.

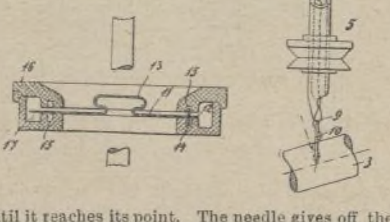
22,456. Sulphonated colouring matters. Dec. 10. C. D. Abel, London (communicated by the Actien-Gesellschaft für Anilin-Fabrikation, Berlin). It is discovered that the derivatives of diphenyl-*a*-naphthylmethane obtained by condensing tetra-alkyl-diamidobenzophenone with methylphenyl-*a*-naphthylamine can be sulphonated without difficulty, and are thus transformed into acid dyestuffs which dye wool a remarkably pure and intense violet.—Oct. 5, 1901.

22,457. Shedding motion. Dec. 10. G. Schwabe, Bielitz, Silesia. In crank looms for weaving twill fabrics, a shedding lever motion whereby the period of rest of the shedding levers already existing in these looms is increased by the introduction of a lever device between the revolving crank and the connecting rod in such manner that the shedding lever motion is rendered equal to that obtained in the cloth or cam loom—namely, a period of rest during the semi-revolution of the loom, and a rapid motion of the shedding levers during the other half.—Sept. 21, 1901.

1901.

6926. Weft replenishing. April 2. W. H. Baker, Central Falls, U.S.A., and F. E. Kip. Relates to multiple-colour or box looms, and the object is to provide an automatic mechanism for supplying weft to such a loom of the kind or colour required. The selecting devices are mechanical, although the supplying or changing mechanism is electrically controlled.—Aug. 17, 1901.

7473. Spinning frames. April 11. G. Josephy, 2, Fabriksgasse, Bielitz. Relates to improvements in spinning frames, and has for its object the production of loosely-twisted yarns of short staple, and especially weft yarns for winding on short cops. The new twist-tube mechanism is constructed as follows: The twist tube is formed as a hollow cylinder, and is provided at its entry with two lateral noses to guide the roving. The lower end of said twist tube terminates in a conical half-open point 9, in which is fixed a needle 10, which may be formed in one with the tube. The needle constitutes a prolongation of the axis of the tube. The yarn or thread winds itself, without friction, in serpentine form



upon it until it reaches its point. The needle gives off the thread easily from its point where it is adjacent to the line of contact of the feed cylinder 3, so that short-fibred material cannot break, and by subjecting it to a false twist the moderation and reduction of the twist caused by the spindle is made possible and generally facilitated. The travelling wire 11, which performs the work of the traveller, and which twists and lays the yarn upon the bobbin, is provided at one end with a circular loop 12, the remaining portion being of any suitable shape. In the present case the wire is bent upwards at 13 for the purpose of guiding the yarn or thread. This loop 12 passes through the runner plate 14, and through two slots therein, whereby the tilting of the wire is prevented. This method of securely supporting the travelling wire 11, and thus removing the liability to tilt, will greatly reduce breakage of the yarn, if not entirely prevent it. The ring or loop 12 enables the travelling wire to oscillate in the runner-plate 14 in the directions indicated by the arrows, so that it can accommodate itself to the thickness of the bobbin of yarn and rest on its periphery.—Oct. 5, 1901.

7883. Fabric. April 17. F. G. Gerli, St. Martin's House, 1, Gresham-street, London. Relates to an improved textile fabric having one side or face composed of wool, or of cotton, or of spun silk, and the other side or face of fleecy silk, the two materials being combined to form a single fabric.—Sept. 28, 1901.

12,951. Spindles. June 25. V. Bélanger, Sea View, Marshfield, Mass., U.S.A. Relates to a spindle having a rotatable eccentric bolster, and the combination of a bolster case, a bolster, and a non-vibratory spindle, with provisions for adjusting the spindles laterally with relation to the bolster case.—Oct 5, 1901.

14,001. Drying cloth. July 9. C. W. Russell, 35, Bridgham-street, Providence, U.S.A. Has reference to an improvement in machines for drying cloth. The main object is to economise space and steam while more thoroughly drying the cloth.—Sept. 28, 1901.

14,010. Knot tying. July 9. A. J. Boult, London communicated by R. Klinger, Altstadt-Stolpen, Saxony). Relates to a device operated by hand for forming knots in binding cords and the like when tying bales, and for other purposes.—Aug. 31, 1901.

14,509. Supplying weft to looms. July 16. W. H. Baker, Central Falls, U.S.A., and F. E. Kip. Relates to automatic means for indicating the exhaustion of the weft or filling in the running shuttle of a loom to a pre-determined extent, for setting in operation an automatic weft, replenishing mechanism, or for stopping the loom in order that the weft may be replenished.—Sept. 28, 1901.

14,725. Weaving slat fabrics. July 19. H. Wendt and A. Junige, Kamenz, Saxony. Relates to a slat-weaving loom embodying novel devices for the mechanical introduction of the slats into the warp by means of a shu tle, as well as for releasing the slat from said shuttle and returning the latter to its original position to enable it to repeat its operation.—Sept. 28, 1901.

14,814. Yarn guide. July 20. F. E. Garner, 200, Main-street, Longmeadow, Mass., U.S.A. Relates to yarn guides for spooling or winding machines, and has special reference to guides of that class adapted to strip off "slugs" or bunches of fibre which are common on certain grades and kinds of yarn, the object being to provide a guide for the yarn which in itself comprises a cleaner. The guide or cleaner consists of a metal body *a*. This is of the rectangular form shown, and each end is turned upwards and has the centrally-located V-shaped notch *b*, which the yarn *c* runs in. At a point about midway is located the abutment *d* lying transversely of the body *a* and extending from one side towards the centre, its inner end lying just beyond the centre line to the end that a

FIG. 1.

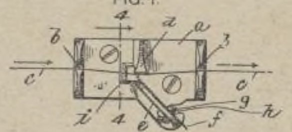


FIG. 2.

FIG. 3.

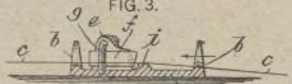
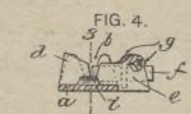


FIG. 4.



yarn drawn through the two V-shaped notches *b* will be deflected out of a straight line by the inner edge of the abutment. The latter in inclined backwards from its base, as shown in Fig. 4. A rib *e* extends beyond the side of the body *a*. One side of this rib is substantially vertical to the surface of the body *a*, and has bolted or secured thereto in any suitable manner a spring blade *f*, whose inner end is made parallel with the inner edge of the abutment *d*. This blade should be secured near one end thereof to the rib *e*. By means of the bolt *g* the blade *f* may be adjusted towards and from the edge of the abutment *d* with which its end is parallel. To prevent the head of the bolt from turning, the end thereof is turned downwards and is made long enough to enter a slot *h* cut in the base of the rib *e*, as shown in Fig. 1.—Aug. 24, 1901.

15,264. Shuttles for horsehair weft. July 27. B. and P. Grosslaub, Hainichen, Saxony. The shuttle is provided at each end with a spring catch mechanism, and is designed to strike a bundle of horsehair and to pick therefrom, according to the size of the catch hook, one or more hairs, so that in its passage it can carry the hair or hairs into the shed It is shown in the drawings, Figs. 1 and 2 being longitudinal sections, Figs. 3 and 4 plan views, Figs. 5, 6, and 7 details, and Fig. 8 a view of a shuttle end striking the horsehair bundle. In the shuttle casing *a* are fixed rods *b*, formed at their outer ends into hooked pins *c*, which project a little from the shuttle ends (Figs. 2 and 4), but normally are just covered each by a spring sleeve *d* which encloses it (Figs. 1 and 3). The seizure of the horsehair takes place mechanically by means of the hooked pins *c* in the manner that when the shuttle is shot against the horsehair bundle *e* (Fig. 8) the spring sleeve *d* is pushed backward, whereupon the hooked pin enters between the horsehairs, seizing (say in this case) one *f* (Fig. 5), which then, by reason of the sleeve *d* pressing steadily forward, is clamped between this latter and the hook of pin *c* (Figs. 6 and 7). To attain this end the

FIG. 1.

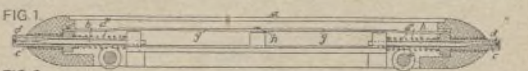


FIG. 2.

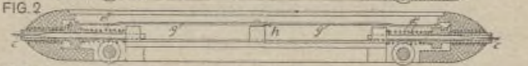


FIG. 3.

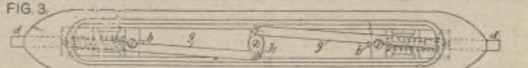
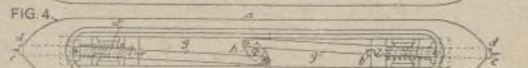


FIG. 4.



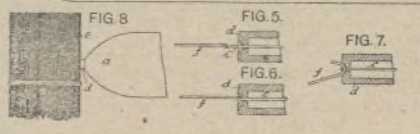


FIG. 8 FIG. 5. FIG. 6. FIG. 7.

spring d^1 placed over and influencing the sleeve *d* is designed of such a strength that only upon the shuttle striking against the horsehair bundle does it permit the sleeve to move backward to leave the hook free. The spring d^1 then again pressing forward, the sleeve *d* going with it, pushes away the superfluous hairs from the hook, whilst the hair caught in the hook is clamped fast. In order to prevent the hair once seized and clamped from escaping laterally out of the hook, the sleeve *d* is somewhat recessed at the end around the hooked pin *c*, so that the hair will bed therein and be more securely held. The hair thus seized is then in the return throw of the shuttle passed into the warp shed like an ordinary shuttle thread. At the opposite end of the loom the shuttle in a like way strikes a bundle of horsehair, seizes a hair with the other hooked pin, and moving in the opposite direction carries the hair through the shed.—Aug. 31, 1901.

15,608. Braiding machines. Aug. 1. A. V. Groupe, 134, South Ninth-street, Philadelphia, U.S.A. Relates to that class of braiding machines wherein the threads from oppositely-travelling sets of thread carriers are interlaced to effect the braiding of the threads about a central point; and more particularly to that type of such machines in which the carriers are rotated in concentric paths, and the threads from one set directed about those of the other set.—Sept. 7, 1901.