THE

TEXTILE MANUFACTURER:

WITH WHICH IS INCORPORATED

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

No. 316.—Vol. XXVII. APRIL 15, 1901. Price One Shilling.

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NOTES OF THE MONTH.

Cotton Trade Conciliation.

AFTER a couple of years of labour, almost ignored, the committee of employers and operatives, who have been negotiating with the aim of establishing a definite sliding scale of wages, have obtained notoriety, and their work is now one of the chief objects of public interest. Unfortunately, their two years' work appears, on the surface, to have been wasted, for the two factions have been unable to come to terms. It is not our intention to discuss the question from the standpoint of either employer or employed; this has been done for both sides by various papers, sometimes in a way far from calculated to close up the breach. It would have been much better if the statements from each side had been allowed to stand in the simple yet distinct terms in which they were issued. The statements came from the men best qualified to explain the situation, and there was no need for the columns upon columns which have appeared in many papers, attempting to explain but really complicating the two original statements. As some of these later discourses have been biassed in tone, and others have blindly advocated the interests of one side or the other, they have been far from calculated to improve matters. The chief aim at the present juncture is to try to bring the contending parties to some mutual arrangement, not to convince each that it alone is perfectly right and the other absurdly wrong. The difference is only slight—that is, as regards the number of questions at issue. The sliding scale of wages has been practically agreed upon, and there only remains to be settled the base from which this scale is to work. The views as to this starting-point do not differ to any great extent, being diverse as to the profit per pound required to give a dividend of 5 per cent. and as to the valuation of machinery. A great deal of discussion has taken place around the first point, yet it is not a subject for discussion at all. The matter can be settled by fact, not by calculation or theory, if a few representative mills are agreed upon by the conciliation committee. A firm or separate firms of accountants would do the rest, working confidentially and divulging no so-called business secrets. If necessary, only the average rate of profit need be declared, and an exact basis arrived at without disclosing the profits of the separate mills. The valuation of machinery, based largely upon deterioration, is a more complex matter. The question of depreciation has never been definitely settled, and that is all the more reason that some such settlement should be made. This again is scarcely a subject for the conciliation committee—at any rate, not in detail; but the existence of such a committee, employing either one or separate firms of accountants, having power to engage machinists and machinery valuers, and securing access to the mills of the Employers' Federation, was an opportunity not to be despised for settling this interesting question. The actual valuation of machinery whose age and cost were known, and which covered the whole range of counts and qualities of cotton spinning, would be so obtained. The Employers' Federation and also the operatives' associations are steadily increasing in power, rendering them more antagonistic in many respects; but they could work mutually together where the interests of the trade in general are concerned. Any agreement which will definitely establish a general wage system will not only be beneficial to the operative, but also to the employer, who has enough to do with the fluctuations in the price of raw material and other requisites, without the constant menace of an unexpected increase in his wage list, or the possibility of a strike, with its immediate losses and succeeding years of ill-will and suspicion between master and man.

Commercial Museums and Exhibitions.

THE commercial museum or exhibition is no more than the revival of the old-time fair which has appeared in a glorified form and carries a more aristocratic name. These old fairs were found, in our own and other European countries, to be the most economical method of introducing merchandise into districts situated at a distance from the centre of any industry, giving, as they did, an opportunity of displaying wares to a large number of people gathered at one centre from miles around, and thus saving both expense and time. The value of this centralisation was ignored when railways were established, and although revived, in a sense, in a new form fifty years ago, it has been left to more recent years to thoroughly establish its value. In fact, it is only within the last few years, and even months, that English manufacturers have been heard to affirm that "it didn't pay to exhibit." It doesn't—in a half-hearted way; but if properly carried out, exhibiting saves the cost of a small army of commercial travellers, and leaves goods to be judged more by their own merits than by the oily tongue of a representative. Foreign trade, with the present means of transit, is about as difficult as the trade between village and village in our own country a hundred years ago, and if the old fair under its old name proved a success up to and after that time, it is more than likely that under its new title and with other modern advantages it will prove an economical and efficient means of reaching foreign markets. There is one difference: where the competition was national, it is now international, and, whilst being competitors, the manufacturing nations of the world will have to work shoulder to shoulder in arranging the centres and times of exhibitions, or the places where commercial museums shall be established. The lead given by America to this question a short time ago has already borne fruit, and signs are evinced in many quarters of the adoption of the new or, speaking more correctly, the revived system. Just recently a commercial museum has been established in Nicaragua, which, in addition to national objects, has a section which is to be devoted to foreign commerce and industry. Its chief aim is to establish better commercial relations between Europe, America, and Nicaragua, and a large hall has been provided in Managua, the capital of Nicaragua, for the public display of the products of foreign lands. The director of this museum invites the Nicaraguan Consuls in Europe and America to solicit from the manufacturers and producers within their consulates samples (not too large) of goods and articles of their manufacture—only such as will be of interest and of commercial value to that country being desired. Articles of this description are to be exhibited at all times free of cost, and it is anticipated that a permanent exhibition of the kind will prove to the benefit of both exhibitors and visitors. Where a manufacturer's products are bulky, such as machinery, it is requested that only small working models or a set of representative photographs be submitted. All exhibits should be accompanied by a lucid description or by instructions how to operate them, their advantages, their technical or commercial names, together with catalogue, price lists, terms, commissions allowed to agents, and especially the style of packing for export. This latter point is of great importance to the Nicaraguans, as the Custom duties of that country are based on the gross weights. The Brazilian Government have also arranged for a permanent exhibition at Cidade de Minas, which is to be opened about April next year. Among many other articles, samples of cloth, cashmeres, handkerchiefs, carpets, etc., are likely to find a place of interest. It is said that both Spain and the United States have already arranged for sections at this exhibition.

The Working of the Patents Acts.

THERE are many British institutions of which Britons are proud, but those which are by far the most popular are the ones which afford some ground for the favourite British pastime of grumbling. It is so customary to grumble at anything and everything, that the authorities become inured to the practice, and it takes no small amount of agitation to procure any change in the established order of things. There is another matter, too, which has weight: whatever the changes or reforms made, they are received with a spirit of biassed criticism, and with perhaps an extra dose on the strength of their being somewhat new. Our patent laws have been under discussion for many years, but there seems a possibility of reform in the near future, and this reform would probably have come sooner if there had been some slight agreement in general as to the tendency which improvement should take. Suggestions based on practice have been very limited, and the Board of Trade have had some difficulty in putting them into acceptable shape. If the suggestions made are adopted as a whole or in part they will receive strong criticism from many quarters, but there is little doubt that they take a step forward, and that they will do something to put our patent laws on a more reliable and substantial basis. The questions which the committee appointed by the Board of Trade were asked to consider were: "(1) Whether any, and, if so, what, additional powers should be given to the Patent Office to (*a*) control, (*b*) impose conditions on, or (*c*) otherwise limit the issue of Letters Patent in respect of inventions which are obviously old, or which the information recorded in the office shows to have been previously protected by Letters Patent in this country; (2) whether any, and, if so, what, amendments are necessary in the provisions of section 22 of the Patents, etc., Act, 1883, which relates to the working of patents in the United Kingdom; and (3) whether the period of seven months' priority allowed by section 103 of that Act to applicants for Letters Patent under the International Convention may properly be extended, and, if so, on what conditions." In regard to the first point, the committee find that old inventions—that is, inventions which, although not patented, are well known in works or factories—are seldom made the subject of a patent, and need not be considered, but they find that inventions previously patented are constantly being re-patented as new, either in their exact form or very slightly modified. They find that the grant of invalid patents is a serious evil, inasmuch as it tends to the restraint of trade and to the embarrassment of honest traders and inventors, and they recommend that, in addition to the existing inquiries, an examination should be made in the Patent Office into the question whether any invention claimed in a deposited specification has been claimed or described in any, and what, specifications of Letters Patent granted in the United Kingdom dated less than fifty years previous to the date of the application; that this inquiry should not be extended to provisional specifications which have been published, but not followed by a complete specification; and that, consequent upon the limitations of this inquiry, an enactment should be passed to the effect that the publication of an invention in specifications of Letters Patent granted in the United Kingdom dated fifty years or more previous to the date of the application, or in a provisional specification of any date of the kind before mentioned, shall not of itself be deemed an anticipation of the invention. The second point is one which has created no little controversy during the last few months, especially with regard to German dyestuffs. The section of the old Act referred to above gives the Board of Trade power, "if, on the petition of any person interested, it is proved that by reason of the default of a patentee to grant licences on reasonable terms (*a*) the patent is not being worked in the United Kingdom; or (*b*) the reasonable requirements of the public with respect to the invention cannot be supplied; or (*c*) any person is prevented from working and using to the best advantage an invention of which he is possessed, to order the patentee to grant licences on such terms as the Board may deem just." The committee now recommend the repeal of the above, and suggest the following substitute: "(*a*) That the right of applying be confined as at present to a person interested; (*b*) that the event on which the jurisdiction is to arise be defined as follows: When it is made to appear that the reasonable requirements of the public in reference to the invention have not been satisfied by reason of the neglect or refusal of the patentee to work or grant licences on reasonable terms; (*c*) that the jurisdiction be transferred to the High Court, to be exercised as part of its ordinary jurisdiction, and therefore be accompanied by the same power of awarding costs, and be subject to the same rights of appeal and to the same regulation by General Orders as are in force in respect to its existing business, except that no appeal to the House of Lords shall be brought without the leave of the Court of Appeal or of the House of Lords; (*d*) that the respondents in any proceedings under this jurisdiction shall include—(1) the patentee, and (2) any persons claiming an interest in the patent as exclusive licensees or otherwise. In addition, the Attorney-General in England or Ireland or the Lord Advocate in Scotland, or any person authorised by them respectively, shall have the right of appearing; (*e*) that the jurisdiction shall apply to all Letters Patent, whether granted before or after the passing of the proposed enactment; (*f*) that unless and until it be otherwise provided by General Orders of the High Court, the application to the High Court shall be made by originating summons; (*g*) that the Court have power to make an order conferring a licence on the applicant upon such terms as to the duration of the licence, the amount of royalties, security for payment, and otherwise, as the Court, having regard to the nature of the invention and the circumstances of the case, shall deem just." Section 103 referred to in the third point relates to international arrangements for the protection of inventions, and gives a foreign applicant priority if his application comes within seven months of the application in his native country. The committee recommend: "(*a*) That foreigners who apply for patents in this country under the convention should be required to file with their application a complete specification; (*b*) that upon acceptance, or at the expiration of the said twelve months, whichever shall be the earlier, the foreign applicant's specification shall be published by the Patent Office; (*c*) that the concession on the part of this country in the above-mentioned extension of time be reciprocally met by a similar provision in favour of British inventions in foreign countries."

Motor Vehicles for Cotton Transit.

ALTHOUGH the manufacturing districts of Great Britain are very compact, and the distribution of raw material confined to a very limited area, such distribution is far from being satisfactory. The modern industrial institutions were only made possible by the advent of railways; yet convenient as these are, they are very far from being ideal. In many districts some particular railway has a monopoly of the traffic. The manufacturer has no redress against delays, heavy charges, and similar grievances, and in many instances is thus heavily handicapped in his business. Where two railway companies supply the same district matters are much more favourable, for competition has a wonderful way of making officials more attentive, and companies more anxious to deliver and collect to time. By this means the larger towns which are served by two or more railway companies have great advantages over country places, and the cheaper labour of the latter is fully counterbalanced by extra transit expenses and difficulties. Unfortunately, we are as yet almost entirely dependent upon railways. The Manchester Ship Canal, originated with a view to cheapening the carriage of raw cotton, is a dismal financial failure. The same, however, cannot be said of the work it is doing; it is of great benefit to the cotton brokers and spinners in the Manchester district, and its value will be more fully appreciated in future years. The smaller canals—smaller as regards width and depth, but forming a network of hundreds of miles throughout industrial districts—have proved successful both as to finance and convenience, and it is only their slow means of transit which stand to their disadvantage. The ideal method of distribution, and the method which will probably ultimately be adopted, is by means of motor vehicles. The legalised advent of these carriages is of very recent date, yet gigantic strides have been taken in the way of perfecting and adapting them to different uses and roads. The machines generally seen on our roads at present cannot be taken as a type of what we shall have after a few years of experience, tests, and trials, and there is no reason to doubt that before half-a-dozen years are over we shall be accustomed to see a reliable, yet sightly, vehicle, adapted to all kinds of loads, roads, and gradients. The convenience of some regular system of transit of this kind will be invaluable. Instead of carrying from ship to rail, shunting on to various lines, and awaiting the convenience of different companies, then being transported to wagons again, a much simpler system can be adopted. Motor vehicles travelling from, say, Liverpool could serve the various Lancashire towns with raw cotton and other imported goods, direct from the dock. In time roads would be improved, and this direct service would become both cheaper and more speedy than by the railway, with its delays at junctions and termini and its unbending officialism. At anyrate, a thorough practical test of distribution by motor vehicles is to be carried out next June by the Liverpool Self-propelled Traffic Association, whose address we give on another page. The object is to provide a means of making a preliminary test of types of heavy motor wagons suitable for haulage operations in Lancashire, prior to their being taken over by a Lancashire syndicate which is to be formed for conducting road transport between Liverpool and the manufacturing towns of Lancashire. Everything is being done to make the test a practical one, and arrangements are being made with Lancashire manufacturers and Liverpool shipowners for the provision of loads of general merchandise, which will be collected, transported, and delivered free of charge, as a demonstration that the motor wagon is commercially practicable. The route is to be varied: hill climbing at Everton Brow and manœuvring at Prince's Dock will occupy the first day (June 3). The next day the wagons will run from Liverpool to Manchester viâ Warrington; the next, Manchester to Liverpool viâ Bolton; the next, Liverpool to Blackburn viâ Chorley; and on the last day, Blackburn to Liverpool viâ Preston. A number of competent judges have been elected, and regulations have been drawn up with the view to only including vehicles whose size, shape, capability, and powers make them possible for regular and serviceable traffic and manœuvring. In judging the vehicles, such factors as prime and working cost, control, general efficiency of working, and construction will all be taken into account, and there should be some basis arrived at when the trials come off as to the type of motor vehicle which will be adopted in the near future.

ARTICLES.

Warp Printed Silk Goods.

PRINTED silks have proved themselves to be the most favoured silk fabrics for spring, and their popularity for the summer season is practically ensured. The second style of importance is that of warp printed goods, which, like

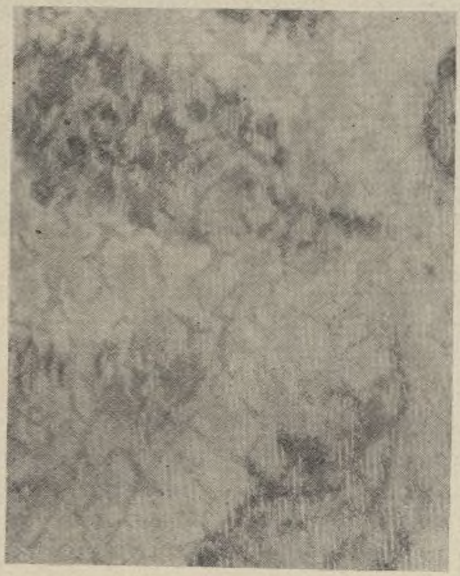


Fig. 1.

the first, are no new thing. The years 1895 and 1896 saw many such fabrics from Lyons, and they were also produced by English, German, and American manufacturers. They were very successful, and

Fig. 2.

the goods sold at high prices. The patterns comprised rich combinations of fancy, jacquard, taffeta, satin, and other weaves. These and a much larger variety are being adopted this

Fig. 3.

year, previous experience aiding to no slight degree. Warp printing is much more expensive than when printing direct, for it embraces operations requiring highly-skilled labour. When printed by the block process the warp is beamed, then placed in the loom drafted in plain healds,

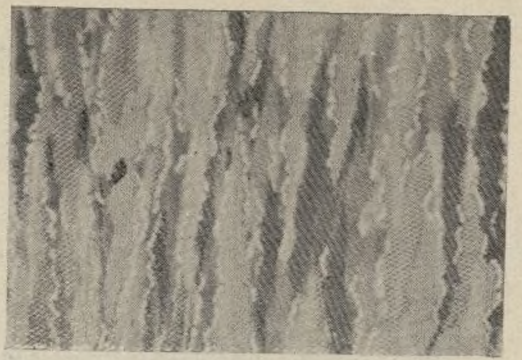


Fig. 4.

and a few picks are inserted at intervals, forming a skeleton of a cloth. This is then printed, steamed, sometimes washed, then dried, and again put in the loom, this time to be definitely woven. The warp must be carefully handled throughout,

Fig. 5.

and it is absolutely necessary that each warp thread preserve its correct position.

A perfectly warp printed fabric would be one where the design retained its original contour of

Fig. 6.

design throughout; but this is impossible. The warp threads shrink in the steaming or washing processes; they are bent and further shortened

Fig. 7.

when weaving, and the introduction of the weft gives the chêne effect so well known. There is, however a feature in warp printed goods which cannot be easily obtained by direct printing, and that is the softness of tone and delicacy of tint owing to the breaking up of the colouring. Unfortunately, the system of weighting has been adapted in this class of fabric as in most silk goods, and the warp printed fabrics used

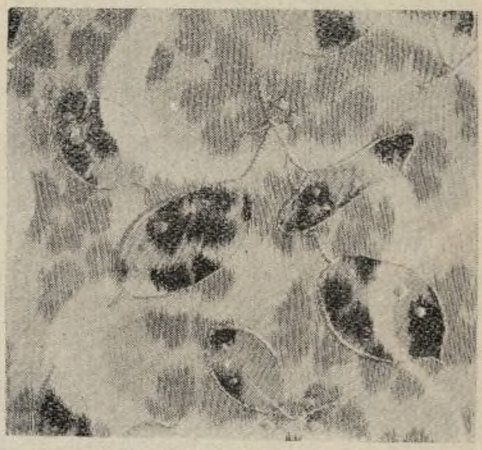


Fig. 8.

for gentlemen's scarves and neckties specially err in this respect. If the cloth is put in a flame it will redden, but not burn. American dyers, believing that if a thing is worth doing at all it is worth

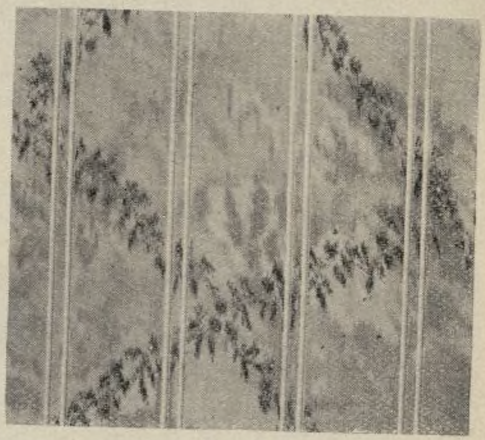


Fig. 9.

doing well, have become special adepts at weighting during the last few years; and much as is the progress made in the art by Continental dyers, American merchants prefer the charging being

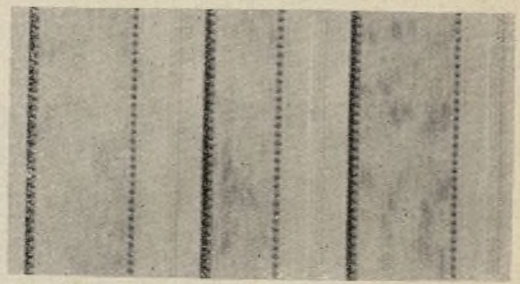


Fig. 10.

done on their side, as being carried out to a greater degree.

Fig. 1 shows a cloth woven in a broken basket figure, on a printed warp. The warp is organzine, the weft tram, and the ends and picks are 284 and 112 respectively.

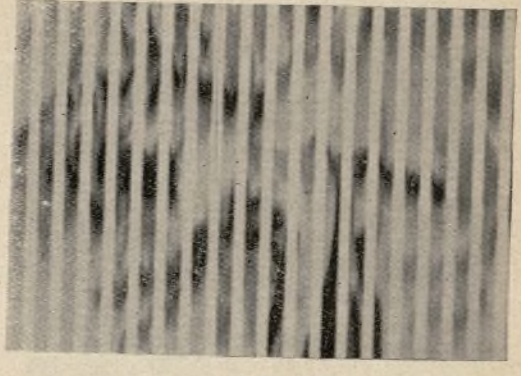
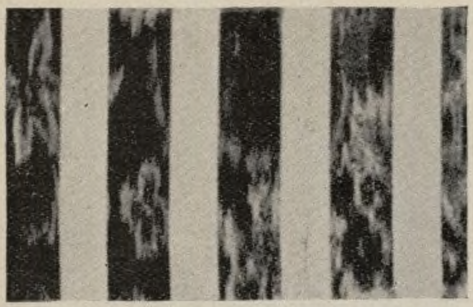


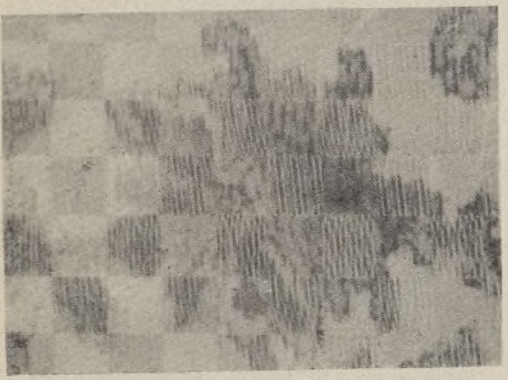
Fig. 11.

Fig. 2 is a warp printed fabric with a jacquard figure on an eight-satin ground. The woven design consists of garlands interspersed with a woven effect in imitation of moiré. The organzine warp has 366 ends per inch, and the tram weft 92 picks.



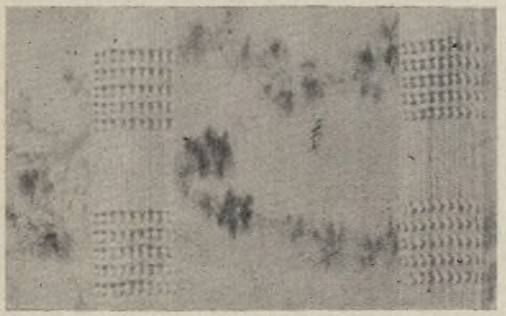
Warp Printed Silk Goods.—Fig. 12.

Fig. 3 shows a pretty combination of jacquard and chêne on a five-satin ground. The fabric is pure silk, 304 ends and 114 picks per inch.



Warp Printed Silk Goods.—Fig. 13.

Fig. 4 is a crêpe design on a printed warp, and the weaves, varying from taffeta to louisine, repp

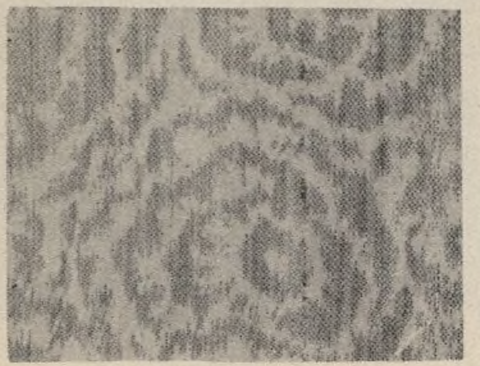


Warp Printed Silk Goods.—Fig. 14.

and satin, throw up the light with varying intensity. There are 346 ends and 132 picks per inch.

Warp Printed Silk Goods.—Fig. 15.

Fig. 5 is on an eight-satin ground, with 218 ends and 90 picks per inch.



Warp Printed Silk Goods.—Fig. 16.

Fig. 6 is on a fine *gros grain* ground, 60/2 schappe (spun) silk being used for the warp, 152 ends per inch, and tram weft 65 picks per inch. Fig. 7 is on a plain ground with warp satin jacquard effects bordered with weft floats. There are 305 ends of organzine warp and 102 picks per inch of tram weft.

Fig. 8 is a similar cloth to the preceding one

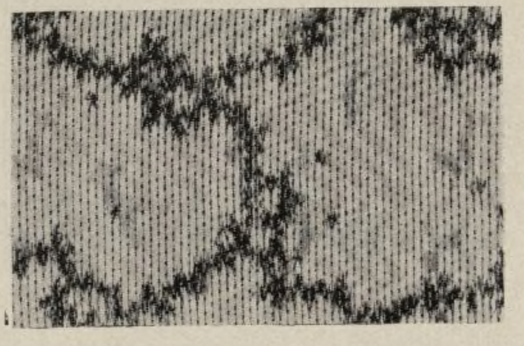
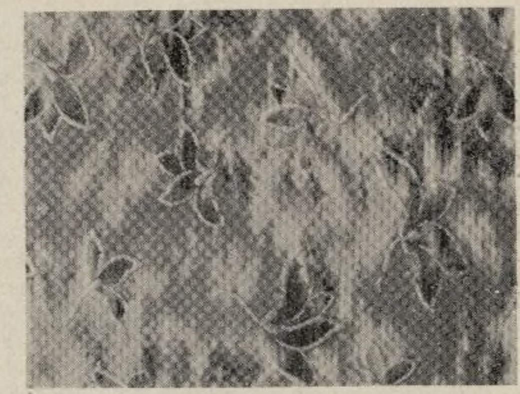


Fig. 17.



Warp Printed Silk Goods. Fig. 18.

with 236 ends per inch of organzine warp and 102 picks of tram weft.

Fig. 9 shows a plain striped taffeta, the cords being formed by thick cotton ends. The warp is organzine and the weft tram, 208 ends and 116 picks per inch respectively.

Fig. 10 is a very pretty pattern having alternate stripes of printed and unprinted warp. The centre of the unprinted portion is broken by three cords formed by thick cotton ends. The ground is taffeta with 162 ends of organzine warp per inch and 90 picks of tram.

Fig. 11 shows another pattern of alternating stripes, the printed portion being eight-shaft satin and the white stripe plain. There are 50 ends in the ¼in. occupied by the printed ends, and 24 ends in the $\frac{1}{16}$in. occupied by the plain taffeta. There are 106 picks of tram per inch.

Fig. 12 has a stripe of printed eight-shaft satin alternating with a hopsack ground stripe. The former has 184 ends in its ½in. width, and the latter is ⅜in. wide with 48 ends per stripe. The weft is two-fold tram, 132 picks per inch.

Fig. 13 is a printed warp woven in a chess board design of alternate taffeta and hopsack squares. There are 214 ends and 112 picks per inch.

Fig. 14 shows a gauze stripe (unprinted), ⅜in. wide, in combination with a printed taffeta 1⅜in. wide. The ground has 198 ends and 127 picks per inch.

Fig. 15 is woven hopsack (louisine), and the fabric, after weaving, is embossed with an indefinite pattern. There are 206 ends and 90 picks per inch. This embossing process was quite a fad about six or seven years ago, and there is a probability of its again being taken up at some early date. With vari coloured fabrics some effective rainbow and electric designs may be thus obtained.

Fig. 16 shows a cheaper grade of cloth, the warp being two-fold cotton 62 ends per inch, and the weft tram 72 picks per inch.

Fig. 17 is a plain taffeta ground with an extra end of schappe silk forming a hairline at regular intervals. The ground warp is organzine 188 ends per inch, and the weft tram 102 picks per inch.

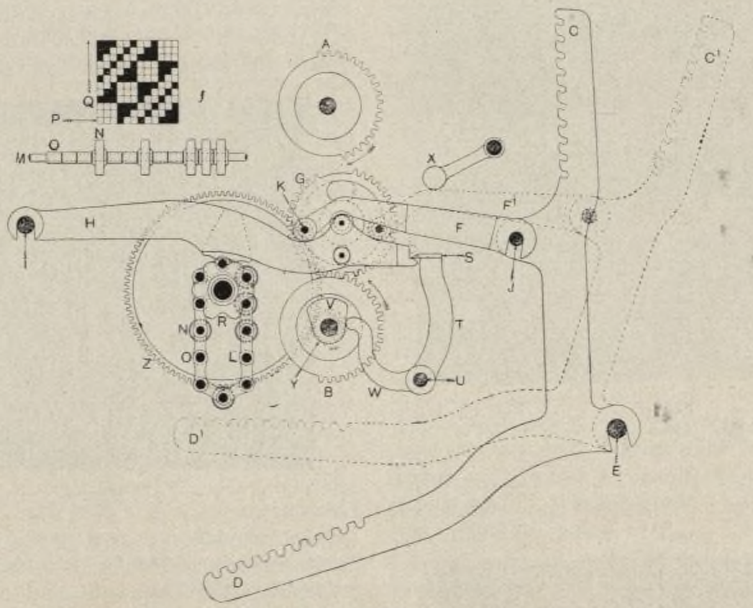
Fig. 18 has a ground of taffeta and hopsack woven in a small chessboard pattern, on which is placed a jacquard design. The fine ground checks are divided by single metallic threads. The rest of the warp is organzine 224 ends per inch. The weft is tram 102 picks per inch.

Jute and Linen Weaving.—XVI.

By Thomas Woodhouse and Thomas Milne

(*Head and Assistant Textile Masters, Dundee Technical Institute*).

THOSE dobbies already described may be considered as shedding mechanisms which may be mounted on almost any loom for the single purpose of governing the shedding of the warp yarn. But in fancy work of any kind where different coloured wefts are used, and where the same are required to keep in unison with a prearranged order of shedding and picking, experience has determined that if at all possible these three actions should be so governed by some simple arrangement that it will be impossible for any one of the motions to get out of harmony with the others. Being a machine that will accomplish the object desiderated is



Jute and Linen Weaving.—Fig. 93.

our reason for introducing Hollingworth and Knowles' dobby, which, although not employed in the linen trade, nor yet extensively in the fancy part of the jute trade, is well worthy the closest attention of manufacturers engaged in the latter branch of weaving. Besides controlling the shedding, picking, box, and up-take motions from one direct source, the mechanism is so arranged that all parts may be reversed by hand; and to facilitate mending broken ends a levelling bar is provided which, in connection with the ordinary mechanism, can bring all shafts to the same level at any desired moment. The loom is made in various widths, and to actuate from 16 shafts upwards, as required. All parts subjected to much wear are casehardened or chilled in casting, and all parts are interchangeable for the same hand of loom. The driving of the loom also is such that a variation in speed may be obtained without change of pulleys or drum.

In Fig. 93 the essential parts of the mechanism of the dobby are shown. A and B are two fluted or toothed driving cylinders, which continually revolve in opposite directions, as indicated by the arrows. Each cambshaft is attached, from the top and bottom respectively, to C and D, arms of a bell-crank lever fulcrumed at E and provided with a separate short connector F, vibrator lever wheel G, and vibrator lever H, the latter being fulcrumed

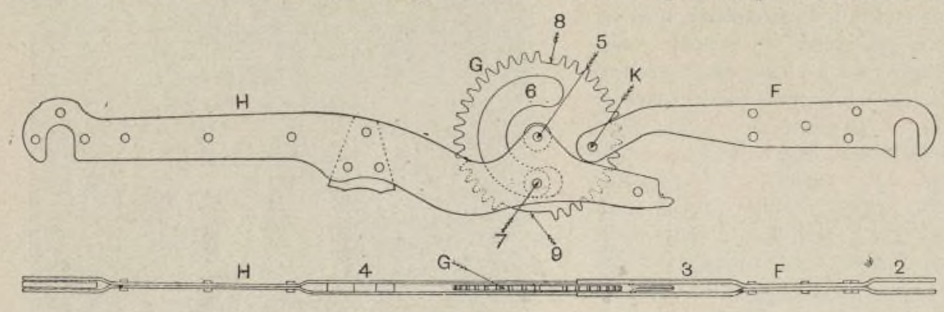


Fig. 94.

at I. One end of the connector F is hooked at J to the bell-crank lever, the other end being attached to the vibrator wheel G by a pin K, the wheel G being supported at its centre by a suitable pin in H. The arrangement of the three parts F, G, and H is shown in detail (plan and elevation) in Fig. 94, which is one sixth the actual size. F and H are each composed of two flat wrought-iron bars, riveted together at suitable points; F is forked at one end 2 to connect with the bell-crank lever C D at J (Fig. 93), and at the other

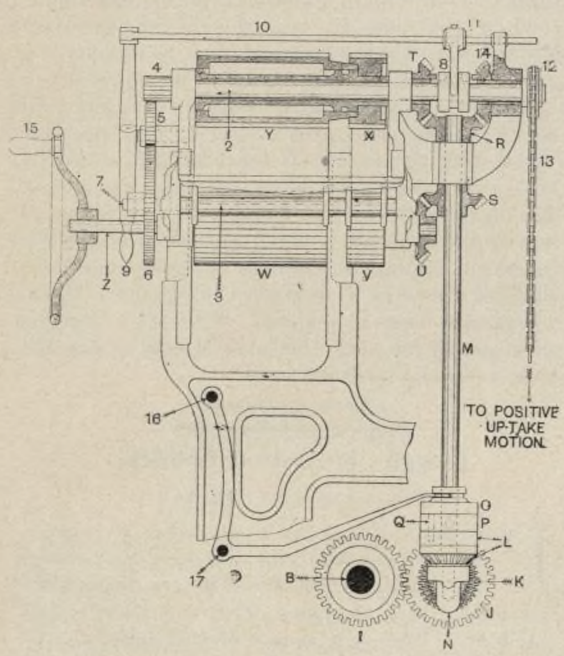


Fig. 97.

end 3 to take in the lever wheel G, to which it is connected by a pin K; while H is also forked at 4 to take in the same lever wheel, supporting it at its centre by the pin 5. The lever wheel G is provided with a concentric slot 6, extending fully half-way round, through which a pin 7, carrying an anti-friction roller, passes to prevent excessive travel in the wheel. The continuity of the teeth of the wheel is broken at 8 by the omission of one tooth to facilitate engaging with the toothed cylinders A and B; and at the point 9 (diametrically opposite 8) is again broken by the omission of four teeth to enable it to remain at rest for any number of successive picks, as may be determined by the weave. In the position shown in Fig. 93 it will be observed that the rotation of the cylinder B will cause the lever wheel

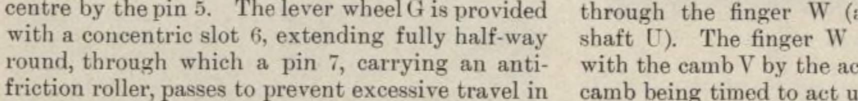


Fig. 99.

G to revolve clockwise, and thus place the connector F and the bell-crank lever C D in the positions represented by F', C', and D' respectively. This movement will result in the lowering of a shaft, and will bring that part of the wheel G with the four teeth missing opposite the cylinder B, which will thus be prevented from rotating G any further, so long as G remains in this position. Lever H, which supports the wheel G and determines the cylinder with which it shall be in contact, rests upon the pattern chain L, which is composed of rods M, with bowls N and bushes O, according to the pattern, and of which one link is shown detached for the first pick P of the weave. The pattern chain L (which shows the arrangement of bowls and bushes for the first thread of the weave in the direction of the arrow Q) is carried round continuously by the chain cylinder R, and according as a bush or a bowl be under the lever H, the lever wheel G will be in contact with the cylinder B or the cylinder A. As already shown, the movement of the cylinder B from the position represented in the figures will result in the large gap in the wheel G occupying the low position, and thus preventing further rotation until the bowl N in the pattern chain L lifts the lever H, thus placing G in contact with the top cylinder A, which will again raise the shaft. It will thus be seen that the mechanism is on the open-shed principle.

The lock-knife S (which serves to keep the gear wheels G in contact with the cylinder B during

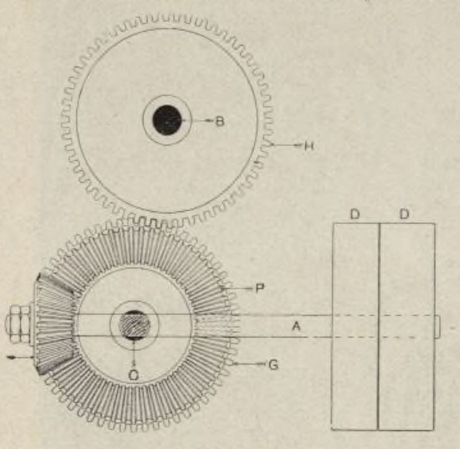


Fig. 96.

action) is supported by two arms T, set-screwed on the shaft U. Motion to the lock-knife is imparted by a camb V (fixed on the shaft of the cylinder B), through the finger W (also set-screwed on the shaft U). The finger W is kept in close contact with the camb V by the action of a flat spring; the camb being timed to act upon the finger W so that the lock-knife S will be withdrawn immediately the pin K has reached its opposite dead centre, and of course before the pattern chain L attempts to lift the lever H and wheel G into contact with the top cylinder A; its timing also permits of S being in the position shown a little before the cylinder B can produce any movement in the wheel G. A steadying weight X rests on all the lifted connectors F. Originally the hexagonal chain cylinder R was driven as represented in the figure from the shaft of cylinder B by a pinion Y of 16 teeth and the wheel Z of 96 teeth.

The levelling apparatus shown in Fig. 95 consists of a grate A, bolted to the framework in such a position that the ends of all the vibrator levers H (Fig. 93) project through it and over the part B. The latter is a flat bar, provided with inclined slots C, through which pins D are passed and fixed in A. When in work, the pins D occupy a position at the top of the slots, but by drawing a handle E (which projects outside the front of the dobby) the part B is raised into the position shown, raising with it all the vibrators H and the wheels G which are in low position into contact with the top cylinder A; half a revolution of the cylinder A

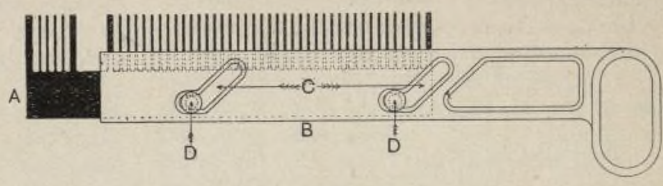


Fig. 95.

will then place all shafts level in the top position. The method of driving this loom differs from that of the great majority of all others in that the motion, instead of being taken to the crankshaft direct, is first imparted, as shown in Fig. 96, to a short cross-driving shaft A placed at right angles to the line of the crank and wyper shafts B and C. The shaft A is supported at two points near the fast and loose pulleys D and bevel pinion E, in a suitable sliding bracket, which enables driving pinions of different values being placed at E, thus securing a ready method of altering the speed of the loom without change of pulleys or drum, and

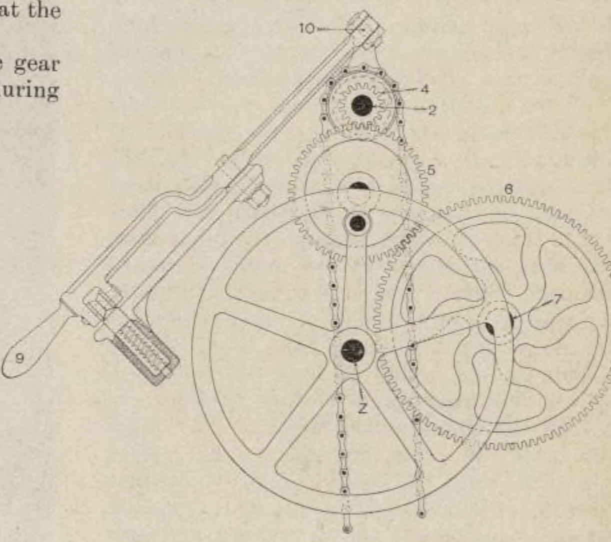


Fig. 98.

therefore without breaking the belt. Three pinions are supplied, which permit of a variation in speed of about 20 per cent. The bevel pinion E gears with the compound bevel and spur wheels F and G on the low shaft C, the crankshaft B being driven by gearing of spur wheels G and H of equal teeth. Because of this latter gearing the shaft C, on which the picking tappet is placed, will revolve at the same speed as the crankshaft. A decided advantage is thus

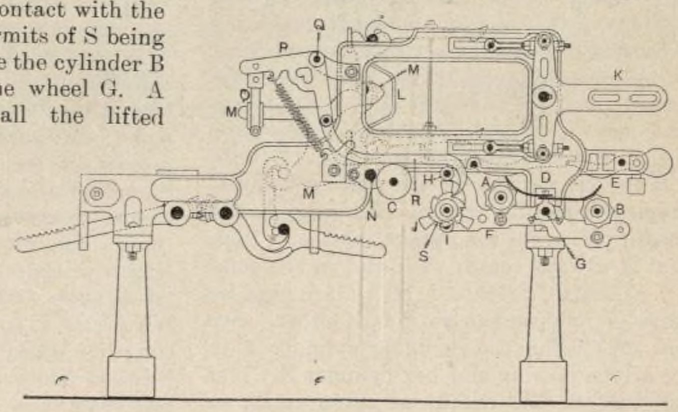


Fig. 100.

gained in picking, as the action is imparted from a shaft which has twice the speed it would have under the usual conditions applying in picking from the low shaft. Due to the respective values of the bevels E and F (approximately as 1 is to 5), the shaft A will run at about five times the speed of the crankshaft. This high velocity of the driving shaft ensures a much steadier movement in the loom than if driven direct from the crankshaft B.

The driving of the mechanism of the dobby is shown in Figs. 97 and 98. On the end of the crankshaft B (opposite to that of the driving) a spur wheel I gears with a stud wheel J of equal teeth. Compounded with the latter is the bevel pinion K, gearing with the clutch bevel pinion L of equal teeth, which revolves loosely round the vertical shaft M supported in the footstep N. Part of this clutch arrangement O is also loose on the shaft M, while the part P is set-screwed on the same shaft; the clutch is completed when in action by a pin Q fixed in O, passing through a hole in P and entering partly into L. Keyed on the shaft M are two bevel pinions R and S which gear with and drive equal bevel pinions T and U; the latter pinion, as well as the low cylinders V and W, are keyed on the shaft Z. The pinion T, however, and the cylinder X are keyed on a sleeve which may revolve freely round the shaft 2. To this sleeve cylinder Y is set-screwed. The cylinders W and Y are those represented by B and A in Fig. 93, and therefore control the shedding; cylinders V and X similarly control the levers for the box and picking motions. Since the pinion R drives the pinion T from below, and the pinion S drives the pinion U from above, it follows that the cylinders Y X and W V will revolve in opposite directions.

As already stated, the chain cylinder 3 was originally driven from the shaft Z, but the motion is now imparted from the shaft 2 through pinions 4 of 16 teeth keyed on the end of this shaft, carrier wheel 5, and wheel 6 of 96 teeth on the end of shaft 7 of chain cylinder. This arrangement will be better seen in the front elevation in Fig. 98. When the loom is working forward, the clutch 8, Fig. 97, which is fixed to the shaft 2 by a sliding key, is brought into contact with the pinion T by means of a handle 9, rod 10, and fork 11, when the shaft 2 and the cylinder Y rotate in the same direction. On the end of the shaft 2 a chain pinion 12 is keyed, which through the pitch chain 13 conveys movement to the positive uptake mechanism. When it is desired to reverse the loom in the case of a broken shot or other defect, the dobby mechanism is liberated from the driving of the loom by the action of lever 16, fulcrumed at 17, withdrawing parts O and Q from the part L of the clutch arrangement at the bottom of the shaft M; then by placing the clutch 8 into gear with the bevel pinion 14 (which also revolves freely on shaft 2, but in the opposite direction to pinion T), and by rotating the hand wheel 15 in the normal direction, the chain cylinder 3 and the uptake chain 13 will be rotated in the backward direction, while the cylinders V, W, X, and Y will revolve in the normal or forward directions, and will actuate the shedding, box, and picking levers just as if the loom was going. The arrangement of the uptake motion is such that when "picking back" the cloth beam gives off the cloth in exact proportion as the shedding is reversed.

Fig. 99 is an isometrical view of the top shaft, cylinders, etc., removed from the framework. C is the shaft, B the driving pinion for the chain cylinder, A the toothed cylinder for operating the cambshafts, E the toothed cylinder for operating the box and picking levers, F the bevel pinion for the forward driving of the shaft C; D the sleeve on which the parts A, E, and F are fixed; G the bevel pinion for reverse driving of the shaft C, J the clutch, K the projections on the pinions F and G for engaging with the clutch J as desired, and H the chain pinion for the uptake motion. Parts B, J, and H always rotate with and in the same direction as shaft C. Parts A and E are fixed on the sleeve D independently of each other, with the view of placing the shedding cylinder A in advance of the picking and box cylinder E. This may be done to the extent of seven teeth, or approximately one-fifth of a revolution of the crankshaft. In the figure, A is four teeth in advance, a position which is found to be suitable for most classes of work. The box, picking, and other motions of this loom will be considered under these respective heads.

Cross-border Dobby.—For cross-border and other similar work special dobbies are provided, or special parts are added to existing machines, which, after a certain number of repeats of the centre or body of the cloth have been woven, automatically bring into play a second set of lags or cards. On this latter set an entirely different weave has been pegged for the cross border of the cloth. Simple effects of this character, such as closing the sides or end of a seamless bag, may be, and frequently are, produced by tappets only. Where, however, the repeat of the weave exceeds about four threads or picks, a cross-border machine becomes necessary. In a machine of this type, by Messrs. Ward Brothers, Fig. 100, the centre and border lags are carried by separate cylinders A and B, which revolve in the same direction, while a third cylinder C determines which of the two former shall operate on the feeler levers. It is immaterial as to which cylinder carries the centre or border pattern, but from practical considerations the longer chain will usually be controlled by the outer cylinder B. The lags on the cylinder A actuate the levers D in a manner similar to that already described in connection with Figs. 85 to 87, while the lags on the cylinder B, when in action, actuate the same levers D through the medium of supplementary levers E. The cylinders A and B are supported by the lever F at opposite sides of its fulcrum. At the

COTTON DESIGNS.—FIG. 1.

inner end of lever F are two anti-friction rollers H and I, between which a hexagonal tappet J is made to revolve. When a projection or blade of J is acting on the roller H, the cylinder A is in action; while cylinder B is brought into action by a similar blade acting on roller I. It is obvious that the tappet will bring the two cylinders A and B into action alternately; but the arrangements are such that either set of lags may make any number of complete revolutions or repeats of the pattern before the other set is brought into play. This number of repeats is, of course, determined by the number of picks per repeat, the number of picks per inch, and the length of the cloth to be woven before a change takes place. All parts from the ⊢ lever K to the beam lever L are similar to the ordinary machine, the parts added to produce motion in the tappet J being as follows:—Connected to the centre of the last beam lever of the machine is a special three-armed lever M fulcrumed at N, which, when actuated by the levers D or E, produces through the link O a movement in the bell-crank lever P fulcrumed at Q. To the lower arm of P a hooked pawl R is attached, which operates on the ratchet wheel S compounded with the tappet J. To the upper arm of P a helical spring is attached, which returns the pawl R to its normal position, at the same time actuating a pushing pawl (fixed on same stud R, but not shown in the illustration), which rotates the cylinder C and the lags attached. According as the lag on the cylinder C is pegged or

COTTON DESIGNS.—FIG. 2.

missed, the lever R will be raised or not, and the tappet J will remain stationary or be rotated one-sixth of a revolution. It is obvious that the lever M and its further connections may be actuated at any desired pick in the repeat of the lags on A or B, although it is generally sufficient to peg the last lag of the pattern on each set for this purpose. The aggregate number of repeats to be woven by both sets of lags determines the total number of lags on the cylinder C. Thus, say seven repeats of lags on the cylinder A were to be followed by two repeats of the lags on cylinder B, there would be a chain of nine lags on cylinder C arranged 1 blank, 6 pegged, 1 blank, 1 pegged. When not engaged on cross-border work the lever M may be utilised as an ordinary shedding lever.

(*To be continued.*)

Designs for Cotton Fabrics.

SPECIALLY CONTRIBUTED.

PATTERN No. 179 is a low class of zephyr, whose neat and effective design is arrived at with little trouble. The ground is plain throughout, and the gauze effect is workable with one doup. The most is made of this doup, and by

COTTON DESIGNS.—FIG. 3.

means of looming, two stripes are arranged to give a honeycomb pattern, and two to give an undulating effect.

Pattern No. 180 is a high-class Oxford shirting, which not only possesses a neat stripe pattern, but is further ornamented by douped ends which give

PATTERN SHEET No. 96.

Samples of Cotton Cloths.

PATTERN No. 179.

PATTERN No. 180.

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. 97.

Samples of Silk Fabrics.

PATTERN No. 181.

PATTERN No. 182.

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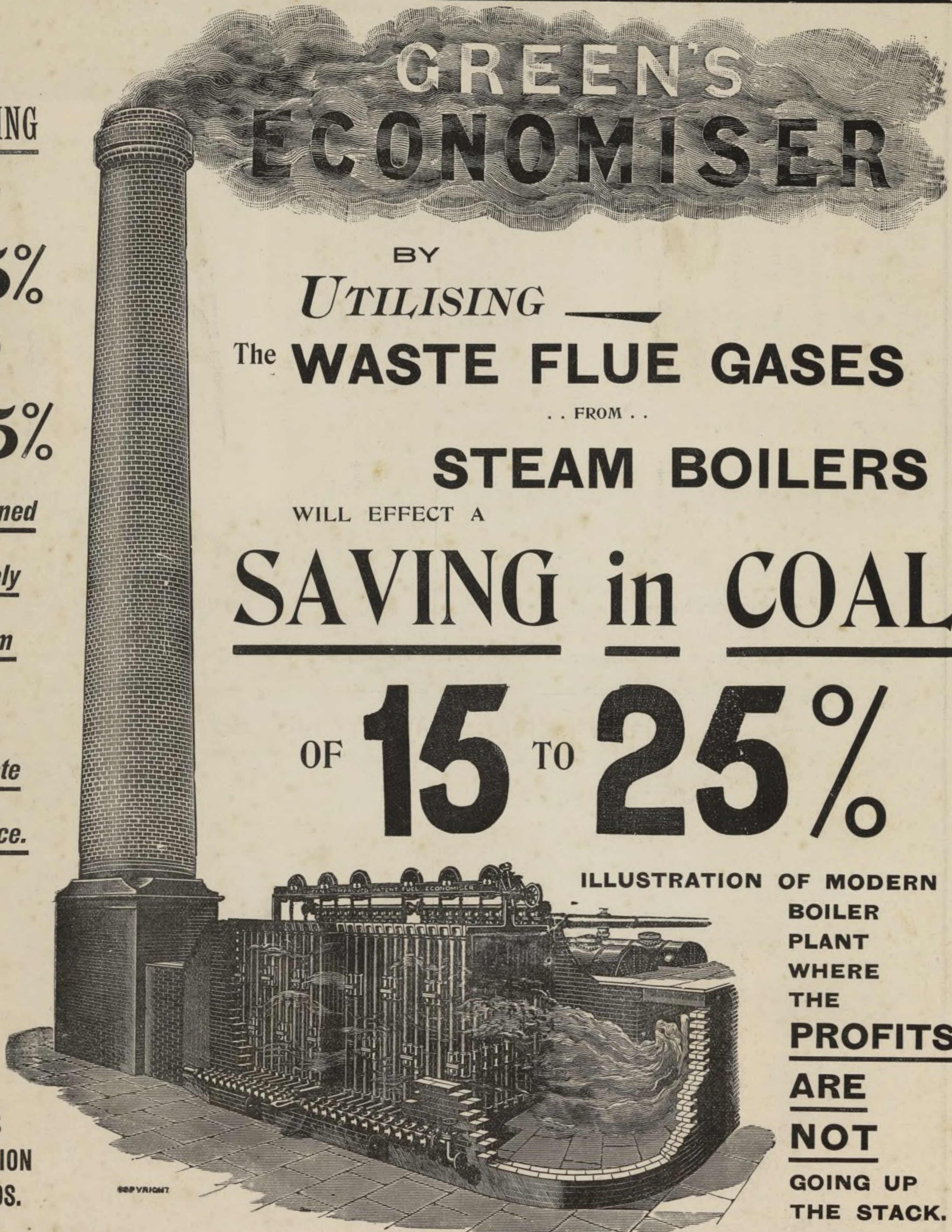

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a pretty effect to the fabric without in any way detracting from its neatness. Only one doup is

COTTON DESIGNS.—FIG. 4

required for the purpose, and as the ground is hopsack, no very elaborate weaving arrangements are required.

COTTON DESIGNS.—FIG. 5.

Fig. 1 is a design for a cotton brocade, and should be made in a 96 reed, shot 100 picks. The black

COTTON DESIGNS.—FIG. 6.

figuring should be warp, and the grey in the flower 3-and-1 warp twill or tabby; the grey figure should also be warp, twilled down with 3-and-1 twill. The ground must be 4-and-1 weft satin. Inside the grey figure a bold weft twill may be introduced. This is an effective treatment of designs for a good quality of cloth, as the fast warp or tabby with the floating warp figure or flecks on the top has a very good effect when the cloth is finished.

SILK DESIGNS.—FIG. 1.

Fig. 2 is a design for a zephyr cloth to be made in an 80 reed, and shot 76 picks to the inch. The black figure should be weft, the grey warp and the ground should be tabby.

Fig. 3 is a design on similar lines to the above. The black should be weft (leaving some good floats on the palm leaves) and the grey warp, with tabby for the ground. To show these designs

SILK DESIGNS.—FIG. 2.

up well, the cloth should be made as a shot, say with white for warp and a sky or some other light colour for weft.

Fig. 4, is a design for a cotton stripe introducing a leno effect. It should be made in a 96 reed and shot 80 picks to the inch. The black figuring should be warp well floated, and the grey should be weft, well bound round the leno shape. The ground should be tabby.

Fig. 5 is also a design for a cotton stripe, but for a lower quality of cloth. The reed should be a 70, and the picks 56 to the inch. The black figure should be warp well floated, with the grey spots, also warp, but bound down with 3-and-1 twill. The warp lines should be 5-and-1 twill, and might be warped in colour; the ground of the design should be tabby.

Fig. 6 is a design for a cotton all-over in a 60 reed, shot 66 picks to the inch. The figure should be made chiefly from weft, but a little warp might be used inside the floral objects and as shadows on the leaves. The ground should be 3-and-1 warp twill or tabby.

Designs for Silk Fabrics.

SPECIALLY CONTRIBUTED.

PATTERN No. 181 is a silk cloth composed of alternate stripes of taffeta and satin. The latter is plain, but the taffeta stripe is ornamented by spots formed with extra warp. The edges of the stripes are ornamented with

FIG. 3.

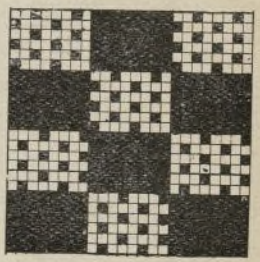


FIG. 4.

SILK DESIGNS.

douped ends of thick three-ply cotton, each ply being twofold. Although the design is fancy, it comes well within the range of dobby work. One doup is required.

Pattern No. 182 is a fabric depending chiefly upon its shade and leno effects for attractiveness. The centre portion of the leno stripe is rather spoilt by the strong contrast shown with the weft, but the edgings of the stripe comprise a very

SILK DESIGNS.—FIG. 5.

pretty effect, produced by a combination of leno threads.

Fig. 1 is a sketch for a silk brocade, and will require a good net silk warp in a 2400/4, shot with 100 picks to the inch of tram. The black edging the grey should be weft, which should be tabby or two-pick, and the ground should be 7-and-1 warp satin. Patterns worked in this way require to be made in shots, and to have a good warp, so that a nice bright satin may be produced.

Fig. 2 is a design for a China tie cloth, to be woven in the gum. The warp should be 2000/2, shot 100 picks to the inch. The black should be weft with grey warp, and the ground should be tabby. A fine storm or oatmeal might be introduced inside the weft figure shape, which would add to the general effect.

Fig. 3 is an idea for a tie cloth made with a 2200/4 warp, shot with both a ground and a tissue shuttle, each putting in 80 picks to the inch. The black figure should be made with the tissue. The

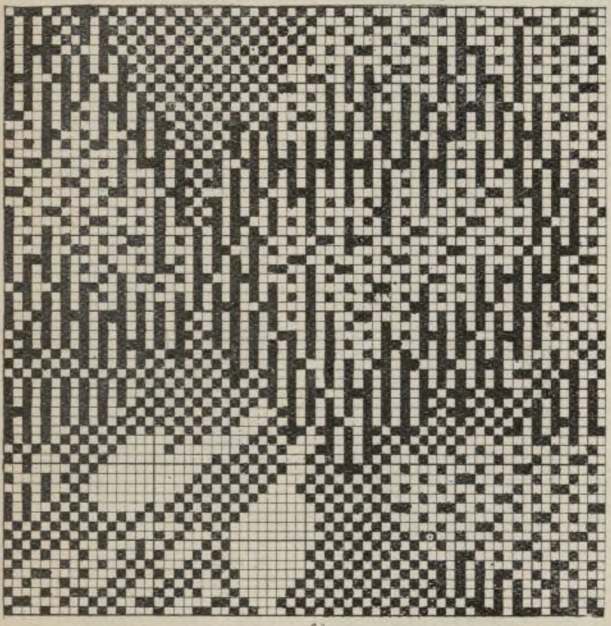
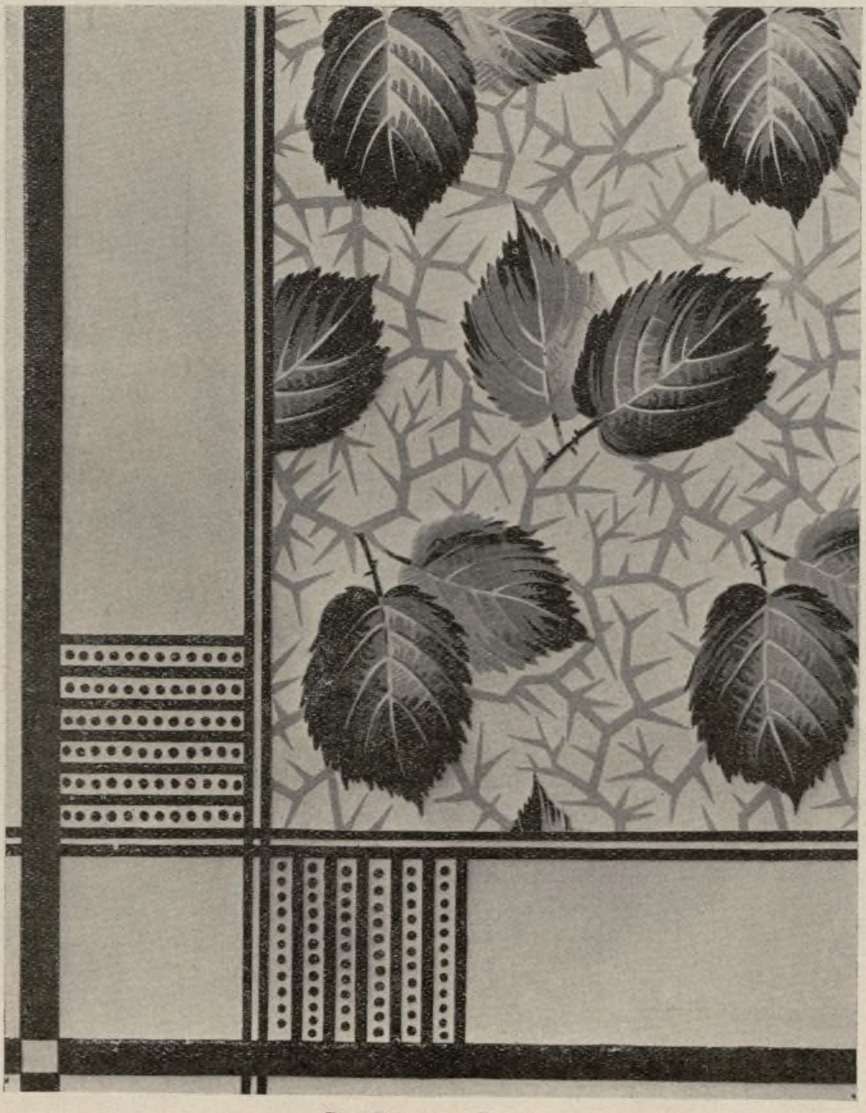


FIG. 7.

striping must be warped in, and the checking made by the tissue shuttle, except where the cross lines run into the down ones, when the corners must be done with the ground shuttle.



SILK DESIGNS.—FIG. 9.

The weave of ground should be the mat shown in Fig. 4. Cloths made with this style of design have a good effect as tie cloths, for the tissued figure stands up well, and the checking has a subdued effect.

Fig. 5 is a design for a cloth made with a 2000/2 spun silk warp, and shot with 96 picks of tram to the inch. The black should be weft, and the grey

SILK DESIGNS.—FIG. 6.

also weft, but bound down with 3-and-1 twill. The ground should be 3-and-1 warp twill. A diamond twill effect or some other fancy ground might be introduced in the leaves as a change.

Fig. 6 is a design for a chêne effect, to be made with a 2000/4 net silk warp put in end-and-end of colour, and shot 100 picks of tram to the inch. The black on the flowers should be brought up with the brightest end of the warp and floated fairly well, whilst the grey is a tabby effect from the same end. The leaves should be treated in the same way, but with the other end of warp. The ground should be tabby with both ends, which gives quite a different effect and colour. A portion marked is worked out in Fig. 7.

Fig. 8 is a design for a blouse cloth, and can be made with a mercerised cotton warp, as the figure is all weft. An 1800/2 warp, shot with 100 picks of tram to the inch, will make a nice cloth. The figure, which should be all weft, must be well

FIG. 8.

floated, and the ground should be 3-and-1 warp twill.

Fig. 9 is a design for a handkerchief, and will require a 2000/2 net silk warp, shot with 110 picks of tram to the inch. The black and dark grey should be weft, and the lighter grey effects warp. The ground figure should be 3-and-1 weft twill on a 3-and-1 warp twill ground. A border as shown, and with the fancy effect made as in the draft shown in Fig. 10, gives a novel finish to the handkerchief.

Fig. 11 is a design for a dress cloth made with an 1800/2 net silk warp, shot with 90 picks of tram to the inch. The black should be weft, with the grey warp, and on a tabby ground. A fancy ground

SILK DESIGNS.—FIG. 10

effect of warp and weft should be put inside the figure to make the pattern more effective.

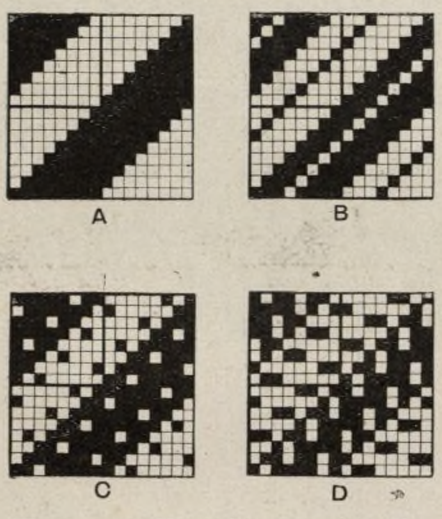
The Design and Construction of Worsted and Union Coatings.—XI.

IT is some years since there was any large demand for coatings of diagonal design, yet the type may be revived at some early date; and if not, this series of articles would not be complete without some reference to the matter. The designing of diagonals is a subject rather difficult to describe, for it depends more upon the designer's aptitude for fitting weaves neatly together than upon the knowledge of any set laws or rules. No class of design is easier to produce than a diagonal, be it plain or fancy, when this simple method of fitting the component parts together is acquired. The blending of the different weaves also need only be arranged once, the remainder of the design afterwards running the same in the natural order of things. This is easy when compared with the arrangement necessary to properly dovetail in the different sides of the various weaves in check and other designs.

A diagonal, as its name implies, is a design running in more or less straight lines at an angle to the edge of the cloth. The angle may be varied within very large limits by the alteration of the closeness of the warp or weft threads, or by the arrangement of the design. A diagonal may, in a

Silk Designs.—Fig. 11.

sense, be defined as an elaborated twill, and in some cases it is difficult to say where the twill ends and the diagonal begins. For instance, taking a diagonal effect showing alternate lines of warp and weft face, and running at an angle of 45°, the 8 × 8 twill shown at A in Fig. 40 will answer the purpose. But such long floats are not always expedient, not only for the looseness which would accompany their use, but because as the float was lengthened the threads per inch would have to be increased, and the width of the diagonal would be practically confined within narrow limits. Taking the example shown at B in Fig. 40, an almost similar effect is shown by another twill, in this case both the band of warp face and the band of weft face being broken up. This method might be used for twills of any width by simply increasing the breaks according to the increase of width. Needless to say, it would still remain a twill, and the

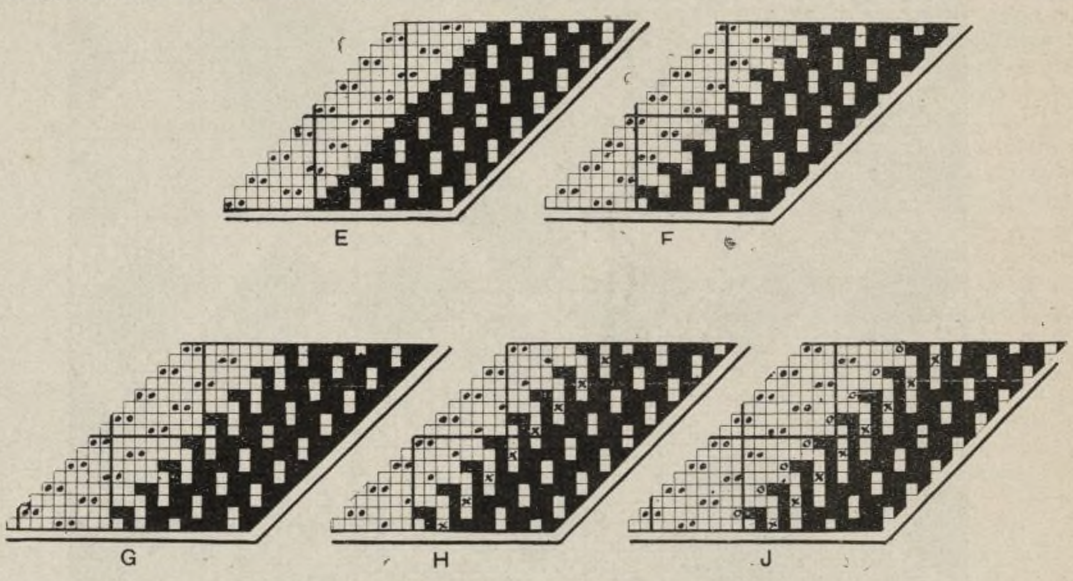


Worsted and Union Coatings.—Fig. 40.

warp and weft faces would show the bindings to a certain extent, for they also would be in twill form.

Stepping from the twill to the diagonal simply means substituting the twill breaks or bindings for others arranged in, say, satin order, by doing which the bindings are covered and the warp and weft faces appear solid. This change is shown at C in Fig. 40, and it will be seen that any width of diagonal may in this manner be obtained on exactly the same counts and sett of warp, and with the same counts and picks weft. The arrangement shown at C is, however, unsuited for some cloths, having too long floats and being too loose for coarsely-set warps, so a further step may be taken as shown at D. In this design the satin breaks or bindings are enlarged, and whilst giving practically the same effect, produce a weave suitable for a much coarser cloth than the design given at C.

The above is a simple example of the evolution of a design from a twill to a simple diagonal; but the



Worsted and Union Coatings.—Fig. 41.

step is only a slight one, and only crosses the boundary line, many more being required before some of the fancy types of diagonals are reached. The chief aim of the designer, when making diagonals, should be to get a nice edge—that is, a neat, well-defined (but not prominent) boundary line between the weft and warp face portions. A few examples of these are shown in Fig. 41, supposing bands of eight-end (6 × 2) satin to be used in each case.

The edge of the warp portion will be considered first, this part of the diagonal being shown by full squares. The simplest form of edge is shown at E, but this is not recommended, for it is found in practice to have the tendency to slightly raise the edge, and so give the cloth a rougher handle. It is, however, an edge that may sometimes be used with advantage, especially when the boundary of the warp face requires to be sharp and well cut. The edge shown at F is, perhaps, the best that can be used. The usual warp float of six is cut down to four, a number which is not too small and which leaves the second row of warp floats unaffected. The turn at the end of each float of four is not essential, but it is the chief factor towards blending the warp with the weft face portion of the diagonal, and yet giving a clear and definite line of demarcation.

The edge of the warp face shown at G is only slightly inferior to its predecessor. The difference is only shown in that the outer warp floats cover one more pick, and in fine cloths this edge would be quite satisfactory. In coarser goods, however, there is a tendency (especially with a fine warp) to make the edge look threadbare. The edge shown at H (considering the solid squares only at first) is an exaggeration of the same fault, which in this case can be remedied to a large extent by lifting the warp at the squares marked by crosses. This change in the design makes a long weft float, under six ends, on the back of the fabric; and this float, although undesirable, draws the straggling edge warp threads towards the body of the warp face portion, and so prevents a thready appearance at that part. The edge shown at J (solid squares only) has not only the liability to threadiness, but the extra length of the edge warp floats aggravates the evil, in addition to giving the warp diagonal a slightly-ribbed edge, which, although aimed at in certain cases, is generally undesirable. The threadiness is prevented to a certain extent by lifting the end marked by crosses, which, unlike the preceding case, do the work without necessitating a long weft float on the back of the cloth.

Turning to the weft portion of the diagonals (shown by dotted squares), and using the same illustrations (Fig. 41), it will be noticed that in E and G a full weft float, covering six ends, is obtained on every other pick at the edge. In E the alternate picks float two, but in G they float four, showing the advantage of the latter method of designing. The way shown at G is the best of the weft joinings given in Fig. 41, that at F coming second with alternate edge floats of five and three. The methods shown at H and J are undesirable, but may have sometimes to be resorted to when other ways fail to fit in. The alternate edge floats in J are over seven ends, one in excess of the normal, and to prevent a ridge it would be best to lift the squares marked with small circles; this alteration brings the weft floats down to their proper length.

(To be continued.)

Fancy Dress Fabrics.—XVI.

By G. Washington.

Figs. 155 and 156 illustrate the appearance and structure of a fancy mohair fabric. The most noticeable feature of the design is the skilful manner in which the oblong figures are arranged in groups of six, and set across with each other. This prevents them from looking stiff and formal, and also distributes the long floats more

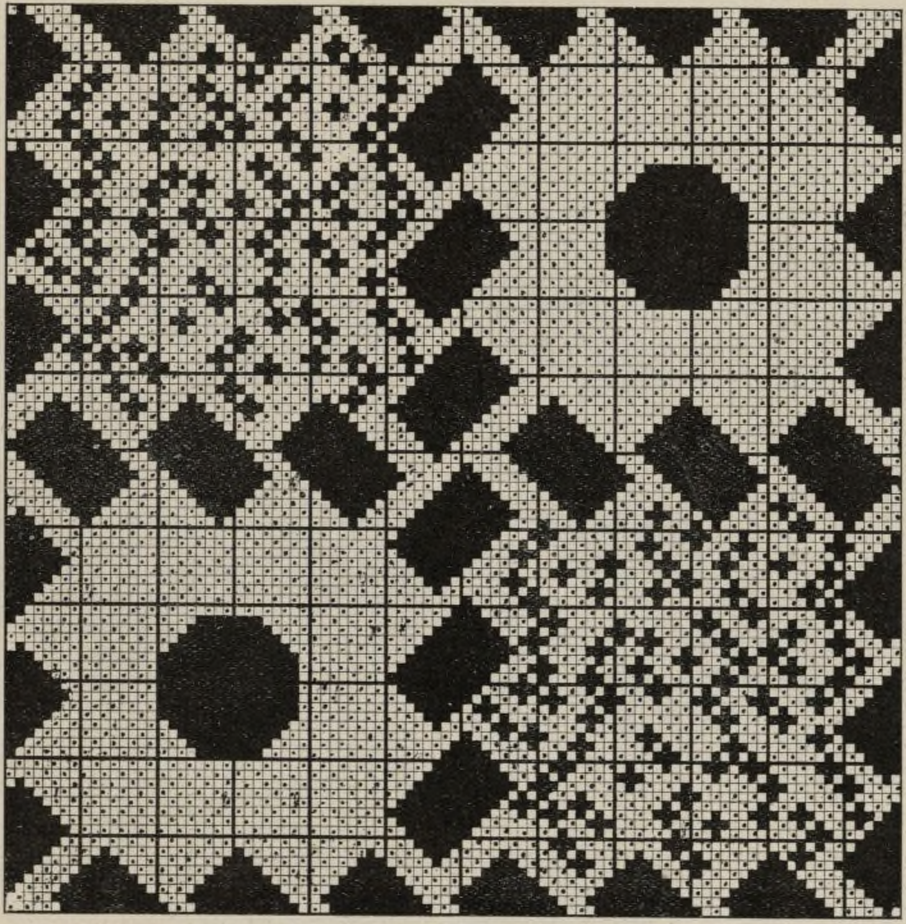
Fancy Dress Fabrics.—Fig. 155.

equally over all the threads and picks. The irregular distribution of the small spots also tends to relieve the stiffness of the design, and forms a broken, lustrous surface which contrasts well with the plain weave and large weft figures in the adjacent squares.

Warp.	*Weft.*
2/100's cotton.	30's mohair.
70 threads per inch.	62 picks per inch.

The structure of the ground weave is often modified so as to produce an irregular reflecting surface. The difference is so slight that the effect is only visible at certain angles, and gives the fabric a mottled appearance.

This is the case with the fabric shown in Figs. 157 and 158. The solid weft figures are surrounded by a few threads and picks of plain weave to compensate for the looseness of the figures. The ground weave is weft cord, two threads working together. The mottled appearance is caused by taking a pair of threads from adjacent cords and floating them on the back; each cord then

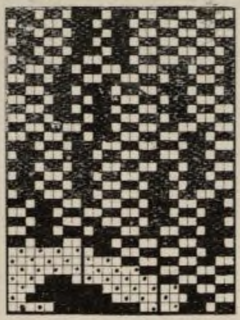


FANCY DRESS FABRICS.—FIG. 156.

contains only one thread. There is a difference in the reflecting angle of the weft at this point, because the two threads on the back tend to keep

FANCY DRESS FABRICS.—FIG. 157.

the two threads left in the cord rather wider apart, and therefore the weft has not to bend to the same



FANCY DRESS FABRICS.—FIG. 158.

angle as if these threads were free to go nearer together.

Warp

2/40's cotton.
64 threads per inch.

Weft.

24's mohair.
60 picks per inch.

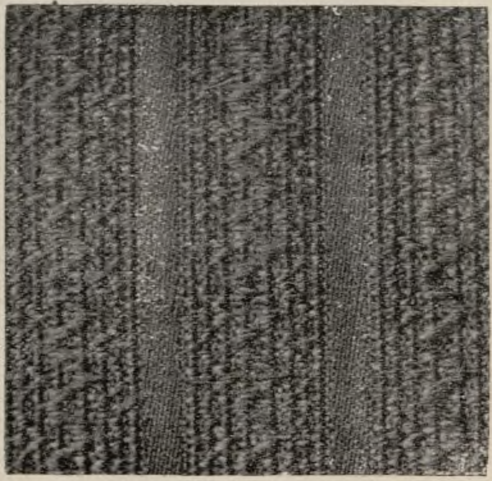
The striped fabric shown in Figs. 159 and 160 is reeded irregularly, and the centre of the stripe is very loose in structure, with the warp nearly all on the back. The thick cotton threads marked in full squares are 1 in a reed, those marked in round dots 2 in a reed, while the remainder, which form the sateen stripe, are 5 in a reed.

Warp.

3 times { 1 end 3/10's cotton.
2 „ 2/70's „
1 „ 3/10's „
4 „ 2/70's „
4 time { 1 „ 3/10's „
2 „ 2/70's „
20 „ 2/50's „
2 „ 2/70's „
30 reeds per inch.

Weft.

28's mohair.
52 picks per inch.



FANCY DRESS FABRICS.—FIG. 159.

The next example, Figs. 161 and 162, contains stripes of mohair and worsted warp alternately. The mohair yarn is thicker than the worsted. This not only causes the solid mohair warp figures to cover better, but also tends to make the fabric firmer and compensate for the more open structure of this part of the design; the worsted warp weaves plain with the weft under the mohair figures. The long floats at the edges of the cord stand out prominently, and effectually separate it from the plain ground.

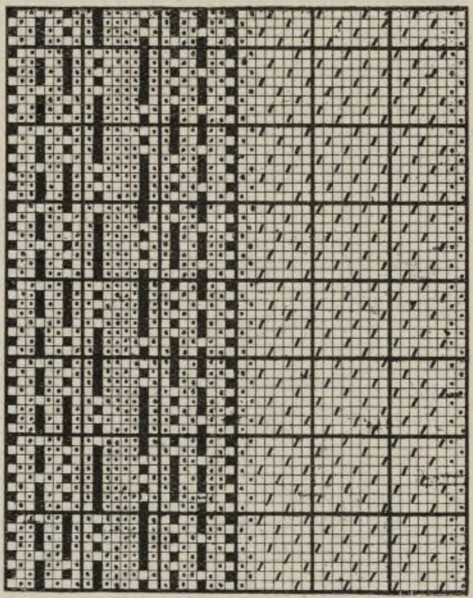
Warp.

6 times { 1 end 2/70's worsted.
1 „ 2/36's mohair.
26 „ 2/70's worsted.
—
38
84 ends per inch.

Weft.

16's black cotton.
58 picks per inch.

The silk repp illustrated in Figs. 163 and 164 has an extra pick of white silk between each cord; when not required to show on the face it is stitched



FANCY DRESS FABRICS.—FIG. 160.

to the back in sateen order by every fifth cotton thread, as shown in Fig. 164, where the silk pick is marked in full squares.

Warp.

2 ends 60/2 black silk.
1 „ 2/70's black cotton.
126 ends per inch.

Weft.

1 pick 6's black cotton.
1 „ 2/80's black cotton
1 „ 60's white silk.
54 picks per inch.

(To be continued.)

Cotton Fibres in Spinning and Manufacturing.—IV.

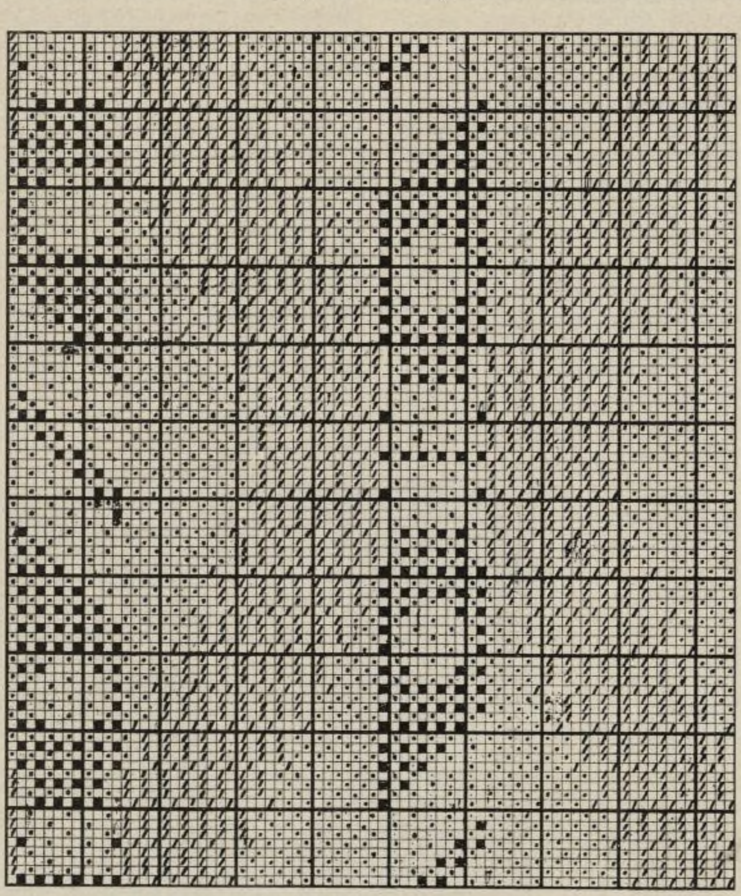
BY W. I. HANNAN.

IMPURITIES and imperfections in yarns are features to be avoided in the spinning processes. The presence of either of these may cause a loss to the spinner in the selling price of the yarn, and a loss to the manufacturer due to

FANCY DRESS FABRICS.—FIG. 161.

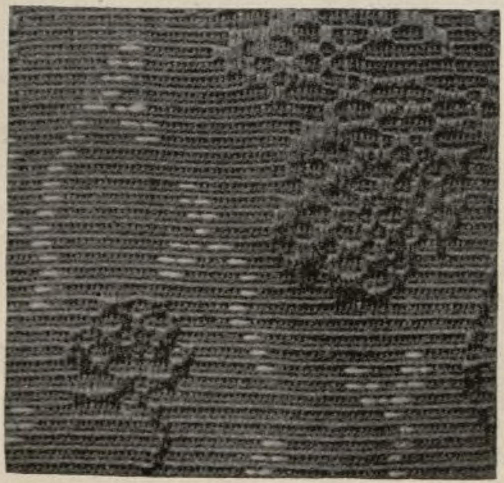
defects shown in the woven goods. In a standard make of cloth, the manufacturer is dependent on the spinner. If the latter produces a yarn from a mixing of cottons heavily charged with impurities, he runs a risk of having the yarn infested here and there with certain defects which are detrimental to the making of a good cloth. Therefore unless some care is exercised in the manipulation of the material to get rid of the impurities in the spinning, bad results will follow.

"Leaf" is a term used in the cotton market to indicate that the raw cotton fibres are accompanied by pieces of membrane of a dark colour that spoil the appearance of the white or brown stapled cottons. The presence of leaf is either a good



FANCY DRESS FABRICS.—FIG. 162.

or a bad sign to the buyer of cotton. When leaf in the raw cotton barely exceeds ¼in. in size, it is often regarded as a good sign, showing that the cotton has not been excessively ginned, and the staple may be relied on as being pretty uniform in tension and flexibility. A skilful buyer of cotton can readily judge whether the size of the leaf is a fair standard when forming his estimate as to a purchase. When the leaf is smaller than the above size it is less controllable in the opening and scutching, and readily passes on with the fibres of the fleece, causing such to have a dull and



FANCY DRESS FABRICS.—FIG. 163.

pepper-like appearance. The minute particles are apt to float in the air with the shorter fibres; and when fine, leafy particles are sustained by the vehicle of yarn, there is often a suspicion that the scutching has been defective. Certain well-marked rules of regulating the speed of the fan in proportion to the speed of the beater, so as to allow the leaf to be dropped in the dustbox as the fleece of fibres is passed on to the sieve cylinders, are often tried, with a fair amount of success. Certainly the dustbox ought to be the proper receptacle for the leaf, under ordinary circumstances. Most staples of cotton will be sustained in the fleece by the pneumatic force that is exercised by the influence of the fan draught, while the particles of leaf will just overbalance the weight of the fibres, and drop finally into the dustbox. The emptying of the latter ought not on any account to be neglected. Machine makers have for years been alive to the making of an apparatus that will take away the leaf automatically, hence the introduction of a leaf extractor—some modifications of which are in use to-day—in which a travelling lattice runs in the opposite direction to the cotton fleece, and intercepts certain portions of leaf from the stream of fibres just after leaving the last beater bars of the grid. Such particles of leaf are readily dropped into the cavity underneath the moving lattice. Another plan of getting rid of the leaf and impurities is the substitution of vibrating and swivel bars, some of which are self-regulating in their movements.

When leaf is very broad, it is liable to get further broken-up in the opening and scutching, and large pieces are physically strengthened by the addition of veins with rough surfaces or corners, some of which are known as sticks or legs, which easily adhere to the fibres, and which are often carried on with the material, appearing in the yarn when spun. A cop of yarn charged with a few of such impurities is badly disfigured, and the unravelling of the yarn in reeling, winding, or weaving is often a source of loss, trouble, and inconvenience, owing to the wiry particles or veins, which interrupt the course of the yarn and cause considerable breakages.

Broken bracts are thinner than ordinary leaf; they are distinguished generally by their brown colour. The membrane is easily broken by the winds in the cotton field, and as the picker takes the seed-cotton plexus from the pod, the thin bracts are readily taken in with the seed cotton. In the ginning, some pieces are sustained, and the lint becomes charged with the particles of bracts, particularly in East Indian staples of cotton.

"Shell" is a term used when the seed coverings are prominent, or when they have been struck out by the cylinder beater in the opener. Pieces of the fleshy kernel of the seeds are also often termed shell; they rank with seeds as heavy impurities. But seeds have generally a few fibres attached to them, which when broken give rise to as many bearded motes as the seed has been broken into. The presence of seeds in staples of cotton is an indication of loss, owing to the weight of the seeds and their liability to be broken up into bearded motes. The latter must be ranked as belonging to heavy impurities, whilst leaf, bracts, and sticks may be classed among the lighter impurities.

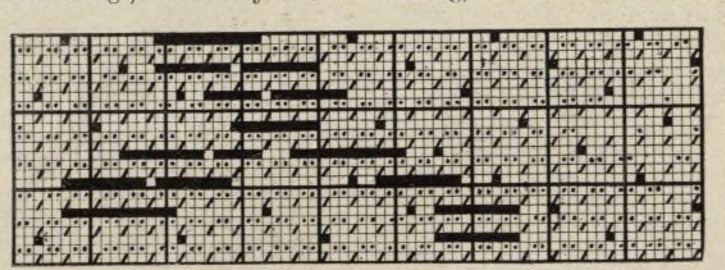
In the conditioning of yarn charged with either of the above impurities it is wise to get it out of the conditioning cellar as soon as possible. If yarn is kept too long a time in the cellar, the particles of leaf have a tendency to turn black, thus giving it prominence on a white ground. When bearded motes are present in over-conditioned yarns, there is a tendency for the motes to part with the oily secretions from the glands of the kernel of the seed and permeate the fibres of the yarn, causing it to become oily and discoloured. Such yarns may be styled cotton-seed-oil stained. Lossy cottons are those in which the amount of moisture is heavier than the permissible limit. Such bales of lossy cottons are sometimes termed water-packed. Some cottons are so faulty with impurities that the ordinary processes through which they are put do not clean the fibres sufficiently. In some cases a double process of combing is resorted to with advantage. In using brown Egyptian, there is a limit as to the amount of carding. Even where cotton is exceptionally dirty, it is always best to rely upon the opening and scutching processes to get out their fair share of impurities. The question of keeping the fibres of cotton for a longer time than ordinary under the action of the carding engine has been tried, but it has been found that extra carding does not bring about such good results as anticipated. The yarn spun under such conditions has been found to be weaker than with the normal amount of carding. The conclusion arrived at is that too much carding has the effect of reducing the spirality of the fibres, and that whatever is done in that respect must weaken the yarn.

(To be continued.)

The Mechanism of Spinning.—XII.

BY H. R. CARTER.

SPINNING LONG AND COARSE VEGETABLE FIBRES. — The slivers from the third or finishing drawing frame are now ready to be spun. Very occasionally the sliver is drawn directly from the can and twisted, without drafting, into an extremely heavy yarn upon a

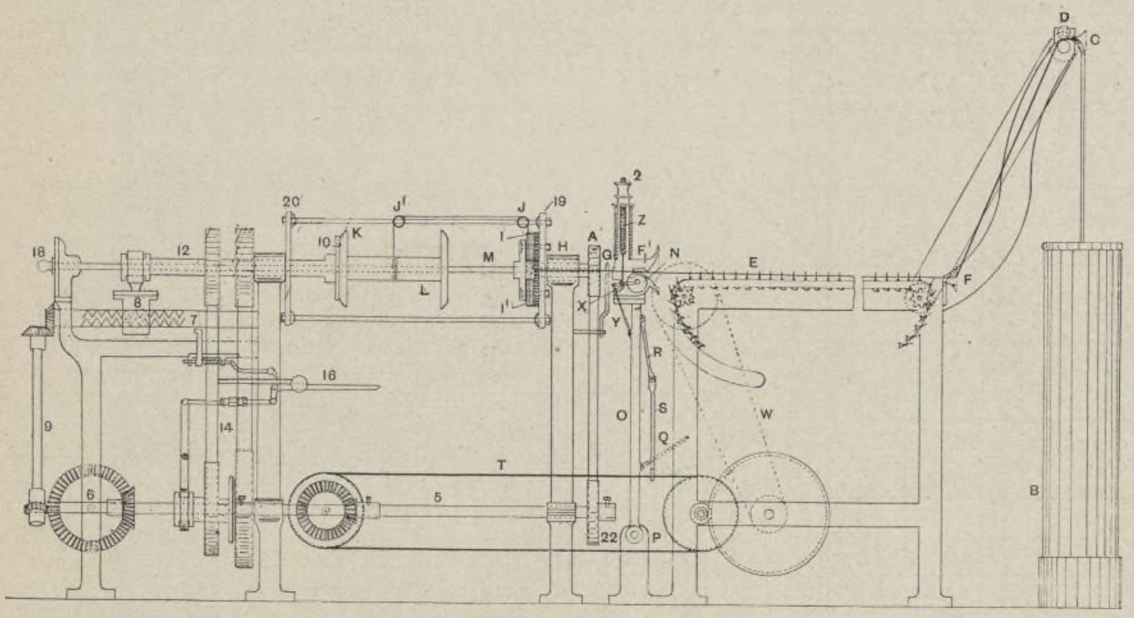


FANCY DRESS FABRICS.—FIG. 164.

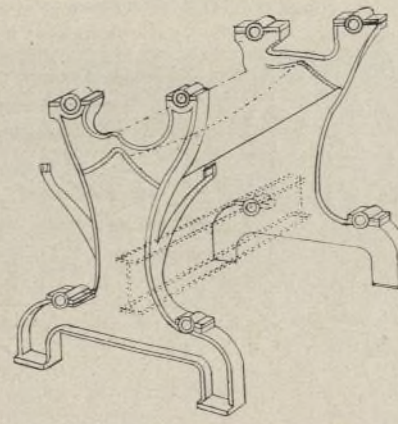
machine usually employed for "laying," and which resembles in principle the spinning part of Fig. 29—viz., the part to the left-hand side of the twist pulley A. When draft is combined with twist in the spinning machine, the use of gills is indispensable for material of this class. There are two broad types of gill spinning frames. In one, the draft is produced by means of rollers, as in the drawing frame shown in Fig. 27, and is constant for any given wheels, being independent of the thickness of the sliver. In the second type the material is drawn away by "haul pulleys," around which the yarn passes after it is twisted, while the feed is regulated and controlled by the feed rollers and the sheet of gills which delivers the sliver forward to the flyer. The speed of the feed rollers and the gill sheet depends upon the thickness of the sliver, so that the draft varies from one moment to another with the inequalities in the sliver. The arrangement of the parts necessary to produce this result forms a machine which rivals the roving frame for beauty of mechanism and interest.

Fig. 29 shows the machine which was first introduced in America by John Good, whose name will long live as a pioneer in hemp machinery. B is the can of sliver from the third or finishing drawing frame. It is placed behind the machine as shown, and the sliver drawn up and passed through the trumpet C (which prevents the passage of knots), then through the feed rollers D, which are geared and given the same surface speed as the gill sheet E by means of a band and pulleys, as shown. The sliver passes through another trumpet mouth F before being pinned by the gills, which are placed on bars and form a sheet working in a similar manner as explained when speaking of the machine in Fig. 26. From the gills the fibres are drawn through the condenser apparatus F^1, then between the cheeks of the stop-motion lever G, through the twist tube H (where it receives its twist), round the haul pulleys I and I^1, then round the guide pulleys J and J^1 (upon the leg of the flyer K), from whence it passes to the bobbin L upon the stationary spindle M, upon which bobbin the twisted yarn is wound. The condenser F^1 is the first point of interest in connection with the draft-regulating movement. It is in two pieces, the trumpet mouth F^1, and the grooved cam-shaped nipping plug N, centred in the throat of the former, and which is intended to automatically contract and enlarge the size of the opening according to the size of the yarn, and at the same time to maintain a nip on the passing fibres. The condenser is mounted upon a vibrating piece O centred at P, and maintained in a vertical position by the spring Q. The upright piece O is also connected by a link R to the short arm of a bell-crank lever S, the long arm of which forms the belt shifter that shifts the belt T which drives the gearing V, the latter giving motion to the endless chain of gills by means of the sheet belt W. The plug N is round and fast upon an axle which passes through it. On one end of the axle is a handle to turn the plug and free the opening when required. In addition, on either end of the axle is a lever X by means of which the plug is automatically rocked. The plug is channelled on its periphery, the channel gradually deepening from its commencement until it terminates in a round shoulder formed in a steel block which is let into the plug.

Condensation of the sliver takes place between the plug and a steel plate placed immediately above it, as shown. The nip is maintained by means of the balanced springs Y and Z attached to the arm X. The coiled spring Z is enclosed in a tube forming a continuation of the vertical arm O, and is connected with an adjustable screw Q pendent from the closed end of the tube. The belt T is a round leather one of small diameter working on a grooved pulley 8⅝in. in diameter, and upon one of three flat-faced pulleys all of the same size—viz., 8in. One of these pulleys is a loose one; another gives the average or ordinary speed to the gill sheet; while the third pulley gives the sheet a quick speed. When the upright arm O is in its normal position with a yarn of the average diameter passing through the condenser F, the belt T is upon the medium-speed pulley. When the upright arm O is pulled forward by a thick portion of the sliver trying to get through the condenser, the belt is shifted on to the slack pulley, and the gill sheet momentarily stops while the thick part is drawn out and the yarn levelled, when the condenser recedes again and the gill sheet starts once more. When a thin portion of sliver reaches the condenser it tends to pass through the contracted opening more readily, and the tension upon the upright arm O relaxes, permitting the spring Q to draw it backwards, shifting the belt on to the quick speed pulley and producing an increased supply of material to the condenser, and consequently uniformity in the yarn. The three driven pulleys, being of equal diameter, have naturally like velocities when the belt is upon them. The two different speeds are given to the gill sheet as follows: The quick-speed pulley is fast upon the spindle upon which all three work. This spindle carries the larger of the two pinions shown, which has 29 teeth and drives the smaller of the spur wheels V of 130 teeth, producing the quick-speed sheet. The slow-speed pulley is fast on a sleeve which runs loose upon the spindle and carries the smaller of the two spur pinions of 18 teeth which gears with the larger of the spur wheels V of 144 teeth, and produces the ordinary speed at which the gill sheet runs. The third pulley is loose on the spindle and gives no motion to the gill sheet. Of the two spur wheels V, side by side, the larger is loose upon the sheet pulley shaft. It has a ratchet cast upon its inner face, with which a spring pawl on the inner face of the smaller spur wheel engages, when the latter stops and the larger wheel becomes the driver. When the smaller wheel is the driver, the pawl naturally slips over the teeth of the ratchet. The grooved band pulley, 8⅝in. in diamater, receives its motion from the countershaft 5 through a bevel wheel of 72 teeth and a pinion of 18 teeth, as shown. The pinion may be placed at one side or the other of the bevel wheel in order to preserve the forward motion of the gill sheet, whether the countershaft turns to the right or to the left, giving the yarn right or left hand twist. The countershaft 5 receives its motion from the short shaft 6, carrying the frame pulleys 12in. in diameter through the bevel wheels of 48 and 20 teeth, as shown. In order that the yarn as delivered from the fixed point J^1 may be built over the whole length of the bobbin, the latter is given a reciprocating motion by means of a traverse screw 7 and a screw box 8, fitting the screw. The screw 7 is driven by the bevel wheel on the end of the slanting spindle 9, which receives a slow motion from an endless worm on the end of the countershaft 5. The end of the bobbin has in it a small hole, protected by a metal ring, in which engages a pin 10 projecting from the disc of the long sleeve 12, both sleeve and bobbin being carried round by the pull of the yarn as the flyer revolves, and both having a reciprocating motion on the stationary spindle given to them by the screw box 8, as shown. The flyer K is driven at a constant speed of, say, 1600 revolutions per minute by means of pulleys 13½ and 7½in. in diameter respectively, the former fast on the countershaft, and the latter upon the flyer sleeve. The belt 14 encircling the bobbin and drag pulley is termed the "friction belt." The bobbin pulley is about the same size as the flyer pulley—namely, 7½in. The drag pulley is smaller than the flyer driving pulley (13½in.), consequently, since it is the tension of the yarn which pulls the friction belt round, the drag pulley has a quicker speed than the flyer driving pulley. This loose drag pulley has a friction surface on one side, which bears against a loose friction plate between the two pulleys. The drag pulley is pushed against the friction plate by means of cranks actuated through links from the weighted lever 16, as shown. The friction plate is prevented from running faster than the flyer by means of studs on its back surface engaging with a similar stud on the side of the flyer pulley. The friction between the two surfaces is automatically increased as required by the augmenting diameter of the bobbin at each traverse by means of the shifting of the weight along the lever as shown. The full bobbin is removed and replaced by an empty one in drawing out the sliding and stationary spindle M by means of the knob 18 on its end. The flyer is composed of two discs 19 and 20, say 12in. in diameter, joined by two stay rods, as shown. Both these rods carry guide pulleys for the yarn, those on one arm serving for right, and those on the other arm for left hand twist. The bottom of the groove of the pulley J is in the plane of the last groove of the haul pulley I. The usual size of the flyer is about 12 by 26in., and that of the automatic bobbin 8 by 10in., with a barrel 2in. in diameter and 1in. bore. The pulley 22 on the extreme end of the countershaft 5 is termed the twist pulley. Its diameter depends upon the degree of twist required in the yarn. It drives a pulley A, 5in. in diameter, forming part of the twist tube H, upon the other end of which is a small pinion of 21 teeth driving the haul pulley wheels on either side, each of 36 teeth. These are compounded with haul pulleys I and I^1 of three grooves each, whose effective diameter is 3½in. These haul pulleys run loose upon studs fixed in the disc of the flyer on one side, and in a bridge piece which supports the end of the spindle, as shown, upon the other. The haul pulley drive is a sort of epicyclic or differential gear. If the twist tube were stationary, the flyer would carry the haul pulleys round the stationary pinion on the twist tube and give them motion in the same direction as itself. When, however, the twist pinion is run in the same direction as the flyer, it tends to drive the haul pulleys in the opposite direction. The speed given by the flyer is the greater, consequently the haul pulleys turn in the same direction as the flyer at a speed equal to the difference of the two contrary motions given to them by their two drivers. It is the amount of this difference which may be regulated by the speed of the twist tube which gives the draft, and affects both draft and twist. It is thus essential to the regularity in size and twist of the yarn that the twist belt should not slip, and that the flyer revolve at a constant speed. An example of the draft and twist for Manila "reaper yarn," 200yds. per pound,



The Mechanism of Spinning.—Fig. 29.



The Mechanism of Spinning.—Fig. 30.

spun from sliver 50yds. per pound, will suffice to show the principle of the draft and twist calculation. Suppose that the twist tube driving pulley 22 be 8in. in diameter, and that the countershaft 5 runs at a speed of 864 revolutions per minute. The speed of the flyer is then $\frac{864 \times 13\frac{1}{2}}{7\frac{1}{2}} = 1555{\cdot}2$ revolutions per minute, and that of the twist tube $\frac{864 \times 8}{5} = 1382{\cdot}4$ revolutions per minute. One revolution of the twist tube gives the haul pulleys $\frac{21}{36}$ of a revolution in one direction, while one revolution of the flyer gives the haul pulleys the same motion in the other direction. The speed of the flyer is the greater, however, so that the effective motion of the haul pulleys is $\left(\frac{1555{\cdot}2 \times 21}{36}\right) - \left(\frac{1382{\cdot}4 \times 21}{36}\right) = 907{\cdot}2 - 806{\cdot}4 = 100{\cdot}8$ revolutions per minute. Their effective diameter being $3\frac{1}{2}$in., they draw through $\frac{100{\cdot}8 \times 3{\cdot}5 \times 3{\cdot}1416}{12} = 92{\cdot}4$ft. per minute. Since the flyer makes 1555·2 revolutions per minute, $\frac{1555{\cdot}2}{92{\cdot}4} = 16{\cdot}8$ turns per foot of twist are put into the yarn.

an inch in the diameter of the pulley making a tremendous difference in both the size and twist of the yarn. The draft alone is changed by increasing or diminishing the rate of feed by changing the lower of the two sheet pulleys in the inverse proportion to the draft required. The stop-motion lever C is balanced by the tension of the yarn passing between its cheeks. When the yarn runs light or fails to pass through the twist tube, the lever falls, releasing the belt forks, shifting the belt on to the slack pulley, and applying a brake to a friction pulley generally placed on the shaft 5. The flyer is thus brought quickly to rest. In Fig. 30 the form of the framework of the machine is shown, from which it will be seen that each automatic spinner has two spindles running side by side. The flyers, owing to the danger attached to them in consequence of their speed and weight, are often protected by a circular iron cover with a sliding door in the top. In practice, the twist and flyer belts must be kept tight, while the tension of the drag or friction belt is rather less. The yarn must be wound around the haul pulleys in the direction of rotation of the flyer, otherwise the machine will not work at all. This machine works very well on yarns spun from hard fibre, the


THE PARIS EXHIBITION, 1900: PRINTED TEXTILES EXHIBITED BY MESSRS. TURNBULL AND STOCKDALE.

The rate at which the yarn is drawn away and wound upon the bobbin we have ascertained to be 92·4ft. per minute. To calculate the draft, we require to know the speed at which the sliver is fed forward, or the surface speed of the gill sheet both at quick and slow speed. From the particulars already given, we find that the speed of the wheel V of 144 teeth is $\frac{864 \times 18 \times 8\frac{5}{8} \times 16}{72 \times 8 \times 144} = \frac{207}{8} = 25{\cdot}9$ revolutions.

If the change pulley for the sheet which is fast upon this axle be 5in. in diameter, and the pulley which it drives on the chain gill sheet front roller 10in. in diameter, with a sprocket wheel of 7 teeth driving the sheet, whose bars have a pitch of $1\frac{2}{3}$in., the speed of this sheet in feet per minute will be $\frac{25{\cdot}9 \times 5 \times 7 \times 1\frac{2}{3}}{10 \times 12} = 12{\cdot}6$, so that the draft thus appears to be $\frac{92{\cdot}4}{12{\cdot}6} = 7{\cdot}3$. When the belt is on the pulley giving the gill sheet its quick speed, the draft is $\frac{7{\cdot}3 \times 16 \times 130}{29 \times 144} = 3{\cdot}6$, so that the actual draft varies between these two figures according to the inequalities in the sliver. The changing of the twist tube driving pulley 22 changes both draft and twist. It must be borne in mind that the change effected is out of all proportion to the difference in size of the pulleys, even a quarter of weight of the yarns varying from 80 to 200yds. per pound.

(To be continued.)

REVIEWS OF BOOKS.

THE PARIS EXHIBITION, 1900. Edited by D. CROAL THOMSON. London: H. Virtue and Co. Limited.

WHATEVER views may be held as to the success, financial or otherwise, of the Paris Exhibition of 1900, there can be no gainsaying that it proved of immense educational value in more senses than one. It is therefore more than ever a matter for regret that we in this country not only took but scanty advantage of the opportunity afforded of studying the industrial progress exemplified in the numerous exhibits, but also that, with the exception of the work under notice, no attempt has been made in this country to place permanently on record the architectural and artistic triumphs achieved, or to deduce the valuable lessons which they offer to the craftsman and the art student.

The present volume makes no pretence to deal generally with the multitudinous exhibits shown at Paris, the treatment being confined practically to a consideration of the subject from an artistic standpoint. Hence, machinery and the more unornate manufactures and products find no place in the work before us, but as a record of the important artistic aspects of the Exhibition the volume leaves nothing to be desired. Fairly complete and well-illustrated descriptions of the main Exhibition buildings, of the two fine-art palaces, and of the Pont Alexandre III. form a suitable introductory section, after which follow a series of descriptive articles upon the various collections of exhibits of pure and applied art. It is impossible to enumerate the many subjects touched upon, including, as they do, varieties of wall decoration, porcelain, bronzes, metal work, furniture, glassware, bookbinding, leather work, wood carving, etc. Unfortunately textiles are not treated as fully as could be desired, but the two illustrations of the exhibits of Messrs. Turnbull and Stockdale (which we reproduce herewith by kind permission of the publishers) afford a good example, not only of the capabilities of English designers and manufacturers in this direction, but also as an indication of the character of the illustrations with which this interesting volume abounds. Not the least valuable feature is the introduction of critical articles by Mr. Lewis Day, that on wall-hangings and wall-covering being particularly commendable. Finally, more than ordinary praise is due to the editors, printers, and publishers of the work, who have certainly spared no effort to produce a volume well worthy to rank with the artistic productions it describes.

WE have also received:—"Notes on the Ventilating and Warming of Factories and Workshops," by W. H. Casmey, of the Blackman Ventilating Company Limited (6d.), being a reprint of a paper read before the Blackburn and Preston Mill Managers' Association.—"The Directory Trade Journal" (Boston, Mass., U.S.A. W. A. Morgan. 25c.) is one of the early numbers of a journal recently started to cater for the interests of directory publishers, agents, and advertisers generally.

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.

W. P. E. (London).—The makers of dress goods are too numerous to give either here or by letter, but you will obtain their names from "Kelly's Textile Directory." You may receive more attention by applying to merchants, as manufacturers do not usually care to sell outside the usual channel.

R. M. (Blackburn).—We know of no automatic looms at work in this country, with the exception of those on view, and as no English experience is forthcoming, it is difficult to give an idea as to their practical value. We are inclined to think that sooner or later they will be adopted on a large scale in this country, and may even supersede the ordinary loom altogether.

G. A. (Paisley).—The speed of the delivery (front) rollers governs the production, whatever kind of spinning machine is in question. The circumference multiplied by the speed is all that is required, afterwards translating to yards, hanks, or pounds. Something must also be deducted for doffings. This can be ascertained by timing a doffing, and counting the doffings per day.

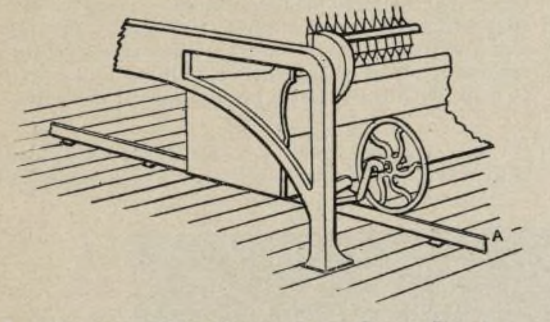
THE TEXTILE MACHINIST:

Devoted to Machinery, Apparatus, Tools, Etc.

Improved Mule Carriage and Rail.

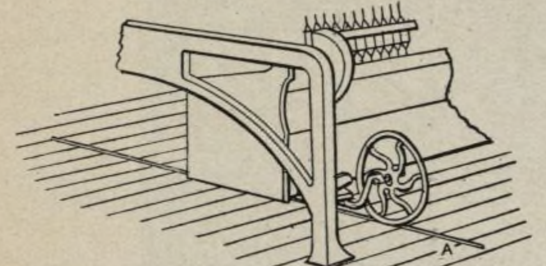
MR. SAMUEL WRIGLEY, HORSEDGE MILL, OLDHAM.

WHEN one considers the great number of mules at work in this and other countries, the age of invention and adaptation in which we live, the energy of the factory inspector, and the working of the Workmen's Compensation Act, it appears almost incredible that the raised rail or slip should have survived so long as it has. Everyone familiar with a mule will well know these raised rails or slips upon which the carriage wheels run, in



IMPROVED MULE CARRIAGE AND RAIL.—FIG. 1.

their backward-and-forward movement. They will know the inconvenience to the operative who minds the mules, and the obstruction they offer to skips at the back of the mule. These drawbacks cannot very well be exaggerated, for the tenters frequently get badly hurt by tripping over these rails or by their bare feet catching under them as they hurry from one end to the other of the jenny-gate. It is also needless to mention the great danger in case of fire, when firemen, unaware of these obstructions, enter the building in the dark. The improvements are very simple—so simple that it is surprising they were not introduced years before. Probably the use of stone or concrete



IMPROVED MULE CARRIAGE AND RAIL.—FIG. 2.

floors made their adoption somewhat difficult, but that can now be easily got over. The new mode consists of lowering the slip flush with the floor, and the inventor has at the same time introduced means for covering the carriage wheel. Reference to Figs. 1 and 2 will show the difference between the old method and the new, Fig. 1 showing the way universally in use, and Fig. 2 giving the recent improvement.

In both figures, A is the slip, in one case being a multiplied obstruction, as from 24 to 26 of these are found in each jenny-gate. In the other case there is no noticeable distinction in the floor where

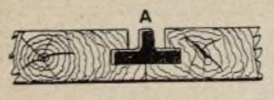
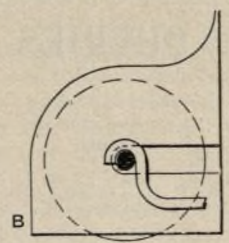


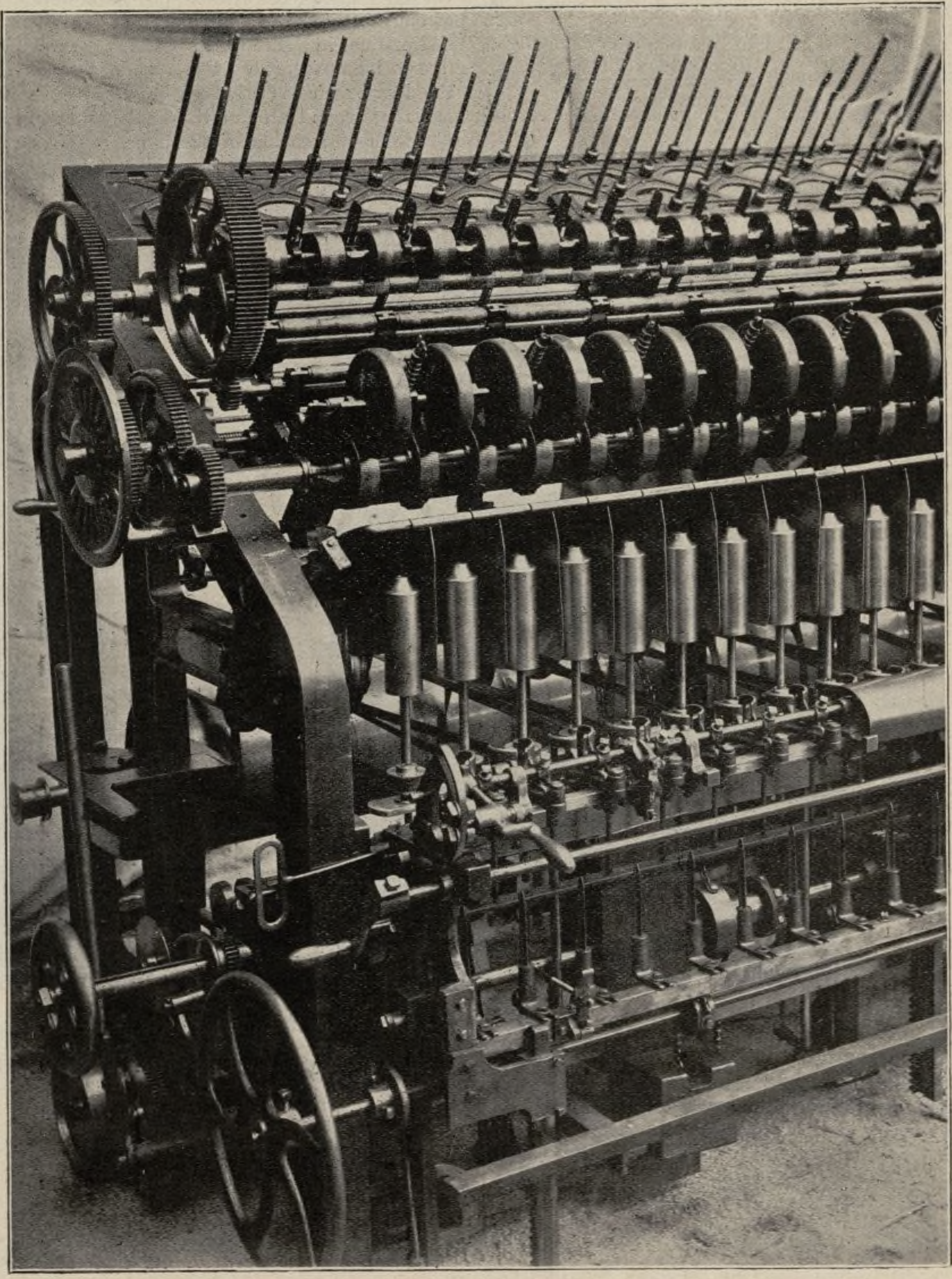
FIG. 3.



IMPROVED MULE CARRIAGE AND RAIL.—FIG. 4.

the slips occur, and no impediment to the tenter. If the carriage wheel works loose and overruns in Fig. 1, it means a serious smash, whilst in Fig. 2 such an event would have little effect beyond cutting a groove in the floor for a few inches beyond the end of the slip. It makes the jenny-gate quite clear, not only for the tenter, but for cleaning, sweeping, and other purposes. The arrangement for the new slip itself requires little change of conditions, especially on wood floors, for the rail is let into the flooring in the manner shown in Fig. 3.

The carriage wheels are also protected, both to keep them free from dirt and lint and to prevent them hurting anyone. When uncovered, these wheels collect a large amount of fluff and dust, and when cleaned there is a risk of this fluff rising and catching on to the yarn. In the new arrangement the carriage wheel is entirely covered by a sheet-metal cover, as shown in Fig. 4, and at the outer end of each cover a tuft of broom (not shown) is placed at B, which, in case the tenter is in the way, slightly pricks his bare feet and warns him of his danger before the carriage has advanced far enough to do any harm.



AUTOMATIC DOFFING MOTION FOR CAP FRAMES.—FIG. 1.

Automatic Doffing Motion for Cap Frames.

MESSRS. HALL AND STELLS, PARK WORKS, KEIGHLEY.

FOR the last few years the scarcity of child labour has been keenly felt by the owners of spinning machinery, and there is no possible hope of the supply becoming greater. About four years ago, when this scarcity began to be recognised as a permanent condition, attention was drawn to the necessity of using some mechanical device to replace hand doffing. One of the first of the practicable automatic appliances put before the trade was that of Messrs. Hall and Stells, a motion adapted for cap frames, which was described at the time in THE TEXTILE MANUFACTURER (October, 1898), and since then a large amount of time and thought has been spent in developing the apparatus. The parts have been modified and simplified, so that to-day only one-third of the mechanism of the older motion is required. Not only this, but the apparatus has been gradually made more fully automatic, and is now apparently as simple as it is possible to make it—a condition which enables the maker to supply it at a price which gives the spinner a profitable accessory, and at the same time overcomes the difficulty arising from the scarcity of child labour.

The parts of the motion affixed to a cap frame are shown in Figs. 1 and 2, the former of which shows the frame at work and the doffing motion lowered out of the way, whilst the latter shows the motion in position and performing the operation of doffing. A better idea of the various operations will be obtained from the line drawings, of which Fig. 3 shows part of the frame in front elevation, Fig. 4 the same portion in plan, whilst Figs. 5, 6, 7, and 8 are end elevations showing the apparatus in different positions. The spinning frame is one of the usual cap frames, and the most prominent portion of the doffing apparatus consists of a number of clips B, one being supplied for each spindle. These clips are arranged on a rod which runs across the entire length of the frame, being secured on brackets at intervals. The clips themselves will be better understood by reference to Fig. 9, where one is shown enlarged in plan and side elevation. The jaws of the clip are normally kept closed by means of a spring, but can be opened when required by means of the hand-lever C (Fig. 4).

On the rod which carries the clips is arranged a series of sliding fingers D, which may be moved so as to support the bobbins held by the clip, or may be withdrawn to allow these bobbins to fall, or for other bobbins to be taken up. These fingers hold the bobbins, but a flange at the lower end of the clip serves to support the cap, when such is held in the jaws of the clip.

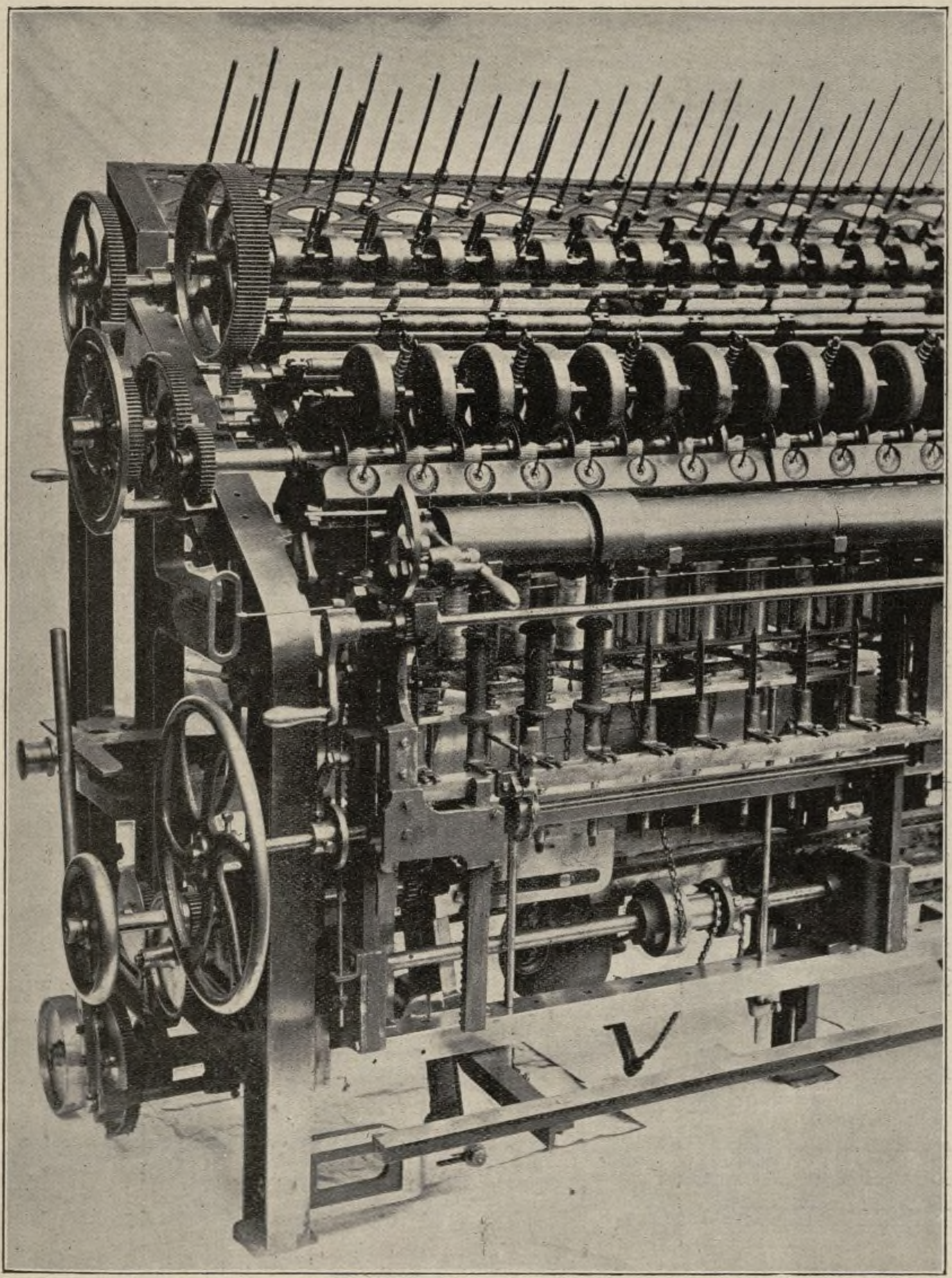


Fig. 2.

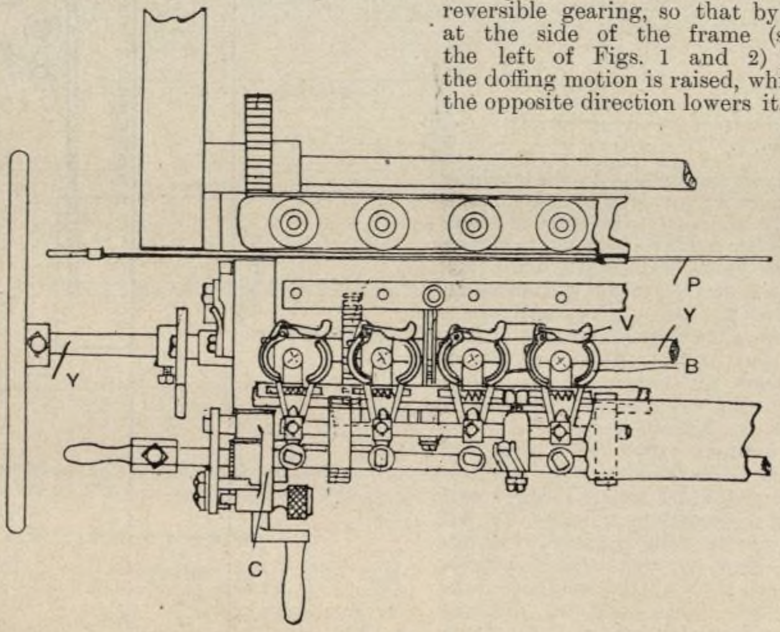


Fig. 4.

When the frame is spinning, the doffing motion is in the position shown in Figs. 1, 3, and 5, but when doffing is about to commence the clips are moved up by means of the racks F, which are raised by toothed wheels, which in turn derive motion from the cylinder shaft of the frame. The power is transmitted through frictional reversible gearing, so that by moving the lever at the side of the frame (seen distinctly at the left of Figs. 1 and 2) in one direction, the doffing motion is raised, whilst a movement in the opposite direction lowers it. When the lever is in its central position the wheels are out of gear, and the doffing motion remains at rest. It is perhaps unnecessary to add that the entire moving portion of the doffing apparatus is balanced by weights, so that it can be easily raised and lowered, and can remain in any position without strain on any part.

The pegs H are arranged to hold the empty bobbins, and are arranged on a bar which is carried by the raising and lowering rack Z. The empty bobbins are placed in readiness on the pegs whilst the frame is running, and at the same time the full bobbins are carried away. During doffing, the full bobbins are placed upon the pegs K, which are arranged for this purpose, and both this set of pegs and the pegs H are capable of a movement by means of the shaft Y which from a hand-wheel at the end of the frame transmits motion to toothed wheels keyed upon it, and so raises the pegs by a vertical rack.

Having thus briefly outlined the parts of the doffing motion, further details will be added whilst describing the typical working of the machine. The machine is supposed to have finished spinning; the bobbins on the spindles are full of yarn, and empty bobbins are arranged on the pegs H awaiting their turn to be put on to the spindles. The

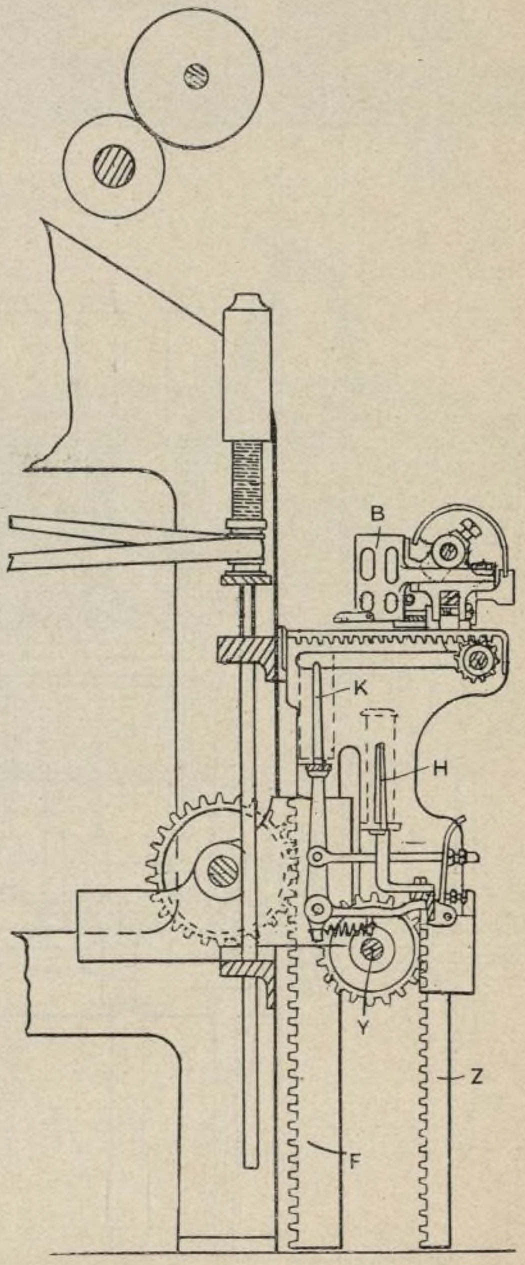
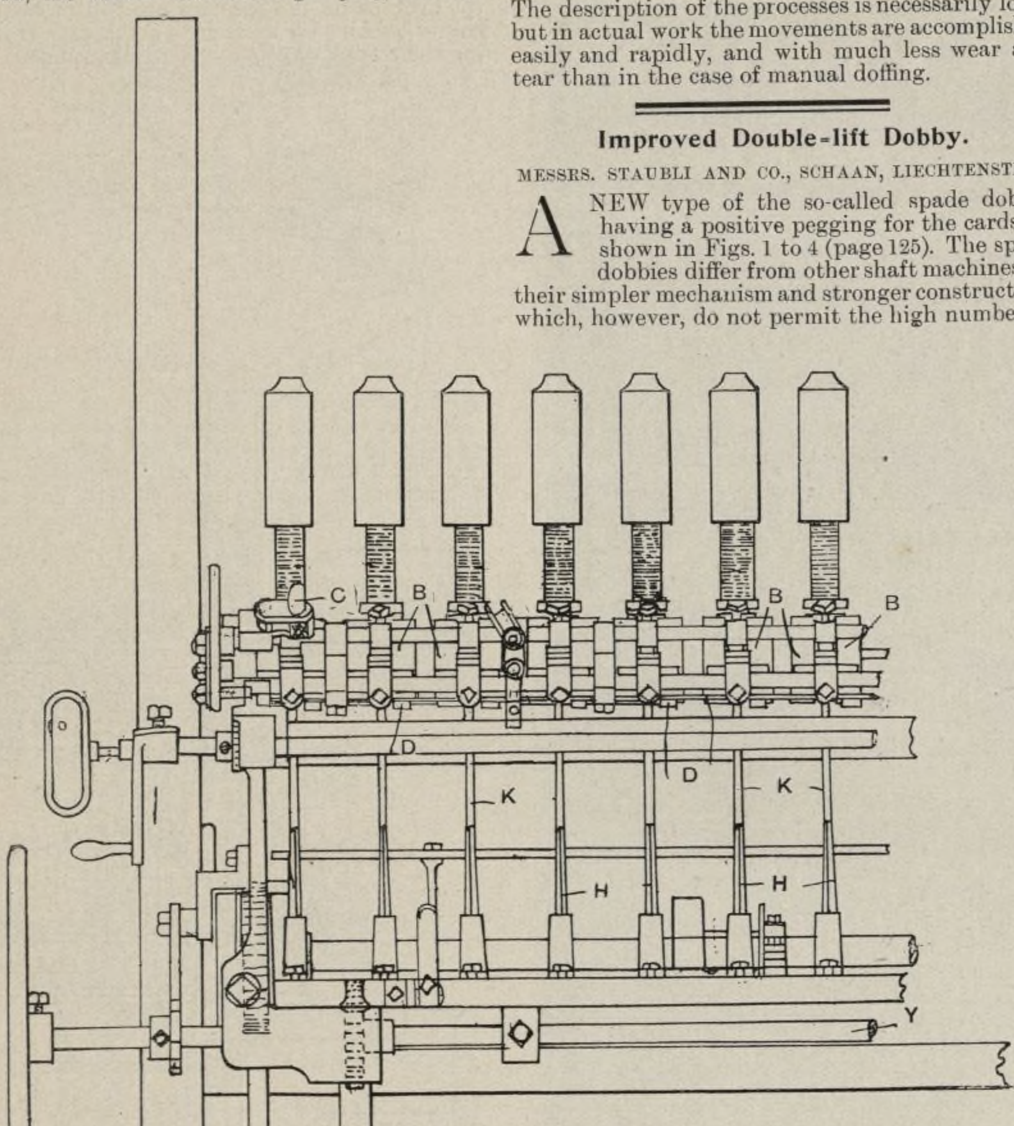


Fig. 5.

yarn all across the frame is first slackened, say by running the finger across them down the frame, and so unwinding an inch or so. Then the framework of the motion is raised by the racks F and brought into the position shown in Fig. 8, this being done by power transmitted through the lowering and raising gear previously described. It is necessary that the lifter rail should be in its highest position at this stage, and as it seldom happens in the ordinary course of spinning to be in such a position just at this time, arrangements are made to bring it up at the same time that the doffing motion rises. This is done by means of a cam which is brought into work by the doffing apparatus raising mechanism, and which automatically raises the lifter rail.

Next, the mechanism carrying the clips B is moved towards the frame in a horizontal direction, so that the clips are immediately over the spindles, in the position shown in Fig. 7. As the space between the tops of the spindles and the front rollers is limited, a slight tilting motion is given to the clips both at the commencement of their descent over the caps and towards the completion of their return, thus keeping everything clear of the front rollers. The guide board, of course, is turned up out of the way all through the operations. The tilting of the clips is caused by nuts X, which, placed on a rod sliding up and down with the apparatus, comes into contact with a projection W, and thus converts the vertical motion partly into a horizontal one by means of the bell-crank lever shown.

If during this part of the proceedings any threads are in front of the caps, and thus in the way of the clips, they are guided to the back during the advance of the clips by the hook-shaped arm V (Fig. 9) which is attached to each clip. The fingers D below the clips B are withdrawn, and the jaws of the clips opened so as to leave a free passage into the interior of the clip, and then the lever at the side of the frame is reversed and the apparatus lowered by power on to the caps and bobbins. The jaws of the clips are released, the fingers D at the same time coming forward, the former movement grasping the cap



Automatic Doffing Motion for Cap Frames.—Fig. 3.

and the latter securing the bobbin. The apparatus is now raised (by power), the tilting previously mentioned being repeated towards the end of the journey.

The apparatus is next moved horizontally away from the frame until the clips are immediately over the empty pegs K, when the rod carrying the fingers D is moved, withdrawing the fingers and allowing the bobbins to fall, which they do on to the pegs beneath. The caps are necessarily retained by the clips until all the operations are completed. The apparatus is then moved horizontally still farther away from the frame, until immediately over the pegs H which carry the empty bobbins. These are racked up until the empty bobbins upon them are inside the clip, when the fingers D are again operated and the bobbins secured in the clip. After this, the apparatus is moved horizontally towards the frame until over the spindles, when the bobbins and caps are lowered. When these are on the spindles, the fingers D are again withdrawn and the jaws of the clip opened, withdrawn horizontally, and lowered at the same time, leaving the bobbins and caps in position.

During the lowering movement just mentioned the threads are guided by a bar P (having notches for the yarn to rest in) close up to the spindles. As the clips B are withdrawn from the spindles, the threads are again guided by the arm V (on the clip), and at the same time the bobbins are rotated by the sudden withdrawal of the arm until the pegs which hold them in position during spinning fall into the notches which are cut into the base of the bobbin for their reception. The threads in the meantime are extending across from the full bobbins just doffed to the newly-arranged empty ones, and are cut by means of the cutters in whose path they directly lie.

The frame may now be started, and whilst spinning is proceeding, the doffing motion is first moved into a position which facilitates the removal of the full bobbins and the placing of new ones, and is then wound down out of the way.

Guards are supplied for all exposed pieces of mechanism, which not only protect the operative, but keep the various parts clear of dust and fluff. The description of the processes is necessarily long, but in actual work the movements are accomplished easily and rapidly, and with much less wear and tear than in the case of manual doffing.

Improved Double-lift Dobby.

MESSRS. STAUBLI AND CO., SCHAAN, LIECHTENSTEIN.

A NEW type of the so-called spade dobby, having a positive pegging for the cards, is shown in Figs. 1 to 4 (page 125). The spade dobbies differ from other shaft machines by their simpler mechanism and stronger construction, which, however, do not permit the high number of shafts possible with other systems. In the machine represented, the number of shafts may reach twenty, but usually is only twelve or sixteen. The card cylinder, with positive pegging, is driven separately from the loom crankshaft, while the motion of the knives is derived from a second crank on the tappet shaft of the loom. The card, which makes a progressive and swinging motion, first acts on vertically-arranged bolts; the latter act on feelers, and the feelers act on the catches. The connection between the catches and the shafts themselves is made in various ways. Fig. 1, for instance, shows a method which many practical men adhere to. Fig. 3 shows a method which is more to be recommended for narrow looms, and Fig. 4 a universal connection suitable for all requirements, whether in wide or narrow looms. The height of the shed is regulated by changing the spades on the upper toothed arm of the front auxiliary jacks, and an inclined shed can be produced by a stepped tieing-up of the shafts to the notches of the jacks. An important addition to all machines depending on the pull of the springs is the under-motion to which the shafts are attached from below. Originally all shaft machines were defective in this part: the higher the shaft was lifted, the greater the tension of the springs, which resulted in a waste of

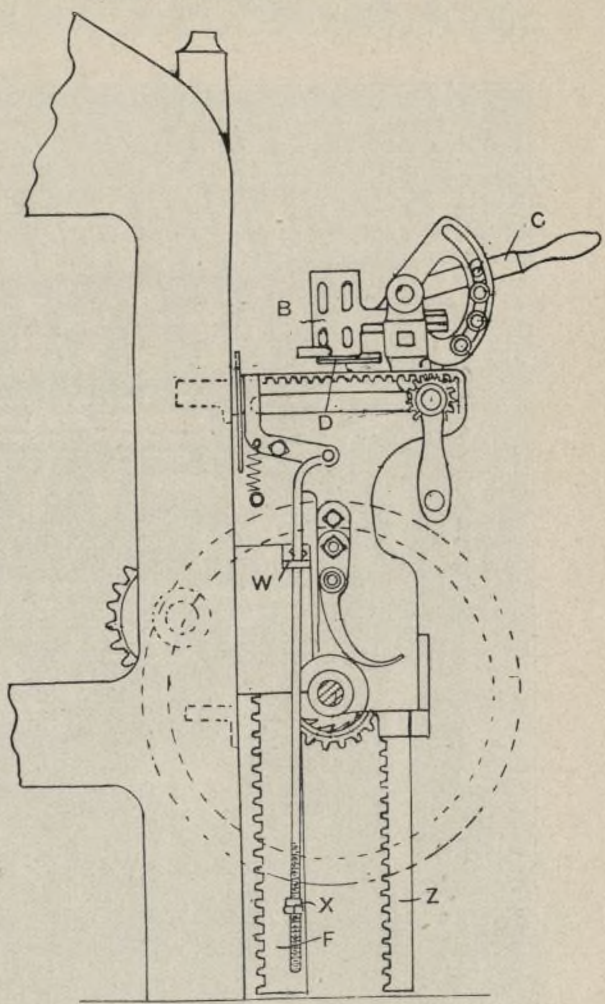
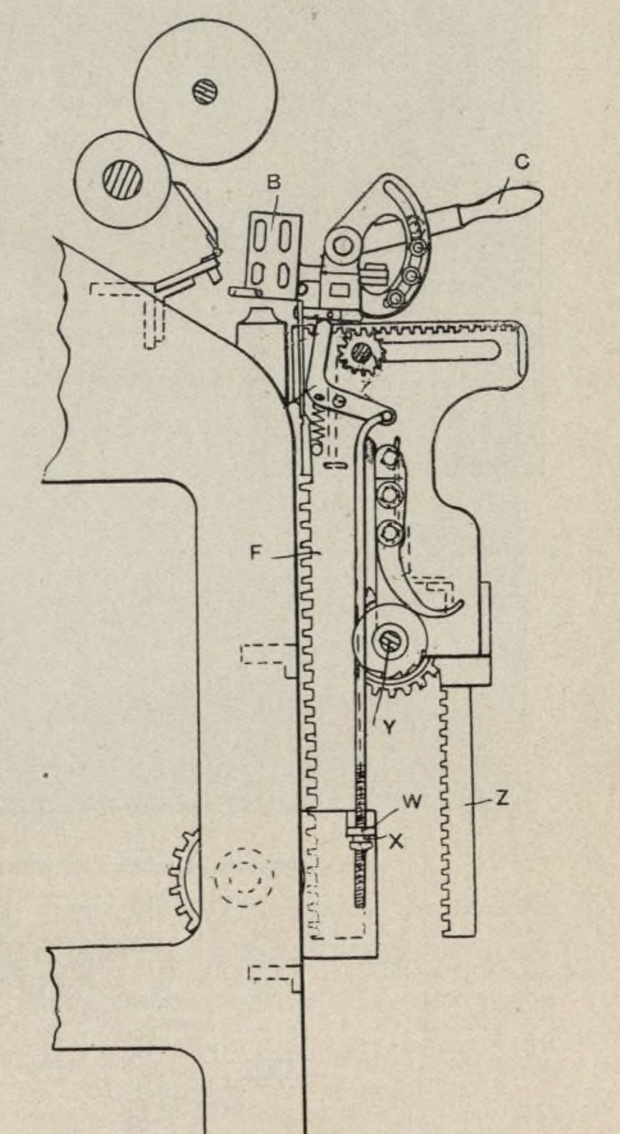
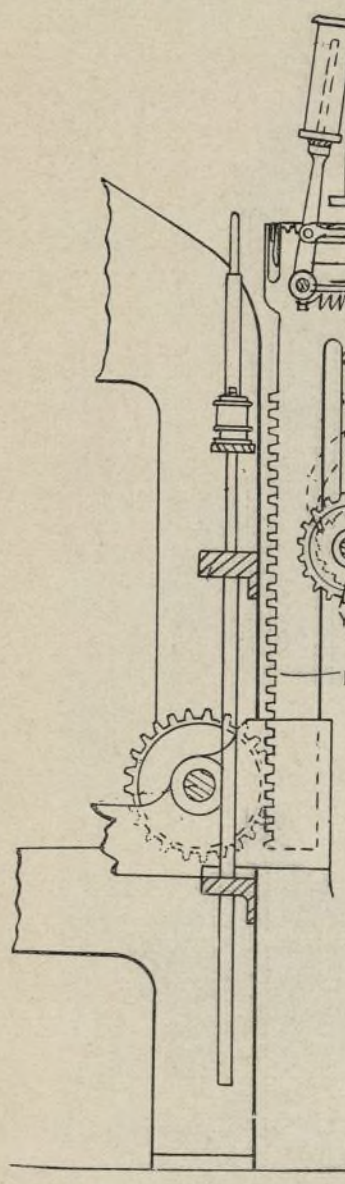


Fig. 6.



Automatic Doffing Motion for Cap Frames.—Fig. 7.

driving power and greatly reduced the durability of the jacks and hooks. At present, compensating under-motions are used, as shown in Fig. 2, these being applicable to the spade dobby or any other machine. The spiral springs are arranged horizontally, are attached by means of chains to sectors, and expand only a short distance. The cords connected to the shaft wind off and on the sectors in a perfectly straight line, and any slanting pull on the shaft is obviated.



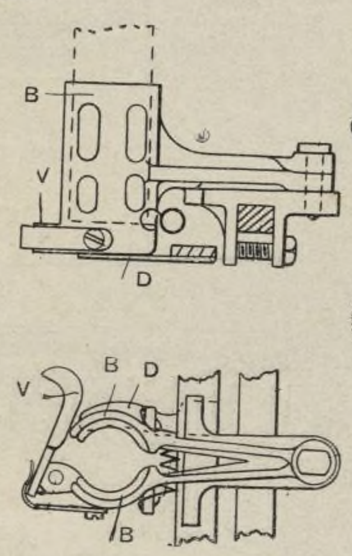
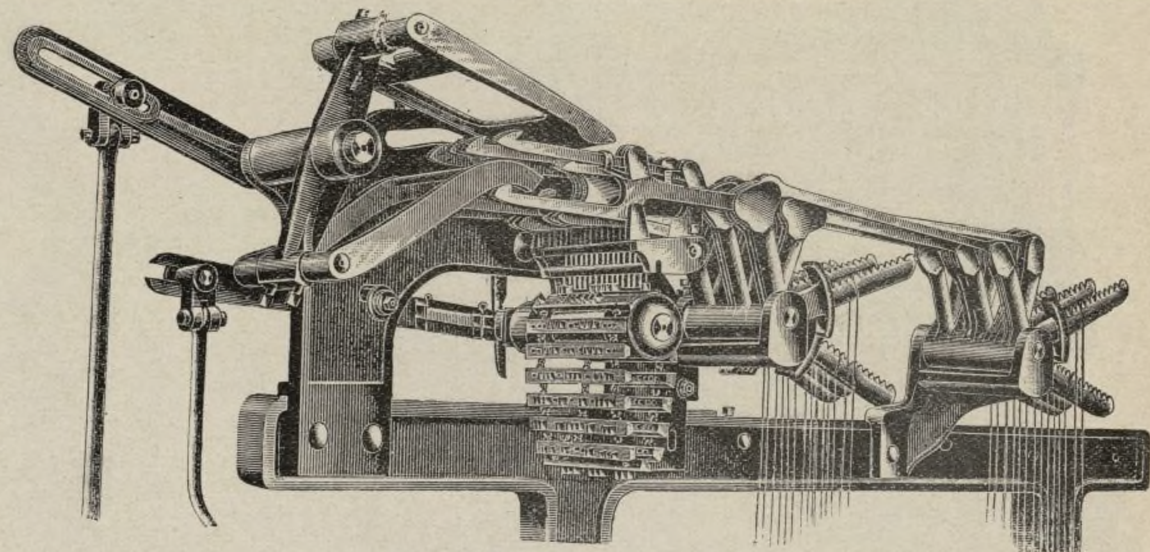
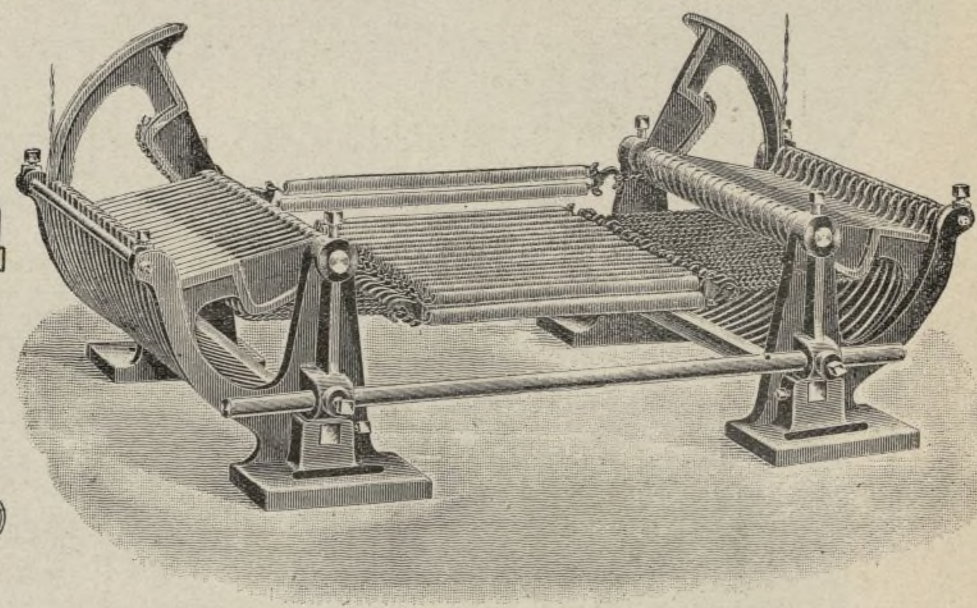


Fig. 8.—Automatic Doffing Motion for Cap Frames.—Fig. 9.



Improved Double-lift Dobby —Fig. 1.



Imploved Double-lift Dobby.—Fig. 2.

With an increasing lift of the shaft the tensional pull of the spring is reduced in inverse ratio. Each spring can be easily detached, and by a

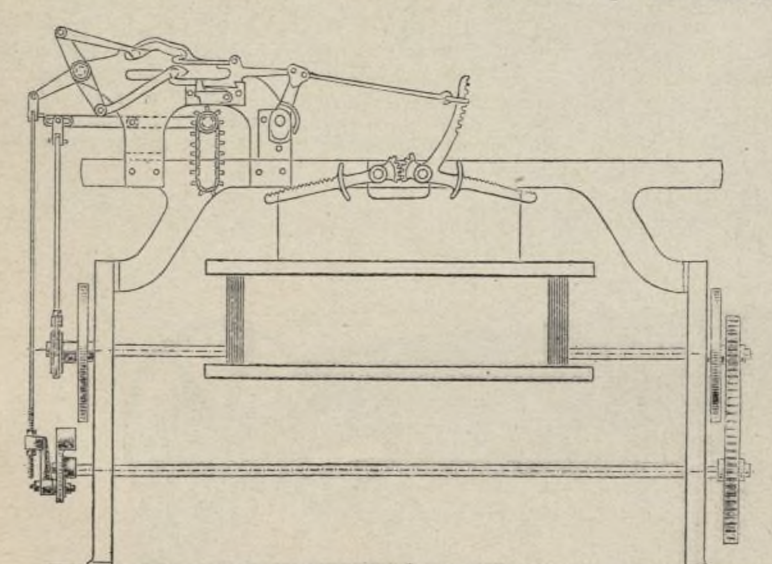


Fig. 3.

Improved Double-lift Dobby.

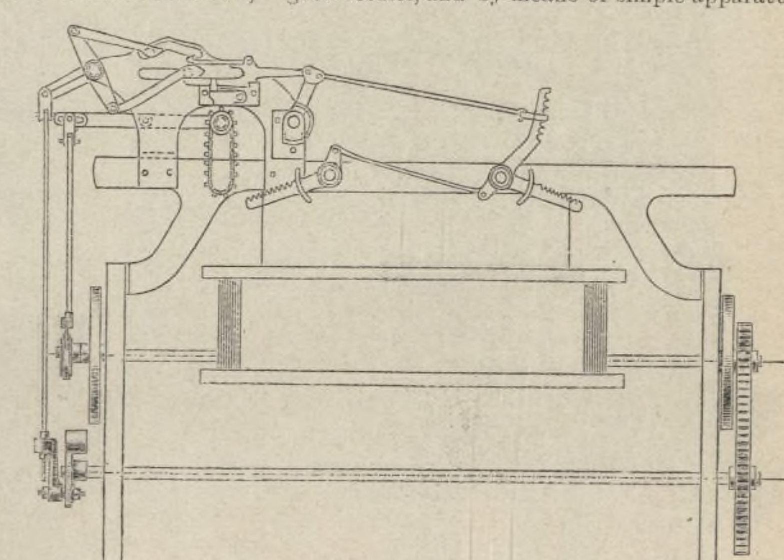


Fig. 4.

variable attachment of its hooks into other links of the chain the tension can be regulated according to requirements.

Higher Mill, Shuttleworth, which has been standing idle for the last ten years, and which was last worked by Messrs. J. and A. Entwistle, waste manufacturers, Brickhouse Mill, Wash-lane, Bury, and prior to that was run by Messrs. Wild, has been taken over by a firm of bleachers at Breightmet, near Bolton, who are converting the premises into a bleachworks. For this purpose extensive alterations are being undertaken. When completed and fully in going order, the bleachworks, it is said, will employ nearly 150 workpeople.

Machinery at the Paris Exhibition.—X.

A SPECIAL calender for treating silk goods, shown by Mr. F. Dehaitre, Paris, is illustrated in Fig. 48, and with the improvements made it has become a machine which gives a perfect finish to silk tissues and their imitations. It comprises three bowls, the upper and lower ones made of special linen paper, and the middle one of chilled and polished cast iron This latter bowl is hollow, and can be heated with steam or gas. The frames, being open in front, allow an easy removal of the bowls. By means of suitable levers the pressure can be regulated and the paper bowls instantaneously isolated from the heated bowl. At the back of the machine a fluting cylinder is arranged, made of polished steel and heated by steam, the object of which is to raise the grain or pattern of the fabric. Brass guide rollers permit the passage of the tissue to be varied according to the requirements of the desired finish. The machine has brakes for unrolling and for lapping on, a set of gear wheels for frictioning as desired, and a perfected system of lubricating all the sliding surfaces economically. It may be driven by a belt—or, better, by an electric motor. The exhibited machine was driven directly by the latter means.

Fig. 49 shows the piece-mercerising machine (David's patent), and Fig. 50 the hank machine by the same inventor. The method of working in both these machines will be seen by the illustrations.

Fig. 51 gives the hank-dyeing machine on the Caron-Dehaitre system, a system which is said to give good results, and by means of simple apparatus to reproduce all the hand operations. The rollers are quite free at one end, and of triangular section with rounded corners, and are eccentric on their spindles in order to open the hank by their rotation. An intermittent rotary motion is imparted to them by means of a clutching cam. The whole of the rollers are mounted on a carriage, movable in its longitudinal direction, which receives a forward-and-backward motion by means of a connecting rod. A rack motion, operated by a hand wheel, permits the entire carriage to be lifted so that the hanks are completely raised out of the dyebeck The preparation and feeding of the dyebath are thereby facilitated, as well as the dripping, putting on, and removal of the hanks. The dyebeck is made of wood, the interior being lined with copper sheets. The heating is done by steam, and also by contact with a serpentine coil.

Fig. 52 is a hydro-extractor with direct electrical driving. The arrangement of this machine is very ingenious; the field magnets are cast in one with the casing, and the armature keyed directly upon the shaft of the cage, which it drives without intermediate gearing. There is consequently no pressure upon the shaft, and the footsteps work under the most favourable conditions. A double machine was also shown. As is well known, the starting of a hydro-extractor absorbs during several minutes a considerable power. But if in the double machine the second cage is put into action while the first is running at full speed, this will act as a fly-wheel to start the second without the belt or motor having to bear too much strain. The inertia thus absorbed will slow off the first cage, which can then be easily stopped to allow the second cage to attain its full speed. There was an interesting collection of laboratory machinery, consisting of small sizing, drying, jigging, and printing machines. A series of small engines suitable for driving calenders, printing machines, etc., were also exhibited, as were coloured drawings of machines, made by the firm, which could not find space in the Exhibition.

(*To be continued.*)

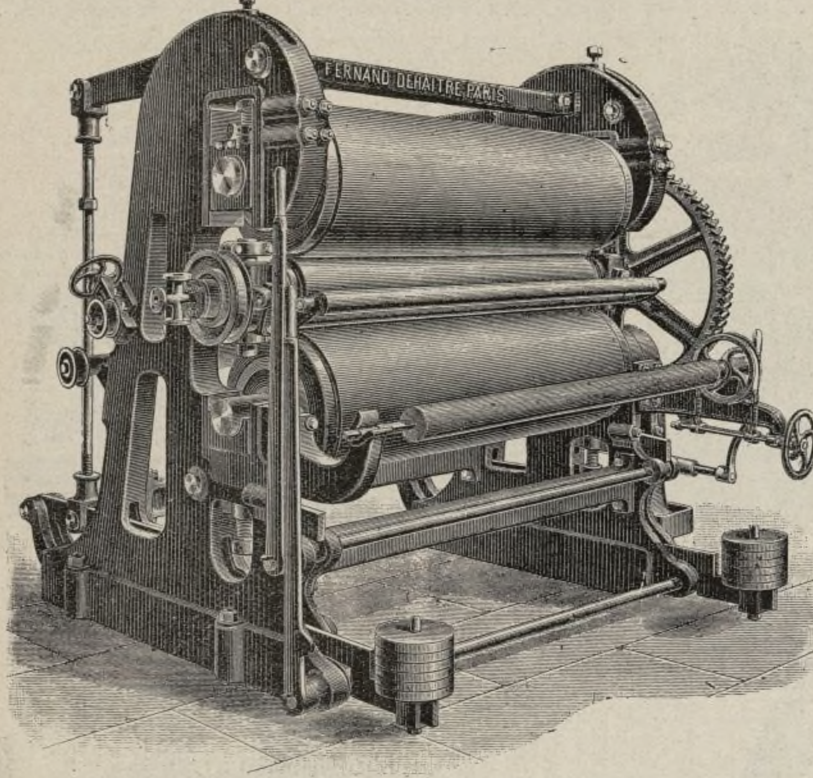


Fig. 48.

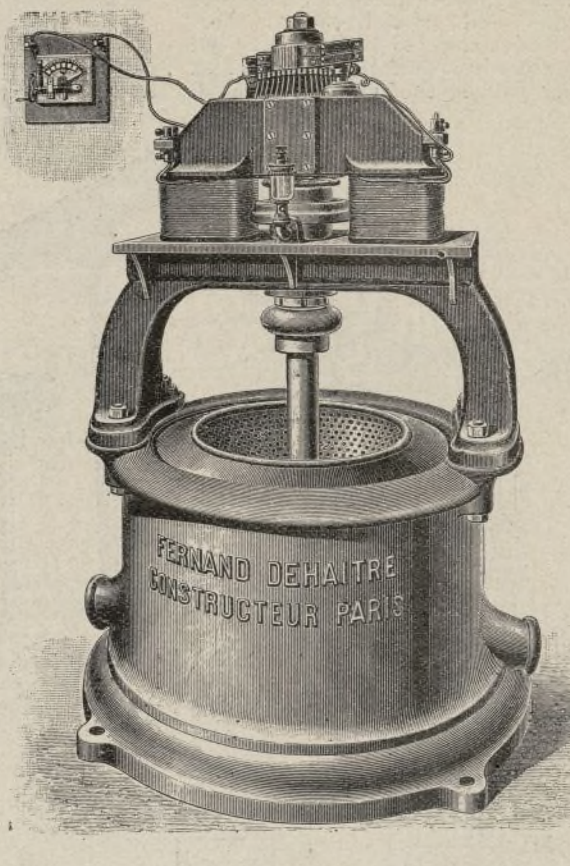
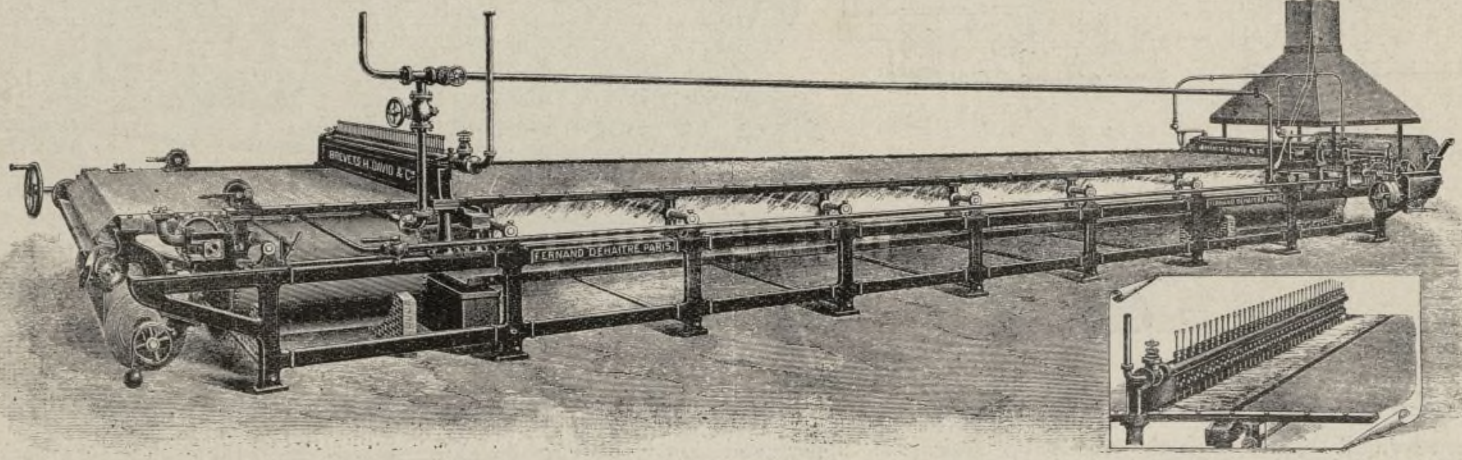


Fig. 52.



Machinery at the Paris Exhibition.—Fig. 49.

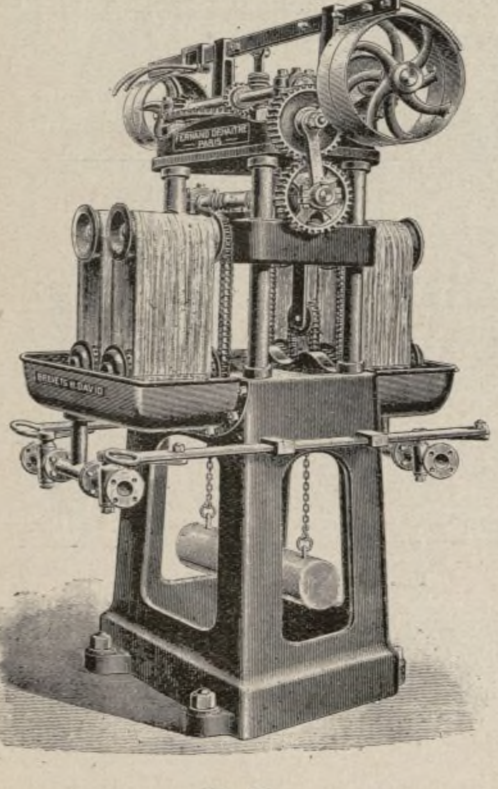
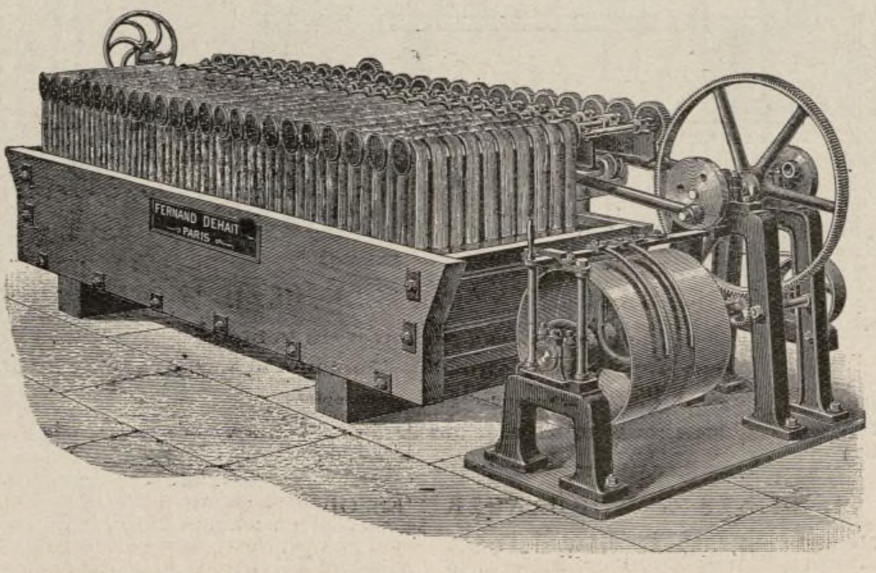


Fig. 50.



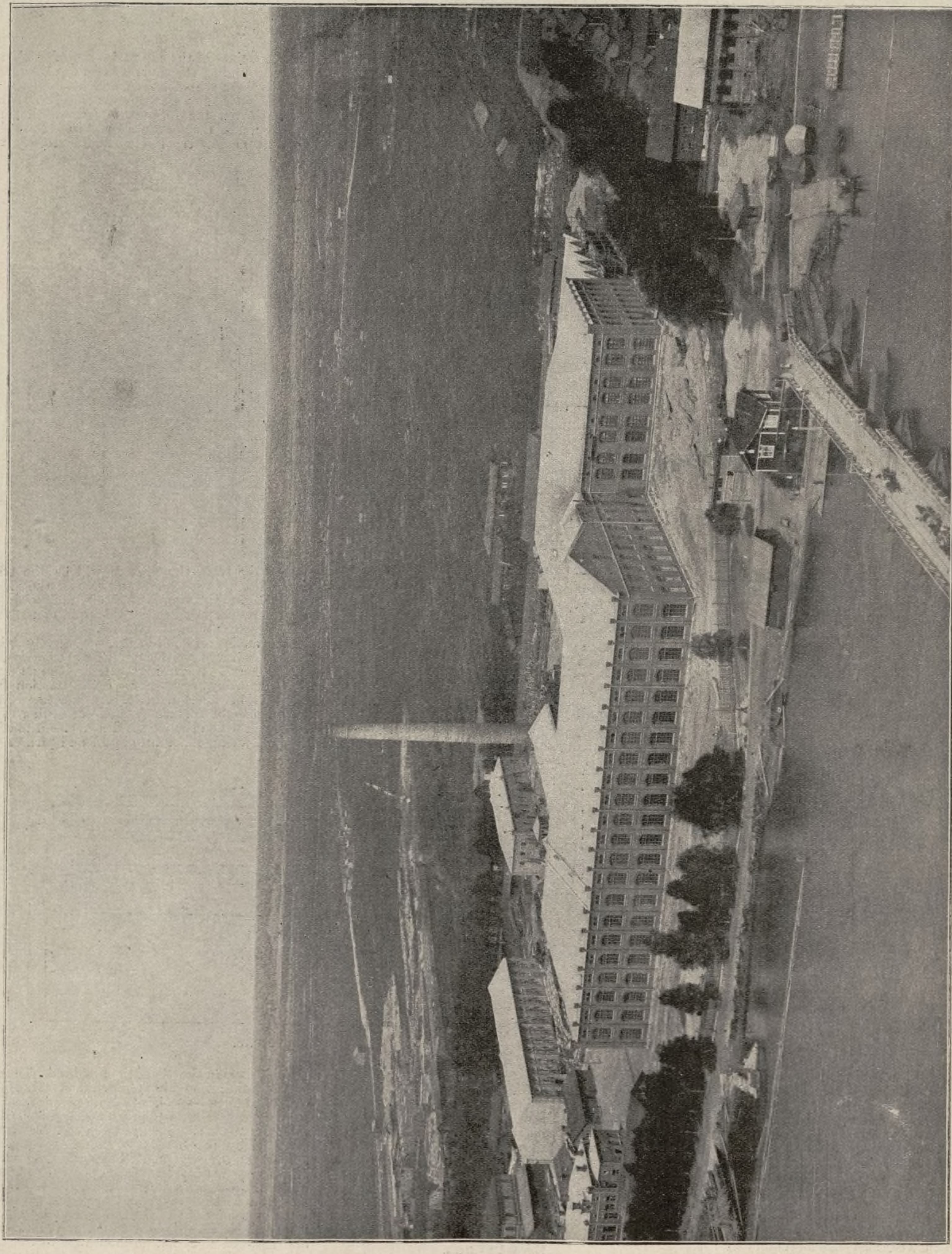
Machinery at the Paris Exhibition. Fig. 51.

New Cotton Mill in Finland.

A NEW cotton mill at Björneborg, in Finland, has recently been erected by the Björneborgs Bomullsmanufaktur Aktiebolag Porin Puuvillateollisuus Osakeyhtiö, and has been supplied throughout with English machinery; in fact, with the exception of the boilers, the whole of the plant comes from the Bolton and Blackburn districts of Lancashire.

The spinning department has been supplied by Messrs. Dobson and Barlow Limited, of Bolton, and the plant consists of a bale breaker, with elevating and mixing lattices; 2 automatic self-regulating hopper feeders; 2 large-size double cotton openers, with vertical cone-feed regulator, pedal motion, and self-regulating trunk feed motion; 4 single scutchers (2 intermediate and 2 finisher), with vertical cone-feed regulator and pedal motion; 32 revolving flat carding engines, with anti-flexion flat-grinding motion; 12 drawing frames of 8 deliveries each; 4 slubbing frames of 72 spindles each; 4 intermediate frames of 132 spindles each; 12 roving frames of 168 spindles each; 20 twist ring frames of 388 spindles each; 6 weft ring-spinning frames; 2 quick-traverse drum-winding frames; 3 ring-doubling frames of 370 spindles each; 2 flier-doubling frames; 12 double bobbin reels of 80 hanks each; and 2 yarn-bundling presses.

There have also been supplied complete installations of wadding, banding, and balling machinery, with tools for the mechanics' shop. The weaving machinery, consisting of 203 looms and the necessary preparing plant, has been supplied by Messrs. Henry Livesey Limited, of Blackburn. The four-cylinder triple-expansion engine of 1150 I.H.P. and the mill gearing have been supplied by Messrs. J. and E. Wood, of Bolton; whilst the boilers have been made by Messrs. Babcock and Wilcox Limited.

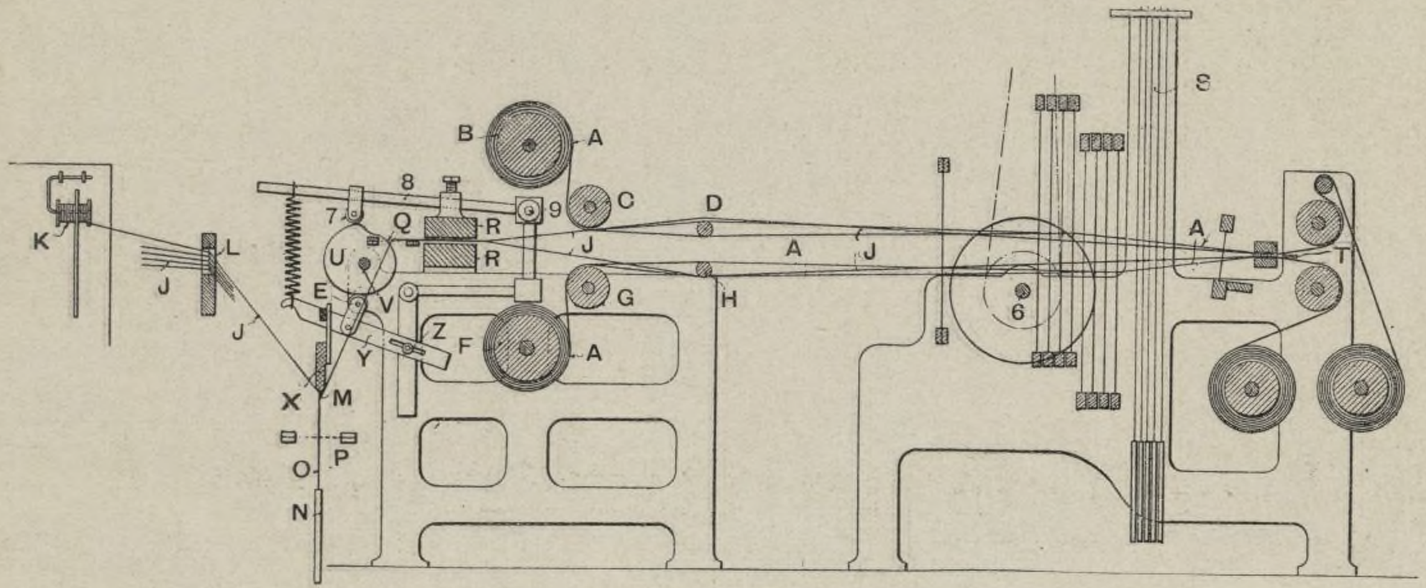

NEW COTTON MILL IN FINLAND.

ANOTHER mill is to be erected in Royton. A site has been taken at the corner of Shaw-road, and the mill is to accommodate 80,000 spindles, with the necessary cardroom preparatory machinery for the spinning of Egyptian yarns. The company is to be called the Delta.

Plush Loom.

MR. E. LEROUX, 5, RUE DU MAIL, PARIS.

IN the usual arrangement for weaving two plush or velvet fabrics face to face, previous to the cutting which serves both to cut the pile and separate the two cloths, trouble is frequently caused by the differing tension of the pile threads. This may, as a rule, be obviated when weaving plain goods by having the pile threads warped on a beam; but in making figured goods such is impossible, for different portions are weaving at the same time, ground or figure, as the case may be. The tension which holds the two fabrics apart is really the factor which determines the height of the pile, but if some threads are drawn off from their bobbins more easily than others, the differing tension of the threads results in different heights of pile.



PLUSH LOOM.—FIG. 1.

The new attachment to the plush loom regulates the pile threads at a point between the bobbins holding the yarn and the place where they enter the back shed of the loom. This regulating device simply consists of a bar which rests upon all the pile threads and depresses them so as to allow the requisite amount being paid off, and so measure the exact length required for the length of pile. At the back of the loom a pressing device grips the pile threads, while the regulating device operates to regulate the depression of the pile threads in front of the loom. This act of gripping the threads at a point between their bobbins and the warp shed has been found necessary to prevent the two cloths being drawn towards each other when the pile threads are measured off.

A longitudinal section of a plush loom is shown in Fig. 1, with the regulating device attached; but this latter apparatus is better seen in Figs. 2 and 3, which are side and end views respectively. The ground warp threads A which form the backing of the upper fabric are wound upon the beam B, pass beneath a guide roller C, then on either side of the lease rod D, and on to the back healds. The warp for the ground of the lower cloth is similarly arranged, being wound on the beam F, passing on to the guide roller G, then on either side of the lower lease rod H, and on to the front healds. The pile warp threads J are wound on bobbins K which are mounted on a rack. The pile warp threads pass from their bobbins through a grid or comb L, and then through a series of rings or eyes M, to which are suspended weights N; the suspending cords O of these weights pass through another grid or comb P. On issuing from the rings M, the pile threads J pass through another comb Q, and then between the jaws R of a gripping device, one of the jaws being stationary, and the other capable of being operated. The pile threads are then divided into two groups and pass respectively around the lease rods D or H, and then to the jacquard. The two fabrics are severed from each other by a knife T situated at the end of the loom, and are finally wound upon separate rollers.

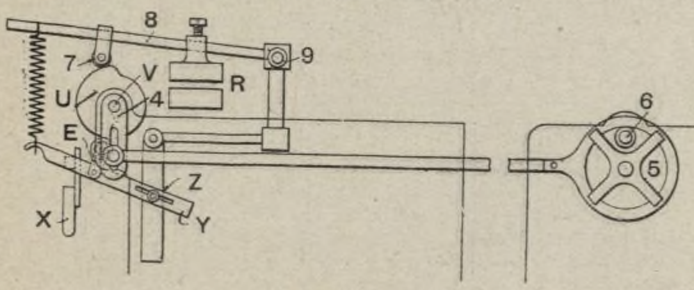
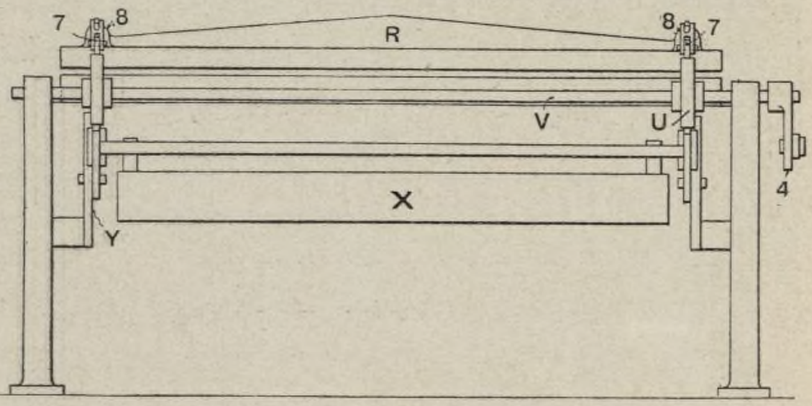


FIG. 2.



PLUSH LOOM.

FIG. 3.

Above the rings M is mounted the tension-regulating device, which is in the form of a transverse bar X rigidly secured at each side of the loom to the levers Y pivoted on the frame of the loom at Z, and each carrying an arm E having a small bearing roller at its extremity, these levers being operated by cams U operating on the bearing rollers, the cams being mounted on a transverse shaft V, to which an oscillating motion is imparted by a crank 4 operated by an eccentric 5 mounted upon the driving shaft 6 of the loom. Each of the bearing rollers of the levers Y is kept in contact with its cam U by coiled springs connected to the outer extremities of the levers Y and to the tails of levers 8. Upon the cams 2 rest other rollers 7 mounted on levers 8, which are pivoted at 9 at each side of the loom. The levers 8 under the action of the cams U lift the upper movable jaw R of the gripping device at the proper times to allow the two fabrics, as they move apart during the weaving operation, to draw the pile threads J necessary for the production of the design.

At each shoot woven the upper jaw R of the pile warp-gripping device rises, and the necessary pile threads are drawn by the two fabrics in their motion apart. Then the upper jaw R falls upon the pile threads J, which are thus held securely, this allowing the regulator bar X which descends under the action of the cams U to unwind from the pile warp bobbins K the length of pile threads necessary for the following shoot of weft, without putting tension upon the portion of the pile threads between the gripping device constituted by the jaws R and the two fabrics in course of weaving. The result is that the fabrics in moving apart to form the pile have only to overcome the very slight resistance due to the small weights N, which have only to be raised, since all the pile threads have been previously depressed below the tension-regulating bar X to the necessary distance, except those already depressed at the preceding operation and not utilised in the design of the fabrics.

Shuttles.

THE shuttle is approximately boat shaped, or it may be called an elongated parallelopiped, hollowed out, the ends of which are tapered and fitted with points or tips. The hollow or opening in the shuttle serves to hold the weft pirn. In weaving, the shuttle serves to protect the weft and facilitate its drawing off. It is made either of wood or iron. The kinds of wood used are hornbeam, gervise, olive, apple, and especially boxwood. Lately, shuttles made of compressed wood have also come into use. Their manufacture requires great care so as not to split the wood at the ends, where the steel tips are fixed.

The weft is drawn off by the propulsion of the shuttle. If P is the weight of the shuttle, p the weight of the cop or spool it contains, v its velocity, and g the acceleration of gravity, the inertia energy will be—

$$\frac{(P+p)v^2}{2g}$$

As the weight of the cop varies at each pick, the speed acquired by the shuttle under the blow from the picker will likewise vary, and in consequence the tension the weft threads receive is not regular. From the formula it follows that the construction of the shuttle should vary according to the fineness of the tissue—that is to say, the coarser the weft, the greater will be the effort required to draw it off, and the heavier the shuttle must be. In other words, the weight of the shuttle must be proportional to the thickness of the weft, or in inverse ratio to its number.

The shuttles for hand-looms are generally lighter than those for power-looms, and are sometimes of curved shape. According to their being thrown by hand or by means of a picking motion their construction differs a little. All shuttles in this section may be further divided—according to the manner in which the weft is drawn off—into winding-off, drawing-off, or into spool and pirn or cop shuttles.

Fig. 1 shows a shuttle of the first kind. The weft bobbin, being wound in cylindrical, rhomboidal, or oval form upon a spool, is placed upon a spindle C. In R there is a helical spring which allows of the insertion of the spindle into the holes. The thread supplied by the bobbin by winding off passes through an eyelet O of porcelain, glass, metal, etc. In working any sort of shuttle, the eyelet O must be turned towards the cloth side, so as to draw off the yarn without effort and to prevent its being worn by the reed. The shuttle shown by Fig. 1 is intended for throwing by hand, and the ends A are deflected so as not to catch against the dents of the reed. In certain cases of weaving from spools, the tension of the weft is increased, especially with silk spools. This resistance to the winding-off is effected in two different ways:—(1) By pressure of the spindle; and (2) by pressure of a plate against the bobbin.

The pressure of the spindle is exercised upon the interior of the spool by means of bent springs. This way of producing frictional resistance is irregular, and depends upon the position of the bobbin while being wound off. The other system of pressure is applied by means of a plate arranged in the bottom of the shuttle, which is pressed against the bobbin by means of a spring. The tension obtained by this means is more regular than that upon the interior of the spool.

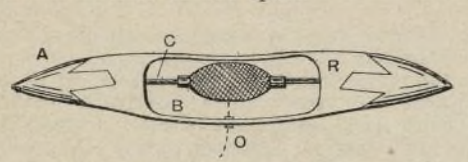


Fig. 1.

Fig. 2 represents a shuttle for pirns. This way of drawing off is still called in France "à la Carribary," after the inventor's name. As the pirn remains stationary, the thread is drawn off over the end and in the direction of the axis of the pirn. The tension is obtained by various

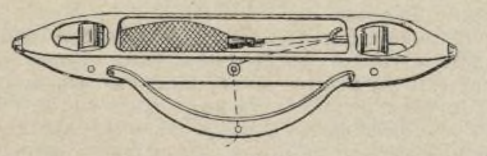
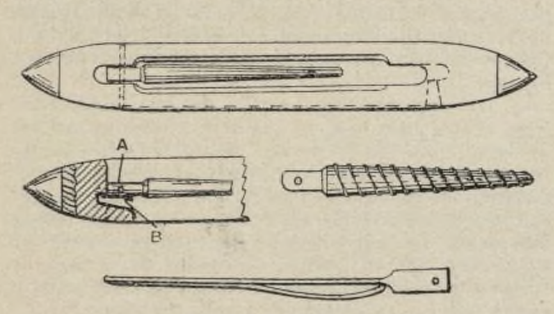


Fig. 2.

bendings of the thread. As the drawing-off takes place in a direction almost perpendicular to the direction of the weft thread on the pirn, it will be easily understood that the slightest roughness in the pirn or its winding causes an additional tension on the weft, which sometimes reaches to the breaking strain. Shuttles for pirns or cops are now generally used for single weft, those with spools being employed for doubled weft yarns. After all, the



Figs. 3, 4, 5 and 6.

regularity of the tension during the drawing-off is never absolutely equal, as the weft comes off more or less easily according to the thickness of the cop. In these pirn shuttles the weft, before passing through the eyelet, is taken over a hook.

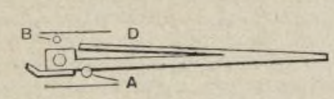


Fig. 7.

The shuttle, Fig. 2, is provided with rollers to facilitate the throwing. All shuttles of this kind are called fly-shuttles. The one in Fig. 2 is also provided with a crescent-shaped conductor for laying the weft more parallel to the cloth, and at as short a distance as possible. These shuttles with conductors are only employed in silk weaving.

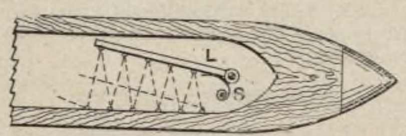


Fig. 8.

In weaving by power, pirn or cop shuttles are used, and they may be classified according as the weft is wound in pirn, tube, or cop form. These shuttles do not differ in shape, but only in the arrangement of the recess or hollow of the shuttle. All shuttles for power weaving are either right or left, according to the arrangement of the eyelet at

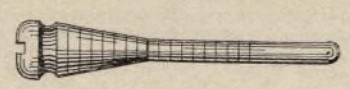


Fig. 9.

the right or left hand. This is of importance in looms with weft stop motions, for on account of the motion being arranged on the driving side, the shuttle, when in the corresponding box, must have its eyelet close to the weft fork.

Pirn Shuttles.—Fig. 3 represents a shuttle used in weaving worsted, shown in plan. The spindle is covered with wood, and can be turned round the pin A, Fig. 4 (vertical section). A flat spring B prevents this occurring of itself. To prevent the rubbing of the weft against the cheeks of the shuttle-box, there is on the side of the eyelet a groove in the side of the shuttle. When the tension is to be increased, the weft, before passing through the

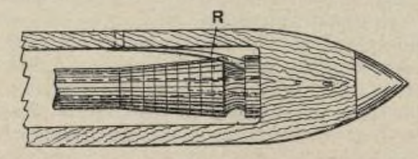


Fig. 10.

eyelet, is led over a piece of cloth glued to the shuttle, or belted to a tuft of threads fixed in the shuttle. It will be noted that the shuttles for power-looms are more tapered than those used for hand weaving, whereby they are better enabled to clear the shed when it is not sufficiently opened. The spindle, Fig. 5, greatly facilitates the fixing of the cop.

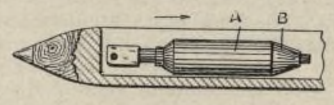


Fig. 11.

This spindle is formed by a conical tube of tinplate, round which a brass wire is soldered in spiral form. This wire forming a screw, it is easy to put the cop on to the bottom by slightly turning it. The thread is drawn through the eyelet by suction, the weaver holding the shuttle to the mouth. Many

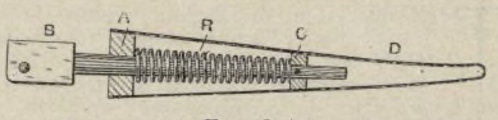


Fig. 12

weavers, however, use a small hook. There is also a small air pump, which, fixed on the breast beam, can perform this operation rapidly and without danger to health. The shuttles for the Northrop loom have no eyelet, or rather the latter is replaced by a helical slit, permitting a self-acting introduction of the thread. Such shuttles should be recommended for all looms, for they are the means of

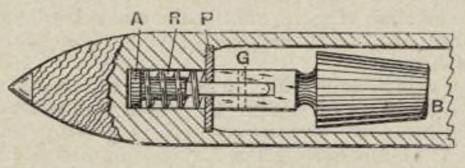


Fig. 13.

saving both time and material in drawing through the weft, while relieving the weaver from sucking. (This rather injurious operation is performed about 100,000 times yearly by a weaver.)

The spindle of shuttles for cotton differs slightly from the preceding ones. As Fig. 6 shows, it carries a flat spring for holding the tube of the cop. Fig. 7 shows a modification of this system. The spindle

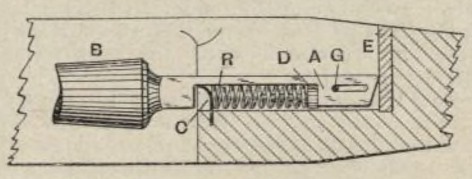


Fig. 14.

when turned into the shuttle, occupies the position shown on the drawing—that is to say, it rests against the pin A. When it is turned upwards, the flat spring D encounters a wire B which presses it back, when the cop tube can be removed without effort. Shuttles for cotton generally have two or

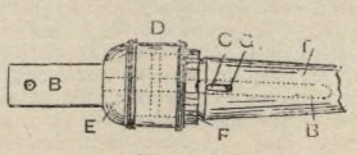


Fig. 15.

three eyelets, in order to impart more tension to the weft. The latter is drawn off at the upper part of the shuttle, so as to prevent its being spotted or dirtied by the cheeks or bottom of the shuttle-box.

Shuttles for silk must contain some kind of tension or check mechanism to prevent the weft running out too freely. The types of these devices are numerous, one of the most approved being shown in Fig. 8, and consisting of a small lever L, which is continuously acted upon by the spring S, and carries a number of rings arranged opposite to other rings fixed on the interior wall of the shuttle. The weft thread, being passed through these rings,

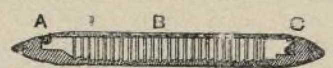


Fig. 16.

is exposed to sufficient tension to prevent slackness. When the weft is wound on a wooden bobbin or pirn (Fig 9), the latter is held in place on a fixed short tongue by a flat spring R, which

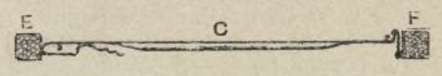


Fig. 17.

engages in a recess cut round the base, as shown in Fig. 10. In the Northrop loom the internal tongue is dispensed with in order to facilitate the rapid ejection of the cops, these being held by two flat springs, like R in the figure last referred to.

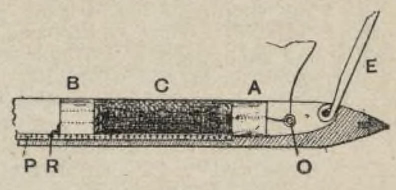


Fig. 18.

Shuttles with Anti-vibration Tongues.—The object of these anti-vibration tongues in shuttles is to prevent the coils of weft slipping out of place over the nose of the cop, since when this occurs the cop

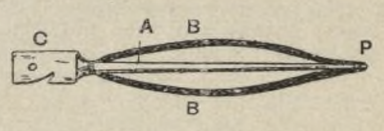


Fig. 19.

is wasted. There are two causes tending to produce this slipping: improper setting of the cop on the tongue, owing to the weaver turning the bobbin the wrong way round, and the force of

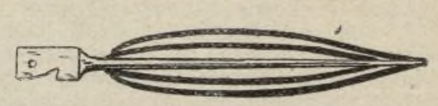


Fig. 20.

inertia when the shuttle is suddenly picked or stopped, the result being to throw the windings of larger diameter (A, Fig. 11) forward on to the tapering end B of the cop, the shuttle

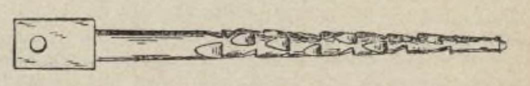


Fig. 21.

being supposed as moving in the direction shown by the arrow. During the return throw of the shuttle the force of inertia is without any appreciable influence on the cop; in other words the cop has a tendency to strip on reaching

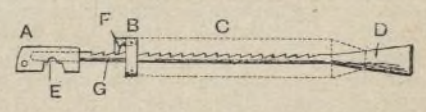


Fig. 22.

the box on the opposite side from the driving gear. In order to nullify this effect of inertia, various inventors have introduced tongues capable of slight longitudinal displacement, the recoil being effected by means of a spring. It should, however, be observed that this movement is of

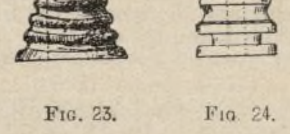


Fig. 23. Fig. 24.

utility in one direction merely; the tongue may be drawn out, but not pushed towards the rear. The idea of this device is quite twenty years old, but has only been developed in practice within the last six years.

One of the most recent forms is the Castelin shuttle. But several anti-vibration shuttles at resent in use will now be described. Fig. 12 shows the Duhamel shuttle, wherein the tongue B is fixed, whilst the tinplate cone D, on which the cop is placed, is mounted on the coiled spring R, the latter being compressed between the fixed ring C on the tongue and the ring A which is fixed to the cone, but slides over the tongue. By this arrangement the stopping of the shuttle on arriving at the end of its throw causes the spring R to undergo compression in one direction, the recoil following by a movement of elongation in the opposite direction.

The Verschaeve shuttle is represented in Fig. 13. Here the tongue B is keyed on to the bolt A by the peg G. A coiled spring R, held between the head of the bolt A and the metal plate P, resists the longitudinal displacement of the tongue B in the direction from the base towards the point.

Fig. 14 shows the Boursier and Bondeau shuttle. The tongue B has a shank A containing a slot, into which is fitted a pin G which, while restricting the movement of the tongue, allows it to turn up when required to fit on or remove the cop bobbin. The elasticity of the tongue is obtained by means of the coiled spring R, held in place between the flat spring C (which rests in a notch in the shank A) and the stop D.

In the Soots' shuttle (Fig. 15) the tongue is fixed, so far as axial movement is concerned, whereas the tube T, which is able to slide on B, has a slot C containing a peg G, by means of which arrangement the sliding movement of T is restricted to the length of the slot C. A piece of indiarubber tubing D is firmly tied on to the wooden rings E, F, of which E is fastened on to the tongue B, whilst the other is fixed on to T. Thus the displacement of the tongue is permitted by the elasticity of the rubber sleeve D. Numerous other cop or pirn shuttles exist, the foregoing having merely been cited as typical examples.

Ball Shuttles.—The use of balls or cocoons of yarn in place of cops is spreading in power-loom weaving, owing to the possibility of getting a greater length of thread into the shuttle at a time, and consequently reducing the loss of time consumed in refilling, etc. Besides, this system has been in use a long time in weaving low counts of carded wool, jute, hemp, etc., yarn. The cocoons may be unwound in two ways: outside from the point, and inside from the base. Each of these methods has its advocates and its particular type of shuttle.

Shuttle for Inside Unwinding.—This system of unwinding is chiefly applied to low counts of weft yarn. A typical shuttle is shown in Fig. 16. It is made of wood with steel ends, and encloses the ball in its central cavity, the inner walls being fluted in order to increase the capacity and to prevent the ball slipping. The ball is merely inserted in the shuttle and kept inside by closing the hinged cover B, the curved outer end of which engages with a hook C. In these shuttles the weft runs off through a porcelain eyelet, the tension being imparted by a pin or wad of wool, as in the preceding systems. In shuttles of this type for jute, hemp, etc., the cover B is provided with dents on its interior surface, these serving the same purpose as the flutings already mentioned. It will be also found that in large shuttles the hole in the cover through which the hinge pin passes is made oval in order to allow the cover a little longitudinal play.

The shuttle cover represented in Fig. 17 was invented by S. Davenport, and devised to prevent the splitting of the wood by the peg, the vibration of the cover being deadened by the insertion of indiarubber washers E and F between it and the wood. It is advisable to provide one or two square peepholes in the shuttle cover to facilitate examination of the ball, especially for those used in jute or linen weaving, if no weft-fork stop motion is employed in these looms. Consequently, when peepholes are made it is easier to see how much weft still remains in the shuttle, and when the latter will need refilling.

Uniform tension of the weft is ensured by the Demarcq shuttle (Fig. 18), wherein the ball is placed between two wooden washers A and B, the former being fixed, whereas B can be adjusted along the rack P, situated in the bottom of the shuttle, and is prevented from giving way by the engagement of the pawl R against the rack, though it may receive a forward displacement under the influence of inertia. The cover E encloses the movable washer and the cocoon, and the thread is run out through A and the eyelet O. This shuttle is suitable for weaving fine counts of linen, cotton, etc.

Shuttles for Outside Unwinding.—In all shuttles of this type the ball is slipped over a tongue, just as when cop bobbins are employed. Fig. 19 shows the usual tongue for this purpose (A), made in one piece with the shoulder C, and fitted with two steel springs B, which are soldered at P, but free at the opposite end; and their arched portion acts on the inner surface of the ball and holds it in position.

The Demarcq shuttle (Fig. 20) contains a double set of arched springs and is very efficient, since the application of pressure at any one point along the ball causes the springs to expand towards that point, and therefore prevents the displacement of the ball.

Serrated tongues, such as that shown in Fig. 21, are largely employed in linen weaving; they hold the ball in place by the fact that the teeth engage with the coils of the thread. Anti-vibration tongues have been recently applied to this type of shuttle, the use of the Verschaeve, Soots, Castelin, and other devices in shuttles of the kinds shown in Figs. 19 to 21 preventing much inconvenience due to stripping.

The Demarcq tongue (Fig. 22) ensures perfectly regular tension on the weft. This tongue may be raised at the base A for placing the ball in position, and, once lowered, the tongue is fixed by the slot E engaging with the peg. The lifting of the tongue at the base is entailed by the presence of the conical head D, against which the ball of weft abuts. A wooden washer B, slipped on the tongue after the ball of weft, is provided with a pawl F which engages with the teeth of the rack G, so that as the weft unwinds the force of inertia moves the washer B on towards the conical head D, and thus compresses the remaining weft. When the ball is unwound from the outside, there arrives a time when the running of the thread meets with opposition caused by the shape of the ball. To prevent this, the core pieces shown in Figs. 23 and 24 are employed as a foundation in building the ball.—"L'Industrie Textile."

Feed Pumps and Feed-water Heating.

THE operation of getting water into a steam boiler is so closely interlinked with the operation of heating it, that it is scarcely practical to consider the two separately. It is unnecessary to point out the saving obtainable from heating the feed water; this is amply and strikingly demonstrated by the fact that using live steam to heat the feed water before it enters the boiler is more economical than putting it in cold. But it is frequently perplexing to determine just what method of heating and what means of delivering the feed water will be most economical. The first cost of the apparatus considered enters into the question, of course, as the interest and cost of maintenance form part of the operating expense of the plant, and the class of help obtainable must also be considered, simplicity frequently being preferable to economy.

Speaking generally, it is safe to assert that for all plants of a size too small to justify the installation of economisers, it is good practice, says L. B. Mather, in the "American Electrician," to employ heaters in the exhaust pipes of the engines, absolutely regardless of the condensing question. If the plant be non-condensing, it is a self-evident proposition that exhaust steam heaters are imperative; even if the exhaust steam be used for heating purposes, it will usually pay to put in a heater between the engine and the heating system, taking care, of course, that the steam shall not be robbed of so much heat as to make it useless for radiator service. In such a case, still speaking generally, it will probably be advisable to use some form of steam pump for boiler feeding, in order that the exhaust from the pump or pumps may be utilised for further heating the feed water in secondary heaters.

It goes without saying that the pump to be used should be of the highest efficiency possible. Ordinary simple direct-acting steam pumps require from 100 to 150lb. of steam per horse-power hour; compound pumps of this type require from 60 to 90lb.; simple fly-wheel pumps, which are really pumping engines on a small scale, may be had that will develop a horse-power on 50lb. of steam an hour; a compound fly-wheel pump requires from 30 to 50lb. of steam per horse-power hour. The writer once came across an odd type of small pumping engine which had one water and two steam cylinders mounted side by side, all three being single acting. There was a single valve between the two steam cylinders which cut off the steam at one-third stroke, no variation of cut-off being provided. The speed was regulated by means of a globe valve in the steampipe, just as the ordinary direct-acting pump is controlled, and it showed the remarkable economy of 38lb. at full load and 45lb. at two-thirds the normal speed. The only reason that can be conceived for the failure of this "freak" pump to become an important factor in the market was the cost of building it.

To revert to the specific subject under discussion: In non-condensing plants where the exhaust steam from the main engines is wholly available for heating the feed water, it will generally be found advantageous to employ electrically-driven boiler-feed pumps for regular service, and to provide a single auxiliary steam pump for use at such times as the electrical equipment may be shut down. A good non-condensing engine will deliver a horse-power on 28lb. of steam an hour, and a decent generator will convert this power with an efficiency of 93 per cent.; the losses in a motor-driven pump should be somewhere near 40 per cent.—say the combined efficiency of the generator and the motor-pump is 56 per cent.; then the pump will deliver a horse-power of 50lb. of steam an hour, which compares with an unusually good compound direct-acting steam pump or a simple fly-wheel pump. Considering simplicity, therefore, as well as economy, the motor-driven pump is preferable, as a fly-wheel pump is a much more complicated mechanism, besides requiring a considerable amount of small piping which has extravagant radiating surface. It seems entirely justifiable, therefore, to say that electric motor-driven pumps are preferable to either of the other types under average conditions for boiler feeding in non-condensing plants, where the feed water can be sufficiently heated by the engine exhaust.

In condensing plants, primary heaters will be found advisable under average conditions. Of course, if the plant is a very large one, economisers claim consideration, but in a plant of ordinary size an economiser is usually barred by the cost of installation and attention. A primary heater will bring the feed-water temperature from 40 to 50 up to about 110° F.; a higher temperature could be secured by imposing back pressure on the engine, but this is obviously not good practice with a condensing engine. It will be advisable, therefore, to still further heat the feed water by passing it through a secondary heater after it leaves the primary heater. If sufficient heat can be obtained from the exhaust steam of the air, circulating and boiler-feed pumps to carry the feed-water temperature up to about 200° F. without deliberately using pumps of low efficiency for the sake of their exhaust heat, then the combined exhausts from all the pumps should be passed through the secondary heater.

If, however, the efficiency of the auxiliaries is so high that a gain of only 40 to 50° in temperature is obtainable in the secondary heater, it will usually be advisable to run the pumps condensing, still passing the exhausts through the secondary heater in order to extract as much heat as possible before delivering to the condenser, and to reinforce the secondary heater with live steam led from the receiver or the high-pressure exhaust of the engine. If the engine is provided with a reheater which superheats the receiver steam, then the steam used in the secondary feed-water heater should be taken out from the high-pressure exhaust before that steam reaches the reheater, in order to avoid a waste of superheat. The plan outlined would be almost universally more economical than to sacrifice the efficiency of the pumps in order to obtain sufficient heat from their exhaust steam to give the feed water the proper temperature. Air and circulating pumps should preferably be engine-driven; but whether they are of this type, or are ordinary forms of direct-acting pumps, they should be run condensing unless their exhaust steam added to that of the boiler feed pumps will supply sufficient heat for the feed water without robbing the engine receiver.

Belt-driven pumps are not, as a general rule, commendable for boiler feeding on account of their inefficiency at partial loads when driven at constant speed, as they would have to be in all modern central stations and isolated plants. If it were practical to vary the speed of the pump according to the requirements of the boilers, without interposing a lot of power-consuming gear, the belted type would show the highest efficiency of any form of boiler feeder.

MESSRS. BARON AND SONS, Rochdale, are having their mill fitted with ventilating fans, which are being supplied by Messrs. James Stott and Co., Vernon Works, Oldham.

ACCORDING to Worrall's cotton trade directory, there was a decrease of twelve firms during the year 1900, and an increase of 480,000 spindles and 2200 looms. It is also shown that four mills are being built, to hold 250,000 spindles. The total number of spindles is put down at 43,119,000, and looms 651,000

MESSRS. ALEXANDER HADDEN AND SONS, woollen manufacturers, Aberdeen, have disposed of two large branches of their business to two different Yorkshire syndicates, the spinning of knitted worsted being transferred to Messrs J. and J. Baldwin and Partners Limited, and the manufacture of hosiery to the Trevor Manufacturing Company Limited.

IN regard to the trials of motor vehicles for heavy traffic, which the Liverpool Self-propelled Traffic Association have arranged to carry out next June, a fourth class has recently been added, to include vehicles which would otherwise be debarred. In this new class there are no restrictions upon the tare or platform area, and the minimum load is four tons. The association, which is the local centre of the Automobile Club of Great Britain and Ireland, has its local headquarters at the Royal Institution, Colquit-street, Liverpool.

RAW MATERIALS, PROCESSES, FABRICS, &c.

The Cotton Fields of the World.

(*Concluded from page 95.*)

SOUTH AMERICA.—Even in the South American cotton states—Colombia, Venezuela, Dutch Guiana, Peru, Brazil, and Paraguay—production has, upon the whole, declined. Accurate statistics of area and production are lacking, and even export statistics are defective. Something over £20,000 worth of cotton were given as the exports of Venezuela in 1892, but this is probably a considerable underestimate. In the 'sixties the American civil war gave to Colombia the opportunity to compete, and cotton was planted with Egyptian seed; but after the war it ceased to compete, and greatly deteriorated. The area under cultivation in Venezuela in 1883 (the last year for which figures exist) was about 5000 acres, with a production of about 2,000,000lb. The production of Dutch Guiana is given at 110lb. According to the latest estimate of Peruvian production, the crop amounted to about 9,500,000lb. For the year 1895, however, the exportation is given at over 12,000,000lb., and for 1897 at about 12,333,000lb. The peculiarities of the Peruvian cotton, especially of the Piura variety, rendered the demand very great; but the production depends largely upon the climatic conditions, and especially upon the rains which recur every seven years. The production cannot be said to be increasing very rapidly. In the beginning of the 'seventies Brazil was one of the principal cotton countries of the world, but the immense extension of the cotton industry in the United States caused the Brazilian production to decrease largely. The more recent revival of cotton planting in Brazil has not been due to any increase of the possibility of exportation, but to the rapid growth of the domestic cotton industry. Brazilian production of cotton from 1871 to 1875 averaged about 110,000,000lb.; for the year 1874, 89,000,000lb.; and for the year 1880, only 30,000,000lb.; but since then there has been an increase, and the production now amounts to about 45,000,000lb. The principal cotton territories of Brazil are the northern provinces of Pernambuco and Marahão. Especially for Pernambuco is the improvement in the home industry of value, and there are large deliveries made to the cotton factories of the city and state of Rio de Janeiro. These deliveries amounted to 24,000,000lb. from June to October, 1898. In Paraguay the production, although very small, is on the increase.

Australia.—The production of Australia and Australasian islands has never been of great importance. In the beginning of the 'eighties the production was estimated by Ellison at 2000 bales, or 800,000lb., an estimate which was also true at the beginning of the 'nineties. In some districts the production is on the increase, in others on the decline, but the production is small and is decreasing. The chief production is in the colony of Queensland.

EXPORTATION.

British India.—While the United States produces two-thirds of the cotton of the world, or in other words, twice as much as is produced in all other countries, the proportion of her exports is even greater, the chief competitor of the United States (India) exporting less than one-half of her crop, while the United States exports two-thirds of her crop. The tendency of the last two decades has been toward an immense increase in the exportation of cotton from the United States, and in general in a partial deflection of the American export from Great Britain to Germany and Italy. In the decade from 1881-90 Great Britain took 62 per cent. of the States total exports as compared with 45·8 per cent. in 1897-98, while during the same period the exportation to Germany increased from 12·5 to 22·4 per cent. of their total crop. In other words, the exportation to Germany was only one-fifth as great as that to Great Britain during the decade from 1881-1890, whereas at present (1897-98) it is over half, or 53 per cent., as great as the exportation to the British Isles. The percentage of exportation to France has remained practically stationary, as has also been the case with exportation to Belgium and Spain. The exportation to Italy, however, has increased from 2·1 per cent. of the total in the last decade to 5 per cent. in the year 1897-98; while the States exportation to Russia, on the other hand, owing to the greatly-increased production of cotton within the Empire, declined during this period from 4·7 to 1·3 per cent. of the total American exportation. The competition of British India in the exportation of cotton is less formidable than would appear from the statistics of production. Not only is the proportion which their exports bear to their production smaller than is the case with the United States, but this proportion, owing to the rapid increase in the manufacture of cotton goods at home, is rapidly declining. During the period 1884-88 there was an average export of 57·9 per cent. of the total crop, which declined in the year 1889-90 to 52·8, and in 1893-96 to 46·1 per cent., as compared with an average export of about 68 per cent. from the United States. In the year 1897-98 the exportation from India, owing to the fact of an unusual American competition, had declined to 3,700,000cwt. The chief consumer of Indian cotton was Japan, which in 1897-98 took 35·2 per cent. of the total exports from that country. Next in order follow Germany, Italy, Belgium, and Austria-Hungary with 15·6, 13·4, 10·5, and 8·9 per cent. of the Indian exports respectively, these four Continental countries taking over 50 per cent. of the crop, and together with Japan considerably over five-sixths. The percentage taken by Great Britain is only 5·4 per cent., and that by France only 4·6 per cent. of the total Indian export.

The conditions existing in 1897-98 are very different, however, from those which existed in the period from 1885-89. At that time Great Britain took 36·6 per cent. of the export and France 10·4, while Germany imported only 2·1 per cent. of the total Indian export. While the exportation to England and France, therefore, has largely decreased, the export of Indian cotton to countries producing the cheaper grades of yarns, the Continental countries other than France, and above all, to the Asiatic countries, has increased very rapidly. This may be seen by a comparison of the percentage which the different countries take of American and Indian cotton. Thus, Great Britain takes (1897-98) 45·8 per cent. of the entire American export, and only 5·4 per cent. of Indian cotton exported; France, 10·9 per cent. of American, as compared with 4·6 per cent. of Indian; while, on the other hand, Germany takes 24·2 per cent. of the total of American export, and 15·6 per cent. of the Indian; Belgium, 2·2 per cent. of the American as compared with 10·5 per cent. of the Indian; Italy, 5 per cent. of the American, and 13·4 per cent. of the Indian; and Austria-Hungary, which receives practically no American cotton, consumes 8·9 per cent of the total Indian export. The most telling example, however, of the competition between American and Indian cotton, as affected by the cheapness of the goods to be manufactured, is furnished by Japan, which takes only 2·9 per cent. of American export, as compared with 35·2 per cent. of the exportation from British India. The chief ports of exportation of Indian cotton are found in the provinces of Bombay and Sind, in the harbours of Bombay and Karáchi, which take from 82 to 83 per cent. of the total exportation. The chief European ports receiving cotton from British India are Trieste, with 21·7 per cent. of the total export to Europe (1897-98); Hamburg, with 17·5 per cent.; Genoa, with 16·3 per cent.; Antwerp, with 14·2 per cent.; Venice, with 10·9 per cent.; these five cities taking 80·6 per cent., or over four-fifths of the total export to Europe. The cities of next importance are Dunkirk, with 6·4 per cent.; Havre, with 6 per cent.; while Liverpool, which in 1891-92 took 9·5 per cent., received in 1897-98 only 2·8 per cent. of the total exportation to Europe. The rapidly-increasing importation to Trieste shows the importance of Indian cotton to the Austria-Hungarian cotton industry.

Egypt.—While India exports about four-ninths and the United States about two-thirds of the cotton raised in these countries, Egypt exports practically all the cotton raised in that country. From 1881 to 1897 the exportation of cotton from Egypt has amounted to about forty-nine-fiftieths of the crop, and in some years has equalled the entire production of the country; so that despite the immensely smaller acreage (only one-tenth as great), Egypt exports cotton in as large quantities and in larger value than does India. The exportation amounted to an average of about 293,000,000lb. from 1881 to 1890, and to 567,000,000lb. in 1897, although in 1898 the exportation decreased to 529,000,000lb. Of this export by far the largest part goes to the United Kingdom, although the percentage of the total crop of Egypt received by that country is decreasing. In 1890 Great Britain received 62·3 per cent. of all the cotton raised in Egypt as compared with only 43·5 per cent. in 1898. Russia is second in the importation of Egyptian cotton, receiving 21·8 per cent. in 1898, as compared with 12·2 in 1890. After Russia come France with 7·9 per cent., Germany with 5·5 per cent., and the United States with 5·3 per cent., while Switzerland, Austria-Hungary, and Italy have 4·2, 4, and 3·9 per cent. respectively of the entire exportation. The importation to Germany, Russia, and America is increasing very rapidly, the importations into Germany and the United States having hardly been in existence prior to 1890, while the importation into Russia has increased 82 per cent. since that year. The chief port of exportation for Egyptian cotton is Alexandria.

Greece and Italy.—The exportation from other countries is of very small importance as compared with that of the United States, India, and Egypt. Greece and Italy have practically ceased to export cotton, and the latter country since the increase of cotton manufacture has largely increased its receipts, the importation into that country increasing from 122,000,000lb. in 1886 to 246,000,000lb. in 1897. A further indication of the progress of the cotton industry in Italy is the fact that the importation of Indian cotton is rapidly giving way before the enlarged importation of the finer and longer-stapled cottons of America and Egypt. From 1887 to 1894 the percentage of importation of Indian cotton to the total cotton imports of Italy declined from 58 to 31·8 per cent., while that from the United States increased from 35 to 45·4 per cent., and that of Egypt and other countries from 7 to 22·8 per cent., of which 13·9 per cent. was from Egypt alone.

Asia Minor and Persia.—The exportation from Asia Minor has varied greatly during the last fifteen years, and has amounted on an average to about £480,000 worth from 1883 to 1893, or about 1 per cent. as great as the exportation from the United States. The chief city of exportation has been Smyrna, although since 1890 the exports from that city have declined, owing to the presence of cholera. The cotton of Asia Minor is chiefly sent to Spain and Italy, although other countries also receive a portion of the crop. The exportation from Persia amounts to about 10,000,000lb., or about one-fortieth of 1 per cent of the export of the United States, although about two-thirds of the Persian cotton crop is exported. The Persian cotton is chiefly exported to India and Russia, although, owing to the miserable condition of the caravan routes in that direction, the export to India is on the decline. The export to Russia, however, is increasing, this trade being largely stimulated by the Russian Government. A considerable portion of the cotton, however, is retained in the country, this being especially true of the Ispahan variety, which is used largely in the manufacture of carpets.

Russian Asia.—The cotton produced in Russian Central Asia is practically all used at home and does not figure in the export, the production of the Russian Empire being insufficient for the needs of the rapidly-growing home industry. During the period from 1883 to 1889 the Russians annually imported about 277,000,000lb. of cotton, and during the period from 1890 to 1898 362,000,000lb., although the value of the imports has declined despite the increase in volume.

China.—In consequence of the remarkable growth of the Japanese cotton industry, the cotton exports of China have rapidly increased. In the period 1882-90 there was an average annual exportation from China of 145,000 piculs, or about 19,300,000lb., and this exportation increased in the period 1891-97 to 571,000 piculs, or 76,100,000lb., an increase of almost 300 per cent. The exportation in the year 1895 amounted to 119,500,000lb. Despite this immense increase, however, the exportation of Chinese cotton even in the year 1895 amounted to only about 3 per cent. of the importation from the United States. The value of the Chinese export increased from an annual average of £660,000 in 1889-90 to an average of £1,100,000 from 1891 to 1897, but sank to £460,000 in 1898, the year of highest export being 1895, when £1,860,000 of cotton was exported. In that year about one-fifth of the crop was exported, the average for 1891 to 1897 being about one-seventh. The exportation has declined in recent years, the exportation in 1898 amounting to only 274,000 piculs, or about 36,500,000lb. The chief cause of the decline in the exportation of Chinese cotton has been the poor results which were obtained from its use in Japanese mills in 1895. Japan consumes practically the whole of the Chinese export of cotton, as this cotton cannot stand the high cost of transportation, and consequently can compete in Europe. Even during the cotton famine of 1861-65 there was only an annual export from China and Japan of about 42,000,000lb. of cotton, and as late as 1899 only 1,330,000lb., or 2 per cent. of the export, went to Europe; while even in 1895 the export to Europe amounted to only about 4,400,000lb., or less than 4 per cent. of the total export. The chief port of exportation is Shanghai. The importation of cotton into China averaged 34,600,000lb. (157,000 piculs) from 1882 to 1890, 19,400,000lb. (88,000 piculs) from 1891 to 1897, and 51,500,000lb. (229,000 piculs) in 1898, the importation taking place chiefly at Shanghai, Canton, and Amoy. The exportation of cotton from Japan is totally insignificant, averaging from 1893 to 1898 about 10,500,000lb. (713,600 catties), of a value of 162,300 yen, the exportation of Japan being about one-four-thousandth of that of the United States. Formerly all of this export went to Korea, but about one-fifth now goes to Russian Asia. Formerly, and until within a few years, Japan imported its cotton chiefly from China, but the unfortunate experiences with this cotton in 1895 led to a great falling-off in the demand, the importation of Chinese cotton falling off from 1895 to 1898 to about a third, while the importation of Indian cotton increased almost 200 per cent., and that of American cotton over 540 per cent. in these three years.

Africa.—With the exception of Egypt there is but little exportation of cotton from Africa, the chief exportation, however, being from the Portuguese colony Angola and from Lagos. The high prices for Angola cotton would make plantations very profitable there if the necessary capital were forthcoming. At present the exportation given is slight, amounting to about £5200 in 1896, the exportation from Lagos from 1887 to 1891 averaging about £5800 per year.

Latin America.—It is somewhat difficult to obtain exact data of the exportation of cotton from Latin America. Although Mexico produced in 1895 about 80,000,000lb. of cotton, her exports amounted to only 190,000lb. in that year, and to but 150,000lb in 1896-97, the growth of a home textile industry compelling Mexico not only to use her own crop, but to import considerable quantities besides. In 1894-95 this importation amounted to almost 40,000,000lb., and in 1896-97 to over 21,500,000lb., there being already 112 spinning and weaving concerns in Mexico as early as 1893. As before stated, the exportation from the once famous cotton fields of the West Indies has declined, and, in fact, has almost ceased. The country from which the chief exports now occur is Haiti. The exportation of cotton from Colombia reached its highest point in 1891, when about 2,800,000lb. of cotton were exported, of which three-fifths went to Great Britain and two-fifths to France.

The exportation from Peru increased from a value of 416,000 soles, or about £40,000, in 1887, to 1,214,000 soles, or about £120,000, in 1893, and to 3,228,000 soles, or about £320,000, in 1895. The exportation to Great Britain averaged about £162,000 annually from 1883 to 1890, and about £200,000 from 1891 to 1897. The increase in the exportation of Peruvian cotton to the United States has been extremely rapid, it having increased from a little over 9000lb. in 1887 to over 2,000,000lb. in 1898. The country which has most keenly felt the competition of the cotton of the United States, however, has been Brazil. In that country the cotton industry was almost annihilated by the progress made in the Southern States of America, and it is only within recent years that the growth of the textile industry in Brazil resulted in the increased production of the raw material in that country. The average exportation from 1869 to 1874 was 120,000,000lb., from which it gradually sank to 19,000,000lb. in 1895, since which time it has increased to 31,500,000lb. in 1897. Until 1890 this exportation was almost entirely to Great Britain. The chief ports of export in Brazil are Pernambuco, Maranhão, and Maceo. The exportation of cotton from Australia is quite insignificant. The exportation from Queensland amounted in 1874 to about 95,000lb., but by 1891 it had sunk to 15,000lb.

Filling Fabrics.

ALTHOUGH the filling of fabrics is generally condemned, there is, unfortunately, little chance of its entire discontinuance, and as showing the interest still shown in the matter, the following process has recently been arranged as being a means of more thoroughly and permanently attaching the weighting material to the fibre. It consists of treating the woven cloth or yarn with a solution of chloride of barium, and then with a solution of soluble sulphate, such as sodium sulphate, potassium sulphate, magnesium sulphate, or aluminium sulphate, incorporating directly upon the fibres a practically insoluble filling of barium sulphate. Or the process may be reversed by using the sulphate solution first and then using the barium-chloride solution. A solution of barium chloride of a specific gravity of 1·14, and a solution of sodium sulphate, preferably a saturated solution, is prepared. The cloth or yarn is first immersed in the barium-chloride solution for a few seconds, and when removed is passed through squeezing rollers to remove excess of liquid. It is then immersed in a sodium-sulphate solution.

The action of the sodium sulphate upon the barium chloride is to precipitate a practically insoluble barium sulphate upon the fibres of the cloth. The sulphuric acid of the sulphate combines with the barium of the chloride, forming a practically insoluble barium sulphate, and the soda combines with the chlorine, forming a solution of sodium chloride, thus depositing a precipitate of barium sulphate direct upon the fibres of the cloth, while the sodium chloride remains in solution. The barium sulphate is thus distributed through all the threads or fibres of the cloth, and practically becomes incorporated with it, expanding or thickening the fibres, adding to the weight, and at the same time rendering the fabric less inflammable. The cloth, after being immersed in the first solution, is best dried and then put into the second solution, or it may be treated as already described without being dried at that stage. After the completion of the process, the cloth should be washed with water to remove any trace of the sodium-chloride solution adhering to the fibres.

Cost of Silk Goods.

THE question of cost, the correct solution of which is so essential to the success of any manufacturing enterprise, is a particularly difficult one to solve in a textile mill making a number of different fabrics. The increase of silk mills in recent years, says the "Textile World," has not been accompanied by a corresponding increase in knowledge on this important subject of cost calculation. Mills have been started, and the cost of the goods left in great measure to guess work. Generally when a manufacturer guesses at the cost, or relies on crude rule-of-thumb methods, he places the estimate much too low. When he compares his guess with the market price, the apparent wide margin of profit leads him to believe that a fortune awaits him, if a large production is turned out of the mill, and this delusion is not removed until the affairs have reached such a state that a meeting of the creditors is found necessary.

The failure to properly appreciate how much a yard of silk cloth costs is generally due to ignorance of the cost per yard of what is called general expense. The cost of labour and supplies for the direct manual operations of manufacturing are easily estimated with a fair degree of accuracy. It is somewhat difficult for any intelligent man with a common school education to make any serious error in an estimate of the cost per yard for throwing, winding, doubling, quilling, warping, twisting, weaving, and finishing. The expense of these operations is well defined, and does not vary materially from week to week. The cost of the various processes can readily be calculated, but not so with the item of general expense. The first question is, What is meant by the term general expense? All will readily agree that such items as cost for interest, rent, fuel, taxes, insurance, salaries, watchmen, engineers, machinists, etc., are general expense. But is this all? In each department there are many employés—such as overseers, second hands, and general helpers—whose wages do not vary with the production. While their services are confined to one process, their wages are fixed, and consequently are as much a general charge as is the rent of the mill. At the same time it may be found that in some cases including such expenses in the general expense account will result in placing the cost estimate on some classes of goods too high by reason of charges being included for fixed charges on processes which the fabric in question does not require.

We will illustrate this point by one illustration. A mill may be making piece-dyed goods and also fabrics that are manufactured from yarn purchased in the coloured state. Obviously, if the general expense account was made to include the dyer's salary as well as other permanent charges of the dyehouse, it would result in placing the estimate on the goods made from yarn purchased in the coloured state too high (as the last named goods require no dyeing), while at the same time the piece-dyed goods would be too low, owing to the fact that a portion of the expense for dyeing is included in the general expenses, and thus charged to cost of other fabrics. Generally, it will be found best to include such charges as those for overseers, second hands, etc., in the process to which they belong, and confine the fixed expense account to the broad general charges of the mill. The special conditions in each mill must determine what course is to be pursued. Only general principles can be laid down, as we are addressing the trade in general, including all manufacturers of silk goods. The fact which many mill owners fail to properly appreciate is the large increase in cost of general expense per yard which accompanies a reduction of the production.

Men who plan a mill enterprise are generally desirous that the enterprise shall "go through," and for this reason figure invariably on a production either equal to or in excess of what is possible. A loom can weave 10yds. per day, they argue, therefore 500 looms will weave 5000yds. per day, which at twopence per yard profit (the difference between their estimated cost per yard based on a daily production of 5000yds., and the market price) shows a profit of £40 per day. The next step in this line of thought is easy. One thousand looms would return a profit of £80 per day, and why be so false to the interests of the shareholders and the community as to deprive the former of the other £40 per day, and the latter of the increased business which such an enlargement would bring to the town? This is theory.

In practice, we generally find the production at its maximum to be much less than the enthusiastic estimate of the promoters, while for a large part of the time there is a greatly reduced production caused by the innumerable circumstances constantly arising to vex the mill manager and thwart his plans. The experienced manufacturer knows that the theoretical production can never be attained, much less maintained. He also knows of the heavy increase in the cost of fixed charges per yard which accompanies a reduced production. The moment a mill is started, there begins an uninterrupted series of events to interfere with the theoretical production. There are holidays, breakdowns of machinery, lack of sufficient help, sickness of employés, inferior work due to innumerable causes, and last, but not least, lack of orders. How many mill-owners realise how much a reduction of 25 per cent. from the theoretical production means in the cost of goods per yard? Moreover, it is not uncommon to have a mill operating for weeks at a time with a production fully one-half less than that which theory promised.

This, then, is the important and difficult part of cost calculation. To avoid the serious error of making the estimate too low, care should be taken to include in the fixed charges every item that the peculiar conditions of each mill will allow. Then base the estimated yardage of each fabric, not upon the greatest product that any one of the mill departments can handle, but upon the product which the weakest department in the mill is likely to turn out, making a fair allowance for all the influences which foresight can disclose. If the result is disappointing—if the estimate so reached shows a probable loss instead of profit, consolation may be found in the thought that forewarned is forearmed, and that an estimated loss on goods not yet made can be avoided by not making the goods. This action may result in the shutting-down of mills and the abandonment of proposed mill enterprises, but will be much more profitable than the headlong plunging into the production of silk fabrics, which we have recently witnessed, and which is now being accompanied by the inevitable consequences of depression and loss.

Coming to the actual calculation of pieces, a good way is to base all such on 100yds. of finished goods. Use of this number enables the division of the total by the number of yards to be done mentally, so that the cost of 100yds. indicates at the same time the cost per yard. One hundred and ten yards of warp is allowed for 100yds. of finished goods. This may be more than is necessary on some fabrics. Taffetas, which are now so popular, will take up nearly this amount, while the take-up on satin duchesse and similar goods may not be over 6 per cent. Where a close calculation is desired, the length of warp for 100yds. of finished goods can be varied to suit the fabric in question.

In calculating the weft, we take the width in the reed, and not the finished width. Careful tests have shown us that this method is very accurate. As the goods "creep up" lengthwise after being woven, and as it is customary to pay for picking and weaving by the length of the goods as they come from the loom, 99yds. is taken as a basis. This loss in length, however, is recovered in the subsequent processes.

The item of waste thus varies from ½ to 2 per cent. for organzine, and from ¾ to 3 per cent. for tram. The writer's opinion is that with care in throwing, the waste on organzine, unless the stock is unusually bad, should not exceed 1 per cent., and can be kept down to ½ per cent. Our own experience has shown that on tram stock thrown by ourselves, out of properly-selected material, six-tenths of 1 per cent. will cover the waste. The outside throwster makes at least 2 per cent. of waste. On tram, however, it is well not to count on less than 1½ per cent., although we always figure 2 per cent. on organzine, and 3 per cent. on tram, in order to be on the safe side.

When manufacturers throw their own silk, the waste can be reduced to a minimum. When it is given to an outside throwster, it is greatly to the latter's advantage to increase the quantity of waste made. The waste made by the throwster is retained by him and sold for his own benefit, bringing from 1s. 8d. to 2s. per pound, and, moreover, by paying no attention to the amount of waste made, the throwster can put a much larger production through his machine. If the amount of waste made by the throwster is so large as to cause a protest from the manufacturer, the thrown silk can be easily weighted, and in this way the manufacturer frequently imagines that he is getting silk thrown with very little waste, whereas the reverse is the fact. Boiling-off tests may reveal the imposition, but there are certain substances used to weight thrown silk which will not come out in the boiling.

The amount for twisting should be divided by 3. This is because it is customary to make the warps 300yds. long on the average. Consequently, as the calculation is on 100yds. of goods, the amount to be paid to the twister is divided by 3, in order to obtain the price for twisting 100yds.

Four per cent. of waste is allowed on warp, and 7 per cent. on weft. The waste made in one mill, according to statistics which have been carefully compiled, has averaged between 2½ and 3 per cent. This does not take into account the remnant lots of tram or organzine remaining on bobbins, and which usually reach a considerable amount. Such lots may remain on hand a long time before an opportunity occurs for their use. During this time the colour is liable to fade, and the value of the material deteriorates in other ways. It is usual to arrange, therefore, to have them re-reeled, twisted, and redyed black, so as to put the stock in shade for conversion into some salable fabric. This entails considerable cost, and the fabrics thus reduced generally are sold at a cut price; for these reasons the percentage of waste in the estimate is placed at the figures already stated. The waste should not exceed from 3 to 3½ per cent. for organzine, and 5 per cent. for tram. At the same time, with the ordinary indifferent management which prevails in many mills, 4 and 7 per cent. are not excessive, whereas with careless or questionable management they might amount to considerably more.

The item of cards and designs will, of course, vary according to the trade. No two manufacturers will have the same experience in this respect. Sometimes many patterns will be made, and not a yard sold from any of them, while at other times large orders may be secured from but one or two patterns. Some manufacturers charge the cost for designing and card-cutting to the general expense account, but this does not seem the right method, as it may result in charging the cost of cards and designs to goods which require none of this expense.

In figuring the item of commission and discount, it is proper to include the cost for claims. Experience will teach each manufacturer the approximate amount of claims, both just and unjust. If the goods are sold through a commission house charging, say, 7 per cent. commission on net sales, and the records show that during the previous year only 1½ per cent. was allowed for claims, it will be necessary to allow 7 per cent. off for the customer (which is equal to 6 per cent. discount and 1 per cent. for the sixty days' time) and 1½ per cent. for claims; then 7 per cent. on the remaining amount for commissions.

We find it useful to have a table or card prepared, showing the selling prices of all the different fabrics in the line, beginning with the cheapest and extending to the highest priced goods. Opposite each fabric is placed the gross selling price, and also the net amount received by the mill. This system of tabulating cost can be extended to the material employed in the manufacture of goods, as well as the cost for various processes. In a business where the material is so expensive as in silk manufacturing, any guesswork in regard to cost or selling prices is liable to be very expensive to the guesser, and the greater the number of tabulations that a person can compile the better, providing they save time and keep the experience of the past in plain view.

Humidity in Wool Manufacture.*

Of all the many problems with which the merchant and manufacturer of woollen materials has to deal, one of the most important and least understood is the hygroscopic nature of the fibre in relation to its commercial valuation, and also the influence of this property on the many processes through which the fibre must pass during its manufacture. All textile fibres possess this affinity for moisture to a greater or less degree, but the wool fibre, it seems, possesses this quality to a far greater degree than either of the others. By the hygroscopic quality of wool is meant the power by which wool is capable of absorbing a considerable amount of moisture without in the least altering its external appearance. The amount of moisture which may be present in the fibre at any one time will be largely dependent upon the physical condition of the fibre, together with the temperature and humidity of the atmosphere. Notwithstanding the great influence this hygroscopic property has upon the weight of wools and wool products, it is only within the last few years that any serious attention has been given to this important subject by the wool manufacturers and merchants of America, and then only by a few who may be termed the leading ones; while, on the other hand, the foreign manufacturers and dealers have been giving this question the closest of attention for many years.

It is the raw silk industry of Europe to which we are indebted for the first steps which were taken in this direction, although the silk fibre does not possess the affinity for moisture to anything like the same degree that wool does, yet so important a bearing has it upon commercial transactions in so high-priced a fibre as silk that to-day there exists in all the principal European centres of the industry what is known as conditioning houses, where this hygroscopic condition of the fibre is determined when bought and sold. The value and importance of these conditioning houses to the silk industry was soon apparent in the improved relations existing between the buyer and seller, and it was not long before such uniformity of regulation was considered to be of equal benefit to the wool industry. As long ago as 1857 these conditioning houses were in existence in France, the principal one being established at Roubaix. Belgium in 1860 established such houses, and fixed by law the allowable percentage of moisture which the product of wool may attain when bought and sold by weight. England in the early 'eighties became cognisant of the fact that European buyers discriminated between her worsted tops and yarns and those of her Continental competitors. Through a report of a Royal Commission, authorised by an Act of Parliament to study the industrial conditions existing on the Continent, it was discovered that this state of affairs was due to the irregularities in weight of products from English mills, as compared with the authorised weights by Continental conditioning houses. The result of this investigation led to the establishing in 1887, at Bradford, England, under municipal control, but by an Act of Parliament, an official conditioning house, which has had a very beneficial effect upon this line of manufacture ever since.

The testing for the amount of moisture is carried out by ascertaining the absolute dry weight of the samples, to which is then added the standard percentage of moisture in order to give the true invoice weight. This standard is supposed to represent the amount of moisture absorbed by the fibre under average normal conditions of humidity and temperature, the average normal conditions having been determined by scientific verification covering a period of one year in the North of England. The allowance for regain as authorised by the Bradford Conditioning House on different wool materials is as follows :—

Wools	16 per cent.
Tops combed with oil	19 ,,
Tops combed without oil	18¼ ,,
Noils	14 ,,
Worsted yarns	18¼ ,,

The allowance for regain of moisture allowable by the Continental Conditioning House at Roubaix on wool and wool materials is as follows :—

Wools	14¼ per cent.
Tops	18¼ ,,
Wool yarns	17 ,,

All necessary expenses for making these tests are of course borne by the party having the tests made. The conditions of humidity in the United States are not the same as they are in England, and consequently materials exported there from England will show considerable difference in weight, proportionate to the difference in climatic condition of the two countries—that is, material will lose in weight on the other side of the Atlantic because of a less amount of humidity in the atmosphere, and often the American importer will be at a loss owing to the fact that the standards adopted in England and on the Continent are not representative here. This will be best illustrated by stating a little instance which happened in Philadelphia during the first year of the workings of the "Wilson Bill," or free wool law. Shortly after the law became operative, representatives of foreign top-makers appeared in the American market with the purpose of making sales of tops. Each solicitation of sale would be accompanied by the statement that they would agree to furnish you with a conditioning-house certificate, explaining at the time the meaning of the same. That was an innocent-looking statement; it looked at first as though you would not be required to pay for any more than you actually received. Sales were made, and one manufacturer secured upwards of 50,000lb. of tops with the conditioning-house certificate attached. They went to America and stood for a few months, and when they were brought out and weighed-up they were found to be about 6 per cent. short in weight. When the buyer hunted up the broker from whom he had purchased the tops, he found out that the conditioning-house certificate, upon which he had relied, simply meant that he had bought the tops at the percentage of regain which was allowable by law on the Continent, and he was compelled to pay for his 18¼ per cent. of moisture.

The American merchant or manufacturer who, through necessity, is forced to procure his wool from Europe, is really in a worse condition than he who purchases his wool in the country, so far as the question of moisture in wool is concerned, for no matter how well he may be versed in this subject, and assuming that he has purchased his wool on a certificate from a conditioning house, and has further been allowed a percentage on the difference between the normal humidity as existing at the time and place of purchase, and the percentage which is acceptable on the Atlantic seaboard of the United States, nevertheless he is still at a disadvantage, since the Government there does not recognise this hygroscopic property in wool when fixing the duty on the wool as it is landed on our wharfs. For illustration, take wools that are shipped from Australia viâ London to the United States, to be transhipped in London. The steamship company which carries the wool from Australia to London charges freight on the gross weight of the wool as it left the Australian port. When it is discharged from the Australian steamer in London for shipment viâ some line to an American port, the usual custom is for the line coming to America to reweigh this wool and establish a basis for its freight charges, or to allow the shipper to add 2 per cent. to the gross weight, as shown on the Australian invoice, thus making a new basis for freight charges to the American port. This addition of 2 per cent. to the Australian weight, or the increased actual weight, which may be found by reweighing, is solely a gain in weight by the absorption of water in transfer. The Custom House weighs every bale, and collects the duty on the face of the invoice, after which a supplementary bill is rendered for the difference between the face of the invoice and the actual weight as found by the Custom House weighers. The Government then claims this difference at 11 or 12 cents per pound, and the shipper is forced to pay so many cents per pound on the water absorbed from Australia or from London to the American port. There is no need of protest, as no rebate will be given, and as the case stands now there is no resource of any kind for the shipper.

When this wool goes into any of the American mills along the Atlantic seaboard, and is exposed to the average normal humidity of the Atlantic coast, it will in most cases return to about the weight of the Australian invoice, if shipped in the summer time, or to the London invoice if shipped in the winter time. This question does not only apply to wool as a raw product, but to the finished yarns and semi-finished products of tops, and also by-products and remanufactured products composed of wool. Indeed, it is a more serious question when considered in relation to these latter products than to the raw wool. A manufacturer in Philadelphia was in the habit of taking from the merchant this merchandise on the merchant's weight for years. One of his superintendents began to weigh the material as they used it, and did so for two or three months. He found that the material as it went to the machinery was lighter in weight per bag than when it came from the merchant. He made claim on that lot, and in addition made a claim on all of this material the merchant had delivered to him for years back. After considerable controversy it was agreed to refer the matter to a reputable manufacturer who had had considerable experience, particularly in the line of raw materials. The referee asked the manufacturer if his experiments had ever led him to consider the question of humidity in the materials he purchased, and if he was aware that such contained anywhere from 12 to 18 per cent. of moisture. He said "No." He was further asked if he had not bought the material under the usual custom recognised in the trade, and he stated "Yes." Both the manufacturer and the merchant agreed that the material was sold under the usual custom, and that the custom had been followed out in every particular. The manufacturer made the complaint that in all these years he had been paying for so many pounds of water per bag of wool, upon which he had not reckoned, and had thereby lost all the profit he had calculated on, that it was not just that he be asked to pay for the difference of weight in the material between the time of purchase and the time of manufacture. The referee stated that as the custom of the trade had been followed out in every particular, no court in the land would recognise his claim, and that there was only one thing for him to do—namely, to conform to the custom of the trade in the matter of purchase and settle the account. As a result the manufacturer agreed to withdraw his claim for all past shortage, and an equitable settlement was made for stock on hand.

The above illustration is only one of many, and proves that some American manufacturers have but very little conception, if any, of this important question, and in many instances calculations have been made as to costs that through neglect of this particular knowledge have caused losses to be sustained which were charged up to some other cause or reason, and the charge appeared finally in the profit-and-loss account. Due to the fact that

* Abstract of a paper read by E. W. France before the American Association of Wool Manufacturers.

there is no official recognition or regulation governing this varying and uncertain condition to which wool products which are sold by weight are continually subjected, there results constant confusion and misunderstanding between manufacturers and their customers. It is no stretch of the imagination to assume that some manufacturers will take undue advantage of the latitude allowed for the variation in moisture, and thereby make prices on their products which are not representative of their true value, and it is partially due to this fact that certain of our leading worsted manufacturers have been compelled to adopt definite standards to which their products must conform, and by which they sell.

Up to this point the question of humidity has been dealt with simply from the commercial standpoint. But it is also a question of prime importance to the technique of all wool manufacture. Especially is this true in the worsted branch of the industry, where its influence must be calculated with in all the processes of carding, combing, drawing, and spinning, both from the point of maintaining a regularity in sizes of numbers or counts, and in order to preserve the good spinning qualities of the fibre itself. Moisture and temperature are two important factors in the proper regulation of the spinning or of otherwise manipulating the cotton fibre, and much stress has been laid on the suitability of one district over another for purposes of cotton spinning, on account of the proper atmospheric conditions which may exist. Apparently a high degree of humidity is most favourable, together with narrow limits in the variations of temperature, these two conditions ensuring the most satisfactory results, through their influence in reducing to a minimum the electrical charges which the fibre acquires during its manipulation, and in preserving the fibre in a proper state of softness and elasticity most conducive to the best results in the manufacturing process.

While cotton depends so largely upon atmospheric conditions for its plasticity, wool is artificially treated with oils and lubricating emulsions to give it, in a measure, the required pliability. Nevertheless experience has demonstrated that humidity plays a part of almost equal importance in wool manufacture as of cotton. This is evidenced by the fact that up to within quite recent times it was generally thought that certain qualities of wool could only be spun to their highest possible numbers in worsted yarns in localities where the humidity and other atmospheric conditions were of a specified nature.

Ever since the important rôle which humidity plays in the spinning industries became recognised, the practice of artificially tempering the various conditions of Nature to the requirements of textile manufacture has had more and more attention paid to it, with the result that various mechanical appliances have been perfected for the proper regulation of the humidity of the air in our textile mills. If we regard this question of humidity in respect to the maintaining of a regularity in the counts of numbers of yarn passing through the process of manufacture, it will at once be seen that proper results can only be attained by preserving a delicate adjustment in the amount of moisture contained in the fibre. If this amount varies without due allowance being made for it, a proportionate variation will occur in the respective count which it is desired to produce. Some manufacturers in order to ensure uniformity of their product make daily tests for moisture in their materials during the various stages of manufacture, and any variation in the percentage is corrected by a corresponding correction in the humidity of the room in which it is being worked. We do not wish to be misunderstood, however, in this latter statement that corrections in size of materials are simply made by the increase or decrease of moisture. What we do mean is that the material is tested for moisture, and the aim is to keep a certain percentage of moisture at all times in the material, not only for good working quality, but so that in the finished product, when the full percentage of normal regain has returned to it, the contents will not be altered thereby. Again, the electrical influences are practically allayed and good spinning qualities are attained.

Spinners of worsted yarn are recognising more and more every day the benefits of a regulated and relative humidity in their workrooms. American woollen manufacturers or spinners of woollen yarn as a rule have not awakened to its importance, at least so far as it relates to the installation in their mills of methods or devices for controlling the humidity of the atmosphere. Oils and emulsions, it is true, do give a pliability to the stock while going through the cards so long as the degree of moisture can be maintained, but unless the heated cardroom wherein the stock is being worked is provided with some form of appliance for humidification, evaporation is bound to take place, and the stock will gradually become less and less moist, even to the point of becoming wild, so to speak. This is one of the reasons why so many woollen carders resort to the use of steam jets on the fronts of the condensers, the use of which proof-positive that electrical influences are at work. It is no uncommon thing in the average cardroom to see fibres of wool so highly charged with electricity that they will adhere to all non-conducting surfaces in bristle-like form, standing straight out at right angles to these surfaces. The reason of this phenomenon is that wool being a poor conductor, when in a dry state is easily charged with electricity, generated not only through the slippage of the belts and the friction of the machinery, but also from the rubbing of one fibre against another. In this manner fibres become charged with different kinds of electricity, in consequence of which they repel each other, thus causing undue waste in carding, and also giving rise to much difficulty in the spinning operation, the fibres when in this condition not having affinity for each other.

In a moist condition the wool fibre is not so susceptible to electrical influences, and does not so readily become charged. These same electrical disturbances are even more noticeable in wool stocks which have been dyed certain colours than in those in their natural condition, and all sorts of tricks have been adopted by carders to endeavour to overcome the so-called electrical troubles. Some find that the working quality is much improved by spreading the stock on a concrete floor for a day or two before using; others add an extra amount of emulsion, and still others introduce common salt into the emulsion, with the object of preventing the electrical charges arising on the fibre. Another trick often practised among carders, especially on cold, frosty mornings, when the atmosphere is heavily charged with electricity, and the steam jets on the front of condensers do not yield the necessary relief—the application being too local,—is to spray the rub rolls and aprons with water by means of a hand brush. This often gives temporary relief, but is not a good practice to resort to, owing to the liability to swelling of the leather, aprons, and rolls, all of which goes to prove that the electrical disturbances in carding and spinning of the wool fibre may be prevented to a very large degree by proper atmospheric conditions of humidity as well as temperature.

It has long been conceded that the wool fibres should not be dried at too high a temperature after scouring or dyeing; indeed, the best condition for drying is the ordinary temperature, which gives what is known as air-dried wool, leaving the wool with its normal amount of moisture. Dried at higher temperatures, there is danger of making the wool too dry, which always results in injury to the fibre. Therefore, in all artificial methods of drying it should be the aim never to reduce the amount of moisture below that which is normally present in wool when dried in the open air. This also holds true in the finishing of both worsted and wool fabrics, as too great heat will often effect a serious injury in both the strength and handle of the goods. This should be a point of careful observance, and a definite amount of moisture should always be present in the fibre, for if more than a certain amount of moisture is abstracted from the fibre it becomes altered in its physical properties, and its good qualities suffer severe deterioration. The elasticity is ruined, and the tensile strength greatly diminished. Many of the just criticisms relative to the feel or handle of the finished fabric are without question due to a lack of knowledge on this particular point.

There is, however, another point to this question of moisture on finished goods, which strangely enough becomes a fault, not of omission, but of commission—that is to say, instead of abstracting more moisture than is good for the fabric, there has been a growing practice among some European manufacturers to increase the amount above the normal by adding to the fabric in the process of finishing various substances which have the property of attracting water. This is what is known as "loading," and bids fair to become a serious menace to honest manufacturers as well as to the purchasing public. For instance, a piece of goods which ordinarily weighed 12oz. per yard is raised to 14oz., a gain of 16⅔ per cent. It is claimed, however, that the feel and physical properties are not altered; but as goods are sold on a basis of weight, as well as on yardage, it becomes quite a factor in the hands of the unscrupulous manufacturer, and gives him an advantage over his honest competitor. To such an extent is this adulteration being practised in some parts of Europe, that legislation has been called for with the hope of stopping this growing evil, or at least regulating it.

A COMPANY has recently been formed at Oviedo, Asturias, in Spain, for the manufacture of artificial silk, with a capital of £72,836. The company has, moreover, obtained the monopoly of the manufacture of this article, and a factory will be established at the village of Colloto.

Openers.

THE object aimed at in the use of openers is threefold—viz., the opening up of the hard masses of cotton so as to bring the fibres to a soft fleecy condition; the removal of heavy impurities, such as seed, sand, leaf, etc., that may be present; and the production of a compact and uniform lap.

The small porcupine opener is generally used to feed a Crighton opener. The advantages derived from its use in this way are that the cotton is well opened, less work is thrown on to the beater of the Crighton opener, and the production is increased. The cotton must be spread uniformly by hand on the feed lattice, which is from 6ft. upward in length and from 2 to 2½ft. in width. The cotton in its passage comes in contact with rollers and a beater, and is opened up to a certain extent. The dirt falls through the grid bars which are placed below the beater. The impurities thus collected must be removed periodically. The large porcupine opener is used for coarse cottons when it is combined with another opener. The beater cylinder for this purpose is provided with blades. This opener can also be used for medium or fine cottons, and is generally used independently of any other opener. For this purpose the beater cylinder is not provided with blades, but cast-iron teeth are used. The cleaning surface of a porcupine opener is rather small, being about 30in.

The chief distinctive feature of the exhaust opener is that the cotton is carried over a very long distance by means of the exhaust or pneumatic tubes. This procedure has the advantage of dispensing with the expense for hand labour in carrying the cotton to considerable distances. The cotton is carried along the tubes by means of an air current, generated by means of a fan running at a very high speed. One system is to connect a porcupine opener feeder in the mixing room above, the exhaust opener in the blowroom below. It is important that some means be adopted to automatically stop one machine whilst the other ceases to work. The exhaust tubes often get choked up with cotton. This is very often due to the exhaust opener ceasing to form a lap, and the porcupine feeder continuing to deliver the cotton to the exhaust opener. It is therefore necessary to keep the arrangement for stopping the machines automatically in a good working condition. During its passage through the tubes the cotton comes in contact with the trunks, and gets separated from some of its impurities. The porcupine cylinder of the exhaust opener runs at about 900 revolutions per minute, and the beater revolves at about 1200 revolutions per minute. The exhaust opener is generally combined with a lap machine.

Trunks are boxes placed at intervals on the exhaust pipe of an exhaust opener. They vary in number from four upwards, according to the nature of work to be done. The greater the amount of impurities in the cotton, the greater is the number of boxes required, and *vice versâ*. A series of transverse bars divide the boxes into two compartments. These bars are inclined in a direction opposite to that in which the cotton travels, in order to open up the cotton and free it from its impurities to a certain extent. The lower half of the box serves the purpose of retaining the impurities which fall out as the cotton travels over the top surface of the bars. The impurities are let out periodically from the bottom half of the box, by means of a hinged bottom. For dirty cottons, Messrs. Platt Brothers have introduced arrangements whereby the bars are given a traversing motion in a direction opposite to that in which the cotton is travelling. The amount of waste made at the trunks depends upon the cleanliness of the cotton passing through, the number of trunks, and the speed at which the cotton is travelling.

In the Crighton or the "vertical beater" opener, as it is termed, the cotton is fed loosely to the beater, and thus the fibres are prevented from being injured to any great extent. It requires comparatively little floor area, has a large beating and cleaning surface, and possesses a discriminating action whereby the dirty cotton remains for a longer time in contact with the beater than the clean cotton. The production of a Crighton opener depends upon the quality of cotton being used. If the cotton is very dirty, too much work is thrown on to the beater and the production is lessened. The production is about 600lb. per hour. The area of the dust pipe is about 320 sq. in., and the outlet from the fan about 312 sq. in. For working very dirty cottons, two vertical beaters are used, and the machine is called a double Crighton opener. The opener may be made to deliver the cotton loosely, or may be combined with a lap machine. The beater spindle runs at about 1000 revolutions per minute, and it is important to adopt some means in order to prevent wear by the spindle bottom. This is effected by means of a loose steel washer placed between the spindle bottom and the footstep. The washer must be removed and replaced by a new one when worn, otherwise vibration will take place, with its consequent evils.

The construction of Messrs. Taylor Lang's opener provides a very large cleaning area, and it is used chiefly for good stapled cottons. The cotton is spread uniformly on a lattice, and is drawn by means of a pair of rollers. It then comes in contact with a toothed cylinder. The beater cover is provided with internal projecting teeth. The cotton is struck upwards by means of the quickly-revolving cylinder, and comes in contact with the projecting teeth. The impurities which are thus separated fall through the grid bars. The opener is combined with a lap machine. It may be a single or a double opener. The chief differences between these two forms of openers are that in a single opener there is one beater, one fan, and a pair of cages, whereas in a double opener there are two beaters, two fans, and two pairs of cages. In order to produce a uniform and compact lap, the opener is provided with draught regulators.

The horizontal conical opener is used in the working of the better classes of cotton. The beater in this case is a conical one, but it is placed horizontally. It is not used for dirty and short-stapled cottons, because there is no discriminating action. The cotton is drawn quickly through the machine, and so it is not sufficiently opened up and cleaned. For working fine long-stapled cottons its action is just sufficient. It may be connected by an exhaust tube with the machine in the mixing room. The cotton is drawn through the tube by means of a fan on the beater shaft. The machine may be made to deliver loosely, or may be combined with a lap machine. The beater runs at about 1000 to 1200 revolutions per minute, and the production is about 400lb. per hour.

Messrs. Dobson and Barlow's opener provides a large cleaning surface. The novel feature of this machine is that the cotton is fed from above. This method gives a greater cleaning surface than the usual method. The cotton is spread uniformly by hand on a feed lattice. The cotton then passes between fluted rollers and a pedal roller. The latter arrangement assists in producing a lap, uniform in weight, yard by yard. The cotton then falls over the centre of a toothed cylinder. The cylinder is covered with a number of teeth which are placed a few inches apart. The cotton is struck against the inner side of the cylinder cover, which is provided with projecting teeth. The area of the grid provided for the passage of dirt is very large in this machine. The opener may be combined with a lap machine or a scutcher and lap machine. This opener has a sort of combing action, and is used in the working of very fine cottons. The cylinder revolves at about 500 revolutions per minute, and does very little damage to the fibres.

Messrs. Lord Brothers' opener is of the Crighton type. It is generally combined with a porcupine feeder by means of an exhaust tube. The cotton is spread uniformly on a feed lattice and comes in contact with the porcupine cylinder, where it is opened up to a certain extent. The cotton is then drawn to the vertical beater through the exhaust tube. In its passage through the tube the cotton passes over bars on the trunks. Some of the dirt is here extracted. This opener effects a good amount of cleaning. The opener is generally combined with a scutcher and lap machine. Arrangements are provided whereby, when the lap part is stopped, the feed is also stopped automatically.

A few points in connection with the subject of opening may be thus briefly noticed :

In order to effectively clean the cotton, it is important that the beater must be run at the required speed ; the beater blades must be kept in good working condition, properly set to the grids and to the feed rollers ; the feed should be well regulated, being neither too great nor too little ; the spaces between the grids should be well regulated, so as to suit the quality of the cotton being used ; and the speed of the fan should neither be too great nor too little.

The important changes which are necessary to be effected in an opener when a dirty short-stapled cotton is replaced by a clean long-stapled cotton are the reduction of the speed of the beater, the reduction in the spaces between the grid bars, the increase in the distance between the beater blades and the grid bars, and the increase in the speed of the fan.

If the cone belt is very slack, it fails to keep the feed going, and so a breakage of the lap takes place. It is therefore important to keep the cone belt tight, otherwise slipping will take place, which is very objectionable. Various arrangements have been adopted in order to automatically tighten the cone belts. It must be remembered that narrow belts work better than wide belts.

The different rollers with which the cotton comes in contact must be kept perfectly smooth by being rubbed with French chalk. It is a good practice to blacklead the rollers at intervals. If this is not done, the cotton will have a tendency to stick to the rollers, and this will result in bad work and waste. The sticking of the cotton to the rollers generally occurs when an opener is newly started; hence the importance of keeping the rollers well blackleaded at this point.

In order to produce uniform, clean and compact laps, it is necessary to clean the machine periodically. The calender rollers must be taken out at intervals and well cleaned. The different parts must be kept well lubricated. The feed-regulating motion must be kept in good working order. The bowls, levers, etc., must be kept perfectly clean. The bowls must be well blackleaded, and worn ones replaced with new ones.

One of the objections urged against a horizontal type of opener is that the cotton has a tendency to lie at the bottom and to pass along without being sufficiently opened up.

Damage to the fibres at the opener may be due to the speed of the beater being too great, the grid bars having rough surfaces, the fan speed being too slow and thus keeping the cotton for a long time under the action of the beater, and the beater blades being in bad condition and set too near the feed roller or the grids.

The advantages of using the exhaust or pneumatic tubes are :—The cotton can be carried to a very great distance in a very short time ; the expense for hand labour is saved ; the cotton in its passage is made to pass over bars in the trunks, and thus some of the dirt is shaken off ; and the cotton leaves the tube in a well-cleaned condition.

The waste made at the opener must be kept within certain limits. Too much waste may be due to there being too many grid bars or the spaces between the bars being too great, to the beater being inaccurately set to the grid bars so as to be near the latter, and to too great a speed of the beater.

In order to get sufficient production from an opener it is necessary to properly regulate the speeds of the different parts. The feed should not be too light, and the feed-regulating motion must be kept in good working order.—"Indian Textile Journal."

Gleanings from Consular Reports.

HAVRE (FRANCE).—Table showing imports of cotton at Havre during the years 1898-1900 :—

Country.	Quantity.		
	1898.	1899.	1900.
	Bales.	Bales.	Bales.
United States	687,536	852,021	589,430
India..................	23,945	26,515	13,164
Other countries......	18,612	15,009	26,846
Total..............	730,093	893,545	629,440

The year 1900 was one of comparative prosperity for the French cotton trade. Both spinners and manufacturers had full engagements for their whole production during the twelve months at prices giving a fair margin, and in some cases a good profit. Some scarcity was experienced during the summer months, and in consequence prices of the raw material reached a level which had not been known for many years. This, however, did not greatly affect the spinners, as they had in most cases secured their supply of cotton in advance when making forward contracts for their production.

The American cotton trade with France is still carried on almost entirely by British steamers, and the relations between shipowners and cotton receivers are very friendly.

The quays on which the bales of cotton are discharged, weighed, and delivered are not paved, and in wet weather are frequently in a deplorable state. This causes great discomfort to the receivers and their workpeople, and gives rise to many complaints.

The prospects of the French cotton trade are distinctly good. The demand for manufactured goods, which began more than two years ago, has steadily increased, and both spinners and manufacturers are heavily under contracts at remunerative prices for the whole of 1901. No complaint has been made by spinners that they are not sufficiently covered in their purchases of raw material, notwithstanding the fact that the quantity of American cotton known as afloat or loading for Havre is some 120,000 bales less than last season, when, as already stated, there was a scarcity during the summer. This diminution in the importation of American cotton will favourably affect the prospects of Indian cotton.

The imports of Indian cotton, which in 1890 amounted to 164,708 bales, have gradually declined until in 1900 they only reached a total of 13,164 bales, the lowest figures yet recorded. It is anticipated that there will be an improvement in 1901 in the importation of Surat cotton, as the crop seems to be large and of good quality.

At the end of 1899 wool was at a high price, owing to a strong demand for fine wool, of which the production had suffered a considerable diminution during the past few years. A sale made at Liverpool in January, 1900, although of small importance, brought about a reduction in price of about 15 per cent., a fall which was confirmed at a subsequent auction in London. Confidence in the maintenance of the price was shaken, and buying power was seriously reduced, the more so as the trade was overburdened with direct importations at a high price, and as a rule without any assurance in the terminal market. Each person involved sought some means of extricating himself, either by selling his importations (a difficult task) or by covering himself at a late hour in the terminal market. The result was disastrous, not only for the persons interested, but for the wool trade in general. The terminal market gave way under the pressure of orders to sell, and many failures occurred in the North of France.

In December, 1900, there was a partial recovery in prices, which had fallen in eleven months about 50 per cent. Merino wool increased in price 15 per cent. ; fine wool, second quality, 10 per cent. ; and ordinary wool, 5 per cent.

The present situation is more favourable, although conditions are still unsettled. The rise in the price of fine wool, which is coincident with the rejection of wool of an inferior quality, indicates that fine wools are again entering into consumption. The present price is moderate, and a gradual improvement in the trade may be looked for during the present year.

New Orleans.—The cotton crop of the United States for the year ending August 31, 1900, amounts to 9,436,416 bales, showing a decrease under the crop of 1898-99 of 1,838,424 bales, under that of 1897-98 of 1,763,578 bales, and an increase over that of 1896-97 of 678,452 bales. More than 50 per cent. of the decrease of the total crop compared with last year was from Texas and Indian territory, the production of which was 27 per cent. less, while that of the Atlantic and other Gulf States dropped 11 per cent.

Compared with last year, in round figures Texas, including Indian territory, shows a decrease of 964,000 bales ; the group known as other Gulf States, consisting of Louisiana, Arkansas, Mississippi, Tennessee, Oklahoma, Utah and Kansas, a decrease of 400,000 bales ; and the Atlantic States, Alabama, Georgia, Florida, North Carolina, South Carolina, Kentucky, and Virginia, a decrease of 475,000 bales.

The record of the year is one apart and peculiar to itself. For many months after the opening of the season the widest differences existed on both sides of the Atlantic as to the probable outturn of the crop, opinions varying from 8,500,000 to 11,000,000 bales or over. The character of the movement, however, soon gave strength and probability to the short-crop side, and with the pressure of the demand upon the supply the market gradually but steadily advanced from an average for the United States of 6·07 cents (3d.) in September to 7·46 cents (3¾d.) in January, and 9·34 cents (4½d.) in April, the "squeeze" in July carrying it up to 10¼ cents (5d.) for spot cotton in New Orleans, the average for the country for that month having been 10·01 cents (5d.).

The average commercial value of the crop is £7 16s. 8¾d., against £5 3s. 5½d. per bale last year, £5 18s. 0½d. the year before, and £7 11s. 7½d. in 1896-97.

The total value of the crop compares with the previous five years as follows :—

Year.	Quantity.	Value.
	Bales.	£
1899-1900	9,436,416	72,756,964
1898-99	11,274,840	56,554,597
1897-98	11,199,994	64,110,521
1896-97	8,757,964	64,384,966
1895-96	7,157,346	58,819,069
1894-95	9,901,251	59,407,506

In short, the South obtained for a crop of 1,838,424 bales less than last year £16,202,366 more, and it is safe to state that no cotton crop since the war has netted better money returns to the American people than the one just marketed.

A notable feature is the product by some of the larger mills of finer numbers, which, while keeping them actively employed, has reduced the number of bales consumed. Altogether it may be said that the year just closed has been most prosperous :—

SPINDLES.

	Number.
Total in operation in the South	4,801,320
Idle	47,346
New, not completed	1,418,497
Grand total........................	6,267,163

This shows an increase of spindles—old, idle, and not complete—over last year of 1,315,071, and a gain of spindles at work during more or less of the past year of 801,674. The total consumption in all the mills, old and new, for the year was 1,597,112 bales, against 1,399,399 bales last year, and 1,231,841 bales for the season of 1897-98, an increase over last year of 197,713 bales, and over the year before of 365,271 bales.

The average consumption per spindle in the mills in operation has been 7·93lb. less than last year, and 1·08lb. less than the year before, due mainly to production of finer numbers, but partly to slackening off during the three closing months of the season.

Large as the consumption of bales of cotton was, it would have been even greater had it not been for the Chinese troubles. The tendency is strongly in the direction of domestic spinners working up the bulk of the cotton grown in the United States into yarns and fabrics.

The importation of foreign cotton during the year amounted to 65,833,514lb., or an equivalent of 130,590 bales in American weights, against an equivalent of 95,097 bales last year. Most of the imports were consumed by Northern mills. They were for special kinds of goods for which American cotton was not adaptable.

The consumption of American cotton, on both sides of the Atlantic, during the past year has been 11,022,000 bales, against 10,768,000.

The largest cotton cargo ever taken out of a United States port in a single vessel was cleared on October 31 on the new British s.s. Mechanician, belonging to the Harrison Line. The cargo consisted of 26,000 square bales of cotton.

It is also interesting to note that on the same day—October 31—no less than 81,521 bales of cotton were cleared in eight vessels, the consignments being to Liverpool, Genoa, Barcelona, and Hamburg. This is considered the largest quantity of cotton shipped from this or any other port in the world in a single day.

Ionian Islands (*Greece*).—A considerable decline in the import of cotton, both in yarns and textures, has unfortunately to be chronicled. The Jewish traders here almost exclusively monopolise the trade with Manchester, Leeds, and Bradford.

In cotton tissues and yarns, Lombardy is an important competitor, but the most formidable rival is Greece itself, the demand of the home-made article growing from day to day. The firm of Messrs. Retzina and Co., of the Piræus, produces, among others, the larger quantities of the above at a price far cheaper than, but inferior in quality to, those manufactured in England.

Woollen yarns and tissues do not yet so emphatically tell the same tale; there is a decline in the import, though less pronounced, but it is to be feared that the decline will continue beyond hope of recovery, should the growing popularity of the Greek-made article be encouraged.

Yucatan (*Mexico*).—The production of hemp during 1900 shows an increase of 20,000 bales, or about 3000 tons in excess of that of 1899—probably about the limit under present conditions.

It is estimated that there are about 350 square miles of land under fibre cultivation in Yucatan.

The variety principally produced is that called *sisalana agave*, and the number of plants which has been found to give the most satisfactory result is 84 to the mecate of 576 square varas Spanish, or 4457 sq. ft. The suckers are planted 2 varas (about 5½ft.) apart, or in rows of 12 by 7 plants. The annual yield per mecate (4457 sq. ft.) is roughly estimated at 100lb.

The cost of production is 4 cents, say 1d. per pound, and the selling price in October last was about 9 cents, say, 2¼d. per pound. The price of henequen is subject to occasional violent fluctuations, arising from speculation, and the fibre has been sold as high as 22 cents, or 5½d. per pound. For industrial purposes fibre less than 3ft. long is unsuitable and generally unsaleable.

The machinery employed is driven by steam power. The machines originally in use were called scutchers, manufactured in Leicester, England. These machines are now being superseded, and can be purchased in Merida second-hand for about £10 a-piece. The new automatic machines are by Prieto, a Spanish manufacturer, and are also made in New York and Merida by Villamor, Pornella, and by Lopez. All these machines can be purchased in Merida at from 3000 to 8000dols. (Mexican currency, say from £300 to £800). These new machines are only employed on the larger estates. There are no English firms engaged in the henequen business in Merida.

NEW COMPANIES.

A. Gregory and Co. Limited.

Registered March 7, with a capital of £6000, in £1 shares, to acquire the business of manufacturers of and dealers in lace curtains, lace nets, etc., carried on by Joseph Orchard Limited, at Alfred-street Mills, Nottingham, and to carry on the business of lace manufacturers and merchants, lace finishers, lace dressers, bleachers and dyers, general merchants, yarn merchants, cotton spinners and doublers, etc. No initial public issue. The number of directors is not to be less than two nor more than five; the first are A. Gregory, J. H. B. Orchard, and T. C. Leman; no qualification; remuneration, as fixed by the company. Registered office, Albert-street Mills, Peas Hill-road, Nottingham.

Dawn Mill Company Limited.

Registered March 5, with a capital of £80,000, in £5 shares, to acquire from John Clegg and Sons Limited, of High Crompton Mills, Shaw, Lancashire, a plot of land (part of the Newtown Estate, Shaw) containing about 18,900 superficial square yards, with the mill chimney and cottages erected on part of such land, to erect a fireproof mill, with the necessary machinery, and to carry on the business of spinners of yarn from cotton and other fibrous substances, buyers, sellers, spinners, weavers, manufacturers, bleachers, dyers and printers of cotton and other materials, patent owners, etc. The number of directors is not to be less than five nor more than seven; the first are E. Thomas, J. T. Henthorne, J. Sucksmith, J. H. Lord, C. W. Rye, R. Hilton, and J. T. Sunderland; qualification, 200 shares; remuneration, £50 each per annum. Registered by C. Doubble, 14, Serjeant's Inn, London, E.C.

Vale Manufacturing Company Limited.

Registered March 6, with a capital of £10,000, in £10 shares, to acquire the Holden Vale Mill, Haslingden, and the premises belonging thereto, with the machinery, apparatus, and plant therein, and to carry on the business of spinners, weavers, sizers, bleachers, dyers, and finishers of raw cotton, cotton waste, wool, silk, yarn, and other materials. No initial public issue. The number of directors is not to be less than three nor more than five; the first are N. Worsley (of Haslingden), H. Worsley, N. Worsley (of Bury), and L. H. Ormerod; qualification, £100; remuneration, as fixed by the company. Registered office, Holden Vale Mill, Haslingden, Lancashire.

Wicken Hall Printworks Limited.

Registered March 7, with a capital of £10,000, in £1 shares, to acquire the Wicken Hall Printworks, formerly used as a dyeworks, and to carry on the business of calico and linen printers and bleachers, dyers, paper makers and stainers, general printers, calenderers, embossers, designers, finishers, spinners, doublers, manufacturers, merchants, brokers, etc. The number of directors is not to be less than three nor more than seven; the first are J. Harrop, S. J. Lewis, and G. Wood; qualification, 50 shares; remuneration, £50 each per annum. Registered office, Wicken Hall, New Hey, near Rochdale, Lancashire.

J. C. Bottomley and Co. Limited.

Registered March 14, with a capital of £7000, in £1 shares (3500 preference), to purchase, prepare, card, comb and deal in wool, hair, cotton, silk, alpaca, mohair, and other fibrous substances, and generally to carry on the business of woolcombers in all its branches in Bradford and elsewhere. No initial public issue. The number of directors is not to be less than two nor more than five; the first are J. Bottomley and J. C. Bottomley; qualification, £100. J. Bottomley is permanent director and chairman, and may while holding £500 shares nominate any qualified person as a director; remuneration, as fixed by the company. Registered by Waterlow Bros. and Layton Limited, Birchin-lane, London, E.C.

Stempel Patent Fire Extinguisher Company Limited.

Registered March 14, with a capital of £2000, in £1 shares, to adopt an agreement with B. Townsend, and to acquire and turn to account any patents, inventions, etc. No initial public issue. The number of directors is not to be less than three nor more than seven; the subscribers are to appoint the first; remuneration, two guineas per attendance. Registered by H. S. Bridge, Copthall-avenue, London, E.C.

Arpley Chemical Company Limited.

Registered March 28, with a capital of £4000, in £1 shares, to acquire, on the terms of an agreement made between R. Henshall, of the one part, and W. Dilworth (for the company) of the other part, the business carried on by the Arpley Chemical Company, to carry on and develop such business, and to carry on the business of manufacturers of and dealers in bleachers', dyers' and calico printers' specialities, etc. No initial public issue. Joseph Mason, James Mason, and R. Henshall are the first directors; qualification, 100 shares; remuneration, as fixed by the company. Registered by Waterlow and Sons Limited, London Wall, London, E.C.

B. F. Evans Limited.

Registered March 29, with a capital of £5000, in £1 shares, to carry on the business of dyeing, bleaching, sizing, printing, raising and finishing woollen, cotton, silk and other goods or other fibrous products or materials. No initial public issue. The number of directors is not to be less than two nor more than five; the first are E. Taprell-Clark and B. F. Evans; qualification, £50; remuneration, as fixed by the company. Registered by Alfred H. Atkins Limited, 23, Bouverie-street, London, E.C.

THE GAZETTE.

ENGLAND.

Partnerships Dissolved.

Thomas Ferrand and Henry Frederick Sampson, wool brokers, Swan Arcade, Bradford.

John Thomas Johnson and Edwin Snowden, hosiery manufacturers, Kibworth, Leicestershire.

William Alfred Whitehead and William Illingworth, top makers and worsted spinners, New Lane Mills, Laisterdyke, Bradford, as W. and J. Whitehead.

John Mitchell, Francis Edwards, and George Edward Mitchell, cotton manufacturers, Bridge-street, Rochdale.

James Torrance Wood and David Ross Cousin, cotton merchants, 4, Chapel-street, Liverpool.

Voluntary Windings-up.

Tottenham Wool and Hair Works Limited. Mr. R. Watson, of Enfield Lodge, Doncaster, liquidator.

R. and A. Chambers Limited. Meeting held at the Victoria Hotel, Manchester, on the sale of the business to the Bleachers' Association Limited. Mr. H. W. Hazlehurst, 16, Clegg-street, Oldham, liquidator.

The Bankruptcy Acts, 1883 and 1890.

Adjudication.

Thomas Moffat and John Dalgetty Duthie (as Moffat Brothers), woollen merchants, Warwick-street, Regent-street, London.

JOTTINGS.

The Bengal Government have formally agreed to grant an annual subsidy of 50,000 rupees for three years for further chemical and scientific researches with regard to indigo cultivation.

The following recipe is said to be a good one for a varnish for covering the rolls on cotton machinery:—Take 1lb. of chrome yellow and mix with ¼lb. of lamp-black and ¼lb. of rouge, rolled well with a roller to take all the small lumps out. Then get 10oz. of joiner's glue and boil it in 2 quarts of water; add to the above, and let it simmer for half-an-hour, constantly stirring it. If it should be thicker than ordinary paint, dilute it with warm water, and then bottle it.

The New Zealand Parliament has passed a law prescribing the minimum wage for those under 18 years of age, by which no boy must be employed in a factory or workroom at less than 1dol. 25 cents per week, and no girl at less than 1dol. The legislation removes the old-standing abuse of the apprentice system, by which system some employers would take young people into their employ, and keep them for a year without wages, and then get rid of them and take others on similar conditions.

Arrangements have been completed by the Fine Cotton Spinners' and Doublers' Association whereby the control of an important competing fine-spinning interest in France has been secured. Messrs. Delebart-Mallet Fils, a fine-cotton spinning firm, has been converted into a French limited company, under the title of La Société Anonyme des Filatures Delebart-Mallet Fils, with a capital of 10,000,000 francs, the majority of the shares being subscribed for by the Fine Cotton Spinners' and Doublers' Association.

The Board of Trade returns show that the imports for March amounted to £46,426,056, against £45,002,134 in the same month last year, being an increase of £1,423,922. The exports for the month were £25,021,293, compared with £25,316,821 in March, 1900—a decrease of £295,528. The imports for the three months ended March 31 amounted to £132,121,432, against £127,198,535 in the corresponding period of last year, an increase of £4,922,895; and the exports were £70,812,279, as compared with £72,120,352, a decrease of £1,308,073.

The most important establishment in the province of Ancona, Italy, for spinning silk from cocoons produced in the Marches and Romagna is situated at Senigallia, in which are employed 151 hands, and has in operation 90 pans worked by two steam boilers of 63H.P. and a motor of 14H.P. Besides this there are 21 mills engaged in the same industry at Jesi and Osimo with an aggregate of 712 pans worked by 21 steam boilers of 155 dynamic horse-power, and 16 steam motors of 52 dynamic horse-power, employing 1559 hands. In addition to the above-mentioned mills for spinning silk from cocoons, a mill is established at Jesi for spinning silk shreds, and has 8600 spindles in activity, with 430 hands employed, of which 30 are males and 400 females. The motive power is obtained from two hydraulic motors of 160 and 180H.P. respectively, and the annual average of working days amounts to 290. The daily wages of female operatives employed in this industry vary from a minimum of 4½d. to a maximum of 1s., and the male hands from 1s. to 1s. 6d.

Mr. B. F. Stone, the American Consul at Huddersfield, has issued his quarterly returns of trade with the United States. These show that for the quarter ending March, 1900, the exports were £96,987, as against £60,074 last quarter, or a decrease of £36,913. Woollens were exported last quarter to the amount of £21,510, as against £25,286 in the corresponding quarter of 1900, or a decrease of £3776. Worsteds last quarter were valued at £19,751, as against £38,634 in the March quarter, 1900. For the year ending March, 1901, the woollens exported were valued at £83,854, as compared with £86,361 for the year ending March, 1900, and worsteds £79,347, against £120,010 for the same period up to March, 1900, showing a decrease of £2506 in one case, and £40,662 in the other. The comparison of the March quarter, 1901 (£60,074), shows an increase over the December quarter, 1900, of £8569. In the same period woollens were £21,510, against £13,537 in the December quarter, and worsteds £19,751, as against £15,984 in the December quarter, or increases of £7973 and £3767 respectively. The net decrease of the 1901 returns as compared with March, 1899, is £8096.

A concession for a term of twenty years has been granted by the Servian Government to a German syndicate, including, amongst other things, the manufacture of cellulose thread, tissue, and silk from wood. The concessionaires are allowed the customary privileges of exemption from all kinds of taxation, including Customs dues on machinery and material imported for the use of their factory, and on its exported produce, and acquire an exclusive right to cut timber for speculative purposes in the South-western State Forests of Golija Planina, Prepovljnik, Radochel, and Djakovachka Planina, and in those from Chemerna to the River Moravitsa on the one side, and to the River Ibar on the other. State or commercial land is to be provided free of charge for the factory, with a first claim to water rights, and the power of expropriating private property for the purpose of making roads, railways, and canals. The use of the State railways is also granted at a reduction of 25 per cent. on the ordinary tariff. They bind themselves to invest a sum of at least £120,000 in their undertaking, and to make exclusive use, where possible, of domestic materials. The building of the factory and timber cutting must be begun within the first year, and the factory must be in full working order at the end of the second year, reckoning from the 11th of December, 1900.

THE TEXTILE COLOURIST:

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

Electrolytic Bleaching Processes.

BY J. B. C. KERSHAW, F.I.C.

THE use of electrolysis for producing solutions of hypochlorite of sodium for bleaching purposes is making rapid progress on the Continent of Europe, and in Germany and Russia especially, a very large number of textile factories are now equipped with the necessary electrical plant and apparatus. In England experimental trials of the new methods of bleaching are now being made, and possibly within the next year or two rapid development of these processes may occur in this country also. Hitherto the proverbial conservatism of our manufacturers has hindered progress, but under the stress of foreign competition this is likely to disappear. In the present article the writer proposes to deal with the subjects under the following heads:—I. Chemistry of the Electrolytic Process; II. Cells in Actual Use; III. Efficiency and Costs Data.

I. *Chemistry of the Electrolytic Process.*—When a current of electricity is passed through a solution of common salt, a splitting up of the salt into its

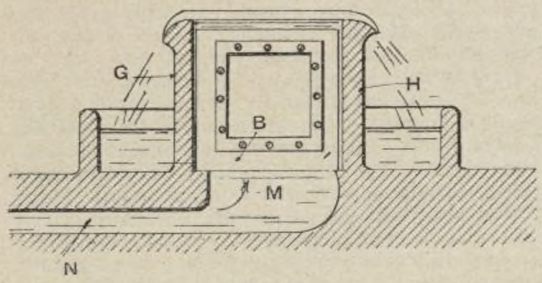


FIG. 1.

constituent atoms occurs. Chlorine gas is liberated at one of the poles, or electrodes, and metallic sodium at the other. This sodium at once reacts with the water in which the salt is dissolved, and a solution of sodium hydrate is produced, with the liberation of hydrogen gas. The visible results of the electrolysis are, therefore, a liberation of chlorine gas at the electrode which leads the current into the solution (called the anode), and of hydrogen gas at the electrode, by which the current passes away from the solution (called the cathode). But if the electrodes be placed near together, and if the solution between them be kept in constant circulation, a further chemical reaction occurs, and the chlorine liberated at the anode combines with the sodium hydrate formed at the cathode to produce a solution of sodium hypochlorite. This salt is of considerable value as a bleaching agent. The formation of this chemical thus occurs in one operation in the electrolytic cell, as a result of three distinct reactions—the first electrolytic, the other two chemical. Using

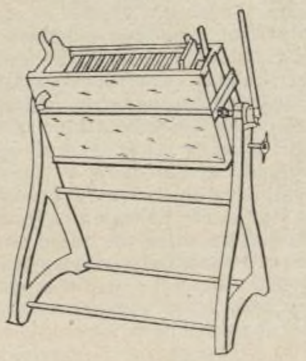


FIG. 2.

chemical symbols, these three steps in the production of hypochlorite of sodium by electrolysis may be set out as follows:—

Electrolytic.—

(1.) $2NaCl = 2Na$ (at cathode) $+ 2Cl$ (at anode).

Chemical.—

(2.) $2Na + 2H_2O = 2NaOH + H_2$ (at cathode).

(3.) $2NaOH + 2Cl = NaClO + NaCl + H_2O$ (at anode).

The three reactions in a well-designed cell take place almost concurrently, and no evolution of chlorine gas ought to be noticeable at the anode. The possibility of producing solutions of hypochlorite by the above method was first realised in the year 1851 by Charles Watt, who described the necessary conditions as: (1) insoluble electrodes, (2) rapid circulation of the electrolyte, and (3) cooling of the electrolyte. The various forms of cell which have been patented for the production of bleaching solutions by electrolysis are all based upon the chemical changes and conditions named above, and they differ one from the other chiefly in details of cell design, and in the nature of the material used for constructing the cell and the electrodes. The chemistry of the hypochlorite cell, if the temperature be allowed to exceed 20° C., becomes very complex, and chlorates are formed. A very large number of investigations have been carried out during the last three years, especially in Germany, in order to explain the changes which occur when hypochlorite is converted into chlorate in an electrolytic cell. As these deal with conditions which are not supposed to obtain in a cell used for producing bleaching solutions only, these investigations, although of great interest and value, will not be dealt with in this article. Under normal conditions of work the greater portion of the current passing through the cell is performing the work set out in equation (1) above—*i.e.*, splitting up the molecules of sodium chloride into their constituent atoms; and only when solutions containing high percentages of active chlorine are being produced do other electrolytic reactions come into play.

II. *Cells in Actual Use.*—For various reasons, chief of which was the impossibility of producing electric currents fifty years ago at a low cost, Charles Watt's patent of 1851 never developed into a practical process. Not until 1885-1890 did this method of producing bleaching solutions receive practical trial, and it is only within the last three years that the electrolytic methods have come into general use on the Continent of Europe. The names of the inventors whose cells are now working in various localities in Europe and America are given below, together with all available information relating to the details of the cell design, and the purposes to which the solutions produced in them are being applied.

The Corbin cell is in use at the cellulose factory of Messrs. Berges and Corbin at Lancey, in France. The cell itself, and all the necessary conduits, are built of cement. Fig. 1 is a sectional elevation of this cell. The solution of common salt passes into the cell from below by the opening N M, and flows away over the sides into the troughs G and H. From them it is carried away to a storage tank, also of cement, whence it is pumped either into the bleaching vats or back to the cell. The electrodes are vertical and of platinum-iridium foil. Each vat contains two terminal electrodes, connected to the sources of current supply, and a large number of intermediate or secondary electrodes, one of which is shown at B. The secondary electrodes are fixed in wide ebonite frames, and are insulated from each other, and from the terminal electrodes. These are entirely submerged, and are placed about ⅛in. apart in the cell. The current, as it passes through the cell, is obliged to traverse each of the secondary electrodes, the ebonite frames being purposely introduced to counteract the tendency of the electric current to pass through the solution along any other path. As the current arrives at the one face of these secondary electrodes it liberates chlorine, and as it escapes from the other it liberates sodium. The effect of these secondary electrodes is therefore to divide the large cell into a number of smaller ones, in each of which the current is performing its desired work. This simple method of increasing the output of electrolytic cells and of adapting them to currents of any reasonable E.M.F. is used in nearly all the patented forms of hypochlorite cell, and was first introduced in America in the electrolytic copper-refining industry by Hayden, about 1888. The Corbin cells at Lancey are provided with thirteen secondary electrodes, and each cell utilises 150 ampères at 120 volts, or 18 kilowatts of electrical energy.

The Haas and Oettel cell is worked at the wool-bleaching works of S. Wolle, at Aue, near Dresden, and at a large number of similar factories in Saxony. The cell has been considerably modified since the first trials were made at the above works in 1895, and Fig. 2 shows its latest form. It consists of an oblong trough containing two terminal and a large number of secondary carbon electrodes ⅛in. thick. The carbon is specially treated by a patented process to render it less subject to attack by chlorine gas or its oxygen compounds. The electrodes are fixed in grooves in the side of the cell, and are perforated to enable the salt solution used as the electrolyte to traverse the cell from end to end, in a zig-zag manner. The whole cell is mounted on trunnions, so that it can be quickly inverted and rinsed out when required. When solutions of hypochlorite containing a high percentage of active chlorine are desired, the cell is immersed in a tank containing the electrolyte, and by a simple modification in design the hydrogen gas liberated at the cathodes is made to effect the circulation and cooling of the solution. The usual size of Haas and Oettel cell takes a current of 45 ampères at 110 volts pressure, and yields 9kilos. active chlorine in ten hours' work. Owing to the substitution of carbon for platinum, the first cost of the cell is considerably less than that of the Corbin, Kellner, and Vogelsang cells; but the carbon electrodes require renewal every six months, and thus the running expenses are higher.

The Hermite cell was one of the earliest patented forms of hypochlorite cell, the first patent granted to Hermite being dated 1884. Many modifications were made in the original design, and the form eventually adopted for the experimental trials of this cell in England consisted of a long shallow open trough containing the electrolyte. Two shafts passed through this trough carrying a large number of zinc disc-shaped cathodes, and between each pair of cathodes were platinum gauze anodes, held in glass or ebonite frames. Sea-water, or a solution of sodium and magnesium chlorides, was used as electrolyte in the cell. When in operation the shafts bearing the zinc cathodes were revolved, and

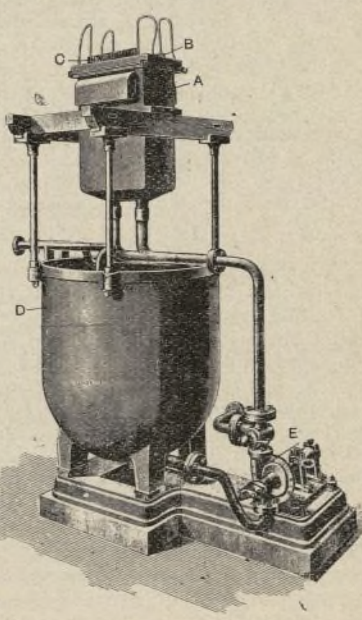


FIG. 3.

circulation of the electrolyte thus maintained. The trials of this cell at Ipswich, Lytham, Worthing, and other places in this country, for producing disinfecting solutions, proved unsuccessful, but it is reported to be still in use at Stjernfors, in Norway, and at Essonnes and other places in France, for bleaching wood pulp and textile fabrics. Probably the form of cell used at these places has been modified, and the use of magnesium chloride in the electrolyte discarded; but reliable information on these points is lacking. The cell differs from the usual type, in the absence of secondary electrodes, and in the use of zinc as cathode material.

The Kellner cell is one of the most successful of the numerous forms of hypochlorite cell, and it is now operated at a very large number of establishments in Austria, Germany, and Russia, for bleaching textile fabrics and wood pulp. Fig. 3 shows the latest form of cell. The electrolyser A is constructed of earthenware, and contains two terminal electrodes B and C, and a large number of secondary electrodes. Platinum wire is used in constructing these electrodes, the wire either being wound round insulated supports, or cut into short lengths and pushed through the supports while these latter are in the plastic state. The vessel D is of enamelled iron and contains a cooling worm. The electrolyte is continuously circulated through A and D by means of the pump E, and by this means the production of bleaching solutions of high concentration is facilitated. Actual trial of the Kellner cell has shown that a current of 114 ampères at 112 volts pressure for three hours will yield 5·5kilos. active chlorine.

The Vogelsang cell is used in a large number of bleaching establishments in Germany, and is about to be tried in this country. It is of the customary secondary electrode type, and, as in the case of all others of this type, the cell can be designed to utilise current of either 65 or 110 volts pressure.

The Woolf cell has been worked at Havana and other places in America for the production of solutions for disinfecting purposes. The installation at Havana was constructed with zinc as cathode material, and platinum-iridium alloy for the anodes. Sea-water was used as electrolyte. The trials at Havana have not resulted in the permanent adoption of the system, and the experience with the Hermite system of sewage treatment, which the Woolf system closely resembles, has thus been repeated.

III. *Efficiency and Costs Data.* - By the aid of Faraday's law, which states that a fixed and definite weight of each element is set free at the electrodes per ampère of current passed through the cell, it is possible to calculate the theoretical yield of any hypochlorite cell, and to compare with this the actual yields of the cells described above under normal working conditions. The electro-chemical equivalent of chlorine is 0·0003672grm. In other words, one ampère, in passing through a solution of sodium chloride, liberates this weight of chlorine at the anode per second. In one hour it will therefore liberate $0·0003672 \times 3600 = 1·322$grms. chlorine. The minimum E.M.F. required to carry an appreciable current through an aqueous solution of sodium chloride is 2·3 volts. Using this figure in conjunction with the former we find that the yield of chlorine per kilowatt-hour $\left(\frac{\text{ampères} \times \text{volts}}{1000} = \text{kilowatts}\right)$ is 574grms. The equations (2) and (3), given in the first section of this article, however, show that for every two atoms of chlorine liberated at the anode only one atom makes its appearance as hypochlorite in the final solution, and therefore the theoretical yield of available chlorine is only half that named above—*i.e.*, 0·661grm. per ampère-hour, and 287grms. per kilowatt-hour. Converting these yields into another form, we find that to obtain 1kilo. of chlorine in the form of hypochlorite it is necessary to expend energy equal to 4·73 E.H.P. hours.

In the following table the expenditure of electrical energy necessary to obtain 1kilo. of chlorine as hypochlorite in certain cells under actual working conditions is given, and the energy efficiency of the cell is calculated by use of the theoretical figure of 4·73 given above. Only those cells have been included in this table for which direct chemical tests of the electrolysed solution have been made. Results based upon the bleaching work achieved by a certain volume of the electrolysed salt solution are excluded, since it has been proved that such solutions possess a higher bleaching efficiency than bleaching solutions prepared in the ordinary manner with calcium hypochlorite or bleaching powder. The amount of active chlorine found in solution, when estimated by bleaching work, is therefore higher than that actually present, and comparisons between the chemical tests and actual trials are rendered incorrect.

YIELDS AND ENERGY EFFICIENCIES OF HYPOCHLORITE CELLS.

Type of Cell.	E.H.P. Hours per Kilogramme Active Chlorine.	Energy Efficiency per cent.	Remarks.
Haas & Oettel	7·48	63	Tests made during 10 hours' run with 45 ampères at 110 volts.
Kellner	9·4	50	Tests made during 3hours' run with 114 ampères at 112 volts.
Hermite	10·2	46	Tests made by Roscoe and Lunt.
Theoretical figures	4·73	100	—

The concentration of chlorine in the resultant cell solutions has considerable influence upon the energy efficiency. When the current is first passed through the cell the whole of it is employed in effecting the separation of chlorine and sodium at the anode and cathode respectively. Later on, however, the hypochlorite formed by the secondary chemical reactions also shares in the electrolysis, and the difficulty in obtaining solutions of high active chlorine contents is due to this fact, for a point may be reached when the hypochlorite is split up by the current as rapidly as it is formed. This of course diminishes the energy efficiency of the cell. The difficulty is usually surmounted by employing fairly concentrated solutions of common salt, and by withdrawing the solution after the active chlorine has attained a certain percentage. In the earlier days of the industry, solutions containing from 1 to 3grms. active chlorine per litre were the best that could be produced with a 50 per cent. energy efficiency, but Oettel in his latest type of electrolyser has obtained solutions containing 10grms. chlorine per litre, without very seriously decreasing the energy efficiency of the cell. As regards the cost of electrolytic bleaching compared with that of the older process, the ratio varies for different localities, the price of bleaching powder, of salt, and of electrical energy being the determining factors.

At Lancey, with the Corbin type of cell, the following figures have been given for the cost of bleaching wood pulp by the two methods :—

Older Method.—750kilos. wood pulp required 150kilos. bleaching powder, costing 24 francs.

New Method.—750kilos. wood pulp required the solution from a carbon cell running 24 hours with 150 ampères at 120 volts With electrical energy costing £4 per E.H.P. year, the electrolytic process is the cheaper.

For the Kellner cell the following figures are given :—

Older Method.—3450kilos. heavy calico for white goods required 50kilos. bleaching powder, costing 7s. 3d., and chemicals costing 13s. 9d. ; total, 21s.

New Method.—3450kilos. heavy calico for white goods required electric energy and salt costing 3s. 10d., and chemicals costing 4s. 7d. ; total, 8s. 5d.

The electrolytic method was therefore notably the cheaper of the two.

The above figures show that under certain conditions the electrolytic methods of bleaching wood pulp and textile goods are cheaper than the older methods. But the value of the new methods is not to be solely judged by a study of comparative costs data. Hypochlorite of soda prepared by electrolysis is a more efficient bleaching agent than hypochlorite of calcium prepared from chloride of lime or "bleach." In the first place, free hypochlorous acid is present in the former solution, and this is a compound of much higher bleaching value than any of its salts. In the second place, hypochlorite of sodium solutions have greater penetrative power than those of the corresponding calcium salt, and the bleaching effect is more uniform. In the third place, no undissolved particles of lime can settle in the web of the cloth, and less chemicals (hydrochloric acid, etc.) are required to complete the bleaching effect, when electrolysed salt solutions are used. For bleaching textile goods, therefore, the newer methods offer undoubted advantages, since they cause less damage to the fibre of the cloth. These advantages have secured for the electrolytic methods of preparing bleaching solutions a firm footing abroad. Whether they will prove equally operative in this country depends largely upon the relative economy, and this can only be settled by actual trial. Electrical energy is likely to cost more here than abroad, while salt and bleaching powder cost less.

Dyeing Immedial Sky Blue.

THE latest addition to the immedial colours (Cassella) is that of Immedial Sky Blue, which gives a shade resembling Methylene Blue. Dyeing operations are best conducted in wooden or iron vessels, although copper may be used if necessary. In preparing the liquors it is best to first dissolve the requisite quantity of sodium sulphide in about ten times the quantity of boiling water and add half of the quantity of soda ash required for dyeing. Mix well the paste of Immedial Sky Blue in a wooden vessel with this liquor, and add hot water for dissolving the same. The dissolving is accelerated by boiling up. Prolonged boiling is not necessary, the dyestuff becoming completely dissolved within a very short time.

Dyeing of Cotton Yarn.—For 100lb. of cotton a bath containing about from eighteen to twenty times the quantity of liquor, calculated on the weight of the cotton, is used. The starting bath is as below :—

	For Light Shades. Lb.	For Medium Shades. Lb.	For Dark Shades. Lb.
Immedial Sky Blue.	10—20	20— 40	40— 60
Sodium sulphide ...	2— 3	3— 4	4— 6
Soda ash	6	6	6
Turkey-red oil	2	2½	3
Common salt	30-60	60—100	100—140

The dyebath does not exhaust completely, and about two-thirds of the colouring matter remains in the liquor; for subsequent lots about the following quantities have therefore to be added, which also represent the quantities actually absorbed. The following additions should next be made, calculated on the weight of the material :—

	For Light Shades. Per cent.	For Medium Shades. Per cent.	For Dark Shades. Per cent.
Immedial Sky Blue.	3½—7	7—13	13—18
Sodium sulphide ...	1 —2	2— 3	3— 4
Soda ash	1¼	1¼	1¼
Turkey-red oil	½	½	¾
Common salt	4 —8	8—12	12—18

The dyebath is prepared as follows :—First add half of the stated quantity of soda ash, then the hot colour solution, and finally the Turkey-red oil and the salt. After a few minutes' boiling, shut off steam, and enter the boiled yarn. It should not be heated any further, as it is best to dye at about 140—160° F., at which temperature the shades come out more brilliant. For this reason it is even advisable to cool the bath somewhat by adding cold water before entering the material.

The quantity of sodium sulphide is of importance, the dyestuff being very slowly taken up by the fibre in the presence of excessive quantities of sodium sulphide, whereas the dyeings may come out uneven if not enough sodium sulphide be present. The quantities of sodium sulphide stated are based on careful trials. They are for the first bath about one-fifth for light shades, and about one-tenth for medium and dark shades, reckoning on the weight of the requisite quantity of Immedial Sky Blue. For subsequent lots add of sodium sulphide about one-fourth of the quantity of Immedial Sky Blue. If the dyebath is left unused for more than two days, add for the next following lot half as much sodium sulphide as colouring matter. For mixtures with Immedial Blue C the quantity of sodium sulphide to be added is calculated on the basis of Immedial Sky Blue only. The first rinsing liquor becomes very strongly coloured, and on this account should be used for repleting the dyebath.

Dyeing is best done on bent iron pipes for about three-quarters of an hour. At first the hanks are turned six times successively, and then only every four or five minutes. The dyevat should be provided with squeezing rollers. In taking out the yarn, each stickful is turned twice, very well squeezed off, and thoroughly rinsed as quickly as possible in the rinsing vat placed close to the dyevat. It is advantageous to add 3oz. soda ash to the first rinsing bath which is used for repleting the dye liquor. After rinsing, in order to enhance the fastness to rubbing, soap hot with the addition of a little soda, or size with 1 or 2 per cent. starch or glue, and then dry. Fastness to washing and to light may be enhanced by the application of :—1½ per cent. bichromate of potash, 1 per cent. sulphate of copper, and 3 per cent. acetic acid, calculated on the weight of the cotton. The yarn is treated at the boil for fifteen or twenty minutes, and then well rinsed.

Dyeing of Loose Cotton.—The dyebath is prepared as follows :—For 100lb. of loose cotton in about 160gals. of liquor :—

	For Light Shades. Lb.	For Medium Shades. Lb.	For Dark Shades. Lb.
Immedial Sky Blue	10—20	20—40	40—60
Sodium sulphide ...	2— 3	3— 5	5— 8
Soda ash	5	5	5
Turkey-red oil	2	2	2
Common salt	25—50	50—80	80—110

The additions for dyeing on the standing bath, calculated on the weight of the material, are :—

	For Light Shades. Per cent.	For Medium Shades. Per cent.	For Dark Shades. Per cent.
Immedial Sky Blue.	3½—7	7—13	13—18
Sodium sulphide ...	1 —2	2— 3	3— 4
Soda ash	1½	1½	1½
Turkey-red oil	½	½	½
Common salt	5 —10	10—15	15—20

First add half of the stated quantity of soda ash, then the hot colour solution, and finally the Turkey-red oil and the salt. Then boil up and enter the dry cotton into the boiling bath. After the cotton has been well wetted, cover the vat with a perforated lid and allow the dyestuff to go on the material for another half-hour at the boil. Then throw the dyed cotton on a carrying frame or into a basket so as to let the liquor drip into the dyevat, and hereafter bring the same as quickly as possible into a rinsing bath placed close to the dyevat, and containing not too much water. After being turned for a short while, the cotton is taken out and thoroughly rinsed as usual. It is important for the production of even shades that the lifting and rinsing of the material should be done very quickly. The first rinsing bath should be rather short and contain about from 60 to 80gals. of cold water for 100lb. of cotton; as it becomes rather strongly coloured, it should be used for repleting the dyebath.

Dyeing of Piece Goods.—Piece goods are best dyed in a padding machine, and copper or brass squeezing rollers may be employed, provided they are, as is usual, well covered with cotton cloth. The dyebath is prepared with :—

	For Light. Shades. Oz.	For Medium. Shades. Oz.	For Dark Shades. Oz.
Immedial Sky Blue	1½	5	8
Sodium sulphide	5/16	9/16	13/16
Soda ash	½	½	½
Turkey-red oil	¼	¼	5/16
Common salt	5	8	9½

per gallon liquor.

It is of advantage to lay off the goods instead of batching them. The dyed cloth is rinsed and dried as usual.

The Temperature of the Dyebath.*

IT is not my intention to discuss the various methods employed in heating dye vessels; rather let us consider why it is necessary to heat the dyebath at all, and especially why, in certain cases, we should regulate the temperature with more or less exactitude, and what misfortunes are likely to follow if these precautions are neglected. Under the general term dyebath I would include not only solutions containing dyestuffs, but all liquids used in connection with the dyeing process, such as mordanting baths and fixing solutions. We all know that some operations are invariably conducted in the cold, either at the ordinary temperature, such as the fixation of tannin on cotton by means of tin or antimony salts, or at as low a temperature as possible—for example in the bath of diazotised paranitraniline used in the production of paranitraniline red, where ice is frequently added to the bath in order to retard the decomposition of the diazo compound. In other cases it is best to dye at a medium temperature—somewhere between 40 and 80° C. This is frequently done, for example, in applying the basic colours to cotton or to silk, whilst in mordanting cotton with tannin it is usual to enter the goods at a high temperature and allow the bath to gradually cool. However, the dyeing operation itself—and here I use the term in a restricted sense—is in the great majority of cases carried on at the boiling temperature. That this is so must be evident if we recall the dyeing of wool with alizarin colours and with acid colours, and the dyeing of cotton with the direct colours, three of the most important branches of our industry.

Broadly speaking, it may be said that wool requires a higher temperature for mordanting and dyeing than cotton, whilst silk occupies an intermediate place in this respect. The chief practical reasons for employing a boiling temperature in dyeing are to cause a thorough penetration of the material by the colouring matter, to obtain as complete a combination as possible of colouring matter and fibre, or colouring matter and mordant, to ensure that all portions of the material shall be dyed exactly alike, and to bring about exhaustion of the dyebath as far as the nature of the colouring matter will allow.

The first of these considerations—penetration of the material—comes into play in the dyeing of thick and heavy materials, such as felt or fustian, and also in the dyeing of straw, where long boiling is required to soften and render permeable the outer siliceous layer. It is also easy to understand that a high temperature may favour the combination of colouring matter and fibre, for whether we consider the dyeing process as a chemical reaction or as an example of solid solution, we know that both chemical combination and solution are usually greatly accelerated by the application of heat. For the complete union of mordant and colouring matter, which is indisputably a chemical reaction, prolonged boiling is sometimes necessary. In the dyeing of certain alizarin blues, for example, if the boiling is only of half-an-hour's duration the dye is found to rub off very considerably; but by continuing to boil for one or two hours this defect may be entirely removed, supposing, of course, that there is sufficient mordant on the wool to combine it with all the colouring matter present. Again, it is invariably necessary to bring the colouring matter into solution in order to furnish a dyebath, and certain dyestuffs, notably the alizarin colours, require a high temperature not only to bring them into solution, but to keep them in solution. With the bisulphite alizarin compounds, such as Alizarin Blue S W, the temperature must be kept for a considerable time below the decomposition point, usually from 65 to 70° C., until the greater part of the colouring matter has been absorbed by the wool; the bath is then raised to the boil, and boiled for some time to ensure combination of mordant and dyestuff. Where dyewoods are employed, unless a previously prepared extract is used, it is necessary to boil in order to extract the colouring matter from the dyestuff.

The necessity for boiling, in order to equalise the distribution of colour already on the material, occurs chiefly when dyeing wool or silk with acid colouring matters, and cotton with direct dyestuffs. One of the chief reasons why this preparation so long found favour amongst dyers is its power of equalising on long boiling, even when the colour is at first very unlevel owing to the goods having been entered into the dyebath at too high a temperature. Hallitt also pointed out that the stripping and redyeing action due to the presence of sodium sulphate in an acid dyebath is most rapid at the boil, and that although many acid colours can be fixed at a lower temperature, it is necessary to boil to make the colours even. A similar effect is frequently observed in dyeing cotton with the direct colours, where it is sometimes possible to equalise the colour on unevenly-dyed goods by reboiling them in the original dyebath, or even in water only, or water containing sulphate of soda.

One important reason for raising the temperature of the dyebath to the boiling point is the desirability of removing, as far as possible, all colouring matter from the solution, and this is especially the case when from any cause it is not possible to utilise the old dyebath for further lots of material. Not only is economy of dyestuff effected by exhaustion of the bath, but the pollution of the water-way receiving the effluents is reduced to a minimum. In order to ascertain to what extent the exhaustion of the dye-liquor is affected by its temperature, I have recently made a number of experiments with various colouring matters, dyeing at different temperatures, and estimating the amount of colour remaining in the bath by means of the Duboscq colorimeter. The first series of experiments were made with six typical acid dyestuffs on wool. The weights of water, colour, acid, and wool were kept constant, the temperature being the only variable. The bath was brought to the desired temperature before entering the wool, and dyeing was continued for one hour, the temperature and the level of the dyebath being maintained constant throughout. Ten per cent. of indigo carmine and 2 per cent. of the other dyestuffs were employed. The results are given in Table I.

The numbers in every case represent the percentage of the original colour which remains in the bath at the end of the dyeing operation.

From this table it is evident that the maximum exhaustion of the bath does not take place, as a rule, at the boil, but rather at some temperature between 60 and 100°, which varies for different colouring matters.

If, however, we examine carefully the patterns dyed at the various temperatures, it is evident that although there is little difference in the depth of colour between the patterns dyed at 60 and at 100° C., yet in the latter the colour is more evenly distributed. The unevenness of the wool dyed at 60° does not consist in patches of uneven colour, nor is the material flecked or spotted, but there is a certain bare appearance which on close examination is seen to be due to certain threads or fibres being more deeply coloured than the rest. In cloth possessing this bare appearance a microscope or strong pocket lens usually reveals that either warp or weft threads are paler than the others, the exact difference depending on the nature of the fibres or yarns and the particular variety of weave. In other cases the individual fibres are unequally dyed—*e.g.*, with induline, which dyes the more highly oxidised portions of each fibre more strongly than the remainder; this, however, is the case even at the boil.

TABLE I.

Temperature.	20° C.	40°.	60°.	80°.	100°.
Acid Magenta (M.)	79·0	14·7	4·6	4·3	5·6
Crystal Scarlet 6 R (C.)...	59·5	1·7	0·79	0 92	1·3
Tartrazine (B. A. S. F.).....	46·9	2·9	1·09	1 06	0·97
Acid Green extra conc. B (C.)	79·0	18·1	4·0	3·6	5·2
Indigo Carmine	46·9	3·4	3·4	3·5	6·2
Acid Violet 4 B N (S.C.I.)	44·8	26·1	20·8	20·8	28·7

From Table I. it appears that with the acid colouring matters, at any rate, the exhaustion of the bath is not so potent a factor in the necessity for boiling as is sometimes supposed. Rather do we boil in order to bring about the other desirable objects which I have enumerated: even distribution, thorough penetration—which is, of course, only a special case of evenness,—and complete combination of fibre and material. It may sometimes be an advantage not to raise the temperature to the boil; this is frequently the case in garment dyeing, for not only is a saving of steam effected, but certain materials have their useful properties less impaired by conducting the operations at a lower temperature, and there is no doubt that by carefully selecting the most suitable dyestuffs it is possible to dye wool at from 60 to 80° C. and obtain satisfactory results, except with very thick materials. With regard to the basic colouring matters a number of similar trials gave the results as shown in Table II.

TABLE II.

Temperature.	Percentage of Colour Left in Bath.				
	20 C.	40°.	60°.	80°.	100°.
Magenta crystals (M.)	28·6	9·5	10·9	13·3	18·5
Chrysoidine F F (C.)...........	28 2	32·0	36·0	46·5	40·0
Auramine (B.A.S.F.)	30·8	25·6	22·2	17·4	13·8†
Imperial Green, cryst. (By.).	42·5	12 8	10·5	15·1	30·3
Methylene Blue, cryst. (M.).	29·2	24·4	28·6	33·1	57·1
Methyl Violet B extra (Ber.)	37·0	7·4	5·3	4·7	6·2

Not only from these figures, but still more from the dyed patterns, we see that the basic colours should never be dyed at the boil. This is true not only for wool, to which fibre they are seldom applied, but also for tannin-mordanted cotton. The temperature in dyeing with basic colours should not exceed 80°, and even at this temperature some of them become pale and dull. Chrysoidine, which at 60° yields a bright orange, at 80° dyes only a dull orange yellow, and with auramine the change is still more marked, but occurs between 80 and 100°. When it is absolutely necessary to apply the basic colours at the boil, as in straw dyeing, such colours as these must, of course, be strictly avoided.

In dyeing with the alizarin colours the results are affected by the solubility of the dyestuffs. An experiment was made at various temperatures, and the amount of colour remaining in the liquors estimated in this case by the addition of sufficient ammonia to render the solution clear prior to the colorimetric examination. The result was :—

TABLE III.

—	Experiment I.	Experiment II.
	Mordant. 3% $K_2Cr_2O_7$.	*Mordant.* 3% $K_2Cr_2O_7$ + 2·5% tartar.
Dyed at	Per cent. of colour remaining in the dyebath.	Per cent. of colour remaining in the dyebath.
20° C..	More than 99.	More than 99
50 ,, ..	74·8	80·8
80 ,, ..	32·1	31·1
100 ,, ,,	5·0	2·9

The patterns were mordanted at the boil and dyed with 8 per cent. of alizarin for one hour at the temperatures indicated.

With the direct cotton colours, both in wool and cotton dyeing, these experiments are complicated by the fact that the exhaustion depends very considerably on the amount of salt or sodium sulphate present, and since the amount of these salts required to bring about precipitation of the colouring matter varies according to the temperature, it is difficult to compare the exhaustion at different temperatures under conditions representing practical dyehouse work.

Similar series of experiments might be made with all the different classes of colouring matters dyed upon the materials for which they are suitable, and although it is not to be expected that any new and startling discoveries would thereby be made, yet it is very possible that by systematic work of this kind a number of data might be accumulated which would eventually prove of service to one or another branch of the dyeing industry. I will at present refer to only one other case as regards wool—viz., the mordanting of wool with bichromate of soda or potash. An experiment was made in which pieces of woollen cloth were mordanted with bichromate alone, bichromate and sulphuric acid, and bichromate and tartar respectively, at various temperatures. All the patterns were dyed with alizarin at the boil, and the amounts of colour remaining in the solution were :—

TABLE IV.

—	Expt. I.	Expt. II.	Expt. III.
Mordanted at	*Mordant.* 3% $K_2Cr_2O_7$.	*Mordant.* {3% $K_2Cr_2O_7$. {1% H_2SO_4.	*Mordant.* {3% $K_2Cr_2O_7$. {2·5 % tartar.
	Per cent.	Per cent.	Per cent.
20° C.	10	1·85	8
50 ,, ...	8	1·78	5·4
80 ,, ...	5	1·66	4
100 ,, ...	1·5	1·25	2

It thus appears that a large amount of chromium is taken up by the wool even in the cold, especially when chromic acid is present. In practice it is an almost invarible rule to boil the wool for a considerable period with the mordant, and no doubt this method yields the most complete and even combination of mordant and fibre. An exception to the rule is the process patented a few years ago by Dr. Amend, which consists in mordanting in a cold solution of chromic acid, and after some time adding bisulphite of soda to effect reduction. Before dyeing the wool is treated in a fresh bath containing 5 per cent of soda ash, and this bath is heated to 55° C. It is claimed that the wool does not lose in weight when mordanted in this manner as in the ordinary mordanting at the boil, and that the appearance and handle of the wool are greatly superior. I have not heard of the process being adopted on the commercial scale in this country up to the present, although I believe it is sometimes employed in America.

(To be continued.)

* A paper read by Mr. R. B. Brown before the West Riding Section of the Society of Dyers and Colourists.

† The bright yellow colour is destroyed on boiling.

The Advantages of Silk Weighting.

It will hardly do to speak of silk weighting as an ennobling of the silk. Silk is considered the noblest material for the production of fabrics. The fabrics made from it possess, in consequence of that gloss and feel peculiar to silk, an appearance and qualities recommending it at once for artistic fabrics, such as Gobelins, etc., for society attire and for decorative and dress stuffs for daily wear. The weighting of silk—that is, the fixing of tannic acid, of iron tannates, of tannates and phosphates of tin, upon the silk, the impregnation with sugar, etc.—can therefore not well be designated as an ennobling of the silk fibre, even though the weighting of silk should impart qualities that the non-weighting silk does not possess. But, on the other hand, such weighting cannot be termed a direct adulteration, for the manufacturer is really not in a position to produce the cheaper silk fabrics from non-weighted silk of the handle and appearance that he can from weighted silk. In this connection the question of price plays an important part. The weighting of silk is not done only to make the silk specifically heavier, but mainly to make the silk thread thicker, and thus to obtain from a given quantity of silk a greater weaving surface. If, for instance, 100grms. non-weighted silk be used to one metre fabric, it is possible, if these 100grms. silk be weighted to from 140 to 150grms., according to the weighting method, to produce 1·2 metre and more fabric of similar handle and appearance. It is self-evident that in the use of weighted silk there are not so many warp and weft threads per square centimetre as in the case of using non-weighted silk. The weight of one metre of the weighted and non-weighted silk stuff may, however, be the same. The feel and appearance, too, of both stuffs may be similar, so that the consumer might be particularly satisfied with the weighted stuff.

Furthermore, it is possible to produce, from weighted silk, stuffs of such appearance and feel as cannot be obtained with non-weighted silk. When the so called phosphate-silicate weighting (that is, weighting with tin, phosphate of soda, soluble glass, etc.) came up, a large number of dealers and consumers demanded, for many goods, just that weighting. The tendency toward quickly rotting that characterised silk stuffs so weighted, and the claims for rebate that naturally followed, do not appear to have diminished the demand. Many dealers, indeed, even to this day, ask for goods possessing the feel obtained through this process. In the silk black-dyeing industry the weighting of silk with tin and phosphate of soda has likewise found an entrance, and is universally employed. That the dyeing of weighted silk is more expensive than that of non-weighted silk needs no explanation. The weighted silk increases the wages account, and also makes necessary the purchase of weighting material. This higher dyeing-wage, however, is richly counterbalanced, during manufacture, by the use of less silk. Should a manufacturer who until now has produced a certain number of articles from weighted silk, want to go over to the use of only non-weighted silk, for getting the same appearance and feel upon the goods, he would have to ask a considerably higher price. In other words, he would not be in a position to compete.

It may be mentioned that certain manufacturers have for years used little or no weighting for many dress stuffs. Naturally such fabrics, made with a view to great lasting qualities, and for which much silk must be used, cannot be cheap. Many silk fabrics, however, do not need to last many years, owing to the quick change in fashions. Ball dresses and elegant toilettes are mostly used but one, or at the most two, years, and are during that time but little worn. Light-coloured borders, etc., are worn only until the stuff is soiled. In the case of such silk stuffs it is only a question of making them as durable as the use to which they are put will demand. Just in that respect manufacturers no doubt make many errors of judgment. If, for example, a silk stuff be used as lining for men's suitings, such as overcoats, etc., the silk stuff should possess the greatest durability, so that the lining and woollen material will wear uniformly. Or the silk stuff should be so cheap that it could be once renewed, ensuring that the price of the lining, with equally fine appearance, would be no higher, in spite of the one renewal, than the price of a silk lining which has the greatest durability.

In the case of umbrella goods, great durability is in general demand, so that the frame and the fabric of the umbrella last alike. But here, too, it is possible, in place of a dear material, to use a much cheaper stuff for the same frame. For black dress goods it is generally desired to have material that will last a long time; while, on the contrary, as above mentioned, coloured dress stuffs do not require such great lasting qualities, owing to the elusiveness of fashion. The weighting of silk cannot, therefore, be absolutely considered as an adulteration. The following is a different case:—A few years ago some sample cards were laid before the writer which came from a large silk house, which particularly emphasised the statement that the silk stuffs delivered by it were produced from non-weighted silk. In one of these sample cards were twelve silk samples. Of these, Nos. 1, 3, 6, 8 and 11 were actually produced from non-weighted silk, and testimonials from chemists, with the results of their analyses, were given to that effect. On the other hand, the other numbers—2, 4, 5, 7, 9, 10 and 12,—not accompanied by testimonials, were highly weighted, although they appeared in an assortment expressly designated as "non-weighted silk stuffs." Such a manipulation is of course designed to deceive the public, and is intended to make the public believe that, like the patterns accompanied by analyses, the other patterns are also non-weighted. Finally, be it said that in many cases the durability of a weighted silk after dyeing is not less, but even greater, than the durability of non-weighted silk. The following table will show this:—

Average out of Ten Tests.

	Extensibility. Mm.		Strength. Grms.
A merely degummed silk showed	173	...	71
The same silk weighted 30 to 40 per cent. above par	191	...	80
The same silk weighted by another method, 30 to 40 per cent. above par......	208	...	83
The same silk weighted about 45 per cent. above par and dyed black	171	...	92
Another silk showed, degummed	84	...	69
The same silk weighted 30 to 40 per cent. above par showed	72	...	96

Nevertheless it is also frequently the case, especially in high weightings, that a not inconsiderable diminution takes place in the extensibility and strength of the silk.

The fact that silks weighted with metallic oxides crackle more, and are more quickly worn out by rubbing, than non-weighted silk, is due to the precipitations that take place upon the silk. Furthermore, there are other influences, such as light and dampness, that have a deteriorating effect. Whether it would be to the advantage of the silk industry, and also to the consumer, if only non-weighted silk were worked, or whether both are better off with the present method of manufacture, is a difficult question to decide. A large number of articles now used could not be manufactured—that is, their high price would preclude purchase—unless weighting were resorted to. Excessive weighting, particularly tin-weighting, says the "Monatschrift Text.-Veredl.-Ind.," appears worthy of being condemned, as experience teaches that this weighting, according to the method now in vogue, is strongly prejudicial to the wearability of the stuffs.

Dyeing and Polishing Cotton.

The manufacture of polished cotton in Germany is practically confined to the Elberfeld-Barmen district. The yarn is made purely from cotton, and is known by its strength, stiffness, smoothness, and lustre. It should not show any loose fibre, and even when made from inferior cotton must look like thread except by not being quite so brilliant. Great care is necessary in dyeing to get no loose fibres, which would have to be removed afterwards with loss of material. Should any accident happen in the dyeing, it is best to dye black and use for some other purpose rather than to waste time trying to put things right. The yarns to be made into dyed polished yarn must be bleached if bright colours are wanted, and should always be scoured from two to three hours in water at 7lb. pressure.

Brilliant warm pink is dyed with Erythrosine and Phloxine. Less brilliant hues, but faster to washing (not very important, however, with polished yarns), are got by mordanting with tannin and tartar emetic, and dyeing in an acetic acid bath with Rhodamine 6 G and B. These dyes colour decidedly more bright than Erica. Cerise is dyed in the same way. If Rhodamine G is used, a yellow shade must be imparted with Auramine. In this way we get a fairly brilliant scarlet, but the mordanting must be efficient. Scarlet is dyed with Croceine Scarlet 2 B, 7 B, and R direct in the alum bath with from 5 to 10 per cent. of dye, or with Ponceau 2 R and G. Lively blues are got with tannin, tartar emetic, and Cotton Blue B J O O, or Methylene Blue, or Ethylene Blue R. Pale shades are dyed direct in the alum bath, violet with Crystal Violet and Methyl Violet 4 R. Navy blue is mordanted with sumach and nitrate of iron, and dyed with New Blue D 120 or Ethylene Blue R. This gives a very uniform colour. Very dark navy blue is done on the same mordant with Methylene Blue and Crystal Violet. Fiery yellow is mordanted with sugar of lead, and dyed with chrome and hydrochloric acid, or more simply and quite as well with Chrysophenine, or Diamine Fast Yellow A and Mikado Orange R. Grey is mordanted with sumach and green vitriol, darkening with nitrate of iron and dyeing in the alum bath with Methylene Blue, fustic, Safranine, Phosphine, etc. Brown is mordanted the same and dyed with Chrysoidine, Diamond Fuchsine, or Phosphine. The reason for using mostly basic colours is that they conform best to the subsequent lustring. Black is dyed with logwood and sulphate of copper or iron. It must be done heavily, or it will go grey in the lustring. The logwood gives a better lustre and handle than Direct Black.

Some experience is needed in dyeing these goods exactly to pattern, as allowance has to be made for the after-finishing. The surest way is to put the finishing material into the dyebath when the shade is almost obtained. If this is too dear, the yarn must be wound from the dyebath, or better, dried, and then starched 2lb. at a time, and then again wound, but not tightly. Then it comes to the special polishing machine, which usually consists of a winch on the circumference of which eight brushes are screwed. It is worked by two men. One lays the skeins of yarn smoothly together on two iron rollers, and ties all the broken threads; the other hangs the rollers as they are ready in front of the machine, so that the brush brushes the yarn as it rotates. This is continued till the yarn is brushed dry, which takes about three minutes. During this time he must keep the yarns separate with the back of a knife, spread paraffin on them, and mend, so far as possible, where necessary. If several threads are broken in the same skein it must be discarded altogether, as it would tangle and become unrinsable. Polished yarn should contain no loose ends, or at least very few. If the skeins are not carefully watched they will stick together, and the same will happen if too much size has been used to them. Such yarn cannot be rinsed, and that process is unavoidable, especially with fine yarns, which cannot be worked up again without much loss. A good polisher can turn out from 30 to 50lb. of fine, or from 60 to 80lb. of coarse polished yarn per day. The driving of the machine requires from 2 to 4H.P. The difficulties of polished yarn making are very great, says the "Leipziger Färber Zeitung"; so much so that the industry has hardly made any progress in Switzerland. This is remarkable, as the demand for it is very large, both for weaving and in the silk manufacture.

Finishing Hosiery.

When it is desired to produce a silk or lisle finish on hosiery, it is necessary to remove the nap or lint from its surface. These can be removed most effectually if, in the case of a cotton stocking, the article is stretched or distended, so as to spread the threads well apart. In this way the flames or other singeing medium employed can reach every fibre that forms this nap or lint, it being apparent that when the stocking is in its normal or unstretched state the flame cannot reach all of these fibres forming the nap or lint. The stocking thus stretched is passed through the singeing machine, and the fibres forming the nap or lint are removed by the singeing operation. To more effectually perform this operation, the stocking is first saturated, while in its white or its normal condition, in a solution consisting of the following ingredients—namely, chloride of soda or chloride of potash, 1lb.; bluestone, ½lb.; aniline salt or aniline oil, from 4 to 5lb., this solution being known as an aniline-black solution, and being the first step in the process of dyeing goods fast black.

After thorough saturation, the goods are dried in the atmosphere, and are then in an oxidised state. It is while they are in this oxidised state that their threads are distended or pulled apart by being stretched upon the board or former and passed through the singeing machine to remove the nap or lint, it being noticed that the board acts as a backing for temporarily and conveniently handling a stocking while being subjected to the singeing action. After the stockings are thus singed they are finished, the finishing agent being, for instance, chrome of soda or chrome of potash, this being the concluding step in a process of dyeing goods fast black.

The nap or lint which detracts from the appearance or finish of the stocking consists of the fine ends or fibres that project from the thread and which alone are almost imperceptible. But the knitted fabric brings these fine ends or fibres together and forms a nap or lint, and the effect of their close congregation becomes apparent on the exterior surface of a stocking by reason of the fact that they prevent the threads from standing out clear as in a lisle thread or silk stocking, or in other words, these fibres on the thread, which by themselves are practically imperceptible, deaden the appearance of the stocking and obscure the fine lines of the thread in the knitted fabric. As it is only to improve the appearance of a stocking that the nap or lint is removed from its exterior surface, it is obvious that it is unobjectionable on the interior surface; and it is not only unobjectionable, but it is not desired to remove this nap or lint from the interior surface, as it makes the surface of the stocking smooth and soft and enhances rather than detracts from its wearing qualities. It is best, then, to singe only the exterior face or surface so as to remove every portion of this nap or lint projecting outwardly from the thread composing the stocking. This leaves the exposed sides of the thread clean and smooth, without affecting other portions, and consequently gives to the stocking a smooth finish and fine surface and lustre resembling a silk or lisle finish, for, as mentioned before, the fine lines of the thread are not obscured. When this latter process is resorted to, the singeing process can be most effectually accomplished by treating the hosiery before singeing so that the nap or lint can be more effectually removed when the stocking is singed—for instance, by first saturating the stockings when white or in their natural condition in the solution given above, and by treating the knitted fabric on the same lines.

Printed Delaines.

PREVIOUS to the printing of half-wool or delaine goods, the cloths are singed in the usual way and then washed in water at 110° F. for half-an-hour. Then follows a soaping, 2lb. soap and 5oz. soda being used for each piece of cloth 120yds. long. The soap bath is used at from 110 to 120° F., and the cloths are heated in this for from an hour to an hour and a quarter, after which they are passed into a bath of 5oz. soda per piece for half-an-hour, and well washed, when they are ready for the bleaching bath. The bleaching bath is made from 16gals. water, 3lb. silicate of soda (at 75° Tw.), and 4¾gals. of peroxide of hydrogen. This is used at boiling heat, and the pieces are immersed in it for from three to four hours, care being taken to see that they are well covered by the liquid during the whole time, and to turn them over several times during the treatment. The length of time depends upon the quality of the cotton used in weaving the goods, says the "Bulletin de la Société Industrielle de Mulhouse." Good American cotton will only take about two hours, while Egyptian cotton takes about four hours. When the colour of the goods shows that they have been sufficiently bleached, they are removed from the bath, squeezed, washed, and dried.

Next follows the chloring. This is done in two vats, one charged with 60gals. of water and 9gals. hydrochloric acid (of 9° Tw. strength), and the other with 60gals. of water and 11gals. chemic liquor (of 9° Tw. strength). The cloths are first drawn through the acid liquor and then through the chemical liquor, after which they are washed. They are finally passed through a bath of stannate of soda (of 4° Tw. strength), allowed to lie for an hour, then run through sulphuric acid of 3° Tw., well washed, and then dried. The printing follows next. It is done with any of the steam colours used in printing cotton, and also naphthol colours. This, and the following operations of washing, soaping, etc., are done in the ordinary manner.

Nitrose Colours.

WITH the object of obtaining a fast navy blue on silk, in place of the blues dyed with a fast resist for producing the well-known printed silks having white patterns on a blue ground, a writer in the "Revue Générale des Matières Colorantes" describes his experiments. They refer chiefly to silk, but with the addition of tannin to the colour the same reactions were employed on cotton. The following quantities were employed at the time:—¾ litre water, ¼ litre acetic acid (10° Tw.), 50grms. nitrosodimethylaniline hydrochloride, 25grms. resorcin, and 20grms. tannin.

The goods were padded, dried, and steamed for two minutes, and passed through tartar emetic, made up as follows:—1 litre water (45° C.), 5grms. chalk, and 5grms. tartar emetic.

The blues obtained were, however, never satisfactory, and this is attributed to the short process of steaming, excess of nitrosodimethylaniline, and the inferior quality of the dimethylaniline which they had to use.

Since 1895 the author has employed a nitroso black which is obtained as follows:—Pad in a bath made of ¼ litre acetic acid, ¾ litre water, 25grms. resorcin, 50grms. nitrosodimethylaniline hydrochloride, and 20grms. tannin (in powder). Add, according to the shade of black required, methyl violet, methylene blue, auramine, etc. Dry on the hot flue, steam for two minutes, and pass for one minute through a bath made up of 1 litre water (60° F.), 10grms. tartar emetic, and 25grms. sulphate of iron. Wash, soap, boil, rinse, and dry. The black is a good one, and may be resisted like nitroso blue, or discharged with chlorate of alumina, etc.

When the products of Meister, Lucius and Bruning are used, a very fine navy blue is obtained with the following colours:—6000grms. starch tragacanth thickening, 2000grms. glycerine, 200grms. nitroso paste M (50 per cent.), 74cc. hydrochloric acid (36° Tw.), 200grms. resorcin, 1500grms. water, 60grms. oxalic acid, 600grms. water, 600grms. tannin solution (1 : 1), and 400cc. phosphate of soda (200grms. per litre). Print on bleached material, steam for three minutes, and pass into a bath composed of 1 litre water (50° C.), 5grms. tartar emetic, and 10grms. chalk. Wash, soap at 50° C., rinse thoroughly, and dry. If 25grms. sulphate of iron are added to the tartar-emetic bath, a blue results which is so dark that it can well serve as a black. This fact indicates that if from some cause or another the nitroso blue comes out too light in printing or dyeing, it can be easily saddened.

The Indigo Industry.

THE indigo industry shows signs of revival. The last crop yielded 112,000 maunds, or about a fifth more than the previous season. There was very little really sound clean indigo, and consequently the finest qualities always fetched a good price. There are four indigo plant-growing districts—Bengal, Behar, Benares and Doab, the largest being Behar and the smallest Bengal. The quality of the latter crop was extremely poor, and the quantity manufactured was the smallest on record. these evils being helped by unfavourable weather which prevailed before and during the process of manufacture. The Behar crop was good, containing an unusually large proportion of good to fine descriptions, but in many cases, particularly in Chumparun, while the colour was all that could be desired, the indigo was either limy and defective or else rough pasted. To set against this defect must be placed the existence of very little coppery or low indigo in the Behar outturn, and the average quality would be equal to standard.

In regard to Benares and the North-western Provinces, the qualities were very disappointing, the finest being practically non-existent, and the bulk of the crop consisted of rather dull and coarse pasted medium kinds. In the early sales, however, the selection offered contained a large proportion of useful middling and low grades, which at first met with very little demand, but the scarcity of good and useful qualities was soon recognised. The result was a ready sale at hardening prices, the purchases being principally for America. The high prices paid for this class of indigo should have the effect of inducing proprietors to cultivate a considerably larger area of land under indigo during the current season. In regard to the market at the beginning of the sales, prices ruled low, and sellers refrained from putting their stocks on the market. Rates still receded, until by the middle of December last indigo was selling at from 7s. to 13s. below opening rates. After the Christmas holidays the demand became brisker until the last week, when the sales realised from 6s. to 20s. more than the opening prices. The improved demand was caused to a considerable extent by Continental dealers labouring under the impression that the indigo crop could not be disposed of in Calcutta except at their own ideas of value. They, however, discovered it was being freely absorbed, and not having sufficient indigo to meet their requirements, had to purchase from Calcutta.

America took a large quantity of indigo this season, and there was a great increase in the shipments to Japan and the Gulf. The existence of the indigo industry has been seriously threatened by the artificial indigo put upon the market, and if competition is to be successful the planters have felt they must either reduce expenses of manufacture or get an increased output during the process of manufacture. Experiments in Behar have been eminently successful. A new process has resulted in an increased outturn of 25 per cent., and it is sufficiently encouraging to induce planters to continue these experiments. The cost is heavy, and the planter, having fallen on evil times, has applied to Government for a grant in aid. It is to be hoped this will be granted, for planters are just as much entitled to be helped in the development of their industry as the Indian ryot to develop his crops by agricultural experiments entirely carried out at Government expense.

NOTES ON DYEING, BLEACHING, FINISHING, &c.

Specially compiled for THE TEXTILE MANUFACTURER.

PROOFING FABRICS.—All the existing methods of proofing textile fabrics are only applicable to cloths with meshes more or less small, if the proofing is to be a success. Nevertheless it is sometimes a matter of great importance that textiles with wide meshes should also be proofed—for instance, jute fabrics which are used for covering goods, or in the shape of sacks, or used for packing finely-pulverised goods, such as cement, dyeing materials, and other articles. It is, moreover, well known that cement bags, for instance, can only be used once, as they are consumed by the active parts of the cement, and it would be beneficial to make the sacking impervious to such influences. Still more frequently is it desirable to protect cloths from acids—for instance, those for workmen's overalls, as well as those used in connection with electric batteries and the like. For this purpose an emulsion consisting of asphalt, papier mâché, cellulose or similar material, and tanned or chrome glue, with the addition of some emollient material such as birch tar oil, vaseline, glycerine or other substance of the nature of grease, should be made. This is prepared by first pulverising the papier-mâché or cellulose as fine as possible, and the same quantity of asphalt, also very finely. At the same time a 10 per cent. solution of glue is prepared, and salts of chrome added, and the mixture of papier-mâché and asphalt then added to same as required; an emollient such as birch tar oil, vaseline or glycerine should also be mixed with the compound. It is then requisite to subject the entire mass to powerful mechanical treatment in a mixing machine so that any particles of papier-mâché which come to the surface during the process may be thoroughly disintegrated and absorb the particles of asphalt. When, after being worked for a long time, the whole is compounded into a homogeneous mass, a volatile oil (such as naphtha, turpentine or benzene) is added as required, which dissolves the particles of asphalt, and the entire mass is then subjected to further mechanical treatment until it becomes a viscous compound of greater or less consistence, according to the relative quantity of the glue solution or of emollient admixtures used. For the proofing of jute fabrics with wide meshes, the following proportions of ingredients will be found to make a suitable emulsion—viz.: 10 parts asphalt, 10 parts papier-mâché, 5 parts glue, 1 part chrome-alum, 8 parts birch tar oil, 16 parts benzene, and 50 parts water.

CARBON BLACK B AND B W.—These new colouring matters (Kallé) are homogeneous products, so that there is no risk of any alteration of the shade when dyeing from a standing bath. They are adapted for dyeing cotton in a bath containing common or Glauber's salt, and yield directly shades similar to logwood black (those of B being somewhat more bluish than B W), having a good resistance to light, water, soaping, soda, and acids. The affinity of these colours to the cotton fibre is said to be so great that the dyebath can be sufficiently exhausted with 20 per cent. common or Glauber's salt; by adding from 0·5 to 1 per cent. calcined soda the colouring matters go on still more readily. For cotton, enter at the boil into the bath prepared with about 1 per cent. calcined soda, 20 per cent. common or Glauber's salt, and the necessary quantity of colouring matter (for instance, about 6 per cent. Carbon Black B for the first dyeing), and dye 1 hour boiling. The use of copper and lead must be avoided as much as possible. The subsequent dyebaths are replenished by adding about two-thirds of the quantity first used of colour and one-fifth of that of salt and soda. For half-wool, both brands dyed in a neutral bath of Glauber's salt yield about the same shade on wool as on cotton. As the cotton takes a stronger shade than the wool, and the dyeings are fast to acids, the new products will prove very useful for the dyeing of half-woollen goods. For half-silk they dye both fibres the same shade from a bath of Glauber's salt mixed with a little bast-soap.

SULPHON CYANINE.—This class of navy-blue dyestuffs gives a bloomy shade closely approaching alizarins, and forms the subject of an interesting pattern-card issued by the Bayer Company, as applied to gentlemen's suitings. For every 100lb. of cloth add 5—8lb. acetate of ammonia to the dyebath, and 5lb. Glauber's salt crystals, and enter the goods, which have previously been well cleaned at about 105° F. Raise the temperature of the dyebath slowly to about 200° F. and allow the pieces to run until the bath is completely exhausted. Should all the colour not fall on, then add a slight amount of acetic acid well diluted with water. Only employ neutral or weakly acid acetate of ammonia—at all events, not that of an alkaline reaction. Particular care should be taken that the goods are previously cleaned well before commencing to dye; the pieces should be therefore treated for half-an-hour at 160° F. in a bath containing sufficient ammonia (spirit of sal-ammonia) to cause the liquor to slightly smell of it. The goods should then be washed in water, and can afterwards be entered into the dyebath. Another method of treatment is the following:—Boil the goods in the byebath first with 5lb. acetate of ammonia for half-an-hour, then cool down to 105° F., and add the dyestuff and proceed as above described. Should the goods contain a great quantity of dirt—which is particularly the case when not stored in a dry place,—it is also advisable to boil them in a bichrome bath, which is done in the usual manner with 3lb. bichrome for about one hour, and after rinsing dye as above described.

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.

4th March.

4539 H. SLATER, Keighley. Spinning, twisting, and like machinery.

4568 O. IMRAY, London. Manufacture of a brown sulphurised dyestuff from 2 : 4-dinitro paraoxydiphenylamine or 2 : 4-nitro-amido-oxydiphenylamine. (*Farbwerke vormals Meister, Lucius and Brüning, Germany.*)

4609 J. Y. JOHNSON, London. Production of substantive colouring matters, and of products for use therein. (*The Badische Anilin and Soda Fabrik, Germany.*)

4613 J. CUTHBERTSON and J. E. DUDSON, London. The manufacture of lace.

5th March.

4631 T. CHADWICK, Halifax. Electric stop motions of drawing frames.

4650 G. ROPER, Oldham. Rollers to be applied to cotton spinning frames

4658 W. J. CLARK, London. Cloth solutionising apparatus.

4662 A. GREAUD, London. "Lamb" knitting machines.*

4689 W. E. BAKER, London. Adjustable bearing for rotary washing machines.

6th March.

4738 R. J. MCKEOWN and MILFORT WEAVING AND FINISHING COMPANY LIMITED, Glasgow. Method of weaving linen fabrics.

4739 G. HOVE, Glasgow. Damask weaving.

4741 G. A. RYDER and OTHERS, Manchester. Rollers employed in machinery for preparing, spinning, and otherwise treating textile materials.

7th March.

4839 H. A. COSTOBADIE and THE CALICO PRINTERS' ASSOCIATION LIMITED, Manchester. Calico printing.

4851 T. GREMME, Charlottenburg, Germany. Process for manufacturing coloured patterns or embossed or relief work.*

4853 E. Y. WALSH, Eccles. Spinning machinery for spinning cotton, woollen, or any other yarns.

4884 J. E. KENNEDY, London. Device for testing leather and other fabrics.*

8th March.

4926 G. B. THORP, Manchester. Lace curtains.

4945 A. REAVILL, London. Cylindrical beams for holding yarn in lace and like machines.

4947 E. TILSTON, Manchester. Apparatus for the automatic supply of fibrous materials to opening, beating, carding, and other like machines.

4949 J. T. THOMPSON, London. Clearers for spinning mules, ring frames, drawing frames, etc.

9th March.

5036 J. R. TATE, London. Apparatus for singeing or "gassing" cotton and other yarns.

5049 THE FARMERS' COMPANY LIMITED and A. WOOD, London. Machinery for cleaning, delinting, and polishing cotton seed.

5053 P. BENDIX, London. Apparatus for automatically alternating ground patterns and weft-border patterns in figure weaving.*

5076 J. E. BOUSFIELD, London. Treatment of nitro-cellulose to be used for the manufacture of lustrous yarns. (*La Société Anonyme de Produits Chimiques de Droogenbosch, Belgium.*)

11th March.

5102 G. HILL and J. K. FIELDING, London. Warping mills.

5167 O. IMRAY, London. Fast double colour lakes. (*Farbwerke vormals Meister, Lucius and Brüning, Germany.*)

12th March.

5236 P. P. CRAVEN, London. Ring spinning, doubling, and twisting machines.

13th March.

5274 J. LIVINGSTON, Glasgow. The spinning of flax, hemp, jute, and other fibre.

5283 R. H. PLACE, Halifax. Dobbies or shedding motions and plain selvage motions of looms.

5302 H. PALMER, Macclesfield. Swivel racks used in weaving silk, cotton, woollen, or any other textile goods.

5317 P. HAYTHORNTHWAITE, Burnley. Slays of fast reed looms.

5326 F. MOLL and M. DICKHUTH, London. Washing and bleaching processes.

5339 A. FISH and J. GRAHAM, Manchester. Take-up motions of looms.

5359 H. H. LAKE, London. Dyes. (*Chemical Works, formerly Sandoz, Switzerland.*)

5363 A. G. GREEN and OTHERS, London. Production of colouring matters containing sulphur.

5365 J. CUTHBERTSON and J. E. DUDSON, London. Lace.

15th March.

5463 H. B. SUMMERSCALES, Keighley. Driving mechanism for rotary washing machines.

5516 C. DANILEVSKY and OTHERS, London. Process for metallising fabrics.

5521 E. SILBERSTERN, Liverpool. Process for applying ornamentations to fabrics.

16th March.

5569 R. C. WATKINS, London. Mats, rugs, and the like

5580 R. B. RANSFORD, London. Dyestuffs. (*L. Cassella and Co., Germany.*)

18th March.

5613 LORD BROTHERS LIMITED and OTHERS, Manchester. Controlling the feed of fibrous materials into the hoppers of openers, scutchers, etc.

5625 E. TWEEDALE and OTHERS, Castleton. Lifting motions of ring spinning and doubling machines.

5644 A. H. ILLINGWORTH, London. Doffing in cap spinning, twisting, doubling, and similar machinery.

5654 C. D. ABEL, London. Acid dyestuffs belonging to the diphenylnaphthylmethane series. (*Actien Gesellschaft für Anilin Fabrikation, Germany.*)

5655 F. T. KÖNITZER, London. Centrifugal machines for dyeing purposes.

5678 G. RICHTER, London. Apparatus for moistening air.

19th March.

5746 N. N. SHAW, London. Dyepans and other similar vessels.

5751 C. BLAIR, Manchester. Machines for slitting textile fabrics.

5811 H. E. NEWTON, London. New anthracene derivatives. (*The Farbenfabriken vormals F. Bayer and Co., Germany.*)

20th March.

5836 W. FISH, Accrington. Automatic stop motions of looms.

5840 S. WRIGLEY, Werneth. Tramway lines or rails used in connection with the carriages of mules.

5841 S. WRIGLEY, Werneth. Brushes for attaching to the guards of mule carriage wheels.

5844 J. O. GAY, Dundee. Adjustable banks for holding spools or bobbins.

5847 W. W. MELVILLE, Glasgow. Block printing on silk, cotton, or mixed fabrics.

5850 R. MYERS and OTHERS, Burnley. Selvage motions of looms.

5853 E. POWELL and OTHERS, Derby. Traverse warp machines.

5878 A. G. BLOXAM, London. Calendering machines. (*J. P. Bemberg, Baumwoll-Industrie-Gesellschaft, Germany.*)

5880 O. IMRAY, London. Black sulphurised dyestuffs directly dyeing cotton. (*Die Farbwerke vormals Meister, Lucius and Brüning, Germany.*)

5887 T. KIRKLAND, London. Apparatus for washing, rinsing, and drying clothes and other fabrics.

5891 J. LANG, Kilmarnock. Lace curtains.

21st March.

5925 J. BUTTERWORTH and W. DICKINSON, Halifax. Sizing machines

5926 J. BUTTERWORTH and W. DICKINSON, Halifax. Looms.

5937 A. H. BALL, Nottingham. Safety guard for ironing or calendering machines.

5946 J. LIVINGSTON, Glasgow. Spinning of flax, hemp, and jute.

5979 P. P. CRAVEN, London. Ring-spinning, doubling, and twisting machines.

22nd March.

6034 R. HARGREAVES, Burnley. Picker-saving or checking appliances of looms.

6069 C. M. EDOUARD and C. SORLIN, London. Jacquard apparatus for looms.

6086 E. ALLARD and L. ROUX, London. Machines for cutting and punching woven fabrics, leather, card, and paper.

23rd March.

6103 J. ANDERSON and ANDERSON, HARDING AND CO. LIMITED, South Shields. Automatic machine for winding wire, hemp, manila, and other ropes.

6109 H. W. WILSON and J. GREENWOOD, Manchester. Loom shuttles.

6116 W. D. BUTZ, Manchester. Machinery for applying knitted fabrics to transfer points.

6117 J. ROTHWELL and T. HALL, Manchester. Sliver can.

6118 J. EATON, Manchester. The production of piled fabrics.

6129 T. R. WOLLASTON, Manchester. Apparatus for softening water and removing suspended matter from liquids by continuous decantation.

25th March.

6247 E. SCHINDELER, London. Harness for looms.*

6253 A. GUTERMANN, Liverpool. Reels and bobbins.

26th March.

6286 J. T. PEARSON, Burnley. Conditioning yarn.

6321 S. A. FLOWER, London. Fibre-curling apparatus.*

27th March.

6399 T. WILLIAMS, Manchester. Bale-hoop and the like joints.

6429 H. E. NEWTON, London. Preventing the weakening of dyed cotton fibre. (*The Farbenfabriken vormals F. Bayer and Co., Germany.*)

28th March.

6493 S. LEBE, Halifax. Apparatus for dividing and condensing fibres.

6543 R. ZIERSCH, London. Apparatus for producing on woven fabrics a gloss resembling that of silk velvet.

6544 G. H. DORNIG, London. Automatic stop motions or disengaging devices for looms.

6545 J. Y. JOHNSON, London. Colouring matters containing sulphur. (*The Badische Anilin and Soda Fabrik, Germany.*)

6546 J. Y. JOHNSON, London. New black colouring matter. (*The Badische Anilin and Soda Fabrik, Germany.*)

29th March.

6582 J. BUTTERWORTH and OTHERS, Halifax. Looms.

6591 W. E. HEYS, Manchester. Apparatus for dyeing cotton slubbings and rovings when wound upon bobbins or tubes.* (*J. Schmidt, France.*)

6643 J. Y. JOHNSON, London. Mordant dyeing colouring matters. (*The Badische Anilin and Soda Fabrik, Germany.*)

6644 J. Y. JOHNSON, London. Treatment of raw silk, and fabrics containing raw silk. (*The Badische Anilin and Soda Fabrik, Germany.*)

6651 C. D. ABEL, London. Colouring matters belonging to the naphthacridine series. (*Actien Gesellschaft für Anilin Fabrikation, Germany.*)

6652 A. G. BLOXAM, London. Machines for cutting and sewing together the edges of materials. (*A. V. Rowley, Germany.*)

30th March.

6666 E. HINDLEY and OTHERS, Stockport. Cop-dyeing machine and extractor.

6667 J. O. COTTRILL, Manchester. Spindles of ring spinning and doubling frames.

6668 A. P. S. MACQUISTEN, Glasgow. Warp stop motions.

6679 R. TALBOT and W. ROSSETER, Manchester. Machines for sizing yarns.

6699 J. F. WHITE and OTHERS, Manchester. Apparatus for drying wool or other fibres or materials.*

6710 E. BENNETT, London. Ring doubling spindles.

6717 O. BRISKE, London. Automatic hank-binding apparatus for yarn reels.

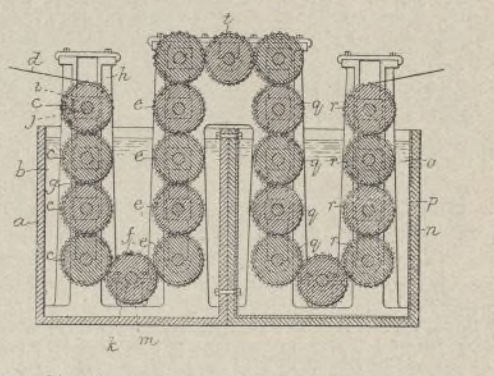
6735 B. SALZER and G. WALTHER, London. Straight-bar knitting machines with petinet mechanism.*

Recent Textile Patents.

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

1899.

24,188. Mercerising fabrics. Dec. 5. J. R. Ecob, 81, Brown-street, Methuen, Mass., U.S.A. Relates to apparatus for the mercerisation of fabrics, and particularly those in which a high lustre is desired. The invention has for its object to provide more efficient and satisfactory means than those heretofore employed for preventing or reducing to the minimum the transverse shrinkage of the fabric which is caused by mercerisation, and to avoid the use of tentering devices, which have been heretofore used for this purpose, and which are necessarily unsatisfactory and comparatively inefficient in their operation and injurious to the edge of the fabric. It consists in a mercerising apparatus comprising a tank or a plurality of tanks for holding one or more of the liquids employed in mercerising, and a connected series of rolls arranged to conduct the fabric in a sinuous course through said tank or tanks, the fabric being held in close contact with said rolls during its passage through the liquid or liquids in said tank or tanks, so that no part of the fabric under treatment is free to contract laterally. The drawing illustrates, in vertical longitudinal section, apparatus in the construction of which the improvements have been embodied. *a* represents a receptacle, which may be of any suitable contour and material, and is here shown as a rectangular tank, preferably of iron, when the fluid agent *b* is to be an alkali, as caustic soda. The action of such a solution causes a very marked degree of shrinkage, to the obviation of which the improvements are directed. The system of rolls includes a plurality of rolls *c*, which serve also to squeeze the material, and are arranged in upright series, to the number of four, to suit the proportions of the tank illustrated, and affording three regions of pressure upon the material *d* as it passes between the adjacent rolls of the series. In passing from one such region to the next, the material will hug the periphery of the roll which it is about to leave, and will thus be held in close frictional contact with said periphery, the material being positively grasped between each roll and the next, so that the material while under treatment is continuously controlled, the control being due to the positive grasp between each roll and the next, and the frictional contact maintained against the intermediate peripheral portions of the rolls. Where it is desirable to prolong the period of immersion in the fluid contained by the receptacle, an additional series may be provided; and in the instance illustrated, this takes the form of another upright series composed of rolls *e*, and to effect the convenient transfer of the material *d* from one to the other of these series is a roll *f* intermediate and preferably tangent, through the material, to the respective lowest rolls *c*, *e*, thus ensuring perfect continuity in the treatment of the material. The support and actuation of these rolls may be accomplished in any suitable manner, and as one convenient arrangement is shown the rolls as geared each to its neighbour, as at *g*, and driven positively through the medium of the roll *f* from a suitable source of power, not shown. Guide frames or other suitable means *h* may be provided, to maintain the rolls in upright



relation, and bearing-blocks or the like *i* may be utilised for the journals *j* of the rolls, permitting, if desired, freedom of vertical movement, so that by gravity the respective members of each series will be maintained in tangency with neighbouring rolls, even down to the roll *f*, the axle *k* whereof may find its seat, if desired, in a stationary bearing *m*. For the sake of illustrating the flexibility of the improvement, *n* may be considered as a tank for acid *o*, with a protective cement lining *p* and stacks of rolls *q*, *r*, which for the sake of convenience in illustration have been shown as similar in form and arrangement to those already described. When it is desired to maintain perfect continuity in contact of the material with neighbouring roll surfaces throughout its period of treatment, one or more rolls *t* may be placed in position to co-operate with the uppermost rolls in the series *e* and *q* respectively. —March 5, 1901.

1900.

3072. Weaving card chains. Feb. 16. F. P. Middleton, Springfield Mills, Adlington. Consists in certain improvements in the method of attaching metallic cards to each other in order to form the chain, by a small flat double spring which passes through the nearest hole of the card, and can be slided down so as to admit of the insertion of the rings and then slided into position again, closing the aperture and securing the rings in place, being retained firmly in position by its own elasticity.—Feb. 16, 1901.

3075. Silk waste spinning. Feb. 16. J. Woodhead, 38, Pannal-street, Great Horton, Bradford, and N. Thompson. The object is to provide a cheap and efficient means of preparing gummed silk waste for spinning. For this purpose the waste is boiled in a suitable alkaline or other solution adapted to remove the gum from the fibre. After drying, the ungummed fibre is passed through a Garnett machine made with particularly fine teeth, then through a gill box, the fallers of which are very finely and closely pinned. The gilled material is then balled ready for combing. The Noble or other comb is very finely pinned, and the top leaving it is balled ready for spinning.—Feb. 16, 1901.

3188. Reels for hanking. Feb. 17. M. J. Nordmann, Schillerstrasse, Dresden, Saxony. Relates to a mechanism for use in connection with reels for holding the widely-spread-out yarn together at certain places in bunches ready for the fastening to be done by a tieing apparatus, characterised by a comb adapted to be turned round the reel, which comb can be placed out of the way of the skeined or hanked yarn, to permit the convenient removal of the same from the reel.—Feb. 16, 1901.

3416. Mercerising. Feb. 21. H. W. Kearns, 4, South King-street, Manchester. In the production of a bright silky lustre on cotton yarns or fabrics by the process of mercerisation under tension, it has hitherto been the custom to select such yarns or fabrics only as have been made from Egyptian or Sea Island cotton, which class of cotton is very costly. It is discovered that by taking ordinary American or other cottons than Sea Islands or Egyptian, and treating them according to the invention, the yarns or fabrics made from such cottons (which are less costly) may have a bright silky lustre imparted to them by submitting them to a mercerising process under tension equal or nearly so to that hitherto imparted only to yarns or fabrics made from Sea Islands or Egyptian cotton. American or other cottons (not being Sea Islands or Egyptian cotton) are taken, and instead of carding them only in the usual manner, they are combed before spinning, and either gassed or singed. It will be found that by this combined method of treatment and mercerisation a perfect silky lustre can be imparted to such yarns or fabrics equal or nearly so to that hitherto produced only by the mercerisation under tension of yarns made from Sea Islands or Egyptian cotton. Yarns prepared from the cotton above specified, or cotton other than Egyptian or Sea Island, which are softly spun and slackly twisted, are the most suitable for attaining such silky lustre when they or the fabrics made therefrom are subjected to the mercerising process under tension.—Feb. 16, 1901.

3517. Changing shuttles. Feb. 22. P. Clément, Wasquehal-Lille, Nord, France. Relates to looms for weaving, and comprises improved means for enabling the empty shuttle to be automatically replaced by a fresh one when the weft thread has run out or become exhausted. The devices heretofore introduced for this purpose are generally dependent upon or are used in connection with a weft thread feeler which comes into action when the weft thread breaks or runs out, and by means of suitable mechanism effects the changing of the shuttle. These devices produce defective parts in the fabric, and moreover the mechanism actuated by the feelers can never start operating till after the loss of a pick and a half of the weft, since the feeler can only act after the first empty passage of the shuttle. These inconveniences are obviated by effecting the substitution or changing of the shuttle after a predetermined length of thread carried by the shuttle has been used, or nearly so, this being effected by the aid of a card-chain which is proportionate to the length of the thread upon the shuttle and arranged in such a manner as to effect the changing of the shuttle between two successive picks without the loss of a single pick in the interval between the withdrawal of the empty shuttle and the coming into operation of a fresh one. To this end the card-chain is chiefly characterised by a number of cards sufficient to enable it to make one turn or complete displacement during the time occupied in using nearly the full predetermined length of the shuttle thread, and also by the provision in two successive cards of a hole or aperture into each of which engages a lever, one of the levers being designed to operate the mechanism for the changing of the shuttle at the moment when the latter, being empty or nearly so, leaves the shed, while the other lever is designed for operating the mechanism for immediately furnishing a fresh shuttle to the shuttle-changing mechanism. In this manner a fresh shuttle is taken up immediately after the changing operation so as to be ready to replace the one then in use when this latter in its turn runs out.—Feb. 22, 1901.

3976. Zinc printing cylinders. March 1. J. A. Dejey, Crémieu, Isère, France. The engraved rollers or cylinders employed for printing on fabrics, or for goffering and analogous operations, are required to possess properties which singularly limit the choice of the materials which may serve for their manufacture. Such material is required to possess malleability, have an exceedingly fine grain and perfect homogeneity, and also possess a certain elasticity. Heretofore the only material which has been found suitable is copper, and consequently this metal is generally employed to the exclusion of any other material, notwithstanding its high price. The object is to produce cylinders for the purpose specified possessing all the before-mentioned qualities, while the manufacturing price is considerably less than that of the copper cylinders. The improved rollers or cylinders are constructed of zinc, and have imparted to them the properties hereinbefore mentioned — which zinc in its ordinary condition does not possess—by a special method of manufacture. The casting of the cylinders is effected by running the metal in at the base of the mould; and a suitable cover, preferably of asbestos and weighted with any suitable material, is provided so as to avoid as far as possible contact with the air. This cover, which acts like a float, rises with the metal as this latter enters the mould from the base thereof. The mould is extensible—that is to say, preferably of the kind used in stereotyping. The core for forming the cylindrical hole is preferably provided with a cardboard or thin iron plate (cardboard being preferable) covered with talc or yellow ochre, so as to avoid the adherence thereto of the casting. By this means a cylindrical shell or body free from air holes and like defects is obtained. The temperature at which the metal is cast should be but very little above the melting temperature of zinc—namely, 410°. The cylindrical shell is now subjected to several reheatings for the purpose of correcting the molecular deformation which may have resulted from the casting operation and from a too quick cooling action The shell or body thus obtained is now immediately mounted upon an iron or other suitable mandrel (previously heated to a suitable temperature) having a diameter of, say, 10 centimetres at one end, and tapering by 4 centimetres per metre for the entire length thereof, which is preferably about 2 metres. The cylinder thus mounted upon its mandrel is finally subjected, at a temperature of between 100 and 130°, to the action of a rolling mill, preferably heated, and which by the compression thus affected (40 to 60 kilos per square millimetre of superficial surface), not only gives the roller or cylinder a perfectly smooth conical hole, but also—and this is the important point—transforms the molecular state of the natural zinc, and imparts to it a grain of very great fineness similar to that produced by acid. Rollers or cylinders produced in accordance with this invention may with advantage be employed for engraving as well as for printing purposes, a result which, as is well known, has not been hitherto satisfactorily obtained except by using rollers of copper or brass, all other materials having been found unsatisfactory, as not possessing the necessary conditions for the particular use They may be engraved like those of copper and afterwards coppered, nickelled, or steel hardened. The coppering may be effected in any well-known manner which will prevent the thin coating of metal loosening while under the strain of working in the machines. The steel hardening imparts to the rollers, after engraving, a hardness equal to that of steel, which permits of their being particularly applicable for use in goffering. Lastly, the nickelling imparts to printing rollers great durability, and enables them to be used for a long period before they become worn out.—March 1, 1901.

4137. Looms. March 5. J. S. Hargreaves, Spring Mill, Heywood. Relates to means for altering the speed of the gearing connected with the taking-up motion at the period when, during the operation of weaving a length of fabric, the parts are required to be produced that ultimately form the fringe when the piece is cut into lengths for towels or the like The primary object is to enable fringes of any length to be formed in a piece of fabric, such as towelling, that is being woven without necessitating the operative moving to the end of the loom to change the motion by hand, as required at present, thereby effecting a considerable saving of time in production It also tends to lessen the risk of accident from flying shuttles, as the necessity for the operative to stoop or bend down or otherwise at the end of the loom to alter the mechanism is avoided. The handle or handwheel at the end of the loom that is employed to alter the speed of the taking-up motion is dispensed with, and fast and loose pulleys are fitted on the shaft upon which the gearing that actuates the taking-up motion is fitted; these pulleys are connected by a belt or strap to a pulley on the tappet shaft. A strap fork is fitted to the end of the frame of the loom in a suitable position for the operative to be able to place the strap on either the fast or the loose pulley without moving from the front of the loom. When certain portions in the length of the piece that is being woven are required to be changed from a close to an open texture so as to produce or form a fringe when the piece is cut into lengths, the operative places the belt on the fast pulley, without moving from the position ordinarily occupied, whereby the speed of the taking-up motion is accelerated and operated in the same manner as when changed by hand from the end of the loom. In like manner, when the belt is placed on the loose pulley, the closely-woven parts are produced.—March 2, 1901.

4675. Anti-ballooning arrangements. March 12. A. Seeley, 34, South-street, Rochdale. The object is to form the separators so that the ballooning threads do not strike against an edge or round surface, but upon a perfectly flat surface, so extensive that they cannot come against the edges of the separator, and the invention consists in forming these separators for any desired number of spindles from a length of thin steel or other suitable metal plate of suitable width with parts cut away from it, leaving those parts which are to form the separators connected with one edge of the plate, each part to form a separator being twisted a quarter-turn (by preference), to bring the flat plane of the separator at a right angle to the part forming the edge of the plate with which they are connected.—Feb 16, 1901.

5410 Circular-box motions. March 22. T. Wadsworth, 41, Cotton-Tree-road, Colne. Relates to what are known as draw rods for circular-box looms which actuate the changing of shuttles in looms for weaving, and the improvements consist of a metal clip swivel arrangement for the bottom of the draw rods, to dispense with the ordinary screw and lock nut. To accomplish this a metal clip swivel is formed with a groove and cavity to receive the drawing rod and slotted clip by which means the draw rod is adjusted and locked in position.—March 2, 1901.

5779 Weft forks. March 28. J Crabtree, Albert-road, Colne, and J. Schofield. Relates to machinery for the manufacture of weft forks. In machines of this description it has been customary to pass the shank end of the fork blank through a forging machine which forges the shank, and then the webbing of the fork blank for the formation of the prongs has been usually accomplished by hand labour on the anvil. The present invention is designed to effect the webbing of the fork blank and the forging of the shank portion by one and the same machine, whereby the manufacture is greatly facilitated and the cost of production proportionately cheapened. With this object in view, a machine is made having two hammers vibrating or beating at a rapid rate, say 800 beats to the minute. These hammers are operated by pneumatic, steam, gas, or other motive power. The webbing of the fork blanks at one end, and the forging of the blank at the other or shank portion thereof, are preferably done at one heat. A rod is taken at any desired length to form a number of weft forks It is heated and passed through the socketing machine to form a number of sockets upon it at desired distances apart. It is reheated and passed through the webbing and shank-forging machine in the following manner:—The end for the formation of the web is passed under one of the hammers, which flattens or beats it out to the required degree At one side of this hammer is made a step slightly inclined, or for that matter there may be an inclined step in the block beneath at one side. After being flattened, this end of the blank is shifted to come under or upon the inclined step, as the case may be, which effects the webbing or tapering of this end of the blank. This end of the blank, forming part of the rod, is then quickly removed and brought edgewise up under the second or adjacent hammer, which trims or finishes the edges of the web portion. The web having thus been formed, the blank is quickly removed, and the web portion and socket are pushed through the space between the first-named hammer and its block, when the former commences to forge or beat out the shank portion of the fork. A fork length is now cut off by machinery, when the operation is repeated with respect to the next fork blank. The shank portion having thus been forged it is cut into shank shape by means of cutters, which may either cut the shank centrally or either right or left-hand as may be desired.—March 2, 1901.

6036. Alphaisatineanilide and indigo. March 31. T. R. Shillito, London (communicated by J. R. Geigy and Co., Basle). Relates to the production of the homologues of hydrocyancarbodiphenylimide as hydrocyancarbodiorthotolylimide, hydrocyancarbodiparatolylimide, hydrocyancarbophenylorthotolylimide, hydrocyancarbophenylparatolylimide by submitting the homologues of thiocarbanilide, in the place of thiocarbanilide, to the process described in Patent No 15,497 of 1899.—Feb. 23, 1901.

6053. Blue colouring matter. March 31. J. Y. Johnson, London (communicated by the Badishe Anilin and Soda Fabrik, Ludwigshafen-on-Rhine) In Patent No. 890 of 1900 the production of black colouring matter from 1—1[1] dinitro-naphthalene is described. The said colouring matter is obtained by treating 1—1[1] dinitro-naphthalene in hot concentrated sulphuric acid solution with sulphuretted hydrogen or the like. It is now discovered that if the isomeric 1—4[1] dinitro-naphthalene be subjected to a similar treatment, a new colouring matter of blue to blue-black shades is obtained.—Feb. 16, 1901.

6059. Hackling flax, etc. March 31. J. Horner, Clonard Foundry, Belfast. Relates to machines for hackling flax, hemp, jute, and other fibrous materials, more particularly to what are known as vertical sheet-hackling machines, wherein the stricks of fibre depending from horizontal channel bars are alternately passed down and drawn up between the operative faces of a pair of hackle sheets, and are subjected during both the downward and upward movements of the stricks to the action of the hackles which move continuously in a downward direction. The combination comprises a sheet-hackling machine of clutch-controlled variable-speed gear interposed between the first-motion shaft and the hackle-sheet shafts, and adapted to be automatically brought into action, whereby the surface speed of the hackle sheets will be so varied at or during each up-and-down stroke of the stricks as to cause the hackling effect to be equalised, or approximately equalised, or to be varied in accordance with any special requirements during the up-and-down stroke or any portion thereof, notwithstanding the reversal of the direction of motion of the stricks.—Feb 16, 1901.

6178. Blanket guider. April 3. W. Wright, 32, Great Norbury-street, Hyde, and F. B. Crabtree. Relates to calico-printing machines, and refers to a novel construction of guider for use in guiding the blanket in a straight path as it passes from the washing machine or the drying cylinders and through the printing machine. Without a guider the blanket has a tendency to run to one end or the other of the printing machine cylinder, and requires considerable attention on the part of the operator to keep it straight. By this invention the blanket is kept in its true line of travel automatically. The blanket is passed, after it leaves the drying cylinders, through an arrangement of rods or bars mounted between two side or end frames, which are capable of endwise movement, and which, together with the rods, constitute a straightener or tension device for keeping the blanket in tension and preventing creases. After leaving the printing machine the blanket passes over a carrier roller, the axis of which is pivotally supported by the horizontal arms of two bell-crank levers, fulcrumed upon studs or axes carried by a fixed crossbar. The vertical arms of these levers are connected to the straightener in such a manner that with any lateral movement of the straightener, due, say, to the deviation of the blanket from its proper path, such lateral movement is immediately communicated to the levers, which, moving on their fulcra, tilt one end and lower the other end of the roller, and thus cause the blanket to travel back to the centre of the roller, or to resist the tendency to leave its proper path, and so keep it in the proper line of travel automatically.—March 2, 1901.

6870. Spinning. April 12. F. S. Herdman and M. Montgomery, Brookfield Linen Company Limited, Belfast. Relates to improvements in machines employed for spinning, twisting, and doubling yarns, and winding such yarn on bobbins by means of a flyer, the object being by the improvements hereinafter described to largely increase the capacity of the bobbins employed, and so to avoid the necessity of repeatedly doffing or changing the bobbins, as heretofore. Heretofore it has been found necessary when spinning fine or weak yarn to employ a small light bobbin so as to reduce the friction between the latter and the builder in order to make it possible for the weak yarn to drag the bobbin round, consequently the small bobbins were very soon filled, and had to be doffed and empty bobbins substituted, and this repeated doffing and replacement of bobbins caused a serious loss of time and labour and minimised the working capacity of the machine by reducing its output. If large bobbins were employed under existing circumstances, the pull or drag of the flyer on a fine yarn broke the latter without causing the bobbin to rotate on its spindle. By use of the improvements hereinafter described, the inventors are able to use a much larger and stronger bobbin, and to materially increase the output of the machine According to the invention there is mounted upon the spindle, and inside the collar—which is increased in bore to receive it,—a sleeve or socket, on the upper end of which is a small disc on which the bobbin rests, and such disc has a wharle on its lower portion. The wharle and its disc or bobbin is driven from the cylinder which drives the spindle, or instead of employing two wharles, one on the spindle and one on the sleeve or socket, the sleeve or socket may have a longitudinal groove in it; and a small peg or key being fitted to the spindle, the sleeve or socket is driven therefrom, or two projecting pins on the top of the ordinary wharle engaging with corresponding holes in the sleeve or socket may be employed, or other mechanism for communicating the motion of the spindle to the bobbin. As the bobbin gradually increases in momentum as it fills, and becomes more easily drawn by the yarn after the flyer by reason of the increasing radius through which the yarn acts or pulls upon the bobbin, it is necessary to use the ordinary drag cord and weight or steady its motion, and these are used in such a way and at such an angle as will have the effect of raising the bobbin and disconnecting its contact with the revolving builder sleeve or socket above referred to, and the bobbin is no longer driven except by the flyer.—Feb. 16, 1901

7061. Spotting net. April 17. E. L. Thorp, 38, Noel-street, Forest, Nottingham Relates to improvements in machines of the type described in Patent No. 25,271 of 1896, for the purpose of attaching portions of chenille and the like to veilings, nets, and similar fabrics. The cutters or top plates in the heads or boxes of the machine are grooved with tapering channels, and so shaped that the cutter forms the chenille into the horizontally lying and almost V-shaped piece, which it cuts off, said piece being afterwards placed in the required position in the netting. Beneath each cutter are arranged, in addition to a pusher, three devices called the pin and pin-plate, the pin-raising slide, and the pointer-slide. Extra cams and shafts are preferably arranged at the back of the machine for actuating the two latter slides, or the pointer may be attached to the pin-raising slide and be actuated from a single cam or camshaft. These devices act together in the following manner:—The pin-raising slide, under the action of its cam, moves forward rapidly towards the net and pushes up the pin which is formed by the bent-up end of a flat spring, whose other end is attached to the under-surface of the pin-plate. The pusher, which is a sliding-plate having a curved channel or recess at its forward end, is arranged between the cutter and the pin-plate; it is held back during the aforesaid movement, so that on the pin being forced upward a space is formed between the pin and the recessed end of the pusher, into which space the chenille is received from the usual feed mechanism. About the time that the chenille is fed into the space, the front end of the lever descends over the pin and retains the chenille firmly in position. The front end of the lever is so cut away that it clears the pin when down, thus avoiding the risk of breaking or damaging it, a stop being also suitably fixed upon the lever as an extra safeguard. The pusher is now moved forward by its cam, and squeezes the chenille between its channelled end and the pin. The pointer which serves to adjust and centralise the mesh of the net, and has suitably shaped surfaces, may now be moved into the net to bring it into a suitable position for the reception of the chenille. The chenille, squeezed between the pusher and pin, which are held together tightly up to a stop by a helical spring which connects them, is then in a condition for being cut off and shaped to form the spot, this being done by the cutter which slides over the pusher and pin. On the cutter retiring, the portion of the chenille is placed in the net by the pusher, and is afterwards acted upon by the jaws or nippers and the sliding ram. The pin now drops by a reverse movement of the pin-raising slide, and the pointer slide retires at the same time, or earlier.—March 9, 1901.

7105. Ring spinning. April 17. E. A. Work, 11, Dummer-street, Bath, Maine, U.S.A. The object is to provide improved means for causing the guide-wire board to rise and fall co-ordinately with the wave motion of the ring rail in the building-up of cops and bobbins in ring spinning machines. The purpose is to so construct the improvements as that they may be readily operated to effect the regulation of the tension on the yarn being spun, and perform all of their offices in the best manner.—Feb. 23, 1901.

7291. Dyestuffs of the anthraquinone series April 19. H. E. Newton, London (communicated by The Farbenfabriken vormals F. Bayer and Co., Elberfeld). It was discovered some time ago that by treating dinitroanthrarufine disulphonic acid, or dinitrochrysazine disulphonic acid, with sulphursesquioxide (that is to say, with a mixture prepared from fuming sulphuric acid and sulphur), the corresponding diamido compounds were obtained. It is now found that, carrying out this process, intermediate products are produced which it has not been possible to isolate up till now, and that from these intermediate products contained in the melt the above-mentioned diamido compounds, or the corresponding quinoneimides, can be obtained, according to the treatment to which the intermediate products are subjected. On pouring, for instance, the melt which is obtained from dinitroanthrarufine-disulphonic and sulphur sesquioxide into water, diamido anthrarufine disulphonic acid is produced.—March 2, 1901.

7443. Tension of warps. April 23. O. Wolff, Stadtoldendorf, Herzogthum Braunschweig, Germany. Consists in apparatus for regulating the tension of warps in looms for weaving, and its object is the provision of simple and effective apparatus by which warps shall be preserved from undue strain while being woven, and by which an increased production and a better appearance of the fabrics produced shall be obtained. There is provided as the back yarn-rest or support for the warp being woven in a loom a roller or bar, but preferably a roller mounted in slides upon suitable supports, or otherwise made movable to and fro, and there are provided springs, or a spring of spiral or other form, so arranged as to tend to move the roller or bar in one direction and to restore it to its normal position when it is displaced by the increase of the tension of the warp, due to the formation of a shed or to the beating-up of the weft. In the accompanying drawings—in all the figures of which the same letters of reference are used to indicate corresponding parts,—Fig. 1 is a side elevation, Fig. 2 a partial rear elevation, and Fig. 3 a plan illustrating one arrangement of apparatus provided according to the invention, and so much of the loom to which it is applied as is requisite for the illustration of the invention and the manner of carrying it into effect. In the accompanying drawings, *a* is the roller provided as the back yarn rest or support for the warp being woven in the loom. The roller *a* is mounted so as to be capable of being revolved in slides *b*, each of which is capable of being slidden lengthwise of a fixed bracket *d* secured to the loom side *c*, and is guided thereon by being provided with projections engaging with grooves formed in the bracket *d* on which it is mounted. Each slide *b* is provided with a rod b^1, which is made to extend through a hole formed in a projection d^1 formed on the fixed bracket *d*, on which the said slide *b* is mounted. Around the rods b^1 of the slides *b* are placed springs *e*, each of which bears at one end against the slide *b* with which it is used, and at the other end against the projection d^1 of the fixed bracket *d*, carrying such slide *b*. The warp or yarn A from the warp beam or yarn beam of the loom being led over the roller *a* to the healds, or other means

FIG. 1.

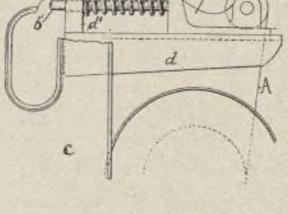


FIG. 2.

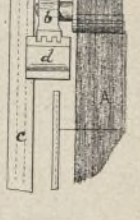
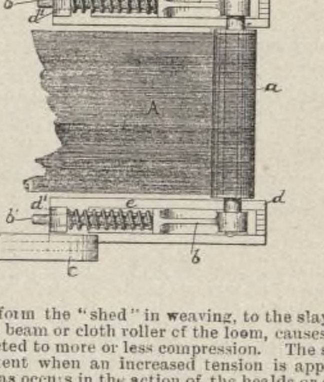


FIG. 3.



used to form the "shed" in weaving, to the slay or lathe and to the cloth beam or cloth roller of the loom, causes the springs *e* to be subjected to more or less compression. The springs *e* yield to some extent when an increased tension is applied to the warp threads, as occurs in the action of the healds or other means used to form the "shed" and in the beating-up of the weft, and again expand when the tension of the warp threads is allowed to diminish. By so yielding and expanding, the springs *e* tend to preserve a uniform tension in the warp threads and prevent such warp threads from being strained and broken by sudden or variable strains, and thus enable an increase in the speed of working of the loom to be attained, and also obviate, to a large extent, the loss of time and consequent reduced production and faulty appearance and lessened value of the fabrics produced which are involved by breakages of warp threads. It is obvious that the elasticity of the springs *e* will allow of any requisite tension being applied to the warp threads being woven at any time, and also that if it be considered desirable any suitable means, such, for instance, as collars adjustable in position upon the rods b^1 and placed between the springs *e* and the projections d^1, may be provided to subject the springs *e* to any desirable tension additional to that placed upon them by the warp threads. It is also obvious that by the slides *b* and brackets *d* being formed and arranged in an appropriate manner, springs arranged to work in tension or otherwise may be used instead of springs arranged to work in compression, and also that if each slide *b* be provided with a pulley, or be otherwise arranged so as to be acted upon by a cord, rope, or chain, guided in any suitable way and connected to a spring, a single spring may be made to serve in conjunction with both the slides *b*. A rod or bar which cannot revolve may be employed instead of the roller *a*, but it is preferable to employ a roller, as it more readily permits the warp threads to pass over it as is requisite.—Feb. 23, 1901.

7530. Self-acting mules. April 24. R. Clegg and J. Clegg, 80, Stoneleigh-street, Oldham. Relates to improvements in self-acting mules, the object being to effect the backing-off before the carriage arrives at the end of its outward run, and thereby economise time.—March 2, 1901.

8176. Spinning frames. May 3. T. A. Boyd, Shettleston Ironworks, near Glasgow. Refers to improvements in the construction of the supports of and in the means of manipulating drawing rollers in spinning frames used for fibrous materials. The first part relates to improved means of constructing and supporting the racks or slides upon which spinning rollers are carried and moved up and down, according to the length of the fibres being spun. The ordinary method of mounting these is to construct the spinning frame with two rails, one along each side of the frame, carried longitudinally. Above these rails, and in the centre of the frame, is placed a top rail. The racks or slides, placed at intervals on both sides of the frame, recline between the top and under rail, being bolted top and bottom. With the vibration of the frame and from other causes the lower ends of these racks are apt to become loose and slide outwards, thus getting out of line with the rest of the racks on one side. This of course puts the rollers out of alignment. A triangular frame, consisting of a horizontal bar or principal and two racks, is used, the toes being bolted to the outer end of the principal, and their inner and upper ends being carried on a round shaft placed longitudinally in the framing, thus forming a triangle. The structure thus made is like the couple of the roof of a house, giving lightness and stability. Upon the shaft placed at the apex of the triangle described are placed whorles over which chains or cords are carried from the back roller carriers so as to counterbalance these and make them more easily moved up and down the rack. The second part refers to means of applying pressure to the front top and under rollers and removing the pressure when required. Certain kinds of pressing rollers and frequently the yarn itself gets damaged by the continuance, after a frame is stopped, of the pressure required while spinning is proceeding. The front feed rollers consist of a shaft placed longitudinally along both sides of the frame, and on the said shaft a boss is fixed opposite each spindle. A pressing roller is held against the boss referred to, and between them the yarn passes and is delivered to the spinning spindle. The arrangement of holding and applying pressure to the pressing roller depends upon the relative positions of the pressing roller and the boss. In one arrangement, such as is common in worsted spinning frames, the top pressing roller is centred at or about right angles to a line passing over the tops of the back, intermediate, and front rollers. In this case a link is used, its upper end engaging with the axle of the top pressing roller, and its lower end engaging with a lever fulcrumed below and behind the under roller or boss. This lever extends inwards towards the centre of the spinning frame. Between each pair of racks along both sides of the frame are jointed cradles centred at right angles to the pressing levers. From these cradles there is attached to each pressing lever a spring to give the required pressure. In the centre of the spinning frame, between the swing cradles on both sides, is a longitudinal bar which has on its underside cams formed like an inclined plane. These cams engage with projections on the swing cradles so that on the bar being moved longitudinally the cams bear upon and press downwards the cradles, or if the bar is moved in the opposite direction the cradles are allowed to rise. It will thus be understood that by moving the horizontal bar and its cams endways the springs and pressure levers are drawn downwards or are released. The longitudinal bar may be worked in concert with or independently of the belt guide of the frame.—March 9, 1901.

8230. Mercerising. May 3. J. Y. Johnson, London (communicated by F. Hasslacher, 26, Bleichstrasse Petersthor, Frankfort-on-Main). Machines as hitherto used for stretching the material during mercerising act either after the manner of tentering frames, the material being stretched by the tentering chains, or the material runs over openers to prevent shrinking. The machines acting after the manner of tentering frames are satisfactory as regards quality of production, as shrinking is prevented, the material being seized at the selvages, but the capacity of these machines is too limited. In the machines wherein the material runs over openers the capacity is greater, but the shrinking force of the mercerised material is so great that shrinkage is not sufficiently prevented, and therefore the mercerising effect is also materially diminished. According to this invention, the mercerised material is stretched by passing the goods between rollers, the peripheries of which are corrugated or formed with undulations, the wet material being firmly held by them, and stretched sufficiently owing to the formation of the rollers. The depth of the corrugations or undulations determines the extent to which the material is stretched. The wet material, after passing through the squeezing rollers, may pass immediately between two such corrugated or undulatory rollers, and afterwards through another pair of such rollers, the latter effecting the washing out of the lye during the stretching. If the material be required to remain longer in contact with the corrugated or undulatory rollers, it may be passed over a large drum whose periphery is formed with corrugations or undulations, small rollers provided with similar corrugations or undulations pressing the material into the corrugations or undulations of the drum and stretching the material, and then the material may be passed between another similar arrangement of drum and rollers, which may effect the washing out of the lye.—March 2, 1901.

8608. Pickers for looms. May 10. J. Frankland, 29, Ainsworth-street, Blackburn. Pickers for weaving are usually formed from one or more pieces of hide or other tough material. The method of manufacture is to cut the material to shape and afterwards fold and press to form the finished picker. A metal staple is usually passed through the picker near the part which has to strike the shuttle, and this staple is clenched to hold the whole together. The improvement consists in providing other staples in addition to the main staple so as to render the picker less liable to come asunder at such joints as are formed in the structure of the picker.—March 2, 1901.

9247 Carding-engine gearing. May 19. R. Tyack and Howard and Bullough Limited, Globe Works, Accrington. Relates to an improved arrangement of mounting and operating the disengaging tooth-carrier wheel, which is one of the two carrier wheels betwixt the carding-engine doffer wheel and the driving wheel on shaft end of draw or calender roller. Such disengaging wheel usually being mounted on a stationary stud, disengaging has to be accomplished by pulling such carrier wheel endwise along the stationary stud until its teeth are completely out of alignment with its companion wheel, so that now when Workshop and Factory Acts demand wheel gearing of this type, being encased within a wheel cover, such method causes an increase of width on the exterior parts of the total width of the machine, thereby occupying so much extra floor space per machine. Now the object is to reduce the width of the machine at this part, to give better facility to the operator, by bringing the disengaging handle that is connected with the stud of the disengaging wheel nearer to hand, and also to bring the whole width of the teeth of the disengaging wheels into action at once. This is accomplished by mounting the disengaging wheel on a movable stud, which is preferably secured to a swing or hinged lever, the latter taking its centre from a companion carrier wheel on a stationary stud for the maintenance of these being kept in gear, and thus admitting of the disengaging carrier wheel being either brought in or out of gear with the driven wheel of the draw or calender rollers.—Feb. 16, 1901.

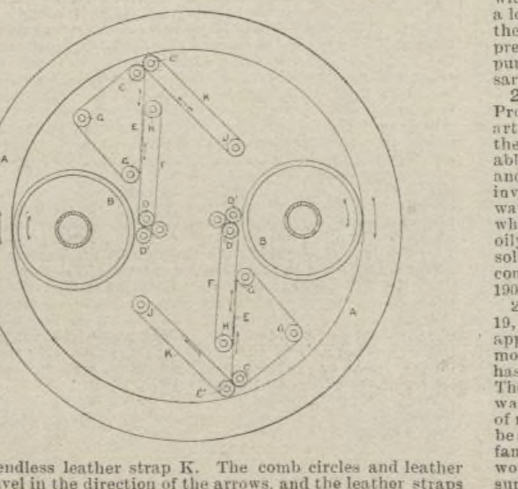
14,440. Mules. Aug. 13. T. Sampson, 80, Lee-street, Oldham. Relates to apparatus for preventing loss of time and ensuring economy in the production of yarns consequent on the variation of speed affecting the tin roller shaft of mule or like spinning machines as is necessary when alteration or variation of twist is made or necessary in the production of the various qualities of yarn. The object is to provide a means or apparatus for maintaining an equality or regularity of motion of the backing-off mechanism in such machines when the speeds above referred to are changed. There is mounted loosely upon the rimshaft of the mule or spinning machine a grooved pulley which actuates a correspondingly grooved pulley fixed upon the tin roller shaft. In connection with the pulley on the rimshaft is a leather-covered friction cone which is adapted to be placed at the proper periods in engagement with the ordinary backing-off cone or "dish" of the machine, which is well known. The loose pulley on the rimshaft is conveniently actuated by the ordinary taking-in mechanism, as the taking-in mechanism is conveniently geared to a sliding backing-off wheel or "dish," which is caused to engage with a leather-covered friction cone on the loose pulley, which, when in engagement, causes the pulley to revolve therewith, and thus drive or operate by means of a band the pulley on the tin roller, consequently the taking-in mechanism operates the loose pulley on the rimshaft when such pulley is in engagement with the "dish," and obviously drives or operates the tin roller shaft at or during such period.—Feb. 23, 1901.

15,157. Cone-driving mechanism. Aug. 25. J. Moorhouse, Ashton-under-Lyne, near Manchester. Relates to cone-driving mechanism, and chiefly to the arrangement of cones and driving strap or belt used with slubbing, roving, and scutching machines, with which there is at present much waste of belting and power due to the differences in the diameters of the cones at the opposite edges of the driving strap. Two endless belts or straps are used, supplementary or additional to the driving strap, but shorter and narrower. One of those supplementary straps is placed upon and around each cone, and with the driving strap upon and encircling the two cones in the ordinary way, each supplementary strap fits between its cone and the driving strap at that side or edge of the strap which lies nearest to the narrower end of the cone, one being on the right-hand and the other on the left-hand of the driving strap. With the supplementary straps so placed, they serve as packing for the driving strap, and they so increase the periphery over which the strap has to pass at the side which travels over the narrower portion of the cone that the speeds of the two edges of the driving strap are rendered equal or approximately equal.—March 9, 1901.

15,201. Jacquard card cutting. Aug. 25. C. Junge, London, W.C. (communicated by C. Handwerck, 22, Carolenenstrasse, Leipzig). Relates to means for producing jacquard cards or for operating the lifting wires of jacquard looms. In the manufacture of pattern cards or fabrics with the aid of electric patterns, according to which the stamps or punches in the lever-punching machine or the lifting wires in the jacquard loom are released, care must be taken that each of the stamps or each of the lifting wires shall be released in accordance with the coloured design (or figure and ground in the case of plain fabrics), and also in accordance with the binding of the fabric. The method consists substantially in employing for each separate part of the design two patterns placed one behind the other, one containing the part of the design alone, and the other the corresponding binding. Accordingly, a stamp of the lever-punching machine, or a lifting wire of the jacquard loom, is released only when the circuit which includes the electromagnets operating the releasing mechanism is closed by the pattern containing the respective part of the design, and also by the pattern containing the binding of this part of the design.—March 9, 1901.

16,487. Winding. Sept. 17. S. van A. Hunter, The Universal Winding Machines Company, Pall Mall, Manchester. Relates to improvements in machinery for winding both fine and coarse yarn or thread, string, binder twine and most other windable material, and relates more particularly to the class of winding machines referred to in Patents No. 17 387 of 1897, and Nos. 6896, 12,673, and 12,674, of 1899, known as the "Leeson," in which the yarn is traversed very quickly a predetermined distance and built up into cheeses of various lengths and diameters, the yarn being contained on inexpensive paper tubes or the like. The characteristic feature of the Leeson machines is that the yarn is built up on the paper tubes without bobbins being required with end flanges, and that the yarn is laid exactly side by side so as to be self-supporting and without any tendency to over-riding or crushing. Each layer of yarn is exactly similar to the preceding one, consequently each is laid upon a firm supporting surface without spaces, and the material is maintained in perfect condition without crushing or impairing the twist, and as none of the coils ever pass across the end of the cop, the thread can be drawn off the periphery of the latter over the end without catching or increasing the tension. Whilst the present improvements are more particularly applicable to the machines referred to, it should be understood that they are applicable to other winding machinery. The object of the improvements is to provide improved means for regarding the revolution of the bobbins, spools, or the like on which the yarn to be wound into cheeses is contained, and also an improved compensating and stopping arrangement situated between the supply bobbins and the spindles on which the yarn is wound.—Feb. 16, 1901.

18,229. Combing machines. Oct. 13. J. C. Bottomley, Greencroft House, Victoria-avenue, Harrogate. Relates to certain improvements in the mechanism employed for drawing the fibre from the large circle of "Noble's" combing machines, and has for its object the combination with the large comb circle of certain additional parts connected with the drawing-off rollers applied in such a manner that what is known as "lapping" of the fibre around one of the drawing-off rollers is prevented; also to reduce the wear and tear of the leathers and rollers and obtain a better drag on the fibre, with less pressure on the leather and rollers than has been practicable with rollers applied in the manner as hitherto. The comb circles A and B are constructed and operated in the manner as hitherto, and the drawing-off rollers C and C^1, and D, D^1 are supported by brackets of the ordinary construction and operated in the usual manner. Around each drawing-off roller C is placed an endless strap E, and around each drawing-off roller D is also placed an endless leather strap F. Each leather strap is supported and kept in tension by the respective guide rollers G, G and H in the usual manner; but instead of running the drawing-off rollers C^1 in contact with an endless leather strap E as hitherto upon rollers C^1 and guide rollers



J, is an endless leather strap K. The comb circles and leather straps travel in the direction of the arrows, and the leather straps E and K are traversed up and down in the axial direction of the rollers, by traverse motions of the ordinary description applied in the usual manner. It will be obvious that by mounting the additional endless leather straps K on the drawing-off rollers C^1, the two endless leather straps E and K, meeting at the nip of the drawing-off rollers C and C^1, form a cushion between the rollers, thereby more readily gripping the fibre as it is drawn from the comb circle A, and by combining with the present endless straps E the additional endless straps K, the fibre as it is drawn from the comb circle A cannot collect around either of the rollers C^1, as is sometimes the case when the circumference of the drawing-off portion of the rollers is exposed as hitherto; and by the leather straps K covering the rollers C^1 opposite the comb pins of the circle A, and reciprocating in an axial direction with the endless leather straps E, the fibre does not cut the hitherto exposed fluted drawing-off rollers C^1, and thereby reduce the diameter of the same by the cutting of the narrow groove opposite the comb teeth of the circle A, where the fibre comes in contact with the rollers as it is drawn through the comb pins of the circle; thus by protecting the rollers C^1 in the manner described, the rollers retain their diameters, and a cushion is formed between the rollers C and C^1, thereby rendering it unnecessary to apply so much pressure on the rollers in order to obtain the necessary drag; and by the endless leather straps E and K reciprocating, the surface of the same in relation to the fibre leaving the comb circle A is constantly changing, thereby preventing the cutting of a groove in the leathers K.—March 2, 1901.

18,453. Looms. Oct. 16. W. H. Baker, Central Falls, Providence, U.S.A., and F. E. Kip. Relates to looms having means for automatically supplying thereto weft or filling, and particularly to that class of such looms wherein the shuttle or weft carrier is picked or driven through the warp shed by a compressed aëriform fluid, such as air, for example. The object is to provide a means whereby, when the weft or filling in the shuttle shall be nearly or quite exhausted, a supply of weft or filling shall be furnished to replace that exhausted. Means also are provided whereby, if the shuttle in play does not get home in its box or cell from some accident, the loom will be stopped. In a general way the principal feature of the invention consists in a rotatively-mounted magazine shuttle box which will be filled, normally, with shuttles full of weft. One of the cells of this magazine will be at the picking or driving point, or aligned with the raceway if there be one, and when the shuttle in play shall be exhausted of weft, or nearly so, and it enters this working cell, it will set in action mechanism to shift the said shuttle box so as to bring the next succeeding cell, containing a fresh shuttle, to the driving or picking point. The magazine shuttle box may, of course, be rotated by any going part of the loom, but it is convenient to operate it by the reed, or by the lay or batten, if there be one.—March 2, 1901.

18,501. Woven fabrics. Oct. 17. A. Heald, 63, West Johnson-street, Germantown, Philadelphia, U.S.A. Relates to a woven fabric in which sets of pile-forming warp threads, alternating with binding warp threads, are interwoven with heavy weft threads, alternating with binding weft threads, in such a manner that the pile-forming warp threads will produce pile loops on both faces of the fabric, the heavy weft thread distending the pile loops, the binding weft threads tying and indenting the pile-forming warp threads between the heavy weft threads, and each binding warp thread passing over a heavy thread, thence to and around a binding weft thread, and thence back to and around a heavy weft thread.—Nov. 17, 1900.

18,781 Carding fibrous materials. Oct. 20. G. Laurency, 41, Rue Pierre Van Humbeek, Brussels. The invention enables machines for opening, carding, or combing filaceous materials to lay the fibres or filaments parallel by a special combing and drawing operation between teeth of cards or combs, to withdraw the material operated on from between these teeth without disturbing the parallelism of the fibres, and to thus produce combed, semi-combed, or carded yarn of all numbers without any further manipulation than is required in ordinary carding. It consists mainly in withdrawing the material which is in the form of fleece between teeth of cards or combs, not by means of the doffer comb generally employed, but by means of a roller turning faster than the cylinder on which are the teeth filled with material to be removed; this roller rotates with friction in a recess which, surrounding a portion of its circumference, provides a nipping point very near the point of the teeth, and by means of which a combing and drawing is effected of the fibres, which are compelled to slide and become parallel between the teeth from which they are afterwards withdrawn. The fibres thus combed and drawn in the form of fleece upon the carding cylinder itself can be further subjected to the action of several combing or drawing rollers acting in the same manner in suitable recesses for effecting a more thorough combing and drawing, and if required the fleece of fibres can be directly divided into strips or ribbons by means of a divider specially adapted to the particular requirements of the present invention.—Feb. 16, 1901.

19,250. Yarn dyeing machines. Oct. 27. J. Hussong, 609, Pearl-street, Camden, New Jersey, U.S.A. The object is first to circulate the dye liquor through the yarn, and to provide means for suspending the yarn in the liquor, so that a circulation will be maintained throughout the entire vat.—Jan. 12, 1901.

19,433. Attaching card clothing. Oct. 30. E. Honegger, Rüti, Zürich. Relates to an improved clamp for attaching card clothing to card flats, consisting of clamps, the cheeks of which project over the borders of the card clothing, and are provided at short intervals with teeth, which, on fastening the clothing, penetrate into same to such an extent that all layers of the fabric are equally and securely gripped, and that between the points of the teeth and the card flat a resilient layer of clothing remains which prevents contact between the points of the teeth and the card flat, for the purpose of permitting the tight and close contact of the card clothing with the card flat, preventing the wrinkling of single layers of clothing and obtaining the uniform stretching of each separate layer thereof along the whole length of the clamp.—Jan. 12, 1901.

19,688. Recovering solvent after degreasing wool. April 18. W. Erben, 56, South Third-street, Philadelphia, U.S.A. Consists of improvements in the process of extracting grease from wool in which the wool is subjected to the action of naphtha or other solvent of the grease, and subsequently to treatment with a cleansing agent, such as water, whereby the solvent will be removed, and at the same time potash salts and potash soaps of the fatty acids known as "yolk" or "suint" will be washed out.—Feb. 9, 1901.

19,937. Yarn mercerising machines. Nov. 6. F. Shuman and C. Shuman, 3508, Disston-street, Tacony, Pennsylvania, U.S.A. Provides a construction of machine adapted for mercerising yarn. An endless chain of carriages, each of which is provided with means for holding and stretching skeins of yarn, is used, and a long caustic alkali tank through which the carriages pass with the yarn, and through which the alkali is circulated in a direction preferably opposite to the travel of the carriages. By means of a pump, or other suitable device, the alkali is cooled if found necessary during the circulating operation.—Jan. 26, 1901.

20,066. Cleaning fibres. Nov. 7, 1900. E. Maertens, Providence, Rhode Island, U.S.A. Relates to improvements in the art of cleaning wool and other animal fibres with volatile solvents, the object being to obtain wool or other fibre in a superior workable condition, and to recover the by-products, such as wool-fat and the potash, of which the following is a specification. The invention relates more specifically to the process of removing with water, or aqueous solutions, the residual solvent and potash salts which remain in the material under treatment after the fatty, oily, resinous, or other matters have been extracted therefrom with solvent, and is designed for use in establishments where existing conditions make such a process possible or desirable.—Jan 5, 1901.

20,377. Drying warps and yarns. Nov. 12. F. Gilli, 19, Via Vigna Nuova, Florence. Relates to a machine or apparatus for the drying of sized, glued, or dyed or otherwise moistened warp threads, yarns, rovings or similar material after it has undergone the sizing, dyeing, mercerising or bleaching process. There is a combination of longitudinally moving conveyers for the warps or yarns with a drum rotating transversely to the direction of movement of the conveyers, any suitable number of which may be arranged upon the surface of the drum, and combined with a fan or other suitable means for effecting the drying of the material wound upon the drum and upon the conveyers arranged upon its surface.—Jan. 19, 1901.

20,824. Weft forks. Nov. 19. E. Brierley, 12, Fitton-street, Rochdale. Relates to an improvement in weft forks for looms. The object is to enable the legs or prongs to be of uniform pattern and perfectly true so that the weft fork may balance properly in the fork holder and not injuriously affect the material passing over them. The tang end of the fork is made with a projection or projections extending from the opposite side of the boss through which the pin passes that supports the fork in the holder. Holes are drilled longitudinally in these projections, and the wire legs inserted and soldered or otherwise made secure in said holes. These holes are all drilled of uniform size, and the legs are formed of round wire of uniform gauge, which thereby obtains an equal balance in each weft fork, and all the legs are perfectly true and smooth.—Feb. 16, 1901.

21,970. Improved dyestuffs. Dec. 4. M. Lange, 35, Nicolas Witsarkade, Amsterdam. If a fatty or aromatic carboxylic acid radicle be introduced into the nucleus of 1 : 8 dihydroxy naphthalene (Erdmann, Ann. 247, p. 358), ketones of the dihydroxy naphthalene are formed which possess the valuable property of dyeing fabrics impregnated with iron or aluminium mordants in the same manner as alizarin dyestuffs. On fabrics mordanted with aluminium salts, shades varying from yellow to orange are obtained, depending upon the particular carboxylic acid radicle introduced.—Jan. 26, 1901.

23,645. Jacquards. Dec. 27. F. Wadsworth and A. Beedham, Greenside-lane, Droylsden. Relates to jacquards in connection with looms for weaving, and is applicable to those jacquards wherein the two cylinders do not operate together, but are placed in and out of action alternately for the purpose of producing cross-border or other fabrics presenting adjacent patterns of different character, such as tablecloths, shawls, or the like; and the improvements have for objects to effect the desired alteration in the action of the cylinders by simple means, whether wholly or partially automatic, as well as to simplify the operation of the lifting hooks in the manner described.—Feb. 9, 1901.