

shearing mechanism. The brush rest 7 is made adjustable, so that the cloth can be given more or less raising (brushing effect) as may be required. In

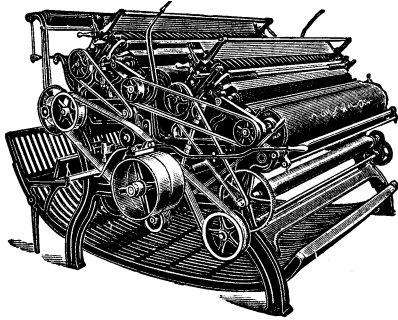


Fig. 36.

passing from the brush rest 7 to the cloth rest 9, the back of the cloth is operated upon by a flock brush 10, which is used to clean off any loose threads, flocks, etc., from that side of the cloth, so that they will not get under the cloth at the cloth rest 9 and lift the corresponding places in the fabric into the path of the blades of the shear cylinder 11.

The shearing mechanism consists of the cloth rest 9, over which the fabric passes, the ledger blade 12 which acts as the lower part of the mechanism for the actual shearing, and the shear cylinder or revolver 11, which is made up of a series of (10 or 14—according to kind of rest used) spirally placed blades, with their cutting edges extending the same distance from the centre, said shearing cylinder being revolved at a high rate of speed. The shearing width of the

the ledger blade and shear cylinder to them, special illustrations Figs. 38, 39, 40 and 41 are given.

The common or plain steel rest is shown in its outline section by diagram 38, in which A indicates the rest, B the ledger blade and C the shear cylinder (having 14 edge fly blades). The run of the cloth (as shown by means of dotted line in connection with Fig. 37) has been omitted in this illustration for the sake of clearness; the cloth passing in the direction of arrow D over the cloth rest, coming under the action of shearing mechanism, where cloth rest, ledger blade and shear cylinder nearly meet, and leaves the shearing mechanism, passing between cloth rest and ledger blade in the direction of arrow E.

The List Saving Steel Rest. If the selvage or listing of the cloth is thick or curling, a list saving rest is used, which has a jointed portion at each end, by which the thick or curling selvage is guided away from the path of the blades on the shear cylinder, by means of a self operating mechanism which automatically extends or lessens the effective edge of the cloth rest.

An illustration in section of this list saving steel rest, showing also position of ledger blade and shear cylinder to the

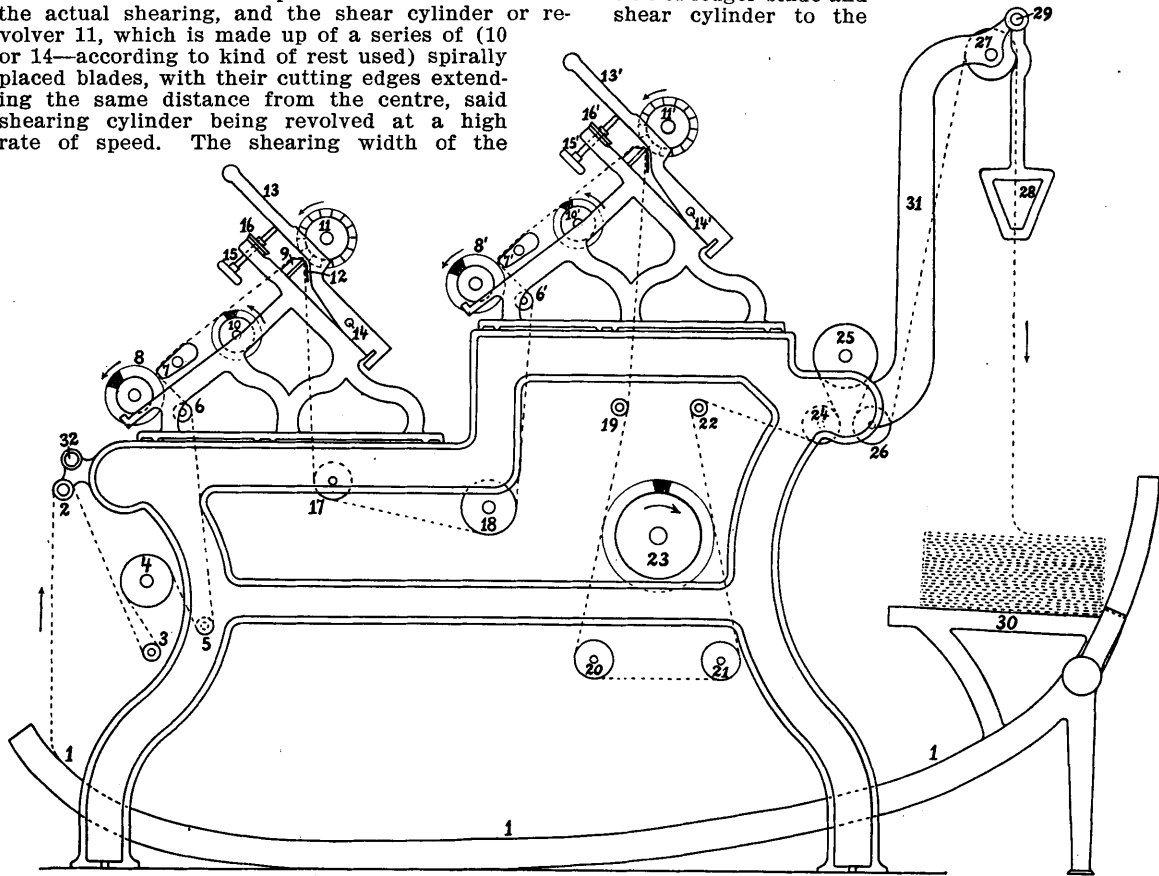


Fig. 37.

cylinder in a regular woolen or worsted broad shear is 66½ inches, but it varies in width for other fabrics from 30 to 120 inches.

The cloth rests are made in various patterns, according to the class of goods mostly under operation, and in order to show their shape and the position of

rest, is given in diagram Fig. 39, and in which A indicates the cloth rest proper, B the ledger blade, and C the shear cylinder (having 14 edge fly blades). D indicates the dial screw for setting the shear cylinder nearer or farther away from the cloth rest according to amount of shearing to be

done (and which corresponds to numerals of reference 15 and 15' in Fig. 37). E is the dial (corresponding to numerals of reference 16 and 16' in Fig. 37). F indicates the frame for carrying the shear cylinder, being pivoted at G (13, 13' and 14, 14' respectively in Fig. 37). H is the feeler of the list saving attachment. The passage of the cloth to be sheared (and

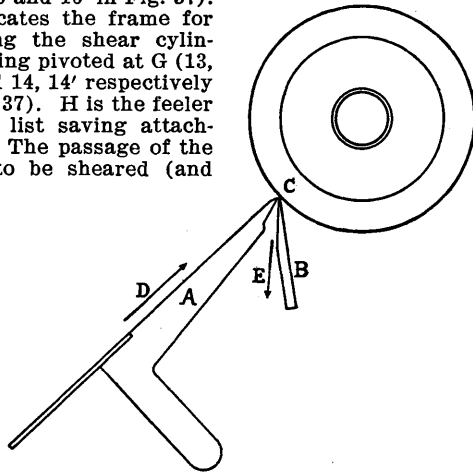


Fig. 38.

as shown by dotted lines in Fig. 37) has not been shown, in order to better show up the various parts composing this shearing device.

The Rubber Rest. There is also built a rubber rest, i. e. a rest having a soft edge in place of the solid steel rest as previously explained. The purpose of

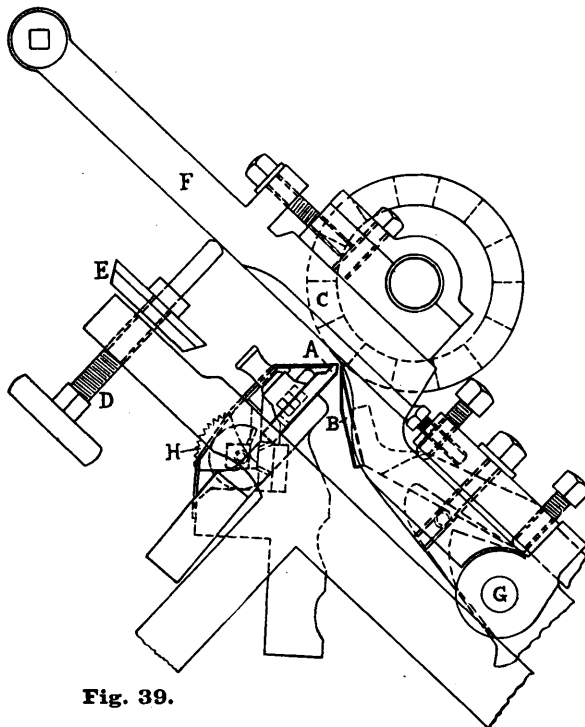


Fig. 39.

this soft edge is to prevent knots, if present on the back of the goods, from lifting the cloth at such points into the path of the shear blades and causing injury (shear marks, holes, etc.) to the cloth, since the softness of the rubber allows the knots to sink into it, and in this manner the face of the fabric

under operation is not raised. The rubber rest is used both in connection with the ordinary and the list saving style of cloth rest.

Diagram Fig. 40 shows this rubber rest in section, showing also position of ledger blade and shear cylinder as used in connection with this rest and which differs considerably from the mechanism used in connection with the solid or steel rest, especially the position of the ledger blade to the rubber rest and the blades of the shear cylinder, and which item plays a most important part to be considered in the difference of shearing, using either a common or a rubber rest. Besides these three parts of the shearing mechanism there is also shown in the diagram the list saving device applied.

Letters of reference in the illustration indicate thus: A = rubber tube, B = the passage of the cloth through this shearing mechanism, C = the apron as passing over the rubber tube in order to protect the latter from wear as well as to keep it properly in place. The ledger blade is shown as coming towards the shearing point at an angle of nearly 90°. D = feeler catch roll of list saving device.

In connection with the rubber rest, the metallic part of the rest, both the solid part as well as the pieces of the list motion, is grooved sufficiently to receive the rubber tube A, and after this is placed in the groove, an apron of tracing cloth C is passed over the tube as a protector and to keep it in position. The metallic part of the rest is flexible, that is to say, it can, by means of screws, be adjusted, which is necessary on account of the more or less unreliable nature of rubber, of which the tube is composed. By having the rest made flexible there will be frequent occasions when the rest needs to be trued up. To keep the rest perfectly true at all times is an impossibility, but it is a fact that any unevenness in the rest is not as likely to produce bad results as an unevenness in the steel rest would do. The operator may have the rest perfectly true when he starts a piece, but he cannot be sure that it will be true by the time the piece is finished.

The rubber tube is raised or lowered by means of compression or expansion, which is done from the side. In order to raise the tube, the groove is compressed, or made smaller, while, when the groove is expanded or made larger or wider, the tube is lowered. The metal part of the rest remains in the same position all the time, and any unevenness of the surface of the rubber rest must be thus remedied as explained before.

The tube is about three-eighths of an inch in diameter, the thickness and also the degree of hardness of it varying according to the cloth to be sheared. Some use a tube with very thick walls while others use a tube with very thin walls, and some of them use either one of these kind of tubes composed of very hard rubber while others prefer very soft rubber. It depends altogether on the finish required and the goods sheared.

The whole final object in view in the selection of a tube is, of course, to have the knots or lumps on the back of the goods bury themselves into the soft surface of the

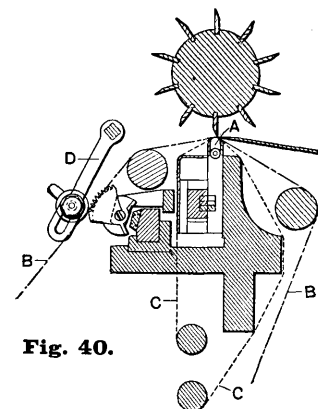


Fig. 40.

edge of the cloth rest and yet raise the pile or nap of the goods into the path of the blades of the shear cylinder. Experience will show best the kind of tube wanted.

The use of the rubber rest is now very largely confined to "running the shear on backs," which means pushing the knots as on the face of the goods, through the cloth, into the back, then running the goods over the rubber rest, face down, and shearing the back. This takes all of the knots off the back of the goods that were there in the first place and also those that have been pushed through from the face of the goods. After the fabric has been thus sheared on the back, it then can be sheared on its face, over a regular steel rest, because the back has been cleaned from knots and lumps and consequently no chance for shear marks.

From the fact that rubber and oil are antagonistic to each other, the operator must be careful to keep the tube free from oil, since if the latter should come into contact with the rubber, the first thing to be noticed is an increase in the size of the tube, due to swelling. Although this would seem like a small item, yet it is often enough to make the tube useless. Oil, when it does get on, generally gets on the list motion, causing the tube to swell at that point, and thus making the part of goods passing over those places shear closer there than on the other part of the goods, and if allowed to get worse, the selvage will be cut. To a certain extent, the evil can be remedied by adjusting the motion, although this is only temporary, so that it is best to replace the tube with a new one.

With reference to the tracing cloth apron C, which is put on over the rubber rest, (unwinding from one roll onto another), if said apron is damaged from any cause, the rubber tube which is somewhat compressed by it, will come through, and the cloth, being operated on and running on top of this will be cut as a result. For this reason the apron must be very closely watched, and should not be allowed to have too many pieces of cloth pass over it before its position on the rubber rest is moved, the reason for this being that the cloth under operation comes in contact with the apron for not quite half an inch, and will therefore wear only at that part, but if the apron is moved so as to subject a new surface about twice or three times a day, there will not be much danger of its breaking.

When shearing coarse and wiry goods, it will be necessary to move the apron after every two or three pieces of cloth have passed over it, in order to keep the apron from wearing through quickly at the one working surface. This changing of position of the apron C is readily done by slightly turning the rollers upon which said apron is winding and unwinding itself.

When replacing old tubes, care should be taken to see that the new tube to be put on is of the required diameter, since the groove in the rest is of a definite size, and if the tube is slightly larger, it must be pressed into the groove which, however, is not so bad as if the tube were too small, because in the former case, after the apron has been put on, there will be no trouble, but in the latter case, the tube being too small for the groove, the same is liable to rest against one side of the groove at one place and another side at some other place, thus producing an uneven surface for the cloth. When a smaller tube than the required size has to be used, it is a good plan to apply a thin coat of glue to the groove and then place the tube in it, keeping said tube pressed evenly down (leaving the cylinder down on it lightly, just enough to hold the tube in position) until the glue hardens; however, the best plan in all cases is to have the tube of the right size.

A felt cushion for the steel rest is one of the latest devices designed for a similar purpose as the rubber rest, for the reason that with a cushion formed of felted fibre, in this instance, interposed between the cloth rest and the cloth, knots and other imperfections in the fabric will cause the cushion to yield locally, so that an even surface of the cloth is maintained and the nap is shorn evenly.

The application of a felt cushion to a steel cloth rest is best shown by means of Fig. 41, which is a cross sectional view through the cloth rest of a shear, also showing the passage of the cloth to be sheared, through the shearing arrangement.

Referring to the illustration, 1 indicates the cloth rest, 2 is the shear cylinder, and 3 is the ledger blade. The felt cushion is made up of a folded sheet of cotton cloth 4, made to form an apron, the felt 5 being secured between the two pieces of the cotton cloth. The fold of the cotton cloth is secured to a rod 6 by means of a clamp 7.

This apron extends from the rod 6 over the cloth rest and around the nose 8 of the same, being held in position by a sheet of tracing cloth 9 extending from the roll 10, over the apron 4 and 5, to the roll 11, the object of the tracing cloth being to give as smooth a passage way for the cloth under operation as possible.

The felt (5) used in the make up of apron 4-5, is made of short fibre material, and of such thickness as will best support fabrics of a weight most frequently required to be handled by the shear. The felt may be made of any desired density, so as to form a more or less yielding cushion. 12 indicates the run of the fabric over the cloth rest.

The shear cylinder 11, see Fig. 37, is carried in a pivoted frame 13, having its pivot at 14, and can thus be swung away from the cloth rest 9, when the seam in the cloth is to pass over said cloth rest, a special lever arrangement being provided for this purpose on each side of the machine for the convenience of the operator. The amount of nap sheared off by the shearing cylinder is regulated by setting its blades to the ledger blade, which is done by means of dial screws 15 (one on each side of the shearing mechanism) and against which the frame 13 rests. A dial 16 is also provided for each screw, and which indicates how the dial screw is set. The nap of the cloth can, in this manner, be sheared gradually, by turning the dial screw, to thus set the blades slightly closer to the ledger blade after each run of the cloth through the machine. The back side of the shear cylinder is encased in a tin casing, the purpose of which is to collect the flocks, which are being cut off of the cloth, so that they can be drawn away from the cylinder into a suitable receptacle, by means of a conductor connected at one end to the centre of

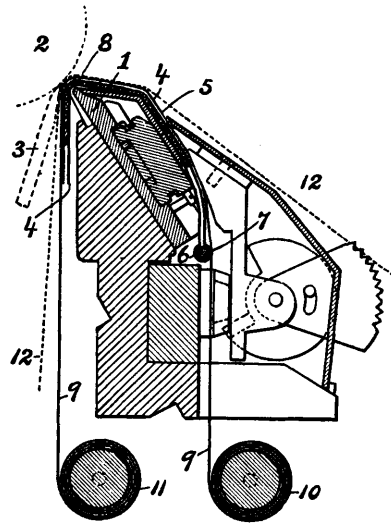


Fig. 41.

the casing, having an exhaust fan located at the other end of said conductor.

After leaving the cloth rest 9, the cloth passes down under the guide roll 17 and draft roll 18, and from there it passes over a guide roll 6' to a second brush rest 7', similar to the one at 7. The cloth now undergoes similar operations to those explained when describing the first shearing mechanism on the machine, and in order to simplify the description (wherever convenient to place) corresponding prime numbers of reference have been used in the second shearing mechanism to indicate parts similar to those of the first mechanism. Lever arrangements are also provided on each side of the machine, for raising the second shear cylinder out of contact with the cloth when so required.

After leaving the second shearing mechanism, the cloth passes down past a guide roll 19 and under two rolls 20 and 21, and up again over a guide roll 22. A laying brush 23 is conveniently placed, so as to act on the face of the cloth twice, once by each side of the brush, which thus does the work of two single contact brushes. From the guide roll 22, the cloth passes under a guide roll 24, then up over a draft roll 25 and down again under another guide roll 26, and from there it passes up over a folder roll 27 to the folder 28 which is given a vibratory motion, using the point 29 as a pivot for this motion. From the folder, the cloth drops back into the scray 1, until, on the final run through the machine, it is folded, as shown in the illustration, on the table 30, which when not needed, is turned out of the way. The folder is mounted on high cock tails 31 to give more room, up and down, for the pile of cloth when being folded on the scray table.

32 indicates the shipper rod extending across the front of the machine being connected at one end to the shipper lever so that the machine can be stopped or started by the operator from either side.

In starting to shear a piece of cloth, the same is first threaded through the machine by attaching (wiring) one end of the cloth to an apron, previously threaded through the machine, and then sewing the two ends of the cloth together. Care must be taken to make a good, fine seam, using for this purpose a regular Mill Sewing Machine. A carefully made seam will more than repay for the time it takes to do this, and it will enable the attendant to finish the ends of the piece as nicely as the middle, and as close as possible to the seam, whereas if a poor seam is made, the goods may be more or less streaked for about a yard at the seam.

The machine is then started and the cloth run through the required number of times until the proper length of nap remains, the shear cylinders being always raised out of the way when the seam is about to pass under them. At the last run, the seam is taken out and the cloth folded on the table 30, as shown in the illustration, a new piece of cloth, or the apron, having been previously attached (wired) to the end of the cloth, before the latter runs out of the machine.

The double shear is just as easy to run as the single shear, requiring only slightly more attention and a no more expert operator than the single. Each run of the cloth in a double shear equals two runs on a single shear, resulting in about double the output of the former compared to the latter. The double shear is but a trifle larger than the single and consequently finishing rooms, can by using double shears, as compared to single shears, about double their shearing capacity, and this without requiring more floor space. Again, should an accident occur to either set of shearing mechanism, the whole shear is not put out of use, because it can then be run as a single shear until the proper repairs have been made.

The cloth is always in sight from the front as it runs over the folder roll 27, so that the operator can easily see the condition of the cloth or note when a seam is going over it, so that he can stop the machine at the proper time to take the seam out at the last run. This double shear, as mentioned before, is generally built with a shearing width of 66½ inches, however, when so required by the width of fabrics manufactured by a mill, they are built to order in any width from 30 to 120 inches.

In order to produce even and smooth work at the shear, before the goods are put on the machine, they should be again carefully back burlled, an operation which consists in removing all bunches and knots in the goods which have been missed during the first burling of the flannel from the loom. The operation at this point should be performed most carefully, it being advisable to use the burling irons only for the raising of the bunches or knots, and then clip them off by means of a pair of scissors. By removing the bunches or knots with burling irons, there is a liability of threads being broken and thus damage done to the goods.

Rubber Rest vice versa Steel Rest. The main reason why there is apt to be more damage done to the cloth on the rubber rest shear than on the common, *i. e.* steel rest, shear, is the fact that the burling previously referred to, when this style of shear is used is not as thoroughly done as for the common shear, the person in this instance relying on the rubber rest to prevent all damage to the cloth, but which is not always the case; however he knows that the burling of the cloth for the common shear has to be thoroughly done, since otherwise there will be damage done to the cloth. In many instances, when dealing with the rubber rest shear, this operation of examining or burling the cloth again previously to shearing is omitted, which certainly is wrong.

A feature in favor of the rubber rest shear is, that when the same is intelligently handled, there is little, if any, chance for holes, from one reason or the other, to be made, and it is only when the person relies on the rubber rest to do everything that damage will be done. This feature also refers to the felt cushion rest.

In the common shear, flock holes are liable to be made when the flock pan of the back brush is allowed to become too full, but on the rubber rest shear there will be no damage done, even if this is the case. While the rubber rest shear does away with some difficulties characteristic to the common shear, the former presents a great many points for careful consideration, which are not to be met with on the common shear. Aside from the rubber rest, a radical departure is made on these shears in the construction of the cutting mechanism, for, while in the common shear, we find fourteen fly blades in the shear cylinder, we find that in the rubber rest shear there are but ten of these, for which reason it is necessary to run the shear cylinder at a much higher rate of speed. The cylinder on the rubber rest shear runs from 1200 to 1500 revolutions a minute, and this is required in order to do good work, while on the common shear 1000 to 1200 revolutions are sufficient for good work. On account of the smaller number of shear blades, it is also necessary to keep these in the best of condition and therefore these shears require grinding oftener than is necessary on the common shears.

On account of the rubber tube, as placed in the rest of the rubber rest shear, it is necessary to bring the cutting mechanism down to the cloth in such a way that the ledger, as well as the revolving blades are brought down on the top of the cloth, thus forming very nearly a correct right angle, or 90 degrees, instead of meeting it at an angle of about 45 de-

grees, and the cutting point is found at the corner of the angle. Care is required to get the blades in the right position with reference to the rubber tube, for, if they are not placed in the proper position, the rubber rest is sure to be more of a source of damage than a help.

For some classes of fabrics, for example in connection with fancy cassimeres, a plain rubber rest (no list saving device) is preferred, since these goods, as a rule, have body enough, so that the blades of the shear will not come in contact with the tracing cloth apron, even when shearing for a threadbare finish.

The selvage or list motion, although a most delicate device, is as simple and effective a piece of mechanism in its principle of construction as there can be found. It consists of a series of metal blocks whose tops are shaped exactly like the blade rest, said blocks having a groove on which a bar runs, which has a projection on the under side which fits the groove and runs in it. One half of this projection is on the upper side of the bar and the other half on the lower side, with a slanting piece connecting the two. To this bar are attached the feeler catches, (see H Fig. 39) which are half round and have teeth on one side, having on their inner side two teeth which fit into a ratchet, which moves back and forth and has teeth both on the top and on the bottom. The teeth on the top, face outwardly and those on the bottom, inwardly. The feeler catches, previously referred to, sit right over this ratchet, so that when it falls, the lower tooth is caught by the tooth of the ratchet and with it taken inwardly, while when it rises to a certain point, the other tooth of the feeler catches is caught by the upper teeth of the ratchet and with them taken outwardly. As the feeler catches move in or out, the bar to which they are attached also moves in or out, and the projection which runs in the groove of the several metal blocks will either raise or lower them according to the way it travels. As the cloth passes over the feeler catches, their outer teeth get caught in the fibres of the cloth under shearing, and are by them lifted and when in turn the ratchet moves the bar outwardly. As soon as the feeler catches leave from under the cloth and there is nothing to hold them up, they consequently drop and get engaged in the lower teeth of the ratchet and are taken inwardly. The device is very effective in preventing the selvages of the cloth from being sheared, requiring however to be kept in good order by the operator. He must keep the several metal blocks composing the device clean and free from dirt, since they must run free and easy but without being loose, since if the latter is the case, the goods will not be sheared as close under the list motion as they will be at the other parts, again if they are made to fit too tight they will run too hard and consequently will stick, and when the cloth will then pass over the feeler catches without being able to work them, or, if the cloth is leaving the feeler catches, they will not be able to follow as fast as they should. The list motion should be lubricated, but not with oil, since the same will attract dust and in this way soon get the list motion clogged up, but instead, when cleaning the list motion, wipe every piece clean and dry, and then, before the several pieces are again assembled, shake them up well with flake graphite, being careful that any loose graphite is removed from each individual piece of the motion, before putting it again in position in the shear. All the pieces are numbered by the builders of the shear, and consequently can be readily assembled. The bar which passes through the groove must be also well cleaned and wiped and then lubricated with graphite on the under side, which runs in the groove. The list saving steel rest should be lubricated with a fine machine oil.

The raising brush, performs also a very important function in the shear, although its action is simple compared to some of the other devices on the machine. The same has a large influence on the amount and quality of shearing done by the shear cylinder, especially when dealing with face finished fabrics like beavers, kerseys, etc. Frequently the cutting part of the shear is blamed for what really is due to the improper performance of its work by this brush. Many times in a mill a fabric is sheared lower on one side than on the other, and when the operator naturally may adjust the cutting mechanism of the shear, only to find, that with the next piece he puts on the shear, that perhaps opposite results on the cloth are produced. It should be remembered that in such cases, it may be found that the raising brush will bear harder on the cloth on that side where lower shearing has been done, than on the other, and for which reason, if such trouble shows itself, the first thing to do, is to examine the raising brush before any adjustment in the shearing mechanism is attempted.

Care must be taken not to force the cloth too hard against this raising brush, and thus reversing the nap on the cloth, from the way it was giggered. The proper way to adjust this brush is to have it raise the nap as nearly straight as possible on the cloth, so that the shear blades can act on the nap to the best advantage. When this brush gets badly worn and will not raise the nap uniformly all across the width of the cloth, the brush must be cut down to make it cylindrical, or when in too bad a condition for this, refilled. Upon face finished goods or fancies having a heavy nap, the intelligent operation of the brush greatly influences the proper finish for such fabrics. The brush should be set off so as to touch the nap lightly on the first few runs, and as the shear cylinder is lowered, the brush must be put on the cloth somewhat harder, until when the shear cylinder has been lowered to its last notch, and when the brush must be put on the fabric, so that it will bring up the last of the bottom fibres in the nap of the cloth. Such a procedure will considerably enhance the beauty of the finish.

In connection with goods that have not been giggered, such as cheviots, meltons, etc., it is best to give them several runs with the brush after the shear cylinder has been lowered to its last point, since the raising brush cannot raise all the fibres on such styles of fabrics at the first application, as it does with face finish fabrics and where the nap has been uniformly laid by giggering, in fact, as the free fibres lie in all directions in connection with cheviots, meltons, etc., the brush is as likely to lay as to raise them, but acting in conjunction with the laying brush, which acts on the fibres in the opposite direction, all the fibres will be sufficiently raised, after three or four runs through the machine, for the final run of the fabric for shearing. This will prevent the face of the cloth from roughing up in the garments.

The flocks taken out by the under brush should not be allowed to accumulate in the receptacles provided for them, since this would force them back into the brushes. A frequent cleaning of the brushes will avoid the possibility of their surfaces becoming caked or clogged, a feature which, of course, would interfere with their working capacity.

Directions for Grinding the Blades. See that the edge of the cloth rest is perfectly straight and see that it is kept so. Fit the ledger blade to the rest, not the rest to the blade. The shear cylinder must also be perfectly straight, and it must be of uniform diameter throughout its cutting length. A straight edge will show at once if the cylinder is high or low in the centre, but if it is tapering, that is, higher at

one end than the other, a pair of calipers only will show it. It is impossible to keep shear blades in good order without using a steel straight edge, now and then, when so required.

In starting up a new shear, or blades that have been refitted, first, lay the blade frame (which has the ledger fastened to it), on the shear, then bring the cut of the ledger to the edge of the rest, see that it is perfectly parallel—that is, the edge of the ledger should come up as high at one end of the rest as it does at the other. Then take a piece of thin paper and slide it along between the rest and the ledger blade, and see that it bears all the way alike. If you find any places that pinch harder than others, then use a fine file taking off a trifle from the rest, until it pinches all the way alike, however only a very small amount should ever be taken off the rest in this manner. Should the ledger touch hard at both ends and be open in centre, or vice versa, then try the straight edge on the back edge of the rest, also front edge of the ledger, and if the ledger is full at the ends and hollow in the centre, then grind the blades, by laying in the cylinder and running it backwards, using for this purpose emery not coarser than No. 120, drawing up the ends of the ledger with set screws while grinding, but not the centre, until it is brought up straight on the front side. If the centre of the ledger is full when you commence with it, then draw up the centre instead of the ends. After grinding, fit the ledger and rest together as before; when you have done this to perfection, lay in the cylinder and screw down the cap screws a little tighter than can be done with the fingers. Be sure the caps do not bind too hard on the bearings, so as to cause them to heat; if they do bind, put some paper under the caps and screw down tightly. After running a few weeks, they can be put down a little closer and the paper can then be taken out.

Should the blades refuse to cut, after running a short time, start the upper set screws on the ledger a trifle in, which consequently will press them a little tighter together. Sometimes when the blades do not cut near the end, the turning out of the conical headed screw on that end, just a hair, will often remedy the difficulty. If this does not remedy it, then lay out the cylinder and with a hone held on front side of ledger with the lower end out, about one inch from the bottom of the blade, hone the edge of blade thoroughly, then lay back the cylinder, turning it forward by hand, to cut off any feather edge that may have been turned over with the hone. You are now ready for shearing again, and many times this will save grinding and besides will be much better for the blades. Always have your blades run as lightly as possible—that is, press the ledger to the cylinder as little as you can and have it do the work. If your blades rattle, slacken the ledger a trifle at the ends; sometimes honing off the bevel of the ledger at the ends will remedy the trouble.

By careful and skillful attention to the preceding directions, shears may be kept in good order, without grinding, for some time. But if they have been in use for a long time, and the ledger is worn down, and the bevel becomes long, it is advisable to grind the shear cylinder together with it. For this purpose all the flocks should first be cleaned from the cylinder, and then the list motion detached and the vibrating wheel taken off as well as all the belts, except the cylinder belt. Every part of the shear which is likely to be hurt by emery should be well covered. Loosen the screws that bind the box which holds the cylinder to the frame, then turn the screws that hold the box up to the ear, say once around, which lets the cylinder down a trifle, then tighten the box again that holds the cylinder, and commence to grind.

With reference to grinding, a good mixture may be made of equal parts of No. 120 and flour of emery mixed with a good lard oil to a thick paste, and when the grinding is nearly completed, finish up with a mixture of flour of emery and oil. When the proper mix is made, we should have what is called a fiddle, about 4 inches wide, made by having a piece of wood 4 inches wide by 20 inches long and putting cleats on 16 inches apart, leaving 4 inches for a handle, and fasten some old 4 inch belting on to the cleats. After having previously covered up all parts of machine where needed, commence grinding. Put your belt on with a cross instead of straight, so as to run the cylinder backwards. Put the paste of emery and oil on fiddle and apply it to cylinder from one end to the other, and have your cylinder all through the grinding operation vibrated by hand. It is a good policy to change the place of beginning to apply the fiddle each time a fresh supply of emery is applied, since wherever the fiddle is first applied, that part is sure to get the most grinding and in this way things can be kept nearly even. Run for about 15 minutes, then tighten up all top rows of screws a little. Remember not to grind longer than absolutely required, since grinding takes the life out of the blades. Keep at it this way slowly and watch front of the ledger blade to see how evenly the emery comes through, as that is a good way to see how evenly we are grinding the cylinder. Grind until the shear blades cut wet tissue paper all the way across. As soon as they cut evenly all the way across take out the cylinder, clean it from emery and oil, and also the ledger blade. Now use a hone and rub lightly on ledger blade at a 20 degree angle to remove feather edge by grinding, and finally finish honing by running the hone straight across from end to end. Wipe ledger blade after honing, and replace the cylinder, bringing it about $\frac{1}{32}$ of an inch forward, so as to take a little away from the heel of your bevel. Put on the bevel and run the cylinder backwards for about ten minutes, so as to polish the blades and insure smooth running, using for this purpose, oil and crocus. Take out the cylinder and wipe all clean, using for this purpose saw dust and a whisk broom; also hone ledger blade slightly, put back, put on swab and you are ready for shearing, but do not force the machine to take off too much nap of the cloth at once. Keep your blades well oiled, and never run them when they are noisy.

A special shear grinding machine in which the ledger and cylinder blades are ground at the same time will be found a valuable adjunct to any mill since it is unhandy and keeps a machine idle when obliged to send the blades to a shop to be ground, thus clearly showing the advantages of having a suitable grinding machine in the mill. To accomplish this many machines have been designed. Some were made with a long roller grinder, run in oil or water, but which would only either grind the fly or the ledger blade and not both at the same time.

Fig. 42 shows the grinding machine as built by B. S. Roy & Son, designed to grind both fly and ledger blade at the same time, without oil or water. The same consists of a suitable iron frame in which is situated a traverse grinder, fitted with a solid emery wheel, with about 4" face, and a differential motion for traversing the wheel very slowly while revolving. On each side of the grinder is a set of bearings, one set for the fly blade, and one for the ledger blade. These bearings are adjustable to the grinder, the ones for the ledger blade being made to be adjusted to any angle while the blade is being ground.

By using a traverse grinder, the grinding wheel runs dry, oil or water being unnecessary as is required when a roller grinder is used. Different widths of blades can be ground on the same machine.

With this machine, accurate and rapid grinding can be made, thus resulting in a saving wherever used.

Grinding does not have to take place as often if the blades are kept in good condition, in fact, if it is

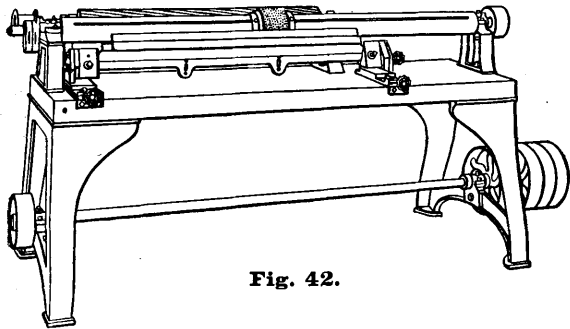


Fig. 42.

handled with a little attention, to the blades at frequent intervals, the shear should do good work for from one and a half to two years. After this procedure has been resorted to for quite a while, there is a time when remedies suggested will fail to give the desired results, and when the finisher may think that it is a good sign that the shear needs grinding. This, however, is not always the case, for as the blade needs honing, it is reasonable to suppose that the cylinder will require a little touching up also, for which reason loosen the stay bolts which hold the cylinder boxes and raise these away from the frame, enough to slip a thin sheet of pasteboard under them, and then secure the stay bolts again and cross the cylinder belt. Get the fiddle, as used for grinding, clean it well of all emery, and give a light sprinkling of lard or sperm oil and apply it to the cylinder while it is running backward, moving it briskly to and fro from side to side. Keep this up for about 10 minutes and then the pasteboard may be taken out from under the boxes, letting things settle back in their accustomed place and when the trouble will have disappeared. These remedies thus mentioned, however refer more to mills which do not possess one of these shear grinding machines previously explained, and thus—for grinding the blades, are compelled to send them to the machine shop where built, in order to have them ground.

However, after shear blades have been run for years and years, and have been ground innumerable times, there will come a time when they will get so that even grinding will fail to make them cut properly, they will heat frequently and get rough and it is next to impossible to do any good work with it. When examining the blades closely, it will then be seen that the bright streak at the point of the ledger has disappeared, it having been ground away, and when of course a new knife must be riveted to the ledger casting.

Oiling. One of the first and foremost essentials connected with the care of a shear is the oiling, since there are any number of movable parts in this machine, all of which need more or less oil, according to the swiftness with which they travel, and while certainly some require less oil than others, still a certain amount is necessary to make smooth work. Many of the places in the machine which need oiling are situated where they are not readily visible, and hence are sometimes overlooked, certainly due to carelessness of the shear tender. Amongst these we find the break roll situated under the brush rest, which turns and therefore needs lubricating. The two application rolls which serve as contact rolls for the laying brush are also out of the way, and easily omitted by the operator, but they need oil just as

regularly as the more prominently located moving pieces. So do also the two wood rolls, set beneath the brush pan and which serve to keep the cloth from rubbing against this pan, need oiling at intervals. These several rolls do not always squeak when they need oil and it sometimes happens that the arbors wear off completely before it occurs to the shear tender that oil is required on them. Oiling up a machine is certainly a very simple process, but after all it must be done right and not one place slighted. Again oil must not be poured on until it can be seen running off on the framework of the machine, since one or two drops may be all that was required.

The oiling of the swab on the shear is also another place where much oil is frequently wasted. The cloth part composing the swab is tacked to a round or square stick and this stick is placed on the cap of the journal box frame, and by means of suitable holes bored into it, is held on and overlapping the blades of the cylinder by the top screws. The cloth part hangs rather straight, in fact almost too straight, to retain the oil to any great extent, thus provided its oiling is done carelessly, the oil will drop off and in turn on the cloth to be sheared, this being a frequent cause of oil stains and consequent damage to the fabrics.

The object of the swab is to keep the blades on the cylinder cooled, since said cylinder revolves at a high speed (from 1000 to 1500 revolutions—according to make of machine—per minute), again the cylinder is running against the ledger blade, which has a tendency to heat them, and which must be avoided. However this does not necessitate the continually applying of oil to the swab, a light oiling, about four or five times a day being all that, as a rule, is required to make the shear run well without heating; whereas, if only oiled once, or at the most, twice, and this with a large quantity of oil each time, it will result in oil spots to the fabric sheared. Another trouble by not oiling frequently enough is that the blades run too dry, which, as mentioned before, causes them to heat. The blades when warm will expand, and consequently run very tightly together. They soon get burnt and roughened up, and cannot do good work, until sharpened again, this being a process as previously explained which takes up time, and consequently causes loss in production to the mill. The flocks which accumulate in between the fly blades on the cylinder should not be disturbed, as they absorb all the superfluous oil, whereas if the cylinder was clean it would throw this superfluous oil out and onto the fabric. If, with a proper oiling of the swab, there should still be a tendency for the blades to get hot, it then is a sign that the blades are running too hard, that is, the ledger and cylinder blades have been drawn together so tightly, in order to make them cut, that the friction thus produced, speedily heats them.

An improved swab consists of a strip of perforated leather fillet, such as is used by card clothing manufacturers. This leather swab rests directly against the fly blade cutters and has two strips of felt on its outside to retain oil and apply it to the leather beneath. This kind of a swab wears much longer than a common swab, and applies the oil evenner and also acts as a stop on the blades of the shear cylinder to keep them sharp.

Practical Points. In shearing a piece of goods, do not have the ledger blade too high, or above the cloth rest, as this will injure the cloth, and provided the selvages are poor, the shearing arrangement will cut them, also every little knot or bunch on the fabric will be cut off. Draw the frame, holding the cylinder, down so that when the last notches have been reached, there will be a slight tremble, or jar,

on the cloth, caused by the cylinder touching it lightly, but which action will not be perceptible when the piece is finished. This applies only when shearing woolen or cassimeres, while for worsteds, the cylinder should not be allowed to touch the cloth, as it is liable to injure the threads.

It is impossible to lay down hard and fast rules for regulating the amount of cutting to be done, by the shear cylinder, the class of goods under operation regulating the practice; for example, with a full heavy nap, the blades would have to be set higher than where the nap is found short and thin. The lowering and raising of the cylinder, as the occasion requires, must be carefully done, for, if too much nap is being taken off the cloth at once, the flocks will soon show by being thrown in front, and the cutting effect of the shear will be very quickly impaired.

For light weight meltons, cheviot and suitings, which require but little shearing, the machine may be run with the blades set as low as is required to finish the goods with one or two runs.

On goods having a nap, like beavers, kerseys, broadcloth, the blades should be raised, so that but a little of the nap will be cut off on the first run, and lowered gradually until the piece is sheared as closely as required. Care should be taken not to lower the blades too fast, since this would cause them to pull, instead of cutting the nap properly. In connection with these fabrics it can be noticed that the nap is getting thicker, the shorter it gets, which is due to many of the shorter fibres which have been raised and which have not been exposed to the shear blades in former runs. When the blades are set low enough down, in order to cut the nap as closely as is required, the fabric (nap) should get several runs at this point to insure a clear and even nap. Much of the difficulty met with in shearing these face finish fabrics, is due to the work being improperly done in the processes of finishing before shearing. Such trouble being frequently caused by having the goods improperly scoured and gassed, which, if done as it should have been, would have permitted them to be sheared perfectly. Should it appear to the finisher that a piece of cloth to be sheared is not sufficiently gassed, it should be sent back to be re-gassed, and this with as much of the original nap on as possible. Any attempt on the part of the finisher to clear its pile in this case by shearing, while in a measure it may be successful, at the same time will produce a hard, wiry face, and if re-gassed after a close shearing, the result may be a tender fabric.

When shearing piece dyed goods, the whole number of pieces in the lot must be sheared the same as the first, because if one is sheared closer or faster than the others, there will be a difference in the shade of these goods.

The shear tender, on account of its being impossible for him to carry in his mind exactly the appearance or shade required of the fabric to be sheared, should always be supplied with samples of the styles of fabrics he has to shear, being careful to shear to match the respective sample as near as possible. On account of a variation in the weight of most all fabrics, the variation in density of the nap, the variation in yarn and cloth during its manufacture, it is impossible for the finisher to give his shear tender rules for shearing to depend upon, neither to closeness of pile nor number of runs to give the cloth, etc., the use of correct samples to shear by, and the exercise of good judgment on the part of the shear tender can only produce good results. In the matter of uniformity of shade in connection with "case goods," much depends upon the careful work of the operator, not that the shearing can change or regulate the shade as relates to the colors,

but in the clearness with which the colors are brought out by shearing, and the effect of the light upon a long or short nap, together with the prominence of the threads or pattern, the shearing may result in what would be termed in the market a variation in shade or "off shade." In many cases a slight variation in fulling, the density of the felt resulting in turn in a corresponding density of nap will render it necessary for the shear tender to give the fabric in question an extra "notch" or run or two, on the shear, in order that the pattern may show up as clearly as in the sample.

Another important matter for the shear tender to notice is to see that the two sides of the cloth shear exactly alike, so that they also in turn will shade alike. If there is any variation, he must discover it at once, and correct it before the piece is sheared down to the final notch, or there will be trouble. The two sides and the middle of the cloth should be compared, and must be kept uniform, and the shearing made to compare with sample as nearly as possible.

Another important point to be considered in connection with shearing, is the proper tension of the fabric while passing through the shear. The tension is controlled by means of a friction plate attached to the take-up or draft rolls of the machine (see 4 and 18 in connection with Fig. 37). This plate of each draft roll should be kept well oiled and taken off at least once a week and the leather thoroughly scraped and oiled. It should be set so that it will slip if the cloth pulls too tight. The cloth should be run through with enough tension to keep it smooth, but not more, since the tighter the cloth runs, the harder it is to shear it evenly, and on a threadbare finish, it would be next to impossible to properly clear out the face of the fabric, provided an excessive tension is employed. Neither is it advisable to have the friction too loose, especially on worsteds and threadbare finished woolens, since although it will aid the clearing out of the face on these fabrics, it must be watched closely to see that it is not overdone, for when the friction is too loose there is liability of cutting the sides of the cloth. The proper amount of tension to the fabric is readily ascertained, by placing the hand on the cloth as it runs over the rest, (about the middle of the rest) and pressing down lightly. If by doing so a slight wrinkle forms itself to the fabric it is a sign that the tension is about right, while if no wrinkle shows, there is too much tension on the fabric. Again if a slight pressure produces a wrinkle, it shows that there is not sufficient friction on the cloth for proper shearing.

Should the selvages be very slack, so that they are cut in spite of the list saving attachments, it certainly is too late to correct this trouble in the finishing room, the only thing that can be done is to increase the tension of the cloth by adjusting the friction plate on the take up rolls, thus tending to take up some of the slack in the selvage.

When dealing with a rubber rest all knots and bunches left on the back of the goods, must be buried in the rubber rest as they pass over it, in order to present a smooth surface of the cloth to the cutting part of the shear, and in order to accomplish this, the cloth must be drawn over the cloth rest tight enough to press these knots and bunches into the rubber tube. This shows that it requires in connection with the rubber rest shear to use more tension on the goods than is necessary to be used on the common shear. Again too much tension on the goods in connection with the rubber rest shear must also be avoided, for, if there was too much tension used, the goods would be drawn into the tube, causing the sides or ends of the rubber tube to stand much higher

than where the cloth is passing over it, and when shearing the cloth, the apron as well as the tube would surely be damaged. In connection with shears having list saving attachments applied, there will be little trouble from this source, although it will not be advisable to have the tension too tight.

As mentioned in the beginning of this article on shearing, in connection with some fabrics, singeing is made use of in place of shearing; for which reason one of the most prominent makes of this class of machines is herewith given, viz.:

Butterworth's Gas Singeing Machine. This machine, as built by the H. W. Butterworth & Sons Co., and of which a perspective view is given in the accompanying illustration is very economical in the use of gas, and so constructed that either one side or both sides of the cloth can be singed at the same operation.

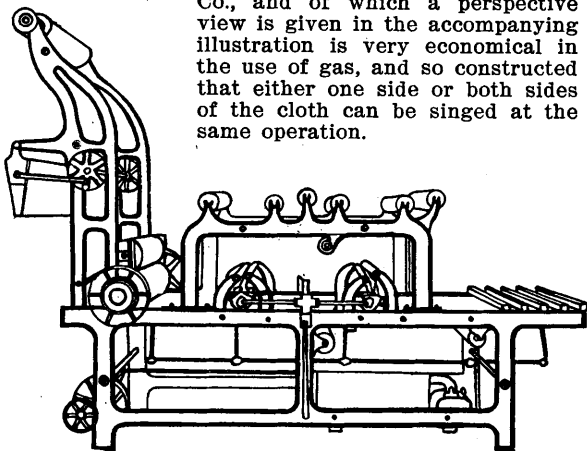


Fig. 43.

The cloth can always be seen by the operator, and the flame can be removed and the machine stopped instantly, thus avoiding any chance of damaging the goods.

The burners are so constructed that the width of the flame can be limited to exactly the width of the goods, thus preventing any waste of gas.

Compressed air is delivered into a large receiver, and the air and gas are mixed at a uniform pressure, which insures a steady and perfect flame. Combustion being complete, the cloth is entirely free from traces of soot. Besides being used for handling Worsted and Woolen fabrics this machine is used very extensively in connection with Cotton and Silk.

For description of the gas singeing machine as built by the Curtis & Marble Machine Co., see Cotton chapter, pages 366-367.

BRUSHING, PUMICING, POLISHING, SANDING.

Brushing has for its purpose to clean out the body of the fabric under operation, from any dust, dirt, loose long and short fibres, and at the same time in connection with face finished fabrics, lay the nap smooth and even, all over the surface, in one direction.

Polishing or pumicing imparts a lustre to the face of the goods, rounding out each thread and giving it the full rich finish that can be accomplished in no other way. The pumicing cylinders are sixteen inches in diameter, and have iron heads with six arms, upon which the lags are mounted. The cloth when applied to a broken cylindrical surface of such large diameter receives a heavy beating effect and vibratory motion. This limbers and softens up the cloth and produces the fine velvety feel that is so desirable. These polishing or pumicing lags are set with alternate rows of the stiffest Russian bristles and fibrous

whalebone with an adjustable steel supporting blade on each side of the lag. This blade prevents the breaking down of the outside rows of bristles and whalebone and greatly increases its durability. It also gives adjustment for wear. For tightly woven and stiff fabrics, polishing or pumicing is unequaled by any other finishing process. Although primarily designed for finishing plain and fancy worsted and all hard faced goods, it is now used in a more general manner on flannel and light fabrics, golf cloths, and many other goods.

Sanding clears out the face of the cloth, smooths it up, and removes all projections like knots, lumps, and threads. The sanding lags, and of which there are also six to the cylinder, are covered with the best grade of garnet paper, which is held on by adjustable clamps. Worn out paper can thus be readily, evenly and quickly replaced, the whole expense of reclothing the lags, in labor and material, being insignificant. However, if so preferred, emery, garnet, ruby, or sand may be applied in the grain direct to the cylinder, when the same is used without lags, or to the lags, if such are used on the cylinders.

In order to give a description of the construction and operation of the machine used for these processes, the accompanying illustrations are given, and of which Fig. 44 is a perspective view and Fig. 45 a side elevation of the machine as built by the Parks & Woolson Machine Co.

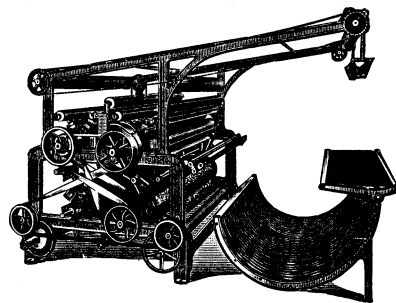


Fig. 44.

The cloth, as is shown by means of dotted line, passes from the cloth scray 1 (a portion of which only is shown in order to bring the illustration within compass of the page), successively over the tension rolls at 2, guide roll 3, steam box 4 and guide roll 5, into the machine. The steam box 4 may be omitted, if dealing with fabrics requiring no steaming.

When using the steam box, the fabric rests upon the guide or application rolls 3 and 5, running also over the top of the steam box. For operating the steam box, open the drip valve provided for this purpose, then wait until steam issues through the felt cover on top of the steam box, then start machine. After box is thoroughly heated, close drip valve. Leave drip valve open when machine is idle.

The cloth is then applied twice to each one of the four cylinders, 6, 7, 8 and 9 (revolving at from 350 to 400 r. p. m.), by the adjustable application rolls 10, 11, 12 and 13. The illustration shows cylinders 6 and 7 as solid brush cylinders and 8 and 9 as what are called "six lag" polishing or pumicing cylinders; this combination being purposely given to show the construction of these two kinds of cylinders.

Brushing cylinders are too well known to need lengthy description, they being simply cylinders covered with brush lags, whereas the polishing or pumicing cylinders as previously mentioned, consist of six lags mounted equidistant on the cylinders, said lags being set with alternate rows of stiff Russian bristles and whalebone, having on their two sides a steel strip (not shown) to keep the rows of bristles from bending over when they hit the cloth. No sanding cylinder is shown in the illustration, the same being either a cylinder having six lags like cylinders

8 and 9, covered either with emery, etc., in the grain or on cloth, or a solid cylinder covered similarly to the lags. As a rule these machines are built with four brush cylinders, or four polishing cylinders, or four sanding cylinders; however any combination of these kinds of cylinders, or any other kind of cylinder in connection with any one or more kinds of cylinders thus explained may be used to fulfill many varied conditions. Again the machine can be so arranged, so that one, two or three of the cylinders will treat one side of the goods and the remainder the other, an arrangement especially advantageous for flannels.

The cloth application rolls 10, 11, 12 and 13 are adjustable by a hand wheel for each cylinder, so that the cloth contact can be regulated quickly for light or heavy work, a dial with indicator showing the setting.

After having passed the action of the last cylinder (pumicing cylinder 8 in this instance) the fabric is then guided by means of guide roll 14 and draft roll 15 to the flock brush 16, which cleans off the back of the goods. 17 indicates another draft roll for the fabric, from which the latter travels to the folder 18, and from there back into the cloth scray which is provided with a tilting table (see Fig. 44). The folder 18 is shown broken away from the machine in Fig. 45, in order to bring the illustration within compass of

finally, the tilting table is put in a horizontal position as shown in Fig. 44, and the cloth thus folded automatically on it by means of the folder 18, whereas when the cloth is to be given a number of runs in the machine, the table is swung into a perpendicular position, letting the cloth drop into the scray for the next run through the machine.

This machine can be also specially arranged for wet work, requiring in this instance a heavy chain drive, draft rolls covered with perforated brass, and wide faced pulleys; dampening rolls or stretch rolls being added if so required.

Steam Brushing. Although the machine just described will, besides Pumicing, Polishing and Sanding, fulfill this purpose in a most satisfactory manner, we must mention, that special machines are also constructed for the purpose of only steaming and brushing the fabric, and a specimen of which is given in connection with Figs. 46 to 49, the same representing the steam brush as built by David Gessner. Points of advantages of this machine are its cloth guiding mechanism and the means for shifting the same, by means of it providing three (in place of two or one point only) points for the main brush to operate upon the cloth, at the same time providing for a convenient removal of the main brushing cylinder (for repairing, etc., purposes).

Of the illustrations, Fig. 46 is an isometric view of the front and one end of this steam brush, with the brushing cylinder cut away for clearness of illustration. Fig. 47 is a section at right angles to the brush shaft through the middle of the machine. Figs. 48 and 49 are details of the cloth folding device, shown broken away from the frame, *i. e.*, stands 3 and 4, respectively, of the machine.

A description of the construction and operation of this steam brush is best given by quoting numerals of reference accompanying the illustrations, and of which 1 and 2 indicate the two side frames of the machine, which are held together by cross ties *o*. To the top of said frames are fastened, in rear, the folder carrying stands 3 and 4, and to the rear, two brackets 5 and 6 (only one being visible in either illustration, a duplicate being situated on the other side of the machine) for holding, when required, the cloth table board 42, shown in Fig. 46 in its dropped position, having automatically folded the cloth upon it by means of folder guide 15. Fig. 47 shows said cloth table board 42 raised, *i. e.*, in the position to permit

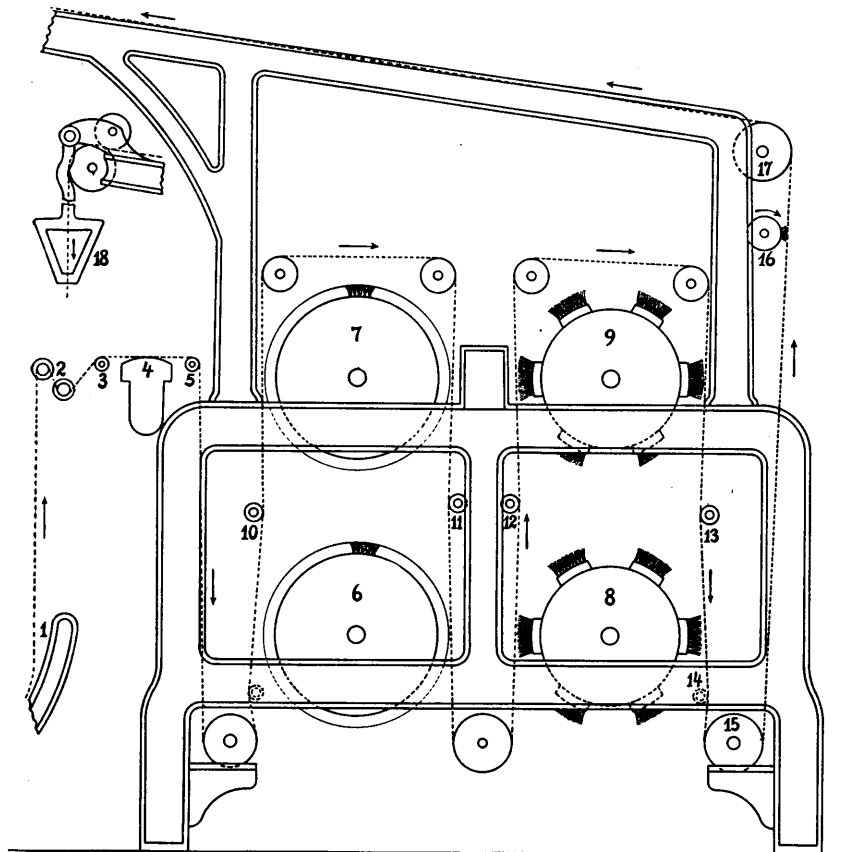


Fig. 45.

the page. The direction of running the cloth through the machine is shown by means of dotted line, accompanied by arrows. The average speed of the passage of the cloth through the machine is 16 yards per minute.

When the cloth is to be run out of the machine

the cloth (see dotted line 7) from the folder guide 15 to drop into the cloth trough 8 for a further operation upon by the machine. The broken line 7 in Fig. 47 shows the course of the cloth through the machine as it is passed from trough 8 successively to the brush 9, acting on the back of the cloth, draft roll

the steam-box 11, main brush 12, acting on the face of the cloth, rear draft roll 13, folder draft roll 14 and folder guide 15.

The mechanism for supporting the main brush 12 and presenting the cloth thereto is as follows:

On the top of the end frames 1 and 2 are stands 16 and 17, containing the bearings of the brush shaft 18, held on said bearings by removable caps 19 and 20.

21 and 22 represent, respectively, the loose and fast pulley for the belt by which the shaft 18, *i. e.*, the machine, is driven.

23, 24, 25 and 26 represent a compound pulley formed of one casting, fixed on the shaft 18. The part 23 constitutes the pulley for driving through belt 27 and pulley 28 the brush 9, and parts 24, 25 and 26 of three different diameters constitute a step pulley for driving the feed. The compound pulley 23, 24, 25 and 26 is provided with a hub adapted to be fixed on either end of the shaft 18, and pulleys 21 and 22 are provided with a sleeve and collar, so that the main brush 12 may be reversed end for end by slipping these pulleys off the ends of the shaft 18, removing the caps 19 and 20, turning the brush end for end and replacing the caps and placing the pulleys on opposite ends of the shaft.

A hand wheel 30 is connected through shaft 31 and bevel gears 32 and 33 with shaft 34, which in turn is connected by the spiral gears 35 and 36 with screw shaft 37 and by corresponding spiral gears (not shown) with a similar screw shaft (not shown) as adjusted to the inner side of end frame 2. The screw shaft 37 is fixed against longitudinal movement in bearings 39, 40, and is held by said bearings parallel with the guideway 41, running horizontally on the side of

the end frame 1, near its top. The other screw shaft (not shown), as running horizontally on the inner side of end frame 2 near its top, is fixed against longitudinal movement in similar bearings as screw shaft 37, and held by said bearings parallel with the guideway (the front end 38 of said guideway being visible in illustration Fig. 46), running horizontally on the inner side of the end frame 2, near its top.

43, 44, 45 and 46 are guide rolls, by the relative movement of which the cloth is pressed against, or removed from, the brush 12. Locating these guide rolls in the position shown and providing for their lateral movement, enables the operator to conduct the cloth tangentially against the same brush at three points of its circumference, a feature forming the chief point of advantage of this machine. This feature of presenting the cloth at three points (see dotted line 7, near brush 18, in Fig. 47) to the action of the brush is accomplished by locating the axes of

the guide rolls 43 and 46, around which the cloth passes to and from the brush in the same, or nearly the same, horizontal plane below the level of the brush shaft 18 and the rolls 44 and 45 above the level of the brush shaft 18.

How to Regulate Amount of Brushing: The means by which the lateral movement of the guide rolls 43, 44, 45 and 46 is produced at one end of the machine from the shaft 37 is the same as that by which it is produced at the opposite end of the machine (not shown), hence a description of one will suffice for both: 47, 48, are inversely-inclined screw threads and 49, 50, are other inversely-inclined screw threads. The screw thread 48 is also inversely inclined with respect to the screw thread 50, and the screw thread 47 with respect to the screw thread 49. Screw threads 49 and 50 are of equal diameter, but smaller than screw threads 47 and 48, which again are of equal diameter. 51, 52, 53 and 54 are carriages mounted to slide in guideway 41, and are threaded, respectively, on to

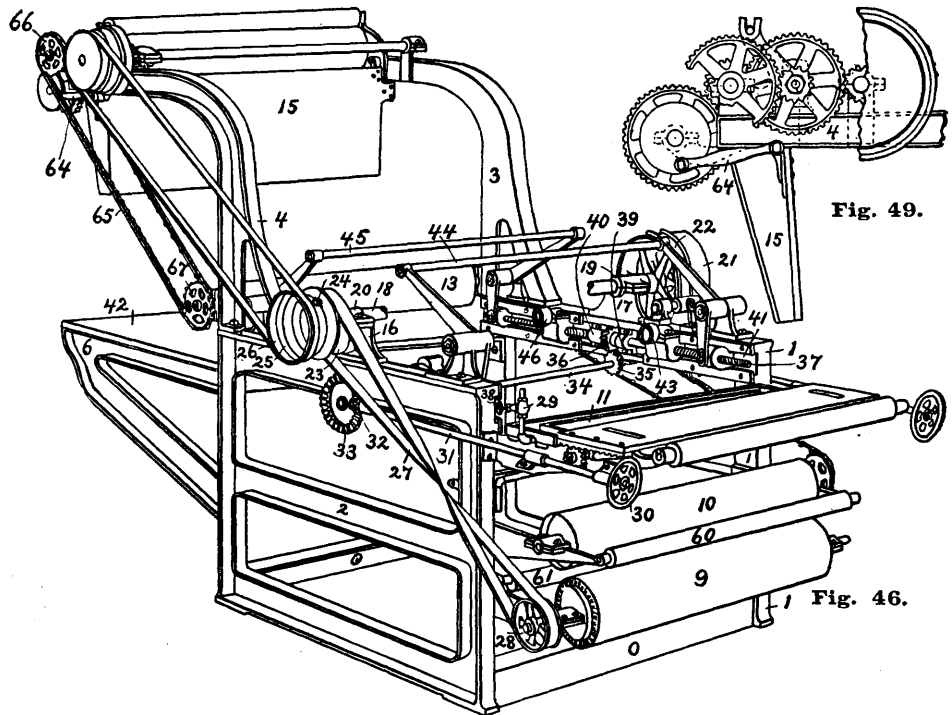


Fig. 49.

Fig. 46.

the screw threads 47, 48, 49 and 50. The carriages 51 and 52, respectively, carry the bearings of the guide rolls 43 and 46. The carriage 53 is pivotally connected with one arm of the angle lever 55, 56, which has a fixed fulcrum at 57 and carries the roll 45 at the extremity of its other arm. The carriage 54 is pivotally connected with one arm of the angle lever 58, 59, having a fixed fulcrum and carrying the guide roll 44 at the extremity of its other arm. When the screw shaft 37 is rotated in one direction, the guide rolls 43, 44, 45 and 46 will all approach the brush 12, and by the proper inclination of the screw threads, their relative movements are so timed that whatever slack in the cloth is produced by the movement of the rolls 44 and 45 is taken up by the movement of the rolls 43 and 46. Conversely, when the shaft 37 is rotated in the opposite direction, it causes the guide rolls to retreat from the brush 12 with such relative movement that the slack produced by the retreat of the rolls 43 and 46 is taken up by the re-

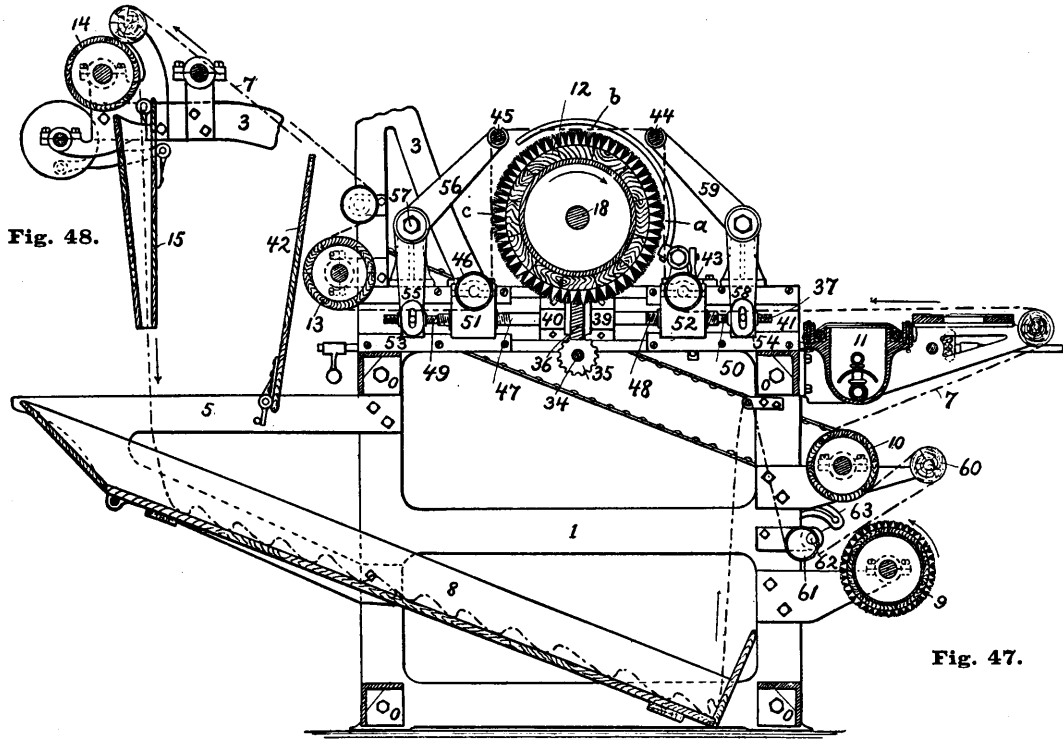
treat of the rolls 44 and 45. The approach of the four guide rolls toward the brush presses the cloth against it at three points of its circumference, as shown in Fig. 47, while their retreat removes the cloth from the brush to any distance required. All of this is accomplished by the operator by simply turning the hand wheel 30, without necessitating the stopping of either the running of the brush or the travel of the cloth through the machine.

To Remove the Main Cylinder from the Machine: By simply removing the cloth from the machine and moving the levers 58, 59, and 55, 56, so as to separate the rolls 44 and 45 to a distance as great as the diameter of the brush and removing the bearing caps 19 and 20, the brush can, without disturbing the position or adjustment of any other part, be raised bodily from the machine and in turn repaired, reversed or replaced. The shafts 34, 37, and the other screw shaft (not shown), as running horizontally on the inner side of end frame 2, near its top (similar

inclination of the screw threads 47 and 48 with respect to the screw threads 49 and 50 and the lever arms 55, 56 and 58, 59.

The mechanism for regulating the amount of back brushing to the cloth, *i. e.* the contact of the cloth with the brush 9 is as follows: 60 is an idler guide roll and 61 a guide mounted upon eccentric journals 62, so that by being oscillated on its journals the cloth may be made to approach or recede from the brush 9. Connected with one of these journals 62 is a slotted segment 63, provided with the handle (not shown) whereby the eccentric guide 61 may be oscillated. For the purpose of locking the segment at the desired point, a set screw (not shown) is provided, which extends through said slot, but is provided with a shoulder adapted to enter an enlargement (and of which there are several) of the slot in turn locking the segment 62.

The cloth after leaving the brushing machine (see broken line 7) passes over a guide roller onto and



to shaft 37 on the side shown), are all located beneath the level of the brush shaft 18; thus either of them is prevented from intercepting the necessary path of removal upward of the shaft 18. The rolls 44 and 45 are provided with open bearings, as shown in the lever arms 59 and 56, so as to permit of their being lifted out of their bearings, if desired.

Since the four levers 55, 56, and 58, 59, diverge from their upper extremities downward, they will carry the guides 44 and 45 in arcs, so that their movement is such as to cause the cloth to approach or recede from the brush at the three points marked *a*, *b* and *c*, in Fig. 47. The guides 44 and 45 move at 45 degrees to the horizontal and the guides 43 and 46 move in a horizontal plane, thus it is necessary that the guides 43 and 46 move farther than the guides 44 and 45, so that the resultant of the horizontal movement of 43 and 46, on a line at 45 degrees to the horizontal substantially equals the movement of 44 and 45. This result is accomplished by the proper

partly around draft roll 14, and from there into the cloth folder 15, to which a swinging motion is imparted by means of lever 64 through gearing shown in detail in Fig. 4, in order to fold the cloth, when required, onto the tilting table 42.

Sprocket chain 65 connects sprocket gears fast on draft rollers 66 and 67, the shaft of the latter (the rear draft roll 13) having on the opposite side of the machine from that shown in Fig. 46 another sprocket wheel, which in turn meshes with a second sprocket chain, in turn meshing on its other end with a fourth sprocket wheel fastened to the end of the shaft of front draft roll 10.

11 indicates the steam box, live steam being admitted (when wanted, and if so, under such pressure as required) to this apparatus by means of valve 29, the steam escaping through minute holes in the top of the box, throughout its entire width, the steam penetrating through the cloth from its face side.

SPRAYING, DAMPENING OR SPRINKLING.

The object of this process, designated by any one of the above quoted four names, is to dampen, *i. e.* condition the fabric either before or after pressing. It is important that this dampening or moistening of the fabric is done even, uniform, as well as thorough, for which reason the water must be thrown against the cloth in a very fine spray (mist) and this with such force that it will penetrate into the structure.

A description of the process is best given by means of illustrations Figs. 50 and 51; and of which Fig. 50 is a perspective view of the Spraying Machine as built by the Curtis & Marble Machine Co., and Fig. 51 a sectional view of such parts of this machine as comprise the spraying device proper.

With reference to Fig. 50, the cloth is laid on a platform in front of the machine, at a convenient height from the floor, then passed around the necessary guide rolls and a stretch roll,

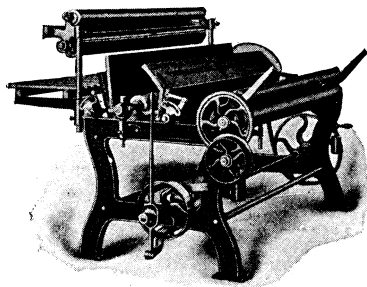


Fig. 50.

over the spraying device, and then to the draft roll, where it is wound up in smooth, even rolls, so that the moisture is evenly absorbed by the entire fabric. Weights are provided for giving sufficient pressure to make a firm roll. If it is desired to lay

the goods off in loose folds, a folding attachment is put on the machine for this purpose.

The operation of the machine with reference to its object—spraying, dewing, sprinkling or dampening the cloth—is best explained by means of quoting letters of reference on the sectional view of the spraying device, and in which A indicates the spraying cylinder, which is caused to rotate at a high speed in the direction of the arrow by means of a belt from the main shaft of the machine. This cylinder is composed of a steel shaft on which are packed a series of disks made of thin, sheet metal, prefer-

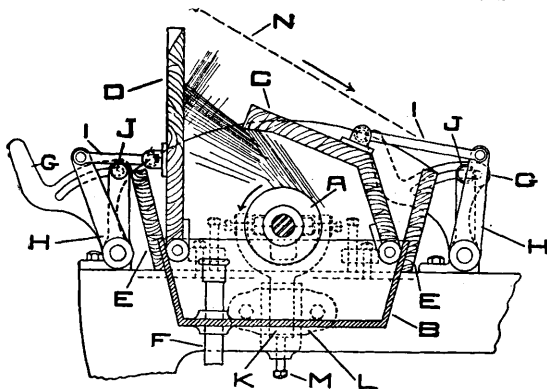


Fig. 51.

ably brass, with spacing collars between, to give suitable distance between the disks. B is the water tank or reservoir arranged on the main frames of the machine, and provided with inlet pipe for the water, and an overflow pipe F, the latter serving to carry away the surplus water and at the same time insure a uniform depth or supply of water in the

reservoir. At either side of the spraying cylinder is a deflector D, hinged at the bottom, and a shield C likewise hinged at its lower portion. Both the deflector and the shield are adjustable in their position by means of segment handles G, acting through fingers H and connecting links I, and they may be clamped in any desired position by means of thumb screws or hand wheels J. The passage of the cloth through the machine is shown by dotted lines N, the same passing above the spraying device in the direction of the arrow. In the operation of the machine, the rapidly revolving disks on the spraying cylinder A take up films of water from the upper surface of the reservoir, and throw these against the inner surface of the shield C and deflector D, whence they strike the goods N in the form of fine spray or mist, free from individual drops of water. The fineness and volume of the spray depend upon the position of the deflector and shield relative to the spraying cylinder. When the shield C is fixed over and quite close to cylinder A, the volume of spray thrown by the cylinder will be reduced, and as the shield is moved in a direction away from the cylinder, the volume of the spray is proportionally increased. The same is true regarding the position of the deflector D. Thus the operator has at his command, at all times, means for governing the amount and the fineness of the spray which different classes of goods under operation may require. Drip boards E, located at either side of the water tank and inclined as shown in the illustration, take any surplus spray or water back into the reservoir. The overflow pipe F has an adjustable top which can be screwed up or down for regulating the depth of the water in the reservoir.

If it should be desired at any time to make the water of greater depth so as to lap more on the disks of the spraying cylinder, the top of the overflow pipe can easily be raised by turning it with the fingers. This adjustable top allows the depth of the water to be regulated to a nicety.

The spraying cylinder A runs in adjustable boxes which are held in a forked stem K, and this stem is adjustable up and down in the stand L fastened to the frame of the machine. By turning the set screw M at the bottom, either one or both ends of the spraying cylinder can be raised or lowered so as to bring the surface of the disks parallel with the surface of the water, and thus insure an even spray being thrown throughout its entire length. A brass rack is placed in the bottom of the reservoir B, though not shown in the illustration, to prevent agitation of the water by means of the constant revolution of the spraying cylinder A, and consequent unevenness in the amount of spray that is thrown off. At the ends of the reservoir are sheet metal guards to prevent the water from splashing over the ends of the reservoir.

For a description of the machine as built by the Textile Finishing Machinery Co. see Fig. 31, page 379, and for such as built by the Arlington Machine Works see Fig. 32, page 380.

PRESSING.

This, as a rule, is the last process the fabric is subjected to, previous to measuring, doubling and rolling, and for which reason it must receive due attention by the operator, in order that the work is done well.

The object of pressing is to smooth the fabric, by means of ironing it, of all its wrinkles and folds, as well as to enhance its beauty of finish. Certainly with reference to the process, the same as with all the other finishing processes, various notions prevail, and the kind of pressing required for a certain fabric, may be frequently regulated more or less by the

whims of the commission merchant than by the actual requirements of the fabric under operation.

There are two methods of pressing in use, viz.:

(1) The old fashioned method of pressing the cloth in folds between press paper boards and heated iron plates, by means of hydraulic presses, and to which process some manufacturers, in connection with some face finished fabrics, like Beavers, Tricots, Uniform-cloth, Kerseys, etc., still may adhere, claiming that by this process the heat permeates the cloth slowly, and in the same manner cools it slowly, and consequently that thus the pressing is set better. In some instances, belt power is used in place of hydraulic power; again pressing by means of electricity in place of heated plates, is also practiced.

(2) By means of the modern steam heated rotary press, which besides perfect pressing—and this as good as by the hydraulic press—will result in a considerably larger production, and consequently saving in labor, time and expenses to the mill.

Hydraulic Cloth Press. The fabrics to be pressed, after proper steam brushing, are then—face inside—doubled and folded, being careful to omit the forming of wrinkles in the cloth. The fabric is then taken to a special bench, for putting it in press papers, it being laid with the selvages towards the operator and a press paper between each fold. When a sufficient number of pieces to fill the press (or less), have thus been papered, the setting of the latter in the press follows. For this purpose a heavy piece of press board is laid down on the bottom of the press, and upon it three iron plates, previously thoroughly heated, are placed. Then another heavy press board, the same as the one previously used, is placed on top of these hot plates, after which two men take one of the papered pieces of cloth, previously referred to, and lay it upon the heavy press board, being careful that the selvaige of the fabric rests on the side and so that it comes square on the plates, so as to get the whole benefit of the heat. Another heavy press board is then placed on the fabric, three other hot plates on top of this, and then another heavy press board, and when the next, previously papered, piece of cloth, is then put in the press, it being placed so that the selvaige rests on the opposite side of the previously inserted fabric. In this manner all the pieces to be pressed (and of which there may be from eight to ten, according to length and weight of fabrics thus handled, to go in the press) are treated, until the press is filled. It will be readily understood that in some instances, what we might call incompletely filled presses have to be made use of, on account of not having a sufficient number of pieces of cloth on hand for filling the press complete.

When thus the press is filled or partly filled, as the case may be, pressure is now applied, and the fabrics thus set in the press, left under pressure until the plates get cold, and when the pressure is then taken off, the fabrics, one after the other, taken out of the press, and in turn to the bench, to have the position of the press papers changed, for the reason that at each end of the fold there is about one-quarter of an inch of the cloth that has received no pressing, and for which reason, the folds are changed, *i. e.* the press papers are changed in re-folding the fabric in such a manner that each press paper is moved about five inches, thus giving a chance for pressing, in the next operation, such portions of the fabric, which previously received no pressing.

After all the pieces that were in the press have thus been changed, the press is again set as before explained. When the plates in turn are again cold, the pressing is completed, and the pieces taken out of the press, to the bench, to have their press papers finally removed. For a lustrous finish, the fabrics

are then ready for measuring and rolling, whereas, for a dull finish, the fabrics are opened out and steam brushed, after which they are then ready for measuring, doubling and winding.

In place of the solid iron press plates, thus referred to, in some instances hollow plates are used, and which are not heated until the pieces of cloth are all in the press. These hollow plates are severally connected by compensating tubular joints to valved steam pipes, whereby the plates are heated by the steam circulating through them, the hydraulic press at the same time being set in operation.

There are objections or disadvantages inherent to these pressing operations—that is to say, in the application of the interposed iron plates, whether direct or steam heated, since they are necessarily disposed at quite a distance apart vertically between the layers of cloth, due to the fact that the necessary thickness of the plates occupies so much room in the press that it would be impracticable of using such a method if said plates were interposed between each layer or even between three or four layers, on account of the too small amount of cloth thus possible to be inserted in one press. Moreover, in such a case the plates would produce streaks in the fabric, thus making an uneven finish in the goods. Again the iron plates are necessarily heated to a temperature considerably exceeding that which is required to finish the cloth, as otherwise the interposed layers would not be evenly warmed through; but even then the cloth nearest or contiguous to the heating plates will become overheated and consequently overfinished, while the other or intermediate layers are insufficiently heated and finished, the result being that the goods when taken from the press may be found to be more or less unevenly finished. These disadvantages are overcome by means of using electrically heated press boards, placed between every third fold of the cloth (a common press paper being placed between the other folds) after which the goods are placed on the vertically-movable bed or platen of a suitable hydraulic press. The pieces of thus folded fabrics are laid in superposed layers on the preceding one, and so on until the desired quantity of fabrics is mounted in the press, thus when a current of electricity having sufficient strength is passed simultaneously through the several (to permit electrical heating) press boards, the heat thus generated is transmitted to and acts upon the adjacent layers of the confined fabric, the latter at the same time being compressed in the press under considerable pressure, and since the degree of heat or temperature can be adjusted or regulated as desired, it follows that none of the layers of cloth will become overheated or overfinished, while the time required for conducting the heat from the press boards is greatly reduced, since the applied heat permeates the cloth almost immediately.

Of the accompanying illustrations Fig. 52 represents in front elevation such a hydraulic press, adapted to be used in connection with electrically heated press boards, and which in its general character is identical with the hydraulic press as used in connection with heated plates as previously referred to. Fig. 53 is a horizontal section taken on line *x-x* of Fig. 52. Fig. 54 is a partial vertical section taken on line *o-o* of Fig. 52. Fig. 55 is a perspective view of one of the press boards or plates adapted to be electrically heated; and Fig. 56 is a plan view showing the interior construction of said press boards.

A description of the construction and mode of operation of the press and the press boards as used in connection with this procedure, is best given by quoting letters of reference, of which A indicates a hydraulic cloth press, provided with a vertically movable bed or platen B, having a piston or plunger *p* extending downwardly therefrom and mounted in the

cylinder *c*. The platen is adapted to be actuated through the medium of water or other suitable agent under great pressure admitted to the cylinder and pressing against the end of the piston. At the upper portion of the press is located a strong head *h*, the

being insulated from one another through the medium of the plate and also by means of individual switches *s*. Thus it will be evident that any or all of the conductors *e* may be energized at will by the current with which the main conductor is charged.

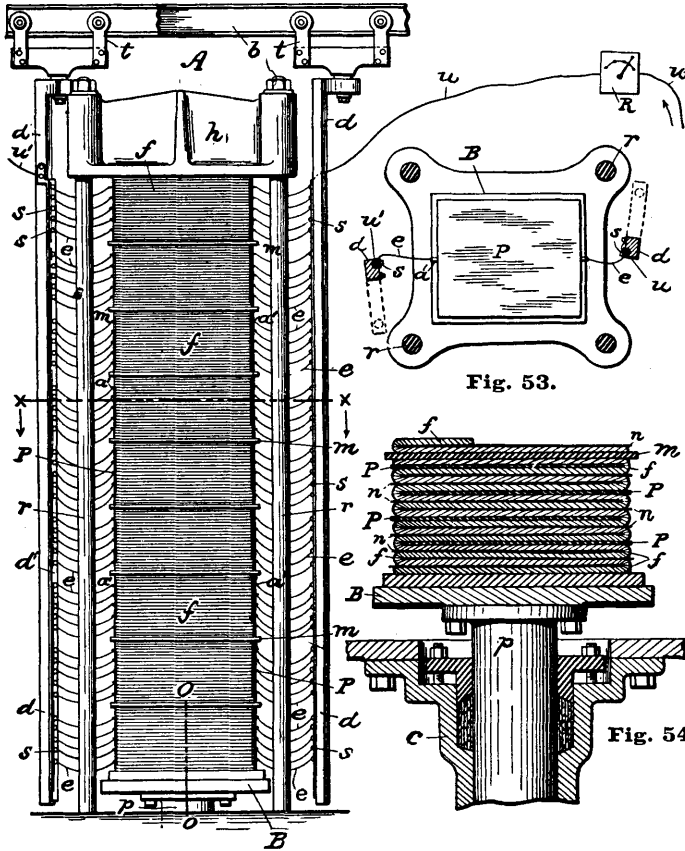


Fig. 52.

Fig. 53.

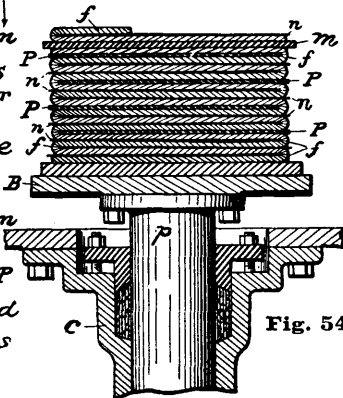


Fig. 54.

same being supported by and secured to the four vertical heavy tension columns *r*, the lower ends of the latter being fixed to the cylinder.

The to be electrically heated press boards *P* are composed of two pieces or sheets of hard and smooth cardboard, laid flatwise one upon the other and cemented together. Arranged between the said pieces of cardboard is an interposed electrical conductor *a*, made of thin sheet metal or wire, the same being bent or cut out in a zigzag shape, as clearly shown in Fig. 56, so as to form a resistance to the free passage through it of the electric current, the result being that when the conductor is electrically energized it also becomes heated, say, to incandescence. The heat thus generated permeates or is transmitted through the press board, thereby heating it. The ends of the conductor *a*, extend through the corresponding ends of the press board and form terminals *a'*, adapted to be readily coupled to circuit wires or conductors. Located contiguous to the press is a pair of vertically arranged posts *d*, each having an insulating plate *d'*, secured thereto along its side. These bars *d* are grooved vertically to receive the corresponding live conductor of an electric circuit, said conductor being at the back of the insulating plate *d'*. At short intervals, vertically, the plates are provided with flexible branch conductors *e*, the latter

In Fig. 52 one of the vertical bars *d* is represented as being connected to the positive conductor *u* of an electric circuit, while the other bar is connected to the negative conductor *u'*.

The conductor carrying posts *d* is suspended from trolleys *t*, mounted to travel on overhead tracks *b*, as is clearly shown in Fig. 52. The posts are also adapted to swivel or turn axially. As thus constructed the relation of the posts to the press or to each other may be changed, such feature being especially desirable in case a number of presses are arranged in a row, the posts in such event being rolled along from press to press to effect the pressing and finishing operation.

The pressing operation, in connection with a press thus described is as follows: The cloth *f* is first folded in a zigzag manner, meanwhile inserting or interposing the press boards *P* and the usually used common boards or press papers *n* between the folds of the cloth and then placing the whole on the platen *B* of the press *A*, as shown enlarged (compared to Fig. 52) in Fig. 54, wherein the relative thicknesses of the cloth and press boards are considerably exaggerated, the operation being continued until the press is filled with the several pieces of cloth to be pressed.

The several short flexible conductors *e* of each post *d* are next coupled to the respective terminals *a'* of the corresponding press boards *P*, followed by gradually forcing the piston *p* upwardly, thereby compressing the goods mounted in the press. At the same time the electric current of the circuit flows from the main or positive conductor *u*, through the corresponding post *d* and branch conductors *e* into the press boards, and from the latter, by means of the other series of conductors *e* and their post *d*, to the negative conductor *u'*, thereby closing the circuit. Owing to the presence of the resistance, conductors *a* in the press boards, the flow of the electric current is retarded, thereby increasing the temperature and heating the press boards to a corresponding degree.

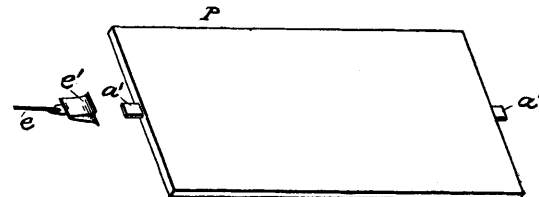


Fig. 55.

The heat thus produced is continued as long as desired and is taken up or absorbed by the cloth. Heavy metal or cardboard plates, as *m*, are placed

at intervals throughout the press load giving in turn greater stability to the pile of folded cloth, and at the same time insuring more uniform pressure to the goods. The free ends of the flexible branch conduct-

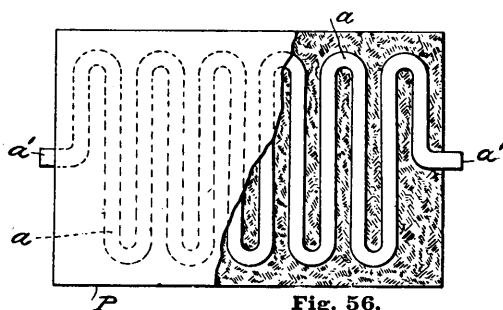


Fig. 56.

ors or connections *e* are arranged to be readily and easily coupled to or uncoupled from the terminals *a'*. (See Fig. 55, wherein the spring clip *e'*, being a conductor of electricity, is adapted to frictionally engage the terminal.) When the connections *e* are not in use or disconnected from the press boards, they hang freely from the posts *d*. In order to produce varying degrees of resistance to the electric current, a resistance box *R* may be interposed in one of the line conductors, as *u*, Fig. 52, the same, however, being in addition or auxiliary to the resistance members *a*, mounted in the press boards.

The Rotary Cloth Press. Considering the construction of the various rotary cloth presses from their introduction to the present modern machine, we will notice that various modes of constructing and running them have been in use, such, for instance, as leaving the cylinder cold, and heating the press bed, or leaving the press bed cold and only heating the cylinder, again heating them both; the last arrangement certainly being the best, since satisfactory pressing of the fabric can only be had when the machine is properly heated, both with reference to cylinder and press beds, a difference with reference to the final finish having to be gotten by the variation in this pressure, or a final steaming or steam brushing, if such is required.

When fabrics are pressed in this way in connection with one of our modern rotary cloth presses, there should never be a cause for any person to say that the old fashioned hydraulic process was the best, since by means of one of these modern presses, and a good steam brush to be used in connection with it when so required, the fabric will have a finish to satisfy even the most particular commission merchant.

With reference to the kind of pressing to give a fabric, its construction and style of finish required regulate this. For example, in connection with fine face finished fabrics where pressing has for its object to enhance the inherent lustre of the fibres, the fabric must be run "face down" in the machine, *i. e.* with its face to the press beds, and consequently with its back to the cylinder, which arrangement in turn will bring out the full lustre on the face of the fabric, the latter in this instance being what we might consider ironed on the press beds. If then the lustre obtained is too glossy, run the fabric once or oftener over a steam box or the steam brush, as the case may require, in order to get this glossiness off its face. This feature at once will indicate to us, that when dealing with fabrics requiring a dull finish, as for example fancy cassimeres, worsted trouserings, suitings, etc., it will be advisable to run these fabrics "face up" in the machine, *i. e.* with their face to the

cylinder (which takes the cloth along—hence no ironing effect to the face) and the back to the press beds.

It certainly is a foregone conclusion, that fabrics previous to running them in one of these rotary presses must be perfectly clean, on both sides, since any foreign matter adhering to the fabrics will leave marks on them, caused by the hot, heavy, pressing required in connection with some makes of fabrics. This feature will indicate to us that the brushes, as on the press, must be of the best of make and at the same time be kept in the best (clean) condition and watched carefully in order that they fulfill these requirements. These brushes, as a rule, deliver, *i. e.* throw the dirt, as for example, flocks, loose fibres, etc., adhering to the fabric in what is known as dirt pans, for which reason it will be advisable for the operator to carefully examine the contents of these pans, now and then, in order to see that they do not get too full, since otherwise the brushes will throw this refuse back on the fabric.

Another item which must be taken into consideration is to let the operator carefully watch the fabric when running it in the machine, in order that no wrinkles will occur, since if the latter should form, it will be hard to remove them after pressing; especially must he be careful when the fabric in question has a somewhat long selvage, which in turn readily might be the cause of wrinkles on the sides of the cloth. To avoid this trouble, tighten the tension as much as possible, but this without overdoing the affair, thus giving the stretch roll a chance to assist in preventing the formation of wrinkles. Do not use more tension than required during pressing, *i. e.* use just enough to keep them smooth, and consequently giving the stretch roll a chance to work, *i. e.* stretch the fabric properly in its width. Provided not sufficient tension is used, the stretch rolls will not work, since in this instance they will get no hold on the fabric, in order to stretch it, and for which reason it will be readily seen that the proper tension for the fabric is one of the most important items for perfect work of the press.

In connection with mills which make different classes of fabrics, some of which requiring a lustre, others a dull finish, care must be taken with running the fabric either under or over the stretch roll, according to whether the face of the fabric has to be run against the press beds or the cylinder, for the purpose of obtaining either a lustre or dull finish for the face of the fabric. This running the fabric over or under the stretch roll, is in some instances frequently neglected, and yet at the same time it is an important item, since by means of changing the running of the fabric in this manner over or under this stretch roll, we at the same time guide either the face or the back of the cloth in the action of said stretch roll. It will be readily understood that the stretch roll should always work on the back of the cloth, since the surface of said stretch roll is generally covered with some Brussels or Tapestry carpet structure, in order to take a better hold of the fabric, and consequently should only come in contact with the back. This will indicate to us that the fabrics have to run over the stretch roll when they are pressed with face up, and under the stretch roll when they are pressed with face down. Another item must be taken into consideration now, and which is, that if this stretch roll works perfect in one of these instances it will not work perfect in the other instance, for the reason that the pieces which compose the stretch roll are set upon a series of cams, and which cams are securely fastened upon a shaft which has to be placed so that the cams bring the pieces of wood composing the stretch roll outward on top, if goods are to pass over the roll, and just the reverse if goods are to pass under the roll. This

will also explain to us that if this shaft is not securely fastened, that when tension is applied to the fabric, the stretch roll is apt to turn over, and when in turn the stretch roll would have a tendency to narrow the fabric instead of stretching it, being a case which also might result in forming wrinkles in the centre of the goods. If such a case occurs, it will be found necessary to wet the fabric again, since this is the only way to get rid of these wrinkles as pressed into the fabric. In some instances it will be necessary to wet the wrinkles first, let them get well soaked, and pull out the fabric smooth before wetting it again.

It also may happen that fabrics refuse to run properly through the press, *i. e.* wrinkle up badly, in some instances the press grinding parts of the cloth, a feature which may have for its cause several items, the most important of which is the dirty condition of the fabrics, again certain colors on account of the dyestuff used may be the cause of it, again imperfect speck dyeing may be at the bottom, especially if the latter is made with sumac and iron, whereas if made with logwood, blue vitriol and soda ash, as it should be, this trouble is not likely to occur.

Again the trouble with reference to wrinkles may rest in the machine. It may be the cause of the cylinder, which on account of running for any length of time under heavy pressure (especially if dealing with poorly scoured fabrics) may become smooth, and in turn refuse to carry the fabric as it should, in turn causing wrinkles, besides pulling the fabrics out of shape. In such a case, the fabrics will also have to be wet out again, and after drying, etc., re-pressed.

If this occurs, scour the cylinder, a process technically known as "rusting the cylinder," and which is done thus: After the press is cold, apply muriatic acid with a brush, then let the press run with all the weights off for a little while, say about 20 minutes, seeing that the cylinder is wetted evenly. Then wash the cylinder thoroughly, turn on steam, and clean up. The muriatic acid may be used either in its full strength or diluted according to circumstances. Be careful not to touch any other parts of the press but the cylinder. Although brass is not affected by the process, yet it is a good plan after drying the cylinder, to pull out the brass bed jackets, and thoroughly clean and polish them, and then return them in their proper place, and when the press is ready for work again. Be careful to clean the cylinder after this operation for a few days in the morning before starting work, since on account of the process the same will be full of rust after standing all night.

Voelker's Cloth Press. The same is shown in the accompanying illustration Fig. 57, which is a cross sectional view of it, showing also the passage of the cloth through the press. It consists principally of a large hollow iron cylinder, placed about in the centre of the machine, and having concave presser beds (with two contacts on each bed) situated on each side of it.

The cloth is passed to the press first over an adjustable tension rail, shown at the left hand side of the illustration, then down under a bottom adjustable rail and again up to an expansion, *i. e.* stretch roll.

Between the two adjustable rails is situated, on the inside, a brush which brushes one side of the cloth as it passes to the bottom rail, another brush being situated a short distance from the bottom rail, and which brush cleans the other side of the cloth from that cleaned by the first brush. The cloth may be passed either over or under the expansion roll (shown under, in the illustration) and which can be adjusted to stretch the cloth to different widths. From here the fabric passes over a rod (shown in full black), then around the steam heated cylinder between the two steam heated presser beds, where it is ironed and pressed. The cloth when emerging from between the cylinder and presser bed, passes again over a rod (shown in full black) then up over a draft roll, then under two guide rolls to the take-up rolls, and from where it is folded automatically on a conveniently placed truck, by the arrangement shown. The pressure given to the presser beds is obtained through the levers shown, thus making it a

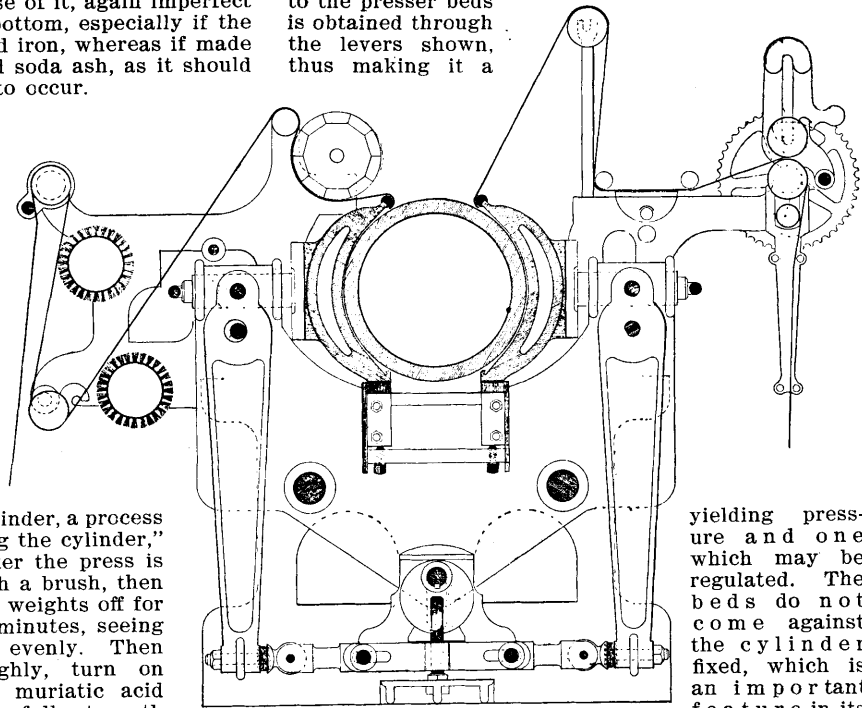


Fig. 57.

yielding pressure and one which may be regulated. The beds do not come against the cylinder fixed, which is an important feature in its construction.

A new attachment to this press is an adjustable stop for use between the outer ends of the presser beds and cylinder journals, so that either bed, independently of the other, or both can be stopped at the desired distance from the cylinder, which limits the compression, and thus prevents an unnecessary pressure, which in some cases might glaze or otherwise injure the fabric, or it may be used when only a limited compression is called for, in order to give the fabric under operation a different and softer finish than the machine as thus explained will do.

To explain this new attachment, illustrations Figs. 58 and 59 are given and of which Fig. 58 is an end view of a press, having the improved devices added, Fig. 59 being a detail (enlarged) in section.

The press, as previously explained, consists of a steam heated cylinder A, rotating upon its axle B in horizontal bearings, and having hollow beds C on either side of the roll, pressed against the roll or withdrawn from it by means of the vertical levers D, pivoted near their upper ends at *d* to the frame of the

machine and operated by toggle-links (not shown) between their lower ends.

To prevent the beds C from coming too near the roll, and thereby pressing the cloth more than is desirable, and yet at the same time to permit the press to be readily opened for the insertion of a

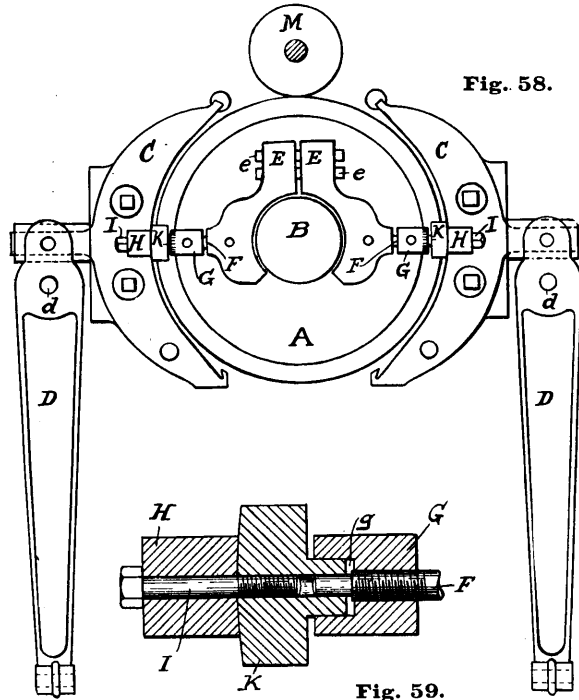


Fig. 58.

Fig. 59.

new piece of cloth, we find placed upon the axle or bearing of the cylinder A, a collar partially surrounding the axle and made in two pieces, (shown as E). Rods *e* pass through the upper extensions of the two portions of the collar and are made rigid in one portion by set screws, while the other portion is free to move upon them, and by reason of the slight space between the two portions take up any wear upon the inside of the collar, so that it will always press closely upon either side of the axle B. Inserted and fastened in each portion of the collar are screw threaded rods F, upon each of which are screwed nuts G, which are made with a recess *g* in their outer ends, and the ends of the screw rods F extend outward through these recesses, with their unthreaded portion. Upon each of the beds there is a lug H, made integral with its bed, and bolts I pass through each of these lugs, with a lock nut K on their ends, the bolts I being made so that they will not pass wholly through the nuts. Each of the nuts K is made with a projection *k* to enter the recesses in the ends of the nuts G and is also made with a hole or recess within the projection to receive the end of the corresponding rod F. These lock nuts K are screwed up tightly upon the bolts I.

To set the bed plates so that they will not press too tightly upon the cylinder A, the nuts G are turned upon the threads of the screw rods F so as to come into contact with the lock nuts K just before the bed plates come into contact with the roll. The required adjustment is very slight, and the threads upon the rods F are therefore cut fine, and the nuts G are marked with horizontal numbered lines upon their circumference, which, with a fixed line upon the lock

nuts K, serve as a micrometer screw and guide. As the screw rods F, with their nuts G, are entirely separate from the lugs H and lock nuts K, the press may be readily opened the required distance for inserting new pieces of cloth, etc.

When working light weight fabrics, a roll M is sometimes placed on top of the cylinder A, and on which the cloth when emerging from the second presser bed is wound, instead of using the folder arrangement shown in Fig. 57, said roll receiving its motion from contact with the cylinder A, it being held in position by levers, the ends of which are weighted in order to have the cloth wound tightly on the roll. By this method of winding the cloth, another advantage is obtained, in that the nap is not disturbed after pressing, since there is no tension on the cloth that might cause it to stretch in length, which might be caused by draft and take up rolls (as are used in connection with a folder arrangement) provided said rolls are driven somewhat faster than the cylinder delivers the cloth. The cloth by being made to wind on a roll on top of the cylinder of the press, also retains all heat after passing between the hot press beds and cylinder, a feature which of course is desirable when pressing light weight fabrics. The minimum speed for the heaviest fabric to be pressed with the machine thus described, should be about six yards per minute.

The Curtis & Marble Double Bed Rotary Press. This press is shown in its perspective view in Fig. 60. It has a large size cylinder, with two press beds, extending three-quarters of the distance around the cylinder, thus giving a great amount of pressing surface. The press beds are self adjustingly mounted to the cylinder, giving an equal and uniform pressure the whole length of the piece, and allowing the cloth to be pressed close up to the seams; also from the manner in which the beds are hung and connected together, both press beds must always press with equal force against the cylinder. The machine is provided with brushes to clean both sides of the goods, a stretch roller for keeping the goods out to their full width, a steamer for moistening the goods before pressing, rolling and folding attachments, so that the goods may be either rolled up or folded, as desired. A pressure gauge or dial is attached to indicate the amount of pressure applied, to enable

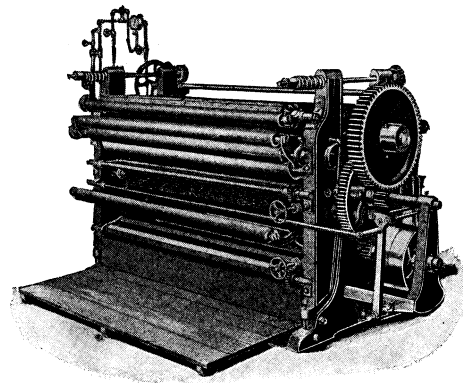


Fig. 60.

the operator to regulate the pressure to a nicety to suit either light or heavy goods at any time, and at the same time to give the same degree of pressing to the same styles of goods when pressed at different times. (Curtis & Marble Machine Co., Worcester, Mass.)

STEAMING.

Steaming the cloth, as previously referred to in connection with pressing, both by means of the hydraulic as well as the rotary press, is done for two reasons, viz.: it removes the gloss on the fibres left by the heat and pressure, and at the same time takes away the harsh, hard, feeling given by this pressing process to the cloth. During pressing, every fibre in the fabric is simultaneously heated and pressed, in consequence of which they lose portions of their moisture and at the same time shrink in themselves and thus to a certain extent become glossy, harsh and hard, a feature not desirable in connection with a great many finishes. Steaming, either alone or in connection with a light brushing, will remove the glaze, and at the same time impart a softer feel to the fabric thus treated after pressing, for the reason that the dampening action of steaming, swells the fibres back to their condition before pressing. Care must be exercised not to overdo the matter, nor the opposite, since in the latter instance the object aimed at is not obtained, whereas too much steaming will take hold not only of the fibre, but of the structure, *i. e.* finish of the cloth, at the same time, thus impairing the latter. The proper process requires such a quantity of steam as will just remove the glaze without softening too much the finish.

For perfect steaming, allow the cloth to thoroughly cool down from the pressing process, since a highly heated fibre will not only, to a considerable extent, counteract the influence of the moist steam, but at the same time, give rise to the formation of electricity, a feature preventing a uniform and even finish to the fabric thus treated, and which in turn in some instances may ruin the finish of the fabric entirely. For this reason be sure to allow the pressed fabric to cool thoroughly so that the finish becomes set or fixed before subjecting it to steaming, *i. e.*, that the fibres, which the hydraulic or rotary press has made to assume new and unnatural positions throughout the body as well as the face of the fabric, must have a chance to get sufficiently cold, *i. e.* set, so that they will retain this new position, and will not be influenced by the after steaming.

The steaming is done by means of what is known as a steam box, a perspective view of which is given in Fig. 61, Fig. 62 showing a section of it, on an enlarged scale. Both illustrations refer to the steam

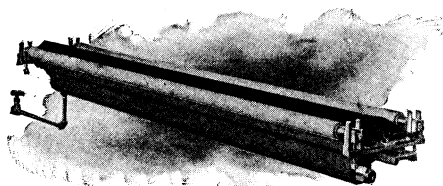


Fig. 61.

box as built by the Parks & Woolson Machine Co. The characteristics of this box are a uniform steam distribution, resulting in absolute even steaming. The cloth in its passage over the box rests on the two application rolls, the shafts of which rest in journals, which in turn can be raised by means of suitable set screws, thus regulating the application of the cloth on the felt cover of the box. The ingenious construction of the box, as seen more particularly from Fig. 62, compels the steam to enter the lower and in turn the upper chamber in such a roundabout way as to result in a uniform escape of it, all over the surface of the top of the box.

When starting to operate the box, open the drip valve, enter steam and wait until the latter issues through the felt cover, and then start the cloth. After the box is thoroughly heated, close the drip valve. Leave the latter open any time the box is not in use.

This steam box, besides being used independent as a machine, is also frequently found applied to other finishing machinery, viz.: in connection with the brushing machine, as generally used between shear and press for the purpose of softening the cloth so that the brushes will do good work, to drive away the electricity and condition the cloth for the press and when this combination machine is then known as a steam brush. Another machine to which this steam box is frequently applied is the stretching machine, and when the combination machine is then known as a steaming and stretching machine; it being also applied to pumicing, polishing, and sanding machines, etc., all the various finishing machinery thus mentioned, having been previously illustrated and described in their respective chapters.

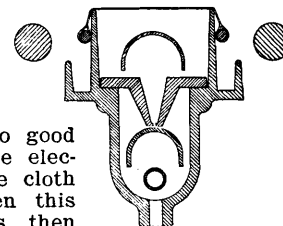


Fig. 62.

INSPECTING, MEASURING, DOUBLING, ROLLING AND WEIGHING.

After the goods have been pressed and steam brushed if so required, they are ready for final examination previous to getting them in shape for shipment to the market. In most mills however the goods are inspected before they are sent to the press, since in this way, provided the finish in any way is lacking, there is a chance to have it remedied, and not after the goods are pressed and ready to be sent to the market. When the pieces are thus inspected before pressing, there are many things which will show up plainer than after pressing and which in many instances can be corrected.

After pressing and inspecting or inspecting and pressing, as the case may be, the fabric is measured and in turn rolled in order to bring it in a shape for shipment to the market. Most mills now use machines for this work, although some smaller mills yet measure the goods by hand.

If the goods are to be measured by hand, the best plan is to pull them over a table, four or five yards long, with the halves and quarters of each yard correctly marked on the edge of the table its entire length. Two persons are required to do the work. After cutting off the heading, and bring the folded fabric even with the end of the table, have the second person, a boy or girl, put in a pin at the other end of the table. The piece is now pulled along until the pin is even with the first end of the table, and is then taken out, while another pin is put in at the other end, and the procedure repeated until the last length of the fabric is measured off (in fractions) on the table. Another method of measuring by hand refers to an attachment fastened to the table with a wheel which operates a dial, upon which the yards, half, quarter and eighth, are marked. The running parts of the device are mounted on a swinging frame, so they can be thrown back to place the cloth in position. The measuring wheel rests on the cloth, which is pulled through by hand, the weight of the swinging frame adjusting it to any thickness of goods. The dial is of bronze, and is very plainly read and records up to 75 yards. It is directly geared to the shaft of the measuring pulley by a worm, so that one revolution of the measuring pulley gives one-half yard on the

dial. The measurement is adjusted by expanding or contracting the measuring pulley, which in turn varies the ratio between it and the dial, so it can be set with absolute precision. If the measurement of the cloth falls short, the pulley should be contracted; if it runs over, it needs expanding. The two adjusting screws should be set alike.

Besides being used in smaller mills, this measurer is especially adapted for taking stock in commission houses, wholesale and retail dry goods stores. In both ways of measuring the fabric by hand mentioned, the rolling or winding of the goods forms a separate operation, and there are various machines in use for this purpose. With hand measuring, in connection with 6/4 goods, one of the greatest drawbacks is the doubling of the goods, which then has to be done by hand and naturally is a most slow operation, especially if one man has to do it alone, but if two men work together, *i. e.* one man doubles and the other folds, the work may be done somewhat faster.

In winding the goods as measured by hand, whether 3/4 or 6/4 goods, on the rolling machine, care must be taken to keep them free from wrinkles.

The Measuring, Doubling and Rolling Machine. The object of this machine, as its name indicates, is to measure "double width," *i. e.* broad goods, and double or plicate them in order to have them rolled up into a compact package of half the width of the fabric, by means of the winding mechanism on the machine. The machine, if so desired, can be also used for rolling, or measuring and rolling "single width," *i. e.* narrow goods.

The construction and operation of this machine are best shown by means of illustrations Figs. 63 and 64, and of which Fig. 63 is a perspective view of the machine, showing the doubling of a broad fabric and

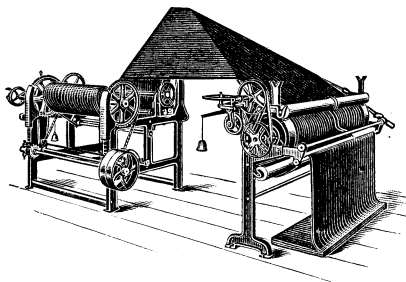


Fig. 63.

Both illustrations refer to the machines as built by the Parks & Woolson Machine Co.

The cloth, as shown in dotted lines in connection with illustration Fig. 64, is laid in its open width in front of the measuring mechanism, and is passed over the front rod or a stationary friction roll 1, then under an idle roll 2, and over the measuring drum 3, from where it passes up and over the triangular bars composing the plicator 11 (see Fig. 63) and then down between diagonal bars, under a narrow drum and over a small steel idle roll to the rolling or winding mechanism, as shown at the left hand side of said illustration.

At the end of the drum 3 (see Fig. 64) and fast on the same shaft 4, is an expansible pulley 5 connected by a belt 6 to pulley 7, fast on the shaft 8, which also carries a worm 9, meshing into a worm wheel 10, whose upper surface 11 is graduated to form a circular dial which registers the measurement of the cloth. A hand nut, as clearly shown on top and in centre of dial, in the illustration, is provided for re-setting the dial finger to zero after each measure-

ment. The expansible pulley 5 is made to contract or expand, as may be required, when setting the machine, so that the relation between the surface speed of the measuring drum 3 and the measuring dial 11 can be slightly varied in order to regulate the accurateness of the latter. This may be required to be

done to compensate for any possible error in circumferential size of the measuring drum, or for a varying stretch due to elasticity, etc., in a certain kind of cloth. The measuring drum 3 is one yard in circumference, and has a finely sanded surface, upon which the cloth has a long firm contact. There is a weight roll 12 on the measuring drum 3, to keep the cloth smooth, so that the fingers governing the automatic stop will work properly. The machine works entirely on the back of the cloth, it therefore does not rough the nap.

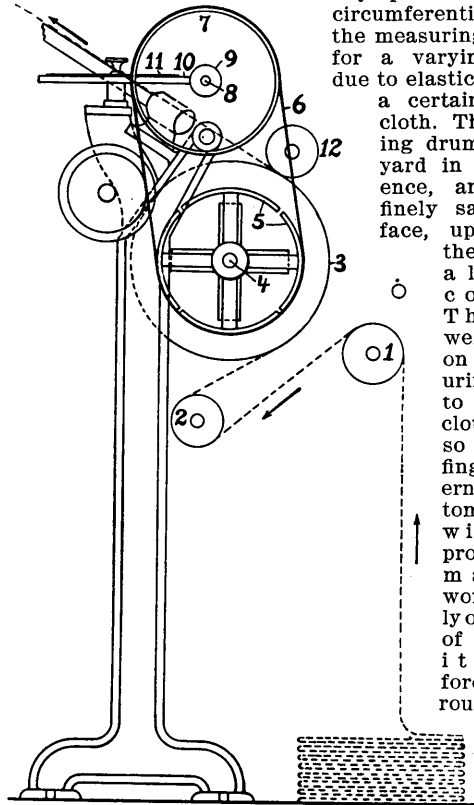


Fig. 64.

In case the measuring device requires re-setting, first carefully measure a piece of cloth by hand, then run it through the machine. If the dial registers below this length, the pulley 5 must be expanded, whereas if over, said pulley must be contracted; a few of such trials setting the measuring mechanism of the machine to a nicety. Four binding screws hold the four segments of the expansible pulley 5, and must be loosened before turning the adjusting hub to either expand or contract. After each regulation these four binding screws must be tightened so that the adjustment made will not change. Every machine is adjusted for ordinary light and heavy weight goods before leaving the shops, and only an extreme change in the weight or nature of the cloth to be handled may necessitate a readjustment of pulley 5. After once carefully setting pulley 5, the mechanism will always measure the same. The same takes care of itself during the operation of the machine, in that an automatic stop motion prevents the dial from over-running.

At the end of the narrow drum located in front of the rolling mechanism, a similar measuring device is found and which is used when single width, *i. e.* narrow goods, or broad fabrics previously folded, are to be measured, and in which case the cloth does not pass over the plicator, *i. e.* the doubling board, but simply goes direct into the rolling mechanism of the machine.

The revolving parts of the rolling mechanism are fitted with six inch jaws, for seven inch wide boards, on regular machine, but other sizes of jaws are provided if so desired, to suit different widths of boards used, they however, should be always from one-half to one inch narrower than the board used. When desired, a flat iron board or square iron rod, to be pulled out after the roll of cloth is finished, can be used in place of the wooden board, and which is left in the roll. Any length of board, from the machine's extreme working capacity down, can be put in the rolling mechanism, the machine being equally good for winding any length of roll of cloth, convenient for the handling. The board adjustment has a quick acting screw, and opens and shuts instantly, stays where you put it, and does not become shaky, and thus is enabled to wind a uniformly compact roll of cloth. The edges of the cloth are kept evenly together by the turn of a hand wheel, the control of the selvages thus being perfect, and no temples required.

The regulation machine is built for handling fabrics up to 66 inches wide, however, if required, as for the manufacture of extremely wide goods, like for example felts, the machine can be specially built to handle up to 120 inches wide fabrics.

The regular machine is what is known as a "right hand" machine and rolls the cloth into a right hand roll, however there are also "left hand" machines built when so desired. A right hand machine will roll left handed by running the driving pulleys with a crossed belt, which reverses the rolling mechanism; however the cloth end in this instance is not quite so conveniently started on the board than if using a "left hand" machine for this purpose. When a "right hand" machine has to be often run in this manner, it will be found more convenient to have the machine fitted with an extra driving pulley and shifter for the crossed belt, which saves changing belts when shifting from one hand to the other. In the same way a left hand machine will also roll right handed, by running the driving pulleys with a crossed belt.

Another measuring, doubling and rolling machine is shown in its perspective view in Fig. 65. Examining this illustration we see on one side of the machine, traveling on a track *a*,

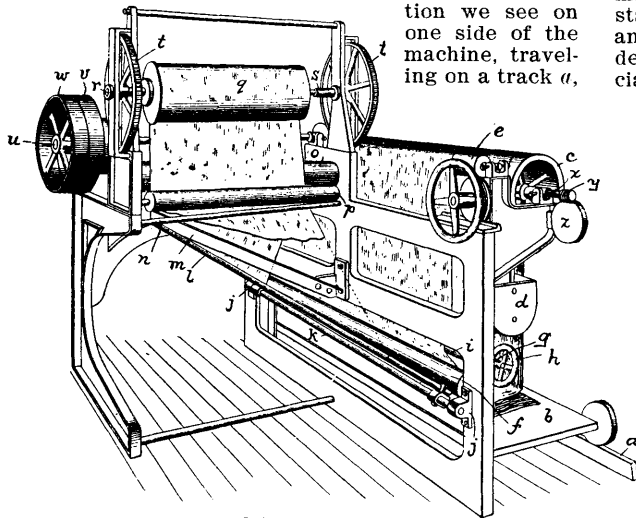


Fig. 65.

mounted a movable cloth table *b* on which the cloth to be in turn measured, doubled and rolled, is deposited in its full width folds as coming from the folder of the brush or press.

The cloth passes from this table *b* around the revolving measuring roll *c* and down into a cloth trough *d*, from which it passes again upwards over a guide roll *e*, thence downwards through a tension device and under a second guide roll *f*. The tension device thus mentioned consists of a shaft *g* having a hand wheel *h*. This shaft *g* is provided with two arms, which carry a rod *i*, the cloth being drawn between said shaft and rod. Thus by simply turning the hand wheel *h* the cloth is wound more or less around the shaft *g*, in turn, more or less, as the case may require, increasing the tension to the cloth.

On the frame of the machine are mounted two brackets *j*, carrying a rod *k*, from which extends at each end a rod *l* formed into a V-shape and attached to an inclined blade *m*, as fastened to the frame of the machine.

These two rods *l* constitute a truncated "former," two "smoothing" rods *n* being extended transversely above the same. From the guide roll *f* the cloth passes beneath this "former" (as shown in dotted lines), the point where the rods *l* meet engaging the middle of the cloth and in turn act to double or fold it. The cloth then passes in this folded condition between the "smoothing" rods *n* and which smooth the cloth from its centre fold toward its edges. The cloth next passes through the pressure rollers *o*, *p*, and then winds itself on the cloth board, forming the characteristic roll of cloth *q*. This cloth board is held between the two stub shafts *r*, *s*, of which one, *r*, is stationary, the other, *s*, being spring actuated, in order to permit ready inserting of the empty board and removal of the roll of cloth. Both stub shafts are driven respectively by gears *t*, which mesh with gears fast to the main driving shaft *u* of the machine as carrying the fast and loose pulleys *v*, *w*.

The measuring of the cloth is accomplished thus: The circumference of the measuring roll *c* is of a known size; its shaft *x* carries a worm *y* which operates a dial wheel *z* graded to suit the circumference of the measuring roll *c*, the number of yards of cloth as coming in contact with the roll *c* being in turn indicated through a fixed pointer (not shown) as the dial wheel *z* rotates.

Fabric Measuring and Packaging Machine. This machine is designed to accurately measure cloth and stamp the measurement on it at frequent intervals, and also register the measurement on a dial, when desired, without stamping it on the cloth. Any special trade mark of the goods which are passed through the machine, may also be stamped on the cloth at frequent intervals, all stamping being done along one edge on the back of the cloth. The machine also plicates or folds the cloth lengthwise as it passes through the machine, and then winds it into a smooth and compact package, which is then in a convenient form for handling and selling.

Fig. 66 shows this machine as is built by the Fabric Measuring and Packaging Co. of New York, in its perspective view, also showing the passage of the cloth through the machine.

It will be seen that the measuring and marking arrangements are located near the back side of the machine, there being also a stop motion arrangement connected with the measuring motion, by which the machine is automatically stopped when the desired number of yards have been wound into a package at the front of the machine. The stamping arrangement is located on the same side of the machine as the dial, but is placed on the inside of the framing in order to be in the line of the passage of the cloth, and consequently cannot be shown in the illustration. It consists of a platen wheel against which the cloth is pressed and the stamping arrangement, which

stamps the correct length of the fabric automatically as it passes to the measuring roll of the machine, shown near the back of the machine. The measurements are stamped on the cloth at intervals of one-eighth of a yard, thus, 1, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 2, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, etc., etc.; the trade mark being stamped separately, one on each yard.

The mechanism for passing the cloth through the

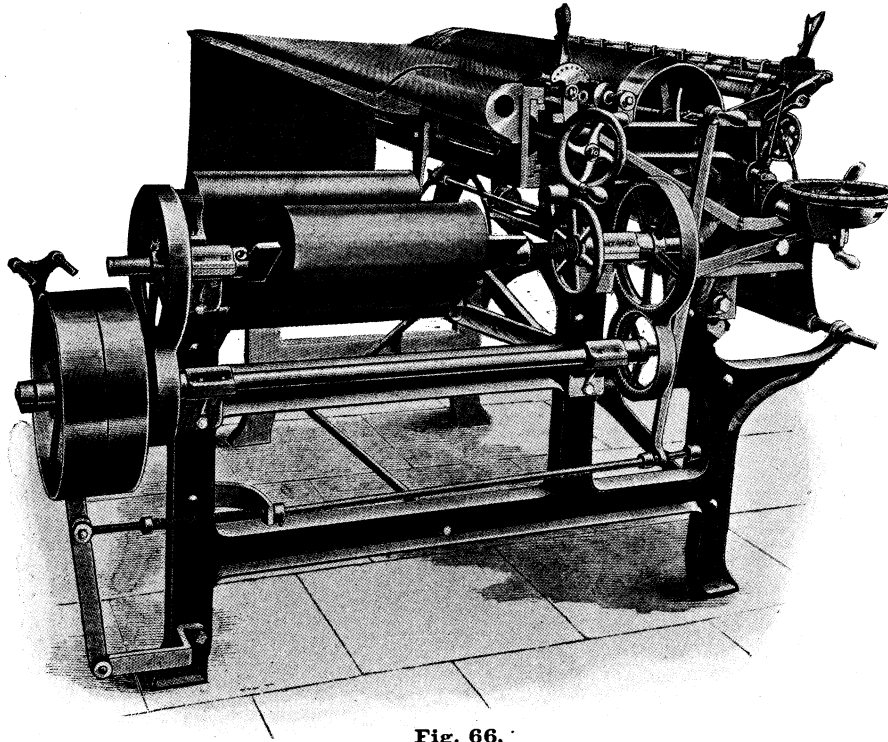


Fig. 66.

machine is independent of the stamping and measuring motions and thus leaves them free to be adjusted, started, stopped, etc., at any point in the length of a piece of cloth; or when one section of a long piece of cloth has been measured, the arrangement may be released which causes a spring to turn it back to zero, and started again to measure off and stamp another section, and thus divide the entire piece of cloth into two or more separately measured sections.

If, because of a delicate color of the fabric, or for any other reason, it should be undesirable to mark it with ink, the stamping may be omitted by having the type run dry, the correct measurement of the piece being indicated on the circular dial shown on the machine as always.

The cloth passes from the measuring cylinder to an actuating cylinder, and having been measured and stamped before leaving the measuring cylinder, it is easily seen that whatever tension or stretch is afterwards put on the cloth, the measurement before such stretch is already indicated on the cloth and serves as a guarantee to the buyer. The cloth is thus allowed to be drawn by the winding motion with sufficient tension to make a compact package.

After leaving the measuring roll, the fabric passes over the actuating cylinder and then between a stretching rock shaft and stretching rod. From the stretch rods, the cloth passes around a guide roll to the plicator or folder, which is shown at the front in the illustration and consists of two tapering and converging side bars, around which the two edges of the fabric are passed to begin the plication, and which is

finished by drawing the two partly folded sides of the fabric through between two guides or fingers under the plicator, only one being shown in the illustration. The two guides are placed so as to make a small space between them and through which space the two folds are passed, thus bringing them together and completing the plication. From the guides the folded cloth is passed down and around a smoothing roll, and from there to a tension regulator and equalizer, after which it is passed to the winding board and wound into a compact form, the amount of tension put on the cloth being regulated by the stretch rod, previously mentioned, a handle for operating the rod being seen in the illustration between the measuring roll and the plicator.

The stop motion, for regulating the length wound into one package, is actuated by placing a peg in the bowl portion of the dial at the proper figure, and which peg will at the proper time come in contact with a finger and push it over, and as said finger is connected to a piece which supports a horizontal lever, shown in the illustration, when the finger is actuated, this lever is released, thus allowing it to drop, which motion is transmitted, through the

levers shown, to the belt fork and the belt is shifted from the fast to the loose pulley.

Weighing. After the pieces have been properly wound in a roll, they are then placed in the cradle of a special beam scale and weighed. A special scale is required, for the reason that it is necessary for us to thus ascertain at a glance, the weight of one yard of cloth in the roll of cloth weighed—expressed in ounces. The compound sliding weight to use, for sliding on the scale beam is made up according to the number of yards in the piece.

One side of the scale beam is graded for showing the units and fractions of ounces per yard, and the other side for showing the total weight of the fabric, expressed in pounds, provided in either case the proper compound sliding weight, according to number of yards in fabric, is used. The denominations, *i. e.* value of minor weights, at the disposal for making up the compound sliding weight, are such as representing respectively—ten, five, three, two and one yard, and quarter and half yard weights.

When a fabric is to be weighed, the gross yards are taken in consideration; for example, if the fabric measures $37\frac{3}{4}$ yards, then 3 ten yard weights, 1 five yard weight, 1 two yard weight, the half yard weight and the quarter yard weight, are put on the sliding hook in order to make up the proper compound sliding weight, which then is slid out on the scale beam, showing the ounces and fractions of ounces, per yard, at whatever point said sliding weight balances the fabric in the cradle.

Provided of interest to know the total weight of

the roll of cloth in the cradle of the scale, read the corresponding number on the other side of the scale beam. At the end of the scale beam is a hollow balance weight, filled with shot, to permit balancing the scale, on account of the cradle to hold the piece and the cloth board.

After weighing, the piece is ready for wrapping in paper and shipment to the market.

CLOTH TESTING.

The object of this process is to ascertain the strength of cloth, *i. e.* to ascertain the amount of tension required to tear it apart, thus ascertaining the quality of the material (as to strength) used in its construction.

Of the accompanying illustrations Fig. 67 is a plan view and Fig. 68 a central longitudinal vertical section thereof of a cloth tester, *i. e.* a device to be used

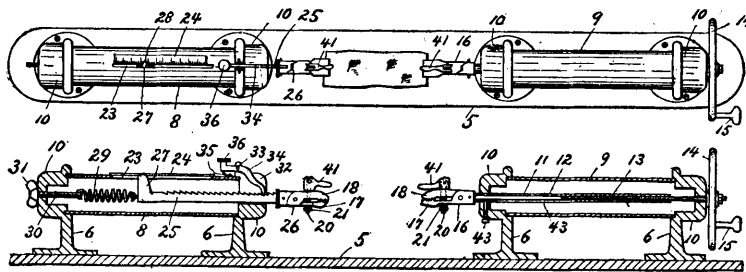


Fig. 67.

Fig. 68.

in thus testing, and at the same time recording, the breaking point of a fabric.

A description of the construction of this cloth tester is best given by quoting numerals of reference of which 5 indicates a base plate or support at each end of which is supported, by means of vertical standards 6, the tubular casings 8 and 9.

The standards 6 are provided with heads 10, between which the casings 8 and 9 are placed and secured and passing through the tubular casing 9 and centrally through one of the heads 10 thereof is a tube 11, the outer end of which is provided with an internal screw-thread, and passing through the tube 11 is a shaft 12, a portion of which is correspondingly screw-threaded, as shown at 13.

The outer end of the shaft 12 is provided with a wheel 14, having a crank handle 15, and secured to or formed on the inner end of the shaft 12 is a clamp head 16, which consists of a jaw 17, formed on the tube 11, and a pivoted jaw 18 and passing loosely through the outer ends of the jaws 17 and 18 is a bolt 20, the lower end of which is screw-threaded and provided with a set nut 21, and the upper end of which is provided with a head which passes through the head of a cam lever 41, which is pivotally connected therewith and mounted on said bolt between said jaws is a spring. The opposite tubular casing 8 is provided in the top thereof with a longitudinal slot 23, at one side of which is placed a scale plate 24.

Mounted in the tubular casing 8 is a rack bar 25, which projects outwardly through the inner head 10 of said casing and which is provided with a clamp head Fig. 26, which is in all respects similar to the clamp head 16, before described, and the inner end of the rack bar 25 is provided with an upwardly directed arm 27, which projects upwardly through the slot 23 and which is provided with a pointer 28, which projects over the scale on the plate 24, and connected with the inner end of the rack bar 25 is a strong spiral spring 29, the outer end of which is connected with a screw-threaded

bolt 30, which passes through the outer head 10 of said tubular casing 8 and which is provided with a head 31.

The inner head 10 of the casing 8 is cylindrical in form, and formed in the top thereof is a slot 32, in which is pivoted at 33 a spring operated lever 34, the inner end of which is adapted to operate in connection with the rack bar 25 and beneath the outer end of which is placed a spring 35, one end of which is secured to the casing 8 and the other end of which bears upon the outer end of the lever 34, which is provided with a head 36.

By manipulating the bolt 31 the tension of the spring 29 may be adjusted, and the jaws 17 and 18 may be caused to securely grasp and hold the cloth by simply manipulating the cam levers 41 or by turning the same downwardly and inwardly and when said cam levers are turned upwardly and backwardly the springs will force the jaws 18 upwardly and release the cloth.

The bottom of the tube 11 is provided with a longitudinal slot 43, which extends from the end thereof, with which the jaw 16 is connected, for about one-half of its length, and passing through the bottom of the inner head 10 of the tubular casing 9 is a set screw 43, the inner end of which works in said slot and limits the movement of said tube, and as the

wheel 14 is turned in one direction the said tube will be moved inwardly or in the direction of the jaw 26, and when said wheel is turned in the opposite direction said tube will be drawn into the casing 9 and in this operation the strength of the cloth which is held by the jaws 16 and 26 will be indicated by the pointer 28, which moves over the scale plate 24.

Another make of a cloth tester is shown in Figs. 69 and 70, the object of which is to provide not only means for indicating the strength of the material tested, but at the same time also means by which the texture or structure of the fabric may be examined while testing its strength.

Fig. 69 is a perspective view of this tester, and Fig. 70 a bottom or back view of it.

The frame of this tester comprises parallel side members 1, an end member 2 at right angles to the side members, and a curved or semi-circular member 3 at the opposite end. At the junction of the member 3 and the side members a cross bar 4 is formed. Movable in the frame thus referred to is a block 5, which has a recess 6, one wall 7 of which is provided with teeth, which, coacting with a corrugated block

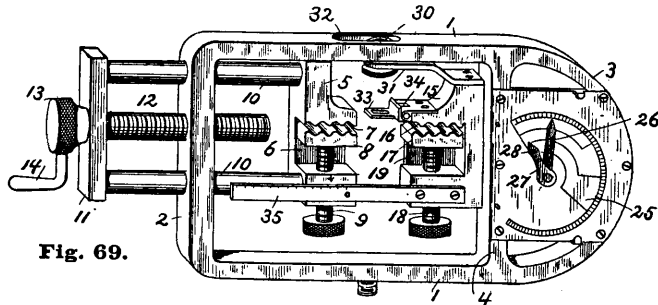


Fig. 69.

8, form jaws for clamping the material to be tested. The part 8 is movable in the recess 6, and it is moved toward and from the jaw section 7 by means of a

screw 9, engaging in a tapped opening in the block 5. Guide rods 10 extend outward from the block 5

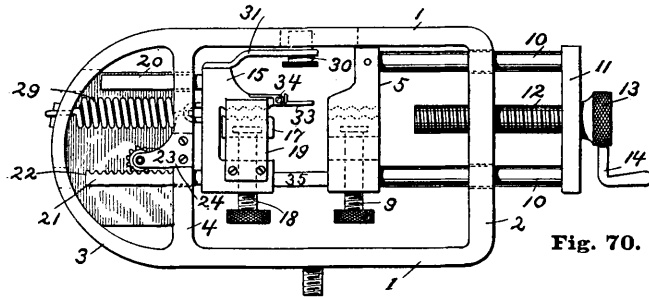


Fig. 70.

through openings in the end portion 2 of the frame, and at the outer end these guide bars are connected by a cross head 11, and mounted to turn in this cross head 11 is a screw 12, which engages in a tapped hole in the portion 2 of the frame. The screw 12 has a milled head 13, and also a handle 14, so that it can be easily turned while stretching the material. Another block 15 is also movable in the frame and has a recess, one wall 16 of which is corrugated to provide a jaw section coacting with the corrugations or teeth on the other jaw section or block 17 in the recess in the block, and this block 17 is adjusted by means of a screw 18. A plate 19 is attached to the rear side of the block 15, and the rear side of the recess 6 is also closed by a cross piece or bridge. These closures provide a stop against which the straight edge of the fabric to be tested is placed when between the jaws, to insure the placing of the threads lengthwise of the pulling strain. From the block 15, guide rods 20, 21, extend through openings in the cross bar 4, guide rod 21 being provided with a rack 22, engaging with a pinion 23, one end of the shaft of said pinion having a bearing in a plate 24, extended from the cross bar 4, and the other end of said pinion shaft extends through an opening in a dial plate 25, secured to the frame of the machine.

Loosely mounted on the shaft of the pinion is the indicating pointer 26, and rigidly connected to said shaft is a shifting arm 27, having a pin 28, adapted to engage with the pointer 26. A coiled spring 29 is attached at one end to the frame section 3 and at the other end to the block 15, said spring serving as a counterbalance for the strain on the material.

As a means for observing the texture and structure of the fabric while being stretched, a magnifying glass arranged in a tube 30, attached to an arm 31, extended from the block 15 is employed. The upper member 1 of the frame is provided with a slot 32, into which the upper portion of the tube passes and wherein said tube moves as the block moves. Also attached to the block 15 is a plate 33, having a rectangular sight-opening in line with the magnifying glass. In order that the plate 33 may be swung upward to permit the blocks 5 and 15, to move close together, the said plate has a hinge connection 34 with the block 15.

In operation, after clamping a strip of material to be tested in the clamping device and the outer edge is trimmed off close to the outer surface of the clamping device, the screw 12 is operated to draw the block 5 outward. The block 15 is also drawn against the resistance of the spring 29. The rack 22 in its movement with the block 15 rotates the pinion 23, and consequently also the arm 27, and the pin 28 on said arm 27 will engage with the pointer 26, moving it over the dial.

When the fabric breaks, the block 15 is immediately drawn back to its normal position by means of the spring returning the arm 27 to its normal posi-

tion, but leaving the pointer 26, having frictional contact with the dial at its adjusted place on the dial, from which the strength of the material may be observed.

The texture of the material may be observed through the magnifying glass during the whole operation of testing it for strength—that is, by its use the parting of the interlacing (weave) of warp and filling can be observed.

This device if desired may be made quite small and comparatively light, so that it can be conveniently carried in the pocket.

To observe the stretching quality of the fabric being tested, a gauge 35 attached to the block 15 is employed, its scale coacting with a pointer or indicator mark on the block 5.

TO ASCERTAIN WEIGHT OF CLOTH FROM A SAMPLE.

Frequently the manufacturer, commission merchant or the buyer is compelled to ascertain from a small sample the weight of the fabric in ounces per yard. The more experienced person certainly will be able to promptly judge said weight to a nicety, by simply handling the sample between his thumb and forefinger, *i. e.*, ascertaining its bulk in this manner, as well as by lifting the sample in his hand, taking into consideration in this instance the size of sample. However, it will also be of benefit to the most experienced person to test the correctness of his practical guesswork by weighing the sample on hand on accurate scales, and ascertaining from it, by figuring in proportion, the weight in ounces per yard for the fabric.

How to Proceed: Trim your sample, most accurately, to the greatest possible size, for the greater amount of surface you can obtain, the more accurately your figures will be. After thus carefully trimming your sample to a known size, put it on the scales and ascertain the weight in grains, calculating then, by proportion, the weight in ounces per yard, from the size of sample and its weight in grains previously obtained.

The whole procedure will be best explained by a practical example.

Suppose we trimmed our sample, which was a 6/4 (*i. e.* 54") fancy cassimere, to 3 × 3 inches = 9 square inches, and found it to weigh 45 grains; thus:

$$\begin{array}{l} \text{(sq. inches)} : \text{its weight} :: \text{(square inches in one yard)} : \text{(its weight)} \\ \text{in sample.} : \text{in grains.} :: \text{of the piece of cloth.} : \text{in grains.} \\ 9 : 45 :: 1944 : x \\ \text{and } 45 \times 1944 = 87480 \div 9 = 9720 \text{ grains.} \end{array}$$

$$9720 \div 437\frac{1}{2} \text{ (grains in one oz.)} = 22.21 \text{ ounces or practically } 22\frac{1}{4} \text{ oz. per yard. Ans.}$$

Above rule given in the proportion might thus be expressed for a standing

Rule: Multiply weight in grains of sample with number of square inches in one yard of the piece of cloth and divide the product by number of square inches in sample; the quotient divide by 437½, thus obtaining the weight of the fabric for one yard expressed in ounces.

The same result is obtained if proceeding after

Another Rule: Cut your sample to a known size and divide the number of square inches thus derived into the number of square inches one yard of the fabric contains, multiply the quotient of this division with the weight in grains of your sample and divide the product by 437½.

The previously given example will figure according to this calculation:

$$\begin{array}{l} 54'' \text{ fabric} = 1944 \text{ square inches.} \\ 1944 \div 9 = 216 \times 45 = 9720 \div 437\frac{1}{2} = 22.21 \text{ oz.} \\ \text{weight of fabric per yard, being the same answer as} \\ \text{before obtained.} \end{array}$$

FINISHING COTTON FABRICS AND ITS MACHINERY.

The finishing of cotton goods varies greatly according to the different kinds of goods in the market, consequently no definite rules for finishing them and which will apply in a general way to all kinds of fabrics, can be given. For this reason we will under this sub-chapter of finishing explain in detail such modern machinery for each of the various processes, which possess points of merit with reference to their construction over other makes.

CLOTH INSPECTING AND TRIMMING.

This is the first process the woven cloth when reaching the finishing room is subjected to, the machine used for assisting in this work being shown in Figs. 1 and 2, representing the Cloth Inspecting and Trimming Machine as built by the Curtis & Marble Machine Co., and which machine is designed for permitting a convenient and rapid inspection of the goods, either in separate cuts as they come from the loom, or in large rolls after the ends have been stitched together. Means are also provided in the machine for disconnecting the operating mechanism of the brushes and then imparting reverse rotative action to the feed or draft roll, so that the cloth can be stopped and automatically run backward by said draft rolls for re-inspection of any portion of the fabric after it has passed the inspection table, without having the surface of the cloth subjected to the brushing action during this backward draft movement, or while the cloth remaining idle thus subjecting one position of its web to excessive brushing.

Of the illustrations, Fig. 1 shows this machine in a photo-perspective view, in connection with a rolling head in rear of the machine, for winding the fabric, after inspection, on rolls; Fig. 2 shows a perspective view of this machine—in outlines and lettered—showing in this instance a folding attachment applied in the rear of the machine, for laying the goods off in loose folds.

A description of the construction and operation of the machine is best given by quoting letters of reference in connection with Fig. 2 and of which A indicates the main frame, carrying upon its tip the in-

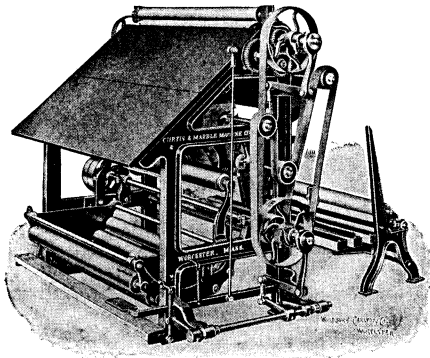


Fig. 1.

clined inspection table B, having a central hinging joint for turning up of the lower part. C indicates the cradle, upon which the cloth is placed, in a roll or plaited web, preparatory to its passage through the machine. Extending across the frame, beneath the front of the table, are the guide and tension bars *b*, *b'* (a third one situated somewhat higher is not visible in the illustration) for smoothing out the

cloth as it is drawn from the cradle. At a more rearward position are the lower and upper guide rolls *C'* and *C²*.

G is the main driving shaft mounted in bearings at the lower central part of the frame and provided at one end with the tight and loose pulleys *G²*, and at its other end carrying the draft operating pulley *G'* and the brush operating pulley *F'*.

D indicates the draft roll or feeder, consisting of a frictionally surfaced or cloth covered roll arranged adjacent to and parallel with the upper rear edge of the table B, with its shaft mounted to turn in bearings on the end frames, and surmounted by the pressure or top roll *d*, resting on the draft roll surface and having its journals running loose in upwardly forked bearings.

Mounted upon the shaft of the draft roll, there is a

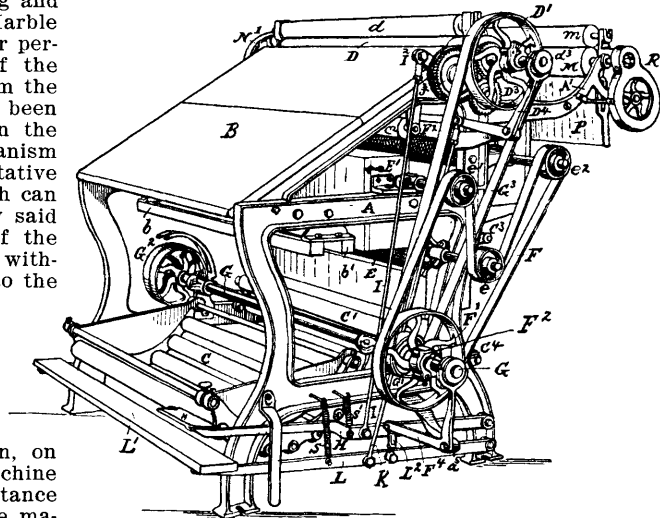


Fig. 2.

loose running pulley *D'*, carrying at the inner end of its hub or sleeve a spur gear that rotates with the pulley, which latter is operated by belt *G³* from the pulley *G'*, fixed on the driving shaft. A friction clutch *D³* is provided for connecting the pulley *D'* to the draft roll shaft for direct operation of the draft rolls, the sliding clutch-controlling cone *d³* thereof being embraced in the fork of the angular shifting lever *D⁴*, fulcrumed on a stationary part of the frame and having its inwardly projecting arm connected by a rod *K* with the treadle lever *L*, so that depression of the treadle board *L'* effects engagement of the clutch and elevation of the treadle releases the clutch. A train of reversing gearing is arranged for actuating the draft roll *D* in backward rotation. The arm *I²* of this train of reversing gearing is connected by the rod *I* with a secondary treadle lever *H*, so that depression of said treadle throws the friction gearing into action for reversing the rotation and feed of the draft roll *D*.

Two primary brushes for clearing the cloth before it passes to the inspecting table are used; one is indicated by *E* for cleaning the face, the other for cleaning the back, being situated in box *E'*; *E²* is the secondary brush for clearing the face of the cloth after it has passed the table and draft-rolls for removing any loose threads or lint which may remain on the face of the goods after being inspected. These brushes operate during the forward movement of the cloth by the draft roll feed and cease operation during any backward movement of the draft roll feed, as well as when the feed movement is stopped, again

the arrangement is such that the backward feed action of the draft roll effects a power actuated movement of the cloth.

The brushes are arranged at the positions shown with their rotating shafts mounted in bearings on the frame A, the primary brushes acting upon the fabric where it is extended between the lower guide roll C' and the upper guide roll C² and the secondary brush acting on the fabric as it runs from the draft roll D to the guide rolls C³ and C⁴. The brushes are inclosed, excepting at their working line, in suitable boxes, which receive the lint or matter cleared from the cloth. The brush shafts are respectively provided with pulleys *e e'* *e*² for the brush driving belt F, which runs from the operating pulley F' on the driving shaft G and passes around the several brush pulleys *e e'* *e*². The pulley F' is loose on the driving shaft G, and a friction clutch F² is provided thereon for connecting the pulley for operation with the shaft. Said clutch is thrown into and out of engagement by an angle lever fork F⁴, fulcrumed at *a*⁵ upon a bracket or arm fixed to the frame. The horizontal arm of the fork lever F⁴ is connected by a link L² with the treadle lever L, so as to be moved at the same time with the clutch actuating lever D⁴, that controls the draft roll clutch. Springs S and S' are provided for returning the treadles L and H to the position when relieved from pressure thereon.

M indicates a delivery feed roll having its journals mounted in bearings on backwardly projecting arms A', fixed on the main frame at the rear part of the machine. Said roll M is operated by a belt from a pulley N' on the left hand end of the draft roll shaft. A pressure roll *m* rests upon the roll M and is journaled in open fork bearings.

P indicates a swinging plaiting down device operated in conjunction with the delivery feed roll through suitable gearing at R. The guide roll C⁴ is arranged at the lower rear part of the frame and guide or roll C³ for steadying the cloth below the brush E².

In the operation of the machine the draft rolls, delivery feed mechanism, and brushes are simultaneously put into effective action by depression of the treadle lever L, the attendant placing a foot upon the board L'. The cloth moves forward over the inspecting table in an upward receding direction, thereby enabling the eye to readily detect imperfections, and this, too, with the cloth moving at a comparatively rapid speed. The draft rolls and delivery feed are put into reverse action without any operation of the brushes by depression of the secondary treadle H. Release of the treadles stops the action, and thereby arrests the feed of the cloth.

The driving pulley and operating shaft G of the machine continue in constant motion, while the control of the draft rolls and brushes is effected by the quick acting frictional-clutch devices responding to the depression and rise of the primary and secondary treadles, so that the starting and stopping of the draft rolls and brushes for feeding and arresting the cloth in its passage over the inspection table and the reversal of the draft rolls are effected instantaneously or as quickly as the foot can act on the treadle, the reversing of the action of the draft rolls requiring only such instant of time as is consumed in passing the foot from one treadle to the other.

If desired to roll the goods after inspecting, in place of laying them in loose folds, as previously explained, the machine is provided with a rolling head to set on the floor back of the machine, and with spreader bars for taking out wrinkles and turned edges; this arrangement being shown in Fig. 1, the folding attachment, previously explained, being in this instance omitted.

These machines are also built without brushes for

handling goods which are run through a brushing or shearing machine, on which the threads and dirt are removed, or on such goods as do not require brushing.

SEWING MACHINES.

The Railway Sewing and Rolling Machine. This machine, as built by the Curtis & Marble Machine Co., is shown in Fig. 3 in its perspective view, and is one of the most complete and convenient machines designed for handling goods in the cloth rooms of cotton mills.

The cloth from the loom is placed in the cradle in front, and the ends stitched together as fast as it is unrolled from the loom bolt, and then as many pieces as desired are rolled up in a large roll ready for the brushing, shearing, folding machines, etc., or for the

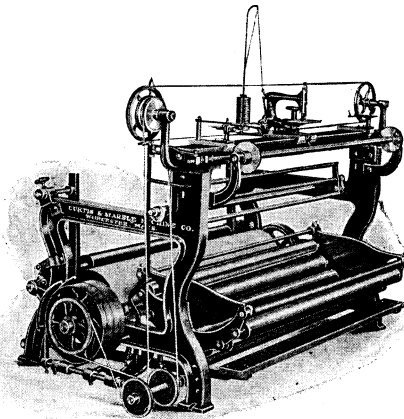


Fig. 3.

bleachery. Before being sewed, the cloth is drawn out to its full width, and held smooth and straight by steel pins on the machine. The sewing machine head then travels across it (the cloth remaining stationary), and sews the ends together with a continuous chain stitch, making a perfectly straight and even seam all the way across. The sewing is done close to the ends, thus causing but little waste in headings; the stitches at the same time can be drawn out easily whenever desired. The machines are adjustable for different widths of cloth, and the sewing machine head stops automatically at the end of each seam. As soon as one sewing is finished, a small hand wheel is turned and the sewing machine head drawn back to the starting point ready for the next seam; the operator controlling the stopping and starting of the machine by means of a foot treadle in front. The sewing machine used is a "Singer" head, which will run with a minimum amount of care and attention in keeping it in adjustment.

The cloth cradle in front, for folding the cloth from the loom, will take in any size roll up to 18" diameter, and is made with wooden rolls in the bottom so as to lessen the amount of friction on the cloth in unrolling it from the loom bolt. By handling the goods on rolls in this way, they are kept clean and free from wrinkles, and put in good shape for brushing, shearing, folding, or other processes.

A folding attachment, to lay the goods off in loose folds, as well as a measuring attachment for measuring the goods as they are rolled up, can be added to the machine when so desired.

The Portable Hand Power Railway Sewing Machine. This sewing machine, also built by the Curtis & Marble Machine Co., is shown in its perspective view in

Fig. 4, the sewing machine (a "Singer" head) being in this instance mounted on trucks so as to be readily moved about the room, for stitching together the ends

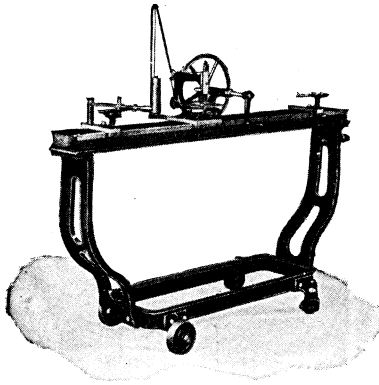


Fig. 4.

of the pieces, in finishing rooms, bleacheries, printeries, etc., where it is not convenient to use a stationary machine run by power. The machine is built in different widths as required. The cloth is held out smooth and straight by pins on the machine, and as the operator turns the crank by hand, the stitching mechanism is operated, and at the same time the sewing machine head is made to travel in a straight line across the goods, stitching the pieces together with a continuous chain stitch. By means of the casters and either iron or rubber wheels at the bottom, the machine is readily turned or moved about as desired.

The Portable Foot Power Sewing Machine, as built by the Arlington Machine Works is shown in its perspective view in Fig. 5, the object of this machine,

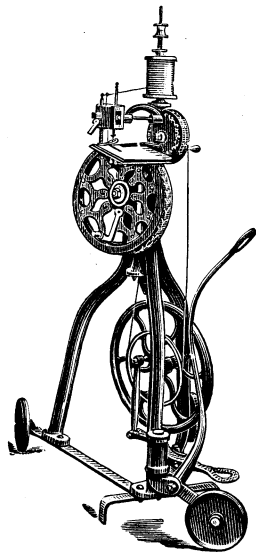


Fig. 5.

similar to the machine previously explained being, to sew piece goods together about the bleachery and other parts of finishing works. The needle in this machine is operated by means of an internal gear working on a smaller gear, which causes the spindle on the end of which is a cam, to revolve. This cam fits into a cavity on the needle slide and so works the needle bar up and down. The looper, instead of revolving as in usual machines, is made to slide back and forth by means of a lower spindle, which is driven by an internal gear. On this lower spindle is also placed an eccentric, which by means of a suitable lever, causes the pawl to operate in a small ratchet, which in turn is attached to the tooth pinion fitted into a steel ring having needle points, and this ring, by means of the eccentric, lever, ratchet, and pawl, is made to run intermittently, permitting the needle to pierce the cloth whilst at rest.

SCUTCHING OR OPENING.

The purpose of this process is to take the fabric, as in a more or less rolled and twisted condition resting in the "white bins" and take out, *i. e.* beat back, its twist, open out the folds in the goods and deliver them perfectly smooth, *i. e.* free from wrinkles, creases and curled selvages, for further opera-

tions, may it be to drying or dyeing machinery, water mangles or any other process, the scutcher in this instance delivering direct to one or the other of these machines as the case may require.

Fig. 6 shows the scutcher as built by the Arlington Machine Works, in its perspective view, and which machine will open the finest and the heaviest goods without any fear of fraying or being damaged in any way, the goods being delivered by the machine in a much better condition than when opened by hand labor, any intelligent lad being capable of taking charge of this scutcher.

In many instances this scutcher is made to work in connection with, *i. e.* deliver to a plaiting machine, the same consisting of two pairs of rolls, one pair being carried in a hanger adjusted below the delivery roll of the scutcher, which in this machine carries on its top an additional weighted pressure roller, the other pair of the plaiter rolls being carried in a swinging lever adjusted to the shaft of the first mentioned pair of plaiter rolls. To this lower set of plaiter rolls, *i. e.* the folder rolls, more particularly, a to and fro motion is imparted by means of an adjustable disk crank and lever on each side of the machine, connected, at proper distance, to the swinging lever which carries the folder rolls, previously referred to, the folding motion to said swinging lever and thus to the set of rolls carried by it, being obtained by means of a large pulley, on the shaft carrying the two disk cranks, the same being driven from a small pulley on the shaft carrying the bottom roll of the upper set of rolls of the plaiter and which in turn is driven from a pulley on the shaft carrying the delivery roll of the scutcher, *i. e.* the main shaft of the combination machine.

It may be mentioned here that this scutcher, either with or without plaiter, is also used in some woolen mills in connection with the cloth as coming either from the hydro-extractor, washer or any other machine where the fabric during the process gets more or less twisted, and where it is of importance to deliver the fabric to the next machine in an open condition, free from folds, wrinkles or curled selvages.

SINGEING.

Most all cotton goods before being bleached and finished have to be singed; which process has for its object to singe, *i. e.* burn off the natural fuzz or fibre from the yarn or cloth. Different kinds of machines are used for doing this work.

Many finishes demand a perfectly clear face, that is as much of this fuzz as is possible, has to be burned off, for which reason it is necessary to have a machine that will do this work in the most economical and thorough way possible. The style of the machine to be used also varies with the kind of goods under operation. Closely woven, flat goods being run over what is termed a "plate" singer, whereas open goods and goods with raised figures are run over what is termed a "gas" singer.

In former constructions the plate singer was a machine containing one or more iron or copper plates heated by coal and held in place with heavy masonry or brick work, somewhat set like an ordinary steam boiler. This method however is objectionable for the fact that, first the setting or bricking-up is very expensive, especially as to foundation, which must be always very heavy and substantial; and second, that on account of the excessive heat used in heating the plates to a red hot or almost melting point, the wear and tear on the brick work is very severe, the same continually cracking from expansion and contraction and in turn requiring continual repair. A third disadvantage of this kind of singer being, that besides dirty work for the help, it at the same time consti-

tutes expensive and troublesome work to keep the plates heated at the proper temperature with a coal fire on account of the time taken to get the fire thoroughly going after first started, on account of the cold draughts that are let into the furnaces when

have to be opened to bank or make up the fires. There is also material time saved in first heating the plates in the morning as an oil fire can be started far quicker than coal.

Other advantages of the machine are: that in con-

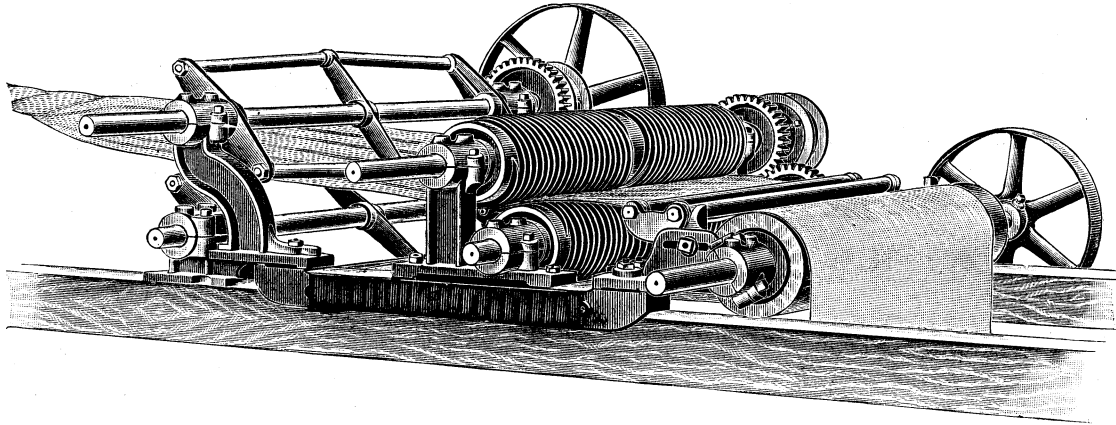


Fig. 6.

they were made up throughout the day, as they have to be, on account of the dirt and dust coming from the removing of the ashes.

The Combined Portable Oil Singer. To avoid and overcome these disadvantages, the "Combined, Portable Oil Singer" has been constructed. Fig. 7 shows a diagram of this machine (with all details omitted) as built by The Textile-Finishing Machinery Co., the advantages of which are that the singer is self contained, has an iron frame work that supports both the iron fire boxes, lined with fire brick, and a carrier arrangement for conducting the cloth through the machine in order to bring it in contact with the plates. The construction of the machine being very light, renders but a small foundation necessary; again, it is so tied together and held that the heat has little or no effect upon it. The plates are heated

by a flame obtained from crude petroleum oil which in turn is atomized for combustion by either compressed air or steam, as may be preferred.

The machine can be run to singe either both sides or one side only of the goods, in one run of the latter through the machine.

These machines are built to contain from one up to five plates, and either with all the plates arranged horizontally in one or two rows, diagram Fig. 7 showing the latter arrangement, viz., three plates on the bottom and two on top, the flame chambers as above coming in between the plates. In a single deck, *i. e.* single row machine, and if dealing with a five plate singer, the two plates (4 and 5) as shown in the

The entire plant as furnished by the builders includes oil storage tanks, large enough to take a whole carload of oil at a time; a compressor if air is used to atomize, or pump and attachments if steam is used.

There are several advantages besides in using the oil for heating the plates, viz.:

(1) In most instances, it is far cheaper than coal.

(2) There is no dirt or dust, as from ashes.

(3) There is no fireman required to keep fires up. The man that tends the machine can adjust his fires in the morning and leave them without attention all day.

(4) The degree of heat on the plates can be regulated to a nicety and maintained without change for any length of time desired, for the fact that no doors

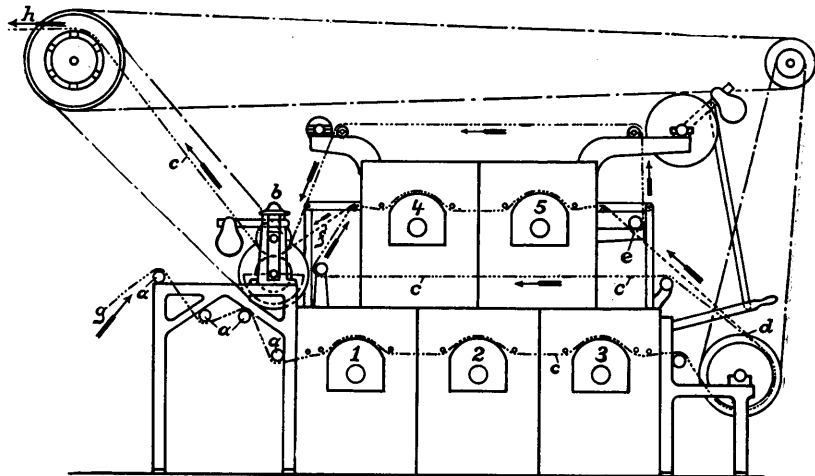


Fig. 7.

illustration in the upper deck, are then taken from there and put on the floor deck, either in front or back of the three bottom plates (1, 2 and 3) shown in

the illustration, leaving the machine then open at its top. Such a single deck, *i. e.* one row machine, can be used to singe either both sides of the fabric or only one, whether built with two plates only, or with up to five plates. When required to singe only one side, the fabric is run from one plate to the other (over as many plates as there are in the machine) and in turn out of the machine, whereas in connection with singeing both sides, the fabric is first guided over and in contact with one or more (as to number of plates in machine) plates, then overhead over the remaining plate or plates to the end of the machine, then down and in turn in a reverse direction over the plate or plates not touched before, at the end of which it is guided again downwards and in turn out of the machine, suitable guide rolls being interposed wherever necessary for the fabric to make the required turns as well as to bring it properly in contact with the plates.

The arrangements for bringing the goods into more or less contact with the heated plates are also complete in this portable oil singer (whether a single or double deck machine) as built by the Textile-Finishing Machinery Co., so that the closeness of the singe can be regulated to a nicety in this machine.

The machine is usually driven by an independent engine, so that the speed, at which the goods pass through the machine, can be easily regulated. As the goods come from the machine, they pass through a water nip, so that all sparks are extinguished before damage is done.

One of these machines will handle far more goods in proportion to the number of plates than one with the plates heated by coal. The product of a three or five plate machine in ten hours being from 2000 to 2200 pieces of 50 yards each. The cost of heating the plates, while of course depending upon the relative cost of oil and coal, being, roughly speaking, about 60% that of coal.

With reference to the diagram Fig. 7 numerals 1, 2, 3, 4 and 5 indicate the five singe plates; *a*, four tension rolls for entering the fabric into machine and *b* the water nip.

The singeing of the cloth on one side only is shown by means ----- line *c*; whereas if singeing the cloth on both sides is required, the same, after passing the lower section of singe plates at point *d*, is then guided direct to the upper section, see ----- line *d—e*. After passing the upper section of singe plates it then goes direct to the water nip *b*, see ----- line *f*, and in turn out of the machine in the same way as when singeing one side of the cloth only. Arrow *g* indicates the entering, and arrow *h*, the leaving of the cloth, to and from the machine respectively.

Sometimes, in place of using smooth copper plates, it has been lately suggested to use corrugated plates, a specimen of which is given in diagram Fig. 8. Said corrugated plates are made either out of a special metal or cast iron, and have formed on their cloth engaging surface a plurality of channels 2, which are connected by cross grooves or air ducts; it being claimed that said channels and grooves serve the double purpose of permitting complete combustion of the nap and also of maintaining the cloth in a smooth unwrinkled condition while it passes over the singe plate. The portions of the surface of the plate between the channels are grooved, thus forming ribs 3, the grooves and ribs being inclined at an angle of about thirty degrees on the channels 2, the ribs on one side of the median line of the plate inclining in an opposite direction from those on the opposite side thereof. It being claimed that with this construction, the cloth has contact only with the ribs 3 or the portions of the plate between said grooves, the movement of the cloth over the singe plate drawing air into the chan-

nels 2 at the edge of the plate where the cloth first contacts therewith and also at the sides of the plate, and from said channels 2 the air traverses through

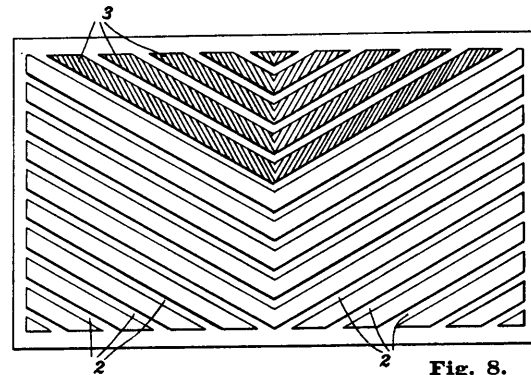


Fig. 8.

the ducts to other channels and along the channels beyond the cloth, and therefore there is a constant sheet of air passing in under the cloth at one side of the plate and traversing through the channels and grooves toward the other side thereof. This complete circulation of the air between the cloth and the singe plate, it is claimed, causes complete combustion, and any smutting of the cloth due to charring of the nap is avoided. It is also claimed that the ribs 3 of the plate, which are outside of the path of the cloth, are prevented by the surrounding air from becoming so hot as to burn the selvage in case the cloth has a slight traverse.

The Gas Singeing Machine. The purpose of this machine, similar to the singer previously explained, is to clear the face, or face and back of the cloth, as the case may require, from any fibres protruding from the structure by bringing the latter in contact with a gas flame; in turn giving the cloth a smooth appearance, clearly revealing the individual threads and their interlacings, *i. e.* bringing out the grain, so much required and sought for in many classes of fabrics; in other cloths however only a slight dressing (as in shearing) may be all that is required, and when consequently less powerful singeing is necessary. In its results singeing closely resembles shearing, only that the procedure is quicker.

Fig. 9 shows a two burner singeing machine, as built by the Curtis & Marble Machine Co., in its perspective view; Fig. 10 being a sectional view of it, more particularly given to show the passage of the cloth through the machine, both for singeing the goods either on one or both sides as required. In the machine illustrated, when singeing only one side, the goods have four contacts with the flames, whilst when singeing both sides they have two contacts on each side at each passage through the machine. The burners have a continuous slot their whole length, and give a solid and uniform sheet of flame from selvage to selvage; there being brass slides which go over the ends of the burners to shorten the flame when singeing narrow goods, so that it may be no wider than the goods, thus avoiding all waste of gas at the ends of the burners. The burners are so arranged that air under pressure is mixed with the gas just before combustion; and, by varying the quantity of air and gas admitted to the burners, various degrees of heat can be obtained, so that heavy, light, or very thin fabrics can be singed with equal facility. Each flame comes in contact with the goods at two points, so that the heat from both sides of the flame is utilized, and as the flame strikes the goods when running first in one direction and then in the opposite

direction, the fibres are thus removed in the most thorough and efficient manner possible.

The method of threading the cloth in the machine is shown by dotted lines in Fig. 10.

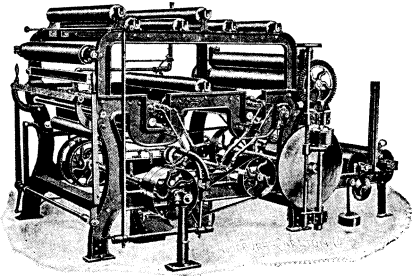


Fig. 9.

When both face and back of the goods are to be singed, the goods on entering the machine, pass over tension and spreader bars in front, to straighten them out and take out wrinkles; they then pass over friction roll A, where they receive the desired amount of tension; thence in sequence around rolls B, C and D, to the burner roll E, where they are first acted upon by the flame V"; thence they pass upward around rolls F and G, and thence down to burner roll H, where they are acted upon the second time by flame V"; they then pass upward around rolls I and J; and down to burner roll K, where they are singed on the opposite side by the flame V; thence to rolls L and M, and down to burner roll N, where they receive a second singeing from flame V. They then pass over the steamer W, where a vapor of steam may be applied to put out any sparks; thence through the draft rolls O and P, which serve to draw the goods through the machine; thence to the rolling-up attachment, where the goods are wound on roll Q, which rests on two winding drums R. The necessary pressure for making a reasonably hard and firm roll as the goods are rolled up, is given by means of cams and weights. The speed of the draft rolls O and P, is easily regulated by means of the differential friction plate S, or in some cases the change of speed is effected by means of a series of cone pulleys on shafts underneath. A supply of air to mingle with the gas to give complete combustion and as intense and hot a flame as possible, is supplied by the fan blower T. The machines may be quickly stopped and the burners turned away from the goods by means of levers, to prevent damage to the goods while the machine is not running; these levers being so ar-

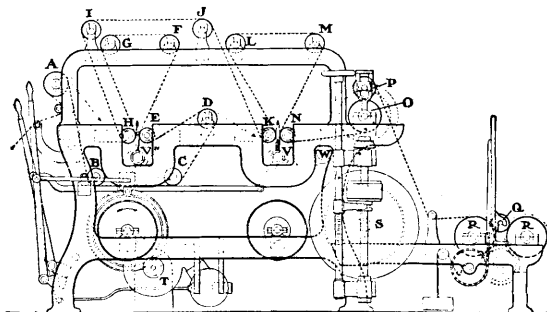


Fig. 10.

ranged that the burners must be turned before stopping the machine. Small lighter pipes are provided, by means of which the flames are re-lighted when the burners are thrown back into working position. The

burner rolls around which the goods pass as the flame acts on them, may be kept cool by a continuous stream of water passing through them, thus presenting a cold surface against the back of the goods and prevent the flame from penetrating the goods to "exhaust" them.

In place of the rolling attachment, as shown in the illustrations, and as is most commonly used for cotton goods, a high folding attachment to lay the goods off in loose folds is provided in machines used in connection with such fabrics as worsted dress goods, upholstery goods, etc.

When only one side of the cloth is to be singed, the goods pass from the friction roll A, directly to the first burner roll H, where they are singed by the flame V"; thence over rolls G and F to the second burner roll E, where they are again singed by the flame V"; thence over roll D to burner roll K, and around rolls L, M and N, the same as referred to above; the rolls B, C, I and J not being used when only one side of the goods is being singed.

The illustrations show a machine with two burners V and V", though larger machines are built with more burners according to the amount of singeing which goods may require and the total product to be put through in a given time. In large mills, bleacheries, printeries, etc., at the present time, singeing machines with three, four or five burners are very commonly used. For goods where a very large amount is singed off, brushes may be added, if desired, to remove the burnt particles after singeing. A smoke hood may be attached over the top of the machine, arranged to be connected by piping to an exhaust or ventilating fan for carrying off all gases and products of combustion.

Where the Singeing Machines are run in connection with a shearing machine, as in print works, etc., an extra pair of draft rolls may be added in front to draw the cloth through the shear, connected by bevel gearing to the back draft rolls, to maintain a uniform draft on the goods through both machines, without any excessive strain.

For an illustration and description of the Gas Singeing Machine as built by the H. W. Butterworth & Sons Co., see page 346.

STARCHING.

This is one of the most important operations in connection with the finishing of cotton goods, being also known as the stiffening or the filling process, the first on account of the final result of the process to the finished fabric, the other on account of the procedure itself, which consists in applying to the fabric under operation a paste or size, principally prepared with starch, farina, etc., in connection with a softener such as prepared oil or tallow; although with some fabrics the latter may be omitted.

There are two methods in use for starching the fabric, viz.: (1) starching both sides, (2) starching its back only; which procedure to use depending upon the nature and character of the fabric under operation.

(1) **Starching both sides of the Fabric.** For this work the machine used consists either of two or three squeezing cylinders or bowls, through which the cloth to be treated is made to pass, after it has been first impregnated with the size contained in a trough placed below the cylinders or bowls, previously referred to, and of which the lower cylinder or bowl is generally allowed to revolve in the size.

Fig. 11 is a sectional diagram (in order to be able to more clearly explain the construction and operation of the machine) of the "Three Roll Starch Mangle" as built by the Arlington Machine Works, the same being adapted to be used in connection with

three different methods of saturating cotton goods, viz.: either with heavy, medium, or light starch or stiffening (of any character) during its transit through machine.

(1) *Heavy Filling.* In connection with this style of starching or stiffening, the routine of the cloth to be treated, through the machine is as follows: 1 indicates the reel of cloth as wound on a wooden roller, through the centre of which runs an iron square bar with round ends 2 for bearings, placed in brackets on each side of machine. 2' indicates a flange on the wooden roller to which an easy tension is applied by means of a brake 3, through tension wheel 3' connected with it. The cloth 1', as coming from the reel of cloth 1, is then threaded through three wooden tension rails 4, 5 and 6, and then under a brass roll 7, which is located in wooden starch box 8, below level of stiffening matter. From brass roll 7, the fabric passes around the upper part (circumferentially) of bottom roll 9 and thus through first nip 10, then following in same direction the rotation (superficially) of middle, 11, and top roll 12 (second nip 13). The cloth is then reeled automatically, by contact, to surface of top roll 14.

It will thus be seen at a glance, that by this arrangement the cloth is assured of a thorough pregation by starch matter, which occurs when entering the starch box, and is unrelieved by any protecting surface. By the two nips 10 and 13, the effect of laying the starch evenly on the cloth is assured.

Compound levers and weights are arranged in the machine so as to be able to apply any reasonable percentage of weight in nip on rolls desired, the construction observed being: 15, 16 fulcrums for compound levers, 17 stud hole for dead set when required, 18 top lever, 19 bottom lever, 20 weights, 21 hand wheels, 22 adjusting screws for regulating lift of compound levers.

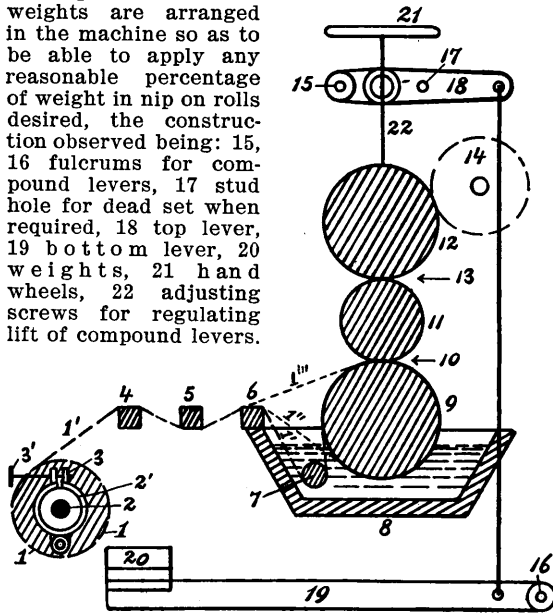


Fig. 11.

(2) *Medium Filling* of cotton goods is accomplished by avoiding use of brass roller 7 in the wooden starch box as a guide for the cloth, applying instead the cloth directly from wood tension rails 6 to the somewhat protective lower surface (circumferentially) of bottom roll 9 (see dotted line 1''), which is immersed in starch, and the cloth collects only that amount of starch that may occur from one side of the surface of cloth being exposed to treatment, and which the fibres of cloth would naturally carry while being conveyed, during its momentary rotation in the filling compound. The cloth is then subjected to the two nips 10 and 13, which perform the even distribution of starch desired for medium weight finish.

(3) *Light Filling* of cotton goods is accomplished by avoiding the entrance of cloth into the starch box at all, taking it direct from tension rail 6 (see dotted line 1''') through nip 10, in this manner applying to the cloth only starch, or other filling compound, that the bottom roll 9 may collect during its rotation through starching composition, in which it is immersed to about one-third its diameter, and which in this instance is relied upon to be sufficient, the two nips 10 and 13 rubbing in this small percentage of starch or similar filling compound most evenly into the whole texture of the cloth.

Starching the Back of the Fabric only. When the size is to be applied on one side of the cloth only, as is mostly the case with printed fabrics, shoe goods, etc., then a differently constructed mangle must be used.

Fig. 12 is a sectional diagram of the "Back Filling Mangle" as built by the Arlington Machine Works, and designed for the laying of starch on back, or unfinished side, of cotton fabrics, leaving the face side of cloth untouched. The machine consists of a large roll made of wood, or more preferably husk, cotton, or paper; the latter three materials being preferable to wood, on account of their greater durability in maintaining a clean and perfect surface. This roll is made to revolve, partly immersed, in a wooden tank containing the starch or filling, as is to be applied to the back of the fabric under operation. Parallel with the surface of this roll, above the tank containing the filling composition, are two adjustable doctors or scrapers, one on each side, which are made to traverse by means of a crank disc; one doctor to rest on face of roll on one side, and the other to rest on filled side of cloth on the other side. A brass roller is arranged in a suitable position above the large roll, previously referred to, so as to apply a mild tension to the fabric, and guide it to overhead wood drums, which are placed at a sufficient altitude to clear the head of operator and convey cloth in turn either to a folder or dry cans. A wooden box for holding the starch or filling composition, and in which the large roll previously mentioned is immersed, and an agitating roll, made adjustable to keep starch from settling, completes the details of this machine.

The routine of the cloth to be treated, through the machine, is as follows: 1 indicates the reel of cloth as wound (face out) on a wooden roller through the centre of which runs an iron square bar or spear with round ends 2 for bearings, placed in brackets on each side of machine. 2' indicates a flange on the wooden roller, to which an easy tension is applied by means of a brake 3, through tension wheel 3' connected with it. The cloth 1', face side up, is then threaded through three wood tension rails 4, 5 and 6, and then around the lower circumference of the large roll 7, which is immersed to about one-third its diameter in the filling composition as contained in the wooden trough 8, in which is arranged an adjustable agitator roll 9, within the most suitable proximity of the cloth, as passing partially around roll 7, and which keeps the filling composition 10 well stirred and unable to settle at bottom of the trough 8. The cloth 1', as mentioned before is run face up in the machine, *i. e.* face against roll 7, and consequently does not come in contact with the filling composition, which only acts, *i. e.* saturates the back of the fabric structure. The cloth just previously to leaving the roll 7 comes under the action of the nip of the doctor 11, and roll 7, *i. e.* a combination which lays on the filling composition evenly, and at the same time rubs it thoroughly into the texture of the cloth under treatment, the moving doctor 11 insuring every fibre in the cloth to get an equal share of treatment. The object of so constructing the machine is to avoid any

squeezing, which might force the filling composition, *i. e.* stiffening paste, through to the face of the fabric under operation.

The moving doctor 11, as situated on the other

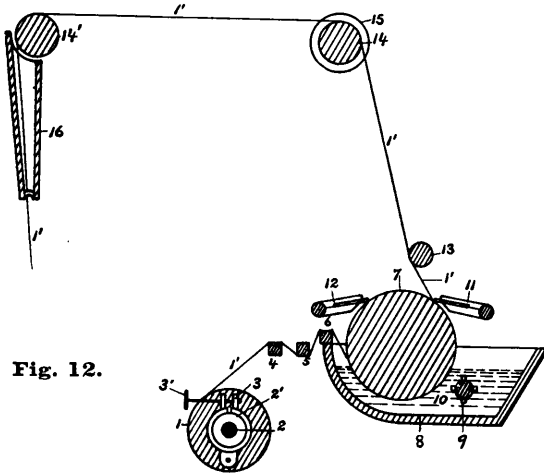


Fig. 12.

side of roll 7, has for its object to free the surface of the roll 7 from any filling composition matter, caking or collecting thereon, insuring all the time a perfectly clean surface of the roll 7 for the newly entering fabric. Both doctors 11 and 12 are adjustable, so is agitator roll 9 in trough 8 fitted with harbers and splash boards for refuse in the filling composition.

After the cloth passes through nip of doctor 11 and roll 7, it is then guided by the brass roll 13, as is placed there to exert proper tension and positioning of the cloth while under the action of the doctor 11, to a wooden guide roll 14 as positioned in the top framing of the machine, and which roll 14 is driven by an expansion pulley 15, so as to regulate the drawing away of cloth from machine in as delicate a way as possible and without any undue tension. The cloth then passes over another wooden guide roll 14' into the folder 16, to which a to and fro motion is imparted by suitable lever and pulley arrangement, and when it is nicely folded on a truck; or it is conveyed from guide roll 14' direct to the drying machine, the folder in this instance being omitted.

In some mills, the fabric in connection with the back filling mangle then used, simply passes, face up, through two rollers, or squeezers, the lower of which revolves into the starch, *i. e.* filling composition, as placed in a wooden trough. The composition then is also only applied to the back of the fabric, said application however being not as perfect as the one previously described, since the pressure exerted upon the fabric, between the two rollers, presses the size, *i. e.* the filling composition more or less into the structure, *i. e.* the starch does not remain entirely on the back of the fabric as is the case with the back filling mangle previously described.

SOAPING AND WASHING.

The object of this process is to thoroughly soap and wash printed goods, dyed goods, and fancy cottons, such as gingham and madras shirtings, etc., and it is particularly recommended for goods whose colors are apt to stain or mark off.

Fig. 13 is a sectional diagram of the open soaping and washing machine as built by the Arlington Machine works, the same being made up of shallow iron compartments or tanks (A, B, C, D, E, F, G, H) placed

in successive order; between each two tanks, a space I is permitted, to allow for escape of dirty liquor; however this space can be filled temporarily or otherwise, according to the goods which are being run through the machine, the object being to save soap and water, which may be in condition to be used in the preceding compartment, or to get rid of the same if too soiled to be used again. The illustration, for convenience, shows an eight compartment machine, although be it understood that any number of compartments may be added, or taken away; an eight compartment machine being usually desired for printed goods, whilst for other classes of work a four, five, six or seven compartment machine is sufficient.

Each compartment contains four rollers—1, 2, 3, 4—two of which, 1 and 3, are usually of plain brass, whilst the others, 2 and 4, are two patent flushing rollers, one of which is shown in its section, in detail, in Fig. 14. At the leaving end of each compartment, a pair of squeeze rolls J, preferably of brass and rubber, or two rubber rolls, are fixed in suitable standards, with weights and levers for pressure, for squeezing the water out of the goods and back into the compartment, thereby permitting the goods to enter into the next compartment in a cleaner and better condition for further soaping or washing. Over each compartment is arranged a series of brass carrying rolls—5, 6, 7, 8—supported by suitable rails, approximately five feet above the lower range of tank rolls.

The first compartment A is often used as a fixing tank, whilst the last two compartments G and H in

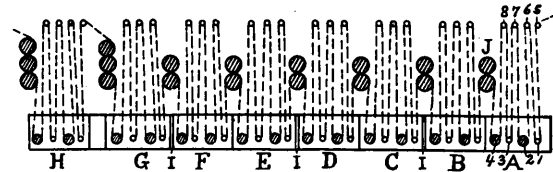


Fig. 13.

the combination machine shown, are used for washing, the other compartments B, C, D, E and F being used for soaping; although be it understood that each mill usually adopts its own method, using at the same time either more or less compartments. The goods are sewn together and made into a continuous string, and enter the machine over suitably placed tension rails, over brass carrying roller 5, and then down under the first roller 1, submerged in the liquor in the first compartment A, then up to the upper roller 6, and then down under the flushing roller 2, and circulated up and down and through the machine, as per dotted lines, and finally delivered over a reel or folder into trucks, or direct to drying machine.

There is a distinct advantage in the construction of this soaper and washer: The shallow compartments or tanks permit the attendant to thread up the machine quickly, the upper range of carrying rolls allows the goods to be in the machine a longer time under operation, and at the same time permits the attendant to watch them closely, as they are in sight during almost the entire run. There is another very important reason why the carrying rolls are placed so high, and this is that every time the goods are dipped into the tanks, the liquor is carried up a certain height, and then on account of its weight and the slight pressure on the cloth as it comes in contact with these rolls, it flows down and washes the ascending goods, at the same time, taking with it all surface color and dirt adhering to the fabric, thus

causing the cloth, every time it goes into the next tank to be in a better condition for further treatment.

The flushing rollers (see Fig. 14) are made of wood *a*, into which deep grooves *b* are cut. The liquor flows into these grooves, and is displaced by the brass bars *c*, in such a manner as to be forced or pumped through the fabric, thereby washing out every particle of matter, and thoroughly cleanses the goods.

The soap and water are arranged to enter at the delivery end of each tank, and flow in the reverse direction to the motion of the goods. Each compartment is fitted with piping for heating the liquor. The machine is driven by jack shaft, side shaft, and bevel gears on lower squeeze rolls.

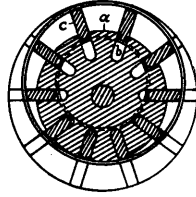


Fig. 14.

STARCHING AND FINISHING YARN DYED COTTON GOODS.

This practically includes all cotton goods, in the manufacture of which the yarn has been dyed before the goods are woven, may it be either by dyeing the raw cotton previously to converting the same into yarn, or by dyeing the spun yarn in the form of warps, cops or skeins.

Yarn dyed goods, with reference to their process of starching and finishing, can be conveniently divided into two general classes, viz.:

Goods which after starching must be dried on a tenter in order to obtain a proper finish, and second, Goods which after starching are dried on a cylinder drying machine.

Whether the tenter or cylinder drying machine is used for drying, depends upon the finish required, as regulated by the demands of the market.

Tentering, compared to cylinder drying, is not only more expensive in proportion on account of less output of one machine, but at the same time the machine requires more floor space and more labor to operate, however it has the great advantage, that besides drying the goods, it leaves them with a soft, clothly, feeling; stretching them at the same time, after starching, uniformly throughout the entire length of the fabric to nearly their original width, from loom. The selvages of the fabric, at the same time are kept more even, since they are kept taut throughout the operation, as compared to the loose running when the fabric is handled on a cylinder drying machine.

The cylinder drying machine, on the other hand, leaves the goods after drying, with a harsh, papery feeling, and of more or less uneven width, for the fact that the goods pass through the drying process without being stretched width-ways.

Tenter drying, as a rule is practiced with gingham, madras, fancy shirtings, fancy dress goods, etc., the better grades of these goods, when coming from the loom being often sheared, singed, soaped and washed previously to starching, on machinery especially built for this work by The Textile-Finishing Machinery Co., whereas the lower grades of these fabrics, before mentioned, previously to tenter drying, however are not sheared, singed or washed, but

when coming from the loom are simply inspected and brushed, and are then ready for starching and finishing. Both, the finer and lower grades of these fabrics are starched on a mangle and dried either on a straightaway tenter, on which the goods enter at one end and are delivered at the other, or on a tenter commonly called a return tenter, and on which the goods enter at one end, pass over the machine, turn and return underneath, are taken off near the entering end, and then led to a winder, as most conveniently located at either end of the tenter. The straightaway tenter is fitted with either clamp or pin clips and is by far the most popular in New England, while the return tenter usually fitted with pin links, is extensively used in Philadelphia and vicinity, and in the South. Both styles of these tenters, with starch mangles applied, are built by the Textile-Finishing Machinery Co.

With reference to the cylinder drying machine, the class of goods handled by it includes tickings, denims, awning goods, etc. These goods, after coming from the loom, are usually inspected, frequently brushed, in turn are then starched or filled on a starch mangle and finally dried on a cylinder drying machine.

Almost all yarn dyed cotton goods are finally finished on either a 3-roll or 5-roll calender, which to give the best result, should be provided with the patent combination "cotton husk" rolls, as described in a special article on pages 382-383.

For starching and drying tickings, denims, awning goods, and many other yarn dyed goods, the outfit or arrangement of machines shown in the accompanying illustration Fig. 15 has been especially designed, the same being the style of machine as is built by The Textile-Finishing Machinery Co. It consists of a 2-roll starch mangle *A*, a horizontal drying machine *B*, and either a 2-drum winder *C* for rolling up the goods after drying, or a folder (not applied in this case) for plaiting the goods when leaving the machine, down into trucks.

The mangle *A* consists of heavy iron frames or housings *a*, with the necessary boxes *b* for supporting the rolls *c* and *d*, and of which the bottom roll is of brass, or what is superior, a copper deposited roll, the top roll *d* being a rubber covered roll.

Pressure to the latter roll is supplied by means of weights *e* through levers *f*, *g*, *h*, and connecting rod *i*, the two levers *f* and *g* being fulcrumed respectively at *j* and *k*. Lever *h*, as directly exerting the pressure upon the roll *d*, is supplied with adjusting wheel *l*, and connecting rod *i* with a double threaded socket bolt for regulating the length of said rod, in order to keep weight *e* in proper position. *m* is the starch tub and *n* are two series of three tension rails each; *m'* is an immersion roll for guiding the cloth into the starch tub. This mangle is driven by means of belt *o*, through expansion pulley *p* from a pulley *q*, fast to a

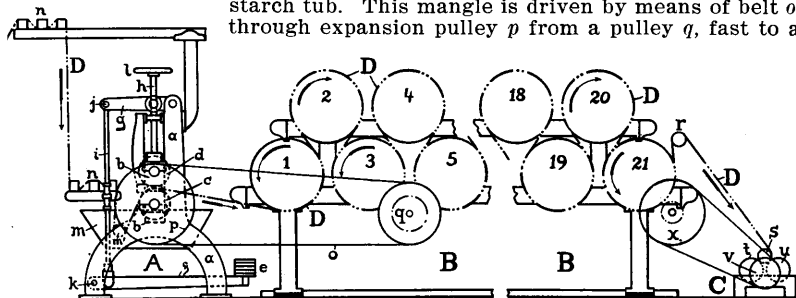


Fig. 15.

shaft carried in the frames of the drying machine *B*. This drying machine *B* is of the horizontal type, with a sufficient number of cylinders (twenty-one)

to dry at most any speed desired, and of sufficient width (face of cylinders) to run either one, two or three pieces of goods at a time through the machine. The centre portion of this drying machine is shown broken out, in order to bring illustration within compass of page, nine cylinders of a twenty-one cylinder machine (which is a number of cylinders most frequently used) only being shown.

These drying machines are made with heavy iron cored frames, hollow boxes and hollow journals in the cylinders, so that steam is admitted at one end of the cylinder, and water discharged by means of patent spiral scoops, described on pages 373-374, at the other end. These cylinders are generally 23" diameter, and made either of Lake Superior sheet copper or English tinned iron, and have iron heads with vacuum valves, to prevent collapse, and spiral scoops for ejecting the condensed water.

The goods after leaving cylinder 21, pass over and partly around guide roll *r*, and in turn are wound on cloth roll *s*, from cloth contact with the 2-drum winder rolls *t* and *u*, driven by means of pulley *v* and belt *w* from pulley *x* as situated on the delivery end of the drying machine.

The whole outfit is driven in unison, so that goods (as shown by line *D*) enter the starch mangle *A* pass without break to the drying machine *B* and are wound up on the winder *C*, thereby requiring the minimum amount of labor.

For starching and drying gingham and many other of the better grades of yarn dyed goods, the outfit of machinery shown in Fig. 16 in side elevation and in its plan view, furnished by The Textile-Finishing Machinery Co., is the standard in use in the vicinity of Philadelphia and in the South, although it is frequently varied by them in detail to meet special conditions of location, of finish required, or to satisfy the preferences of their customers.

This outfit consists of the following machines:

1st.—A 2-roll Starch Mangle (*A*) which has iron frames or housings supporting a bottom brass roll *a* and top rubber covered roll *b* with attachments for putting pressure on these squeeze rolls, starch box *c* with immersion roll (if wanted), tension frame *d* and bars *e* for feeding in the goods, and which is driven by iron cone pulleys *f*, *g*, from the drying machine. *h* is the chain for changing cone speed and *i* the cone belt.

2nd.—A small Upright Drying Machine (*B*) which usually has six 23" tinned iron cylinders fitted with the spiral scoops described in detail on pages 373-374, but may have four, eight or ten cylinders either of tinned iron or copper if desired.

3rd.—A standard 60-ft. Return Tenter (*C*), (the centre portion of which is shown broken out in order to bring illustration within compass of page), with either pin links or clamp clips to hold the goods at the selvages. As these tenters are made in sections of ten feet in length, the tenter may be varied in total length. They are fitted with a shaft driven by power by means of which they can be made narrower or wider according to the width of the goods to be run. The tenter is frequently provided with automatic feeding attachments (not shown in illustration) which assist greatly in getting the goods on to the tenter.

4th.—A Blower *D* with Heater *E*, which usually

stands near the entering end of the tenter and is connected with it by a galvanized iron pipe *j* which leads hot air to the tenter.

5th.—A 2-roll Winder *F*, for batching or winding up the goods previous to taking them to the calender. The winder is sometimes placed in front of the mangle where the goods enter, again sometimes a folder or plater is substituted for the winder.

This entire outfit with the exception of the blower is either driven by a separate double angle 5 × 6 engine or from the main shafting in the mill through a pair of 3-step cone pulleys for varying the speed and a friction clutch for stopping and starting. The tenter is driven at the end opposite to which the goods enter, from pulley *k*, driving by means of gears a shaft *l* running the entire length of the tenter and from which the cone pulley *g* which is supported from the ceiling is driven, and which in turn, as previously indicated, drives by pulley *f* and belt connections the upright dryer *B*.

These cone pulleys *f* and *g*, serve as a means by

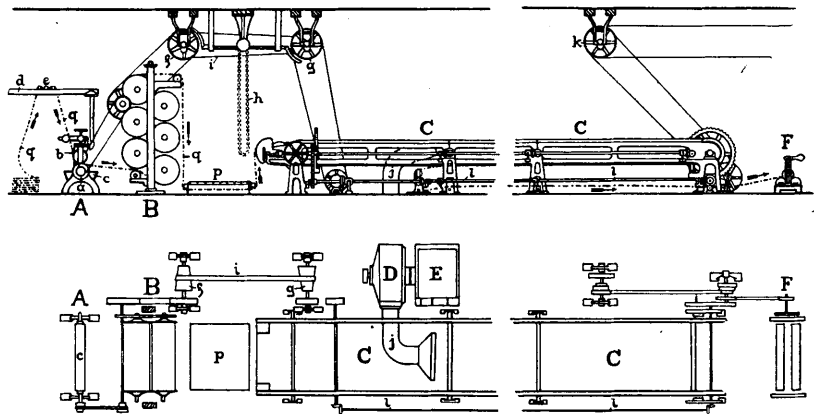


Fig. 16.

which the speed of the drying machine *B* and mangle *A* is varied as compared with that of the tenter *C*.

The mangle *A* is driven from the drying machine *B* by another pair of cone pulleys *m* and *n* so that the speed of the mangle can be varied as compared with that of the drying machine. The blower *D* is usually driven separately from the main shafting in the mill by means of its pulley *o*.

p is a wooden platform, for the operator to stand upon, or pass from one side of the machine to the other when required to do so, the cloth passing, from the upright drying machine *B* to the tenter *C*, below said platform and is thus out of the way.

The goods are brought to the machine in rolls or in trucks and are fed (see dotted line *q*) on to the mangle (*A*) over the three tension bars *e*. They either dip down into the starch by passing under an immersion roll (not shown, furnished if required) or pass directly through the nip of rolls *a* and *b*, receiving in this case the starch as it is lapped up by the bottom roll *a* from the starch tub *c*. The cloth then passes on directly to the upright drying machine *B*, where it is partially dried and in turn guided to the tenter *C*, where the goods under operation are stretched and fully dried.

On the return tenter the goods held by the clips pass the entire length of the machine near the top and then return underneath to the take-off rolls which receive them from the clips and from which they are led by means of floor carrier rolls to the winder *F*.

This arrangement of machines gives the greatest

production and best results in proportion to the floor space occupied.

The goods are starched, stretched, dried and wound in large rolls in one run without rehandling, thereby reducing the cost of labor to a minimum.

Sometimes a back starching machine is required, to suit a certain class of fabrics made by a mill, and when this machine then is substituted by the Textile Finishing Machinery Co., in place of the usual 2-roll mangle A, as shown in connection with the illustration. The drying machine B is frequently omitted, in which case the floor space required is reduced, but the capacity of the tenter cut down from one-third to one-half. This upright drying machine B, however in all instances, must be kept comparatively small, for if the goods are too dry they cannot be fed to the tenter, are very hard to stretch and become harsh and more like goods that are dried on cylinder drying machines.

Cylinder Drying Machines. We will now examine a few of the various constructions, *i. e.* arrangements of cylinders possible, in connection with cylinder drying machines, and which allow either both sides or the face, or the back of the fabric only, to be dried on the same machine—whether the cloth be starched on both sides, or on the back only, in short, whatever may be the means employed for the application of the thickening material.

Under ordinary conditions a cylinder drying machine is composed of a series of cylinders, ranging from 1 to 21 (or less) in number (see B in Fig. 15), they being generally placed so as to alternate, that is to say, that above the first two cylinders, placed in a straight line (1 and 3 in Fig. 15), there is a third cylinder (2 in Fig. 15) which forms an equilateral triangle, with the preceding ones and which constitutes the commencement of the upper series of cylinders.

These cylinders, as shown in connection with the drying machine B in Fig. 15 placed horizontally (in a line), can also be arranged vertically *i. e.* in an upright arrangement, such disposition being preferable when space is limited. B in Fig. 16 shows such an upright drying machine—a single column six cylinder machine—in other words only a small drying machine (but which is all that is there required, since the purpose of this small upright drying machine, in this case, is to only partly dry the cloth under operation previously to it going on the tenter). These upright drying machines, as a rule, are built with 2 or sometimes 3 columns, containing from 18 to 36 cylinders in the complete machine. The cloth after passing through the first column of cylinders, in an upward direction, then passes overhead to the second column and then through this column of cylinders down; and in connection with a 2-column machine then out of the drying machine, whereas if dealing with a 3-column machine, the cloth when coming from column 2, then passes over to column 3, and then upwards through said column of cylinders—leaving this 3-column upright drying machine then overhead.

In some constructions of these upright drying machines the cloth is made to travel from one column to the other—free (not supported), whereas in other makes a special drying cylinder is interposed, to provide a contact for the cloth.

In all the cylinder drying machinery thus described, the cloth in passing over the cylinders will be dried both by the contact of its face and back with the cylinders *i. e.* the first cylinder the cloth comes in contact with, works on one side of the cloth, the next cylinder on the other side of the cloth, and so on, until the cloth leaves the machine. However, in connection with some fabrics like raised face goods—quilts, corduroys, etc., and where contact of the face

of the fabric with the cylinders would injure the former, a series of winces, or woodlaged cylinders also called binding rollers, must be used, in this manner bringing one side of the fabric only in contact with the cylinders of the drying machine.

This arrangement refers more particularly to horizontal drying machines, and in order to explain this subject, diagram Fig. 17 has been prepared, showing arranged in one machine the principle for any mode of drying cloth by means of a cylinder drying machine. In said figure Diagram A shows contact of cylinders with both sides of the cloth, viz.: cylinders 1, 3, 5, 7, 9, 11 and 13 drying the cloth on one side, and cylinders 2, 4, 6, 8, 10, 12 and 14 on the other side. Now if placing a series of binding rollers over and below the two series of drying cylinders, as shown in

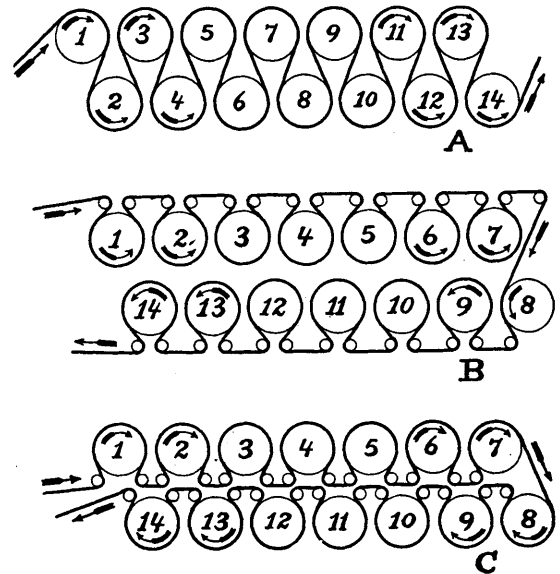


Fig. 17.

connection with Diagram B, the cloth then will have, with the same mode of entrance, contact with the cylinders only on one of its sides. The same result is obtained if placing said binding rolls between the two series of drying cylinders—as shown in Diagram C; the difference between mode B and C being that provided the fabric is fed to the machine in the same way—say for example Face up—then in connection with the arrangement shown in Diagram B, the face of the fabric only will come in contact with the cylinders, whereas in connection with arrangement shown in Diagram C, again such where it is better to dry from both sides. Arrows in Fig. 17 show the run of the fabric through the machine, arrows in circles indicate the rotation of the cylinders and numerals the successive location of rollers as the cloth comes in contact with during its travel through the machine. It will be readily understood that in place of the fourteen drying cylinders as shown in the illustration more or less (as the case may require) can be used.

Butterworth's Vibratory Tentering Machine. This type of tentering machine, as built by the H. W. Butterworth & Sons Co., and of which a perspective view is given in Fig. 18, is particularly adapted to

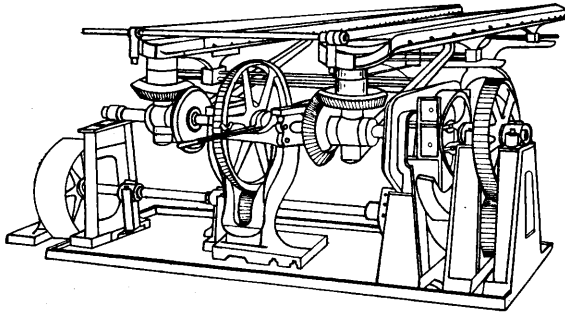


Fig. 18.

tentering and drying all grades of cotton goods, especially where an elastic finish is desired.

Special attention has to be called in the construction of this machine to the patented centre drive, which gives regularity to the swing motion.

The patented automatic clamp, as used in connection with this machine, is shown separately in Fig.

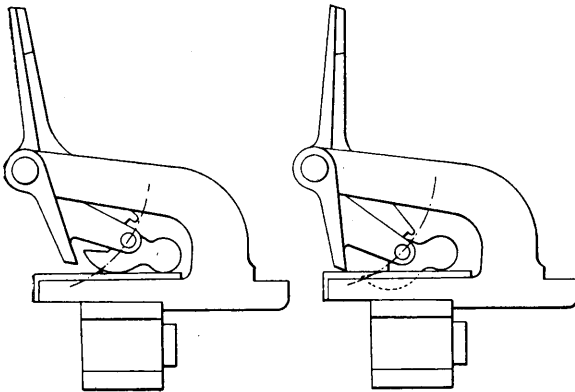


Fig. 19.

19; the same being of simple construction, but at the same time most effective in operation.

Spiral Scoops. It has been in the past almost the universal custom throughout the world wherever cylinder drying machines are used to fit the cylinders with what is known as a bucket scoop for lifting and discharging the exhaust water which accumulates in the cylinder. The live steam enters the cylinder at one end through the hollow journal and this bucket or scoop discharges the water at the opposite end. For a great many reasons, this bucket scoop has never done the work satisfactorily for which it was intended. In the first place, as universally constructed, it does not reach into the cylinder more than 24" from the head, hence it is evident there must always be a considerable quantity of water which it cannot reach at once, and which flows gradually toward the bucket. As the speed at which the cylinder is revolved increases, the water is acted upon more and more by centrifugal force, which tends to keep the water against the surface of the shell of the cylinder and prevent it discharging by gravity. The efficiency of the bucket scoop is therefore proportionately reduced and at a certain speed the bucket scoop practically ceases to operate. It requires but a very small quantity of water in a cylinder to materially reduce the surface heat and hence

the drying capacity of the cylinder. For years many other devices for removing the exhaust water have been tried but all have proved unsatisfactory for many reasons, or altogether too expensive to install or operate, so that until the spiral scoop was introduced upon the market, the old fashioned bucket scoop still remained in almost universal use. It was to overcome the obvious defects of the bucket scoop that the spiral scoop, as shown in section in Fig. 20, was designed and patented by the Textile Finishing Machinery Co. As will be seen from the illustration, this scoop consists of a spiral gutter extending the entire length of the cylinder. It starts shallow at the steam end and gradually increases in depth in order to take care of the increasing volume of water, makes a certain number of revolutions depending on the length and diameter of the cylinder and finally terminates in a lifting pocket or bucket which discharges out through the hollow journal of the cylinder. It will be readily understood that by the use of this spiral scoop, as the cylinder revolves, the water is forced along mechanically and lifted out in a steady uniform stream. There is no rushing of the water back and forth caused by varying steam pressure with consequent danger of damage or collapse of the cylinder, no high steam pressure absolutely necessary to force the water to where the bucket scoop can reach it, and above all no loss of efficiency caused by more and more centrifugal force as the number of revolutions of the cylinder is increased. The truth of the statements just made has been borne out by many practical experiments made either at the works of the Textile Finishing Machinery Co., or at those of some of their customers. It is shown beyond a question that cylinders fitted with the old style bucket scoop operate from 1" to 1½" of water in them all the time when running under the most favorable conditions. They never work on a closer margin than this and usually have a much greater amount of water in them most of the time. The spiral scoop, on the other hand, will absolutely remove all water from the cylinder and keep it almost absolutely free from water at all times. It is demonstrated that in a 23" cylinder, the bucket scoop will commence to refuse to clear the cylinder of water, on account of centrifugal force, when the cylinder revolves to deliver 70 to 80 yards of goods per minute, and at a little higher speed, absolutely ceased to operate. In these tests similar cylinders fitted with spiral scoops were revolved at a speed equivalent to 130 yards surface speed per minute and were kept practically free of water by the spiral scoop.

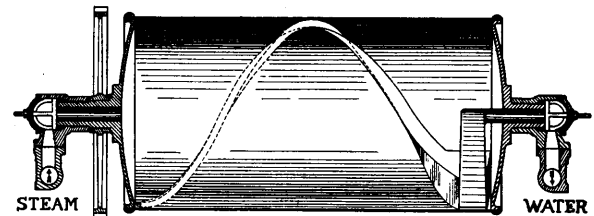


Fig. 20.

By the use of spiral scoops the capacity of a drying machine is not only increased at least 20 to 25%, but the steam pressure and amount of steam necessary to do the drying decreased very materially. In addition to these advantages, the spiral scoop enables goods or yarn to be dried at a lower temperature which leaves them softer and more mellow, as they are not baked by excessive heat. There is very much less or no liability of fugitive colors marking off and of starch sticking to the first few cylinders which is

alone of the greatest value in drying many classes of goods. From a mechanical standpoint, it is possible to fasten the spiral scoop in a cylinder far more strongly than the bucket scoop so that the old trouble of scoops becoming loose in the cylinders has been obviated. They can readily be put into cylinders of any face or diameter and are especially advantageous in cylinders of wide face or large diameter.

Since these spiral scoops were first put on the market some four years ago, hundreds of cylinders have been fitted with them, and those mills who have them will now have nothing else, especially manufacturers who have made a study of drying machines and who have come to realize what an inefficient and costly device to operate the old bucket scoop is, and how unsatisfactory and expensive other methods of removing the exhaust water from cylinders are.

Angular Rollers. It is difficult to run cloth, especially when in a moist condition, any distance without it creasing and running in a zigzag manner. To overcome these difficulties, in connection with any kind of machine where such a smooth feeding of the cloth is required, is the object of these Angular Rollers.

Fig. 21 shows such angular rollers, as made by the Arlington Machine Works, in perspective view, the same being applied to a cylinder drying machine, said angular rollers being made up of four brass rollers, which are caused to revolve by the action of the cloth itself. These rollers are secured to a suit-

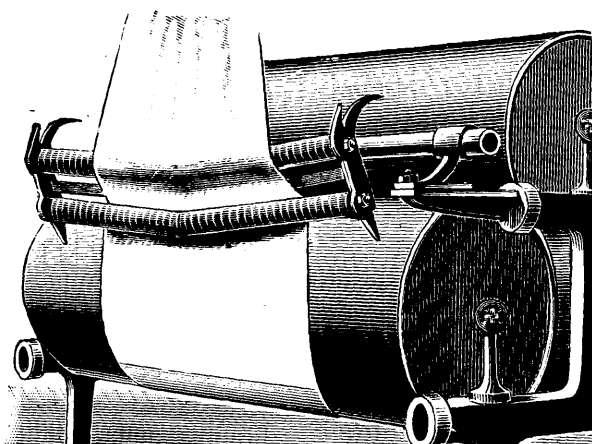


Fig. 21.

able frame, which is pivoted in the middle, and when the cloth runs a little to one side, it causes the device to tilt and thus guide the cloth back to the middle, and cause it to run in its proper path, *i. e.* in a straight line into and through the machine where applied to, the cylinder drying machine in this instance.

The four brass rollers, previously referred to, as will be readily seen from the illustration, are set at an angle, and as the cloth strikes them the opposite sides have a tendency to diverge and to run at right angles to the rollers, hence, any creases in the cloth or doubling of the selvages, are automatically straightened out. The device is composed entirely of brass, and is fitted with patent bushings which do not require any oil, making it safe to run the cloth without fear of oil or rust spots.

STRETCHING OR WIDENING THE CLOTH.

The purpose of this process is to stretch cotton goods in their width before or after finishing, in this

way recovering the width to the fabric it lost during bleaching, dyeing, stiffening, etc.

The process as well as its advantages derived at by the fabric thus treated, will be best explained in connection with a standard make of such a machine, selecting for it the Stretcher as built by the Arlington Machine Works. The advantages arising from its use as compared to other styles of machines are: (1) The cloth is under the perfect control of the operator; (2) no pin holes are made in the selvages; (3) the stretching is uniform from the centre of the cloth to the selvages; (4) no damage is done to the edges of the cloth; (5) goods may be stretched on it after they have been stiffened, calendered or beetled, (if such a process is used), with little disturbance to the finish; and (6) uniformity in the width of the cloth after stretching.

The machine is of utility for beetled and for back stiffened goods, as well as for all kinds of cotton fabrics which have been starched and dried. It is also of value in imparting a clothly finish to stiffened goods.

The principle adapted in the construction of the machine is a well known one. The selvages of the cloth, or more strictly the edges of the cloth, for a width of about three inches, are caused to pass over and at the same time are held by the rims of two diverging pulleys. The rims are further apart where the cloth leaves them than where they seize it, hence the stretching is gradually, certainly, and uniformly performed. The cloth is gripped by the pressure of an endless belt acting against the lower half of each pulley, the edges being held between them. The stretching pulleys are covered with rubber to insure a good grip without undue strain on the belts.

In the process of bleaching and dyeing, cotton cloth becomes considerably contracted in the width, in consequence of carrying on the operations when the cloth is in the form of a rope. The effect is that, together with the tension, although slight, and the drying, the filling partly shrinks and partly curls up, the latter, however, being scarcely observable to the naked eye. It may almost be said that, as regards the width, the shrinkage is due to a number of minute crumples, because the cloth is easily stretched again by the fingers almost to its grey width. The main use of a stretching machine, therefore, is not so much to make the cloth more than it is, as to bring it again to its normal or woven width after operations that tend to shrinkage have been performed upon it. The stretching operation, therefore, is especially useful to calico printers, as it enables them to obtain when desired a wide margin of even width, the irregularities due to bleaching being corrected before printing.

In order to be able to more clearly explain the construction and operation of the Arlington Stretcher, the accompanying two illustrations have been prepared, and of which Fig. 22 is a sectional diagram of the machine, Fig. 23 being a view in detail (top plan view) of those parts more particularly connected with the stretching procedure.

The machine consists of two large revolving central wheels 1 and 2, each covered on its face, by an endless rubber belt of best material, expanded sufficiently to bed itself tightly around the surface of its wheel, to prevent it from slipping when in operation. At convenient intervals of each wheel 1 and 2 respectively, are located two endless leather belt guide pulleys 3 and 4, and two endless leather belt adjustable pulleys 5 and 6, to keep the two endless belts (one for each wheel and series of four pulleys) taut.

When the machine is in operation, each endless leather belt covers a frictional surface of about the whole of the lower half of its circumference, of its corresponding rubber belt, which drives its leather

belt, traveling to delivery and guide pulley 4 under endless belt adjusting pulleys 5 and 6, and over belt guide pulley 3, a feature which of course establishes a continuous (endless) belt surface.

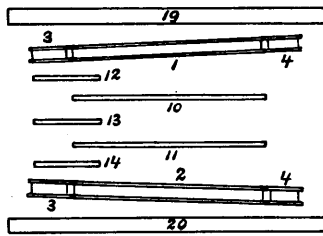


Fig. 23.

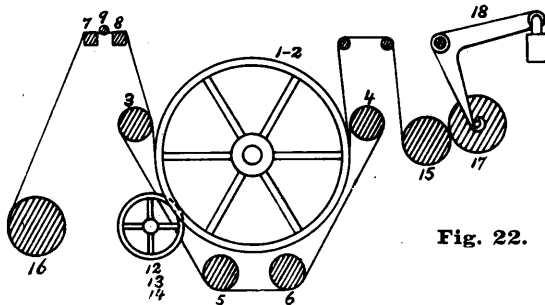


Fig. 22.

The cloth is fed into the machine through tension rails 7 and 8, and round governor tension 9, embedding each selvage between one of the endless leather belts (one on each side) and the rubber belt covering on face of its corresponding large revolving wheel 1 or 2, which conveys it (the cloth under operation) by the strenuousness of its grip to the delivery belt guide pulley 4, where the nip ends and relieves the cloth, which is immediately caught up by wood guide rolls, and quickly transferred over to the surface of wood drum 15, where the stretch in the cloth is maintained.

The large wheels 1 and 2 can be placed at any desired angle, according to amount of stretch required. Arranged between the large wheels and on the same centre are two light revolving tension wheels 10 and 11, about the same diameter as over endless rubber girt on large wheel and below.

In a practical position and on an independent shaft are secured three small tension wheels 12, 13 and 14, regulated by slide and screw, and placed alternately between the large wheels 10 and 11, so that as the cloth passes through, the small wheels are regulated into a position which causes a series of corrugations of the cloth, and which stretches the fibres of the cloth over its entire face. 16 indicates the reel of cloth at entering side of the machine, and 17 the delivery reel of cloth wound by drum 15, and supported by swing arm 18. 19 and 20 indicate the side frames of the machine.

SHEARING.

On all ordinary cotton goods the shear blades are used not for trimming off the nap of the fibres to an even length as on most woolen goods, but rather for cutting off projecting threads and fibres so as to leave the fabric perfectly smooth and free from protruding ends.

Fig. 24 shows in its perspective view the shear as built by the Parks & Woolson Machine Co., the same consisting principally of four shear cylinders (less are used in some machines) placed horizontally in the machine, and two brushes for the face of the

goods. The draft rolls on the back of the shear deliver the cloth either to calender rolls, singeing arrangement, or winding rolls, as the case may be. A rolling up attachment, forming a part of the machine, is applied when desired, to wind the goods up on wooden rolls after being sheared, and to be taken in this shape from the machine. The shear cylinders are similar to those of their woolen shear. Each set of blades composing a cylinder is a unit in itself, and can be removed from the machine without affecting other parts. Either ledger blades or shear cylinders can be removed without disturbing each other. The ledger blades are adjusted entirely from above, the screws being

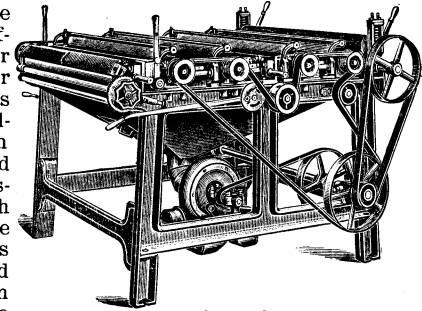


Fig. 24.

all on top and thus do not interfere with the cloth as it passes over, this construction also making it more convenient to regulate when grinding together. The rests, by which the cloth is held to the shearing lines, are adjustable in all directions. They are pivoted and have lifts to raise the cloth when a sewing is passing. A flock exhauster is provided on the machine, which is used to carry away all the dirt and lint made by the operations of the machine. These shears are also built to shear both sides of the cloth at one time. Very often it is of advantage to run, in connection with these cotton shears, rolling machines, either with or without calender rolls, and with or without steam boxes, according to the requirements of the goods to be finished.

Fig. 25 shows the shear as built by the Curtis & Marble Machine Co., in its perspective view, and Fig. 26 is a side elevation with parts in section of this shear, being given to show the location of shear blades, brushes, etc., in the machine, also the run of the cloth through the machine. This shear is made with four sets of shear blades, and three brushes for the face of the goods, and one brush for the back of the goods, which makes a very satisfactory arrangement for printeries, bleacheries,

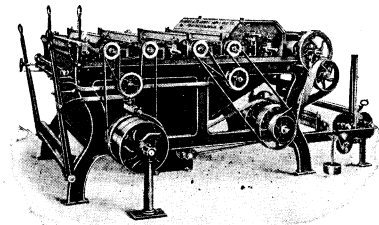


Fig. 25.

cloth rooms, etc., where but one side of the cloth is to be sheared. The brush for the back of the goods is added, since the face and the back of the cloth come against each other when rolled up, and if dirt or lint is left on the back of the goods, more or less of it is liable to come off on the face when the goods are unrolled, and thus cause trouble in the printing and after processes. Besides the arrangement shown, shears are built with two, three, five or six sets of shear blades for the face, and with any desired number of brushes for both the face and the back of the goods.

These shearing machines are made with swinging

cloth rests and stop motion for the revolvers, so that the cloth rests may be raised or the revolvers stopped when seams pass through. The cloth rests, brushes, etc., are held in adjustable boxes so that they can be readily set for any class of goods. On machines for shearing only one side of the goods, a cover is generally placed over the back brush, as shown in the illustration, and the balance of the machine left open, so that the operator may see the work done by the brushes and cutting parts; while on machines for shearing both sides of the goods, the cover usually extends over the entire top of the machine. Underneath the machine is an exhaust fan for taking off dust and lint. Levers are provided at both sides of the machine for starting and stopping the same, as well as for lifting the cloth rests or stopping the revolvers when seams go through. Spreader bars are attached both on the front of the machine where the cloth enters, and at the delivery end just before the cloth is rolled up, for taking out wrinkles and turned edges. The illustrations (Figs. 25 and 26) show a horizontal rolling-up attachment for the goods, having

is shown removed to show the various parts of the machine previously referred to.

On all shearing machines it is advisable to have brushes in front of the shear blades to brush forward the threads and fibres, and have them project from the body of the goods so that the shear blades may trim them off, and also brushes back of the shear blades to remove any loose threads or lint that may cling to the goods after they have passed the cutters.

Where emery rolls, sand rolls or beaters are used, they are commonly put on the front of the machine, where the cloth enters, as shown in Fig. 27. In this way they require but little additional floor space, and are valuable additions for thoroughly cleaning the goods. The emery rolls do good service in removing motes, leaf, chits, etc., and are used especially on the medium and heavier classes of goods, such as sheetings, shirtings, drills, tickings, ducks, etc. For lighter goods they may be covered with finer emery than usual, or with sandpaper, as preferred.

The beaters have steel blades with sharp edges

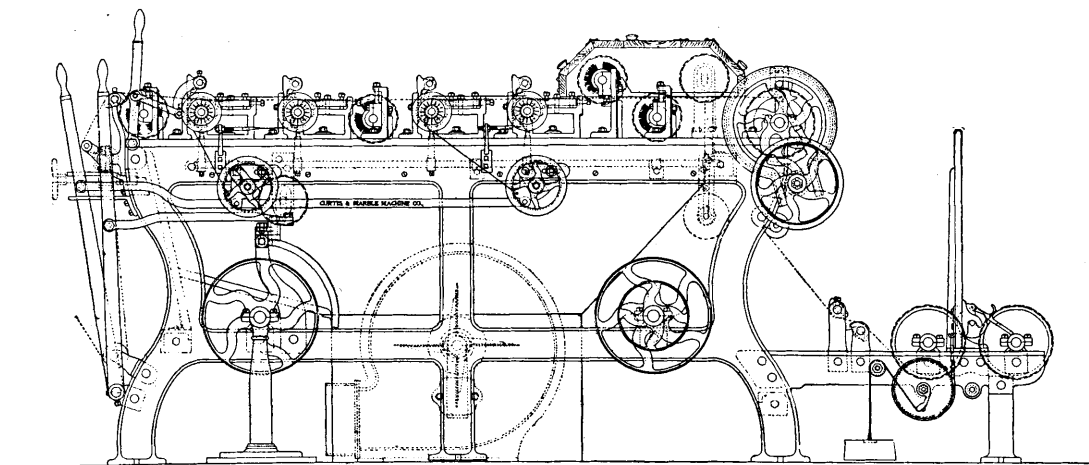


Fig. 26.

two wooden drums, upright standards, brass slides, cams, weights, etc., to give the required amount of pressure to make a smooth, even roll; however inclined rolling brackets with slides, weights, etc., may be put on (see Fig. 27) or the machines may be run in connection with calender rolling machines, singeing machines, etc.

Where both sides of the goods are to be sheared, as is the case with most gray goods in cotton mills generally, various cleaning appliances, such as emery rolls, sand rolls, card rolls, beaters, brushes, etc., are used in addition to the shear blades, and since there are usually more threads on the face or thread side of the goods than on the back, there are more shear blades put on the machine for the face than for the back of the goods. The most common styles have either two sets of shear blades for the face and one set of shear blades for the back, or three sets of shear blades for the face and one set for the back, or three sets of shear blades for the face and two sets for the back, in connection, of course, with the cleaning appliances already referred to. Fig. 27 shows such a cotton shearing and brushing machine in its perspective view, the machine being made with one emery roll, one beater, one card roll, two brushes and two sets of shear blades for the face of the goods, and one emery roll, one beater, one card roll, two brushes, and one set of shear blades for the back of the goods. The cover over top and front portion of the machine

which run against the goods and knock off many of the little knots and nubs which it is difficult to get off in other ways, as well as loosen much of the other dirt so that the card rolls, brushes, etc., which follow, may take it off; they are of great value in connection with the other cleaning appliances and may be used to advantage on quite fine goods as well as on coarse. The card rolls are covered with tempered steel fillet, having less bend to the teeth than usual,

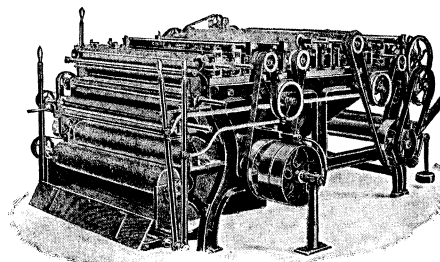


Fig. 27.

and are run with the bend of the teeth pointing backward, so as not to raise a nap; they are effective for removing threads, specks, chits, etc. The brushes are filled with stiff bristles, in order to do effective work.

Where different kinds of goods are made, and some

of them do not require as much finishing as others, by changing belts, or taking off some of the belts entirely, either the emery rolls, card rolls, beaters or shear blades may be stopped, and as many parts of the machine used as will best adapt it to each grade and variety of goods.

An exhaust fan is placed underneath the machine, to carry off dust and lint, and covers are placed over the top and around the emery rolls and beaters in front to keep the room free from anything arising from the machine. Swing cloth rests and a stop motion for the revolvers are provided, to prevent cutting the cloth when the seams go through.

The machines are made with rolling brackets at the back side to put the goods on rolls (either an inclined attachment, as shown in the illustration, or a horizontal attachment as had been shown in connection with Figs. 25 and 26), or they are run in connection with calender rolling machines or gas singeing machines, and will finish from 25,000 to 35,000 yards of cloth per day, they being built in different widths, for goods from 27 inches to 64 inches wide.

The Float Thread Shearing Machine, with change speed device, foot lifting arrangement for revolver, spreader roll, enclosed flock box and bonnet back of revolver, swivel frame in front for spot lappets, and rolling head at rear.

Fig. 28 shows this shear as built by the Curtis & Marble Machine Co., in its perspective view, the same being designed especially for cutting float or bridge threads on fancy spot cotton, and other goods, in which the spots are produced either with filling floats, warp floats or are lappet spots. It will be readily understood that such goods cannot be handled on regular shears, for which reason this float shearing machine has various attachments to facilitate the handling of different styles and patterns of these kinds of fancy goods.

On the front of the machine is a brush which acts on the face of the goods for brushing up the fibres so that the shear blades may trim them off. This brush may be run in either direction as desired, and means are provided for throwing the cloth entirely out of contact with the brush when its use is not required. A beater with wooden wings is provided for cleaning the back of the goods.

Another valuable feature in this machine is the change speed device, by which the speed of the cloth may be quickly changed independent of the other parts of the machine, according to the pattern and the amount of material which you have to cut off. This change speed device enables each particular style of goods to be sheared at the highest practical speed of the machine, consequently increasing production.

There is also a lifting device applied for raising the revolver by means of a foot treadle when the seams go through. This device is very convenient, and is appreciated by all shear tenders, as it leaves both hands free for straightening out and guiding the cloth free from wrinkles. From the fact that these spot goods are usually constructed with a comparatively light body or ground texture and oftentimes have open work stripes in them, there is more or less tendency for them to wrinkle or draw in together, especially at the seams; and the shear is therefore arranged so that the operator can lift the revolver with the feet, leaving both hands free for straightening out and guiding in the goods whenever this may be necessary. Previously this lifting of the revolver had to be performed by the attendant taking hold of the cross bar at the front of the frame on which the revolver is mounted, and this

usually required him to stand centrally in front of the machine, at the same time requiring, as a rule,

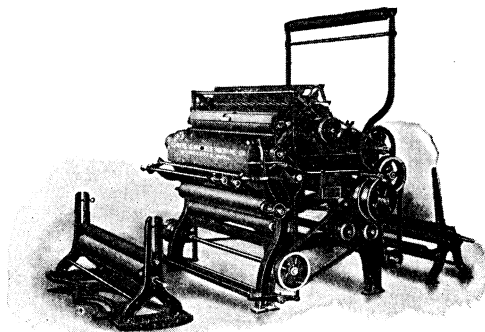


Fig. 28.

the use of both hands to properly effect the lifting of the revolver.

Fig. 29 is a side view of such parts of a float thread shearing machine as will show the nature of this lifting mechanism. Letters of reference in the illustration indicate thus: A the main frame of the machine; B the cloth rest; C the ledger blade; D the revolver or shear cylinder mounted upon the carrying frame F, connected by a hinge to frame A by shaft E; H indicates the draft roll; I the brush; and a the various guide rollers for directing the cloth (represented by the dot and dash line K) through the machine in the direction indicated by arrow.

Referring to the lifting device more particularly, we find provided at each side of the machine a lifting connection 3, having an upper end or head 5 operatively engaged with the frame F, as carry-

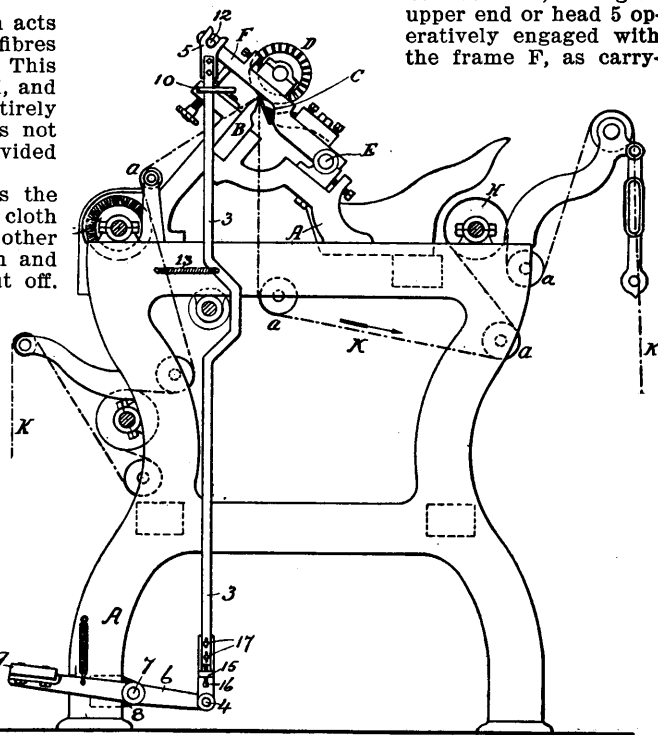


Fig. 29.

ing the revolver D, while its lower end is joined by a pivot stud 4 to the rear arm of a rocker lever 6, that is

mounted on a shaft 7, supported in stationary bearings 8, fixed to the lower part of the frame A; said shaft being movable in its bearings and extending across the frames for uniting the rocker levers at each side of the machine to rock in unison. 9 indicates the foot board supported upon the forwardly projecting arms of the rocker levers 6 and which foot board extends across the front of the machine. The upper part of the connecting bar 3 is supported to slide in a guide 10, attached to the frame of the machine, and the head 5 of the bar is furnished with a jaw adapted to engage with a projection 12, fixed in the end of the revolver carrying frame F. The slot or opening through the guide 10 is elongated to permit limited backward and forward swing of the connecting bar 3 to accommodate the curved line of movement of the hinged frame F, a small spring 13 being attached to the connecting bar 3 to normally draw it to the front end of said slot in guide 10. The jaw of the forked head 5 is open upwardly, but engages beneath the stud 12, so that while the frame F can also be lifted independently by hand, by the hand bar (not shown) as provided in front to the frame F, without reference to the connection 3, the studs 12 then passing by this method of lifting the revolver out of their forks 5, returning again thereinto when the frame F is again dropped to working position. The connecting rods 3 are provided at either their upper or lower ends with adjusting means for varying the length thereof, said means consisting of a grooved bracket 15, embracing the bar 3, and provided with an endwise adjusting screw 16, fitted in a lug thereon, and clamping screw 17, arranged through longitudinal slots in the plate of the member for holding and releasing the adjustment. In the operation of the machine, the attendant by placing his foot upon the foot board 9, effects the lifting of the cutting parts away from the rest whenever necessary or desired, without passing to the central front of the machine.

The cloth K after leaving the shear, is shown to pass through a folder, for laying the goods in even folds on a tilting table, or if the table is tilted and a scray provided underneath, the goods may be run endless. However, as a great many of these goods are handled on rolls, a rolling head, placed back of the machine, as shown, at the left, in Fig. 28, can be provided in place of the folding attachment previously described, in this way keeping the goods cleaner and smoother, besides reversing the direction of shearing at each run of the machine. (This lifting device thus explained, although more particularly designed for these float thread shearing machines has proved of such advantage that the Curtis & Marble Machine Co. have added it to several of their other makes of shears for other goods, more especially to their double cutter woolen and worsted shear for lifting both the front and back revolvers, thus enabling the operator to lift either the front or the back revolver by means of foot treadles in front, at either side of the machine).

A spreader roll, as shown in connection with Fig. 28 is used in many cases in these float shearing machines in front of the cloth rest, so as to hold the goods out in width and remove wrinkles. This spreader roll is made with brass trucks and slides inside, and as the roll is turned by the cloth in passing around it, the slats are drawn outward from the centre toward each end. It is of advantage on almost all goods and will be found especially useful on light goods which tend to draw together, or goods with open work stripes.

The material cut off by the blades may be held in an open flock box and removed from time to time as it accumulates, or the machine may be equipped with an enclosed flock box and bonnet back of the revolver, with inlet and outlet pipes ready for con-

nections to a blower, and an exhaustor for sucking off the material as fast as it is cut off. As a large amount of material is cut off on many fancy spot goods, this is a very desirable attachment, and keeps the machine and the room much cleaner than if the flocks are allowed to accumulate. Where an exhaustor and blower are used, a current of air from the blower enters at each side of the machine, just back of the revolver, to sweep the flocks away from the back side of the blades toward the centre, whence they are sucked off through a pipe by the exhaustor, and are then discharged to any convenient part of the room or mill. The discharge pipe to connect from the machine to the exhaustor, may run either up or down, according to the location of the exhaustor and blower, which are often placed on a platform underneath or overhead, wherever it is most convenient for parties to drive them.

For shearing spot lappet goods, a swivel frame is used as shown in Fig. 28, in order to give a "skewing effect" to the goods as they pass through the shear. This skewing effect is required for throwing up the bridge threads as they run diagonally from spot to spot. This swivel frame is not required for ordinary spot goods, produced either by means of floating warp or filling.

On spot goods, produced either by means of lappet weaving or floating the filling, all the work of cutting off the float or bridge threads is done on the shear, whereas on spot goods produced by means of warp floats, the bridge threads must be cut open before going to the shear by means of a loop cutting machine, which is also built by the Curtis & Marble Machine Co., and of which Fig. 30 shows a specimen

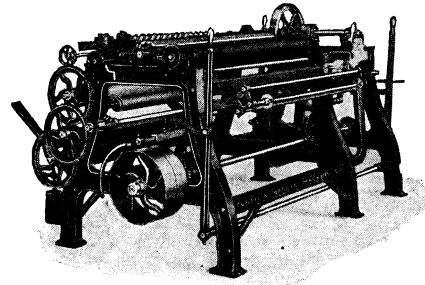


Fig. 30.

in its perspective view. After being cut in this way, the projecting threads are sheared off close on a float thread shearing machine.

The cutting on the loop cutting machine is done by a series of knives attached to a bar which vibrates rapidly across the goods as they pass through. These knives are set so as to cut each way from the centre toward the selvages, and are made with a rounding point, so that they may pass under and cut the loop threads without cutting the goods themselves. Knives with different shaped points may be used, according to the nature of the goods and pattern. The machine is also provided with the necessary tension bars, guide collars and friction roll for drawing the goods out smooth and even, and guiding them straight into the machine.

Before reaching the knives, the goods pass over a spreader roll, which removes wrinkles or creases, and holds the goods out in width. At each side of the knives are nip rolls which hold the goods firmly during the cutting process, and hand wheels are attached to the bottom nip rolls for convenience in threading in the cloth. The rear set of nip rolls are made adjustable so as to bring the cloth closer to or farther

away from the knives, and a hand lever is provided to throw the goods entirely out of the way of the knives when seams go through. There is also a stop and start motion provided, governed by a friction clutch, so that the cloth may be readily stopped and started in its travel through the machine while the other parts are in motion. A change speed device is also provided by which the speed of the cloth is quickly changed, according to the pattern of the fabric, which is being cut, since patterns in which there are long float threads between the spots, may be cut at a faster speed than fine patterns, *i. e.* patterns where the bridge threads are comparatively short. After passing through the machine, the goods are rolled up on brackets at the rear, ready for delivery to the float thread shearing machine. To insure good results, *i. e.* clear, defined spots, the threads which form the spots must be tied reasonably tight and firm into the body of the goods, since otherwise some of these threads, as forming the spots, when interlaced only loosely to the fabric, will pull out during the cutting and shearing processes.

SPRINKLING, DAMPENING, OR SPRAYING.

When cotton goods have been starched and dried, they must be dampened before they can be subjected to further operations. This preliminary operation of dampening, *i. e.* conditioning the cloth for calendering, is one to which frequently little importance is attached, and yet upon it the successful final finish of the fabric greatly depends, since if the goods are insufficiently dampened, they will become hard, rough, paper like, taking the pressure of the calender rollers imperfectly, fold badly, do not press nicely, and finally, in the finished state, present an unmarketable appearance. Again if on the other hand, the goods are too much dampened, they will become limp, flabby, without body, in short we also will obtain an unmarketable fabric; from which it will be readily seen that the proper amount of dampening, according to the character of the fabric under operation, is a most important item to the finisher, which under no condition can be slighted. It may be also well to quote here the fact that if the goods are left in a too warm or too damp place, mildew may be formed, in turn destroying not only the colors but the very fabric itself.

From this it will be seen that this sprinkling, dampening or moistening is one of the most important operations of finishing cotton goods, for which reason it is imperative that it is done even, uniform, as well as thorough, *i. e.*, the water must be thrown against the cloth in a very fine spray, and this with such force that it will penetrate into the structure.

Fig. 31 is a diagrammatic side elevation of the latest form of machine for doing this work, built by the Textile-Finishing Machinery Co. The framing of this machine corresponds practically with the one used for the old fashioned brush sprinkler or sprayer, however, the same can be built of any design or style required. The dampening or spraying part is where the secret of the success of this machine lies. By the former method, revolving brushes to throw the spray or moisture on the goods were used, and which were usually made on a wooden core or centre and of bristles, wire or some substitute. From their construction these would wear more or less unevenly, become waterlogged at times and then when run in this condition, throw an uneven as well as an unpenetrating spray, on to the goods, with the result that the goods will be dampened more in one place than

in another and consequently make the finish that the goods will take, uneven or blotchy.

The spraying device of the machine under discussion and as manufactured by The Textile-Finishing Machinery Co., consists of a copper box with proper nozzles or atomizers set in, and an air pressure

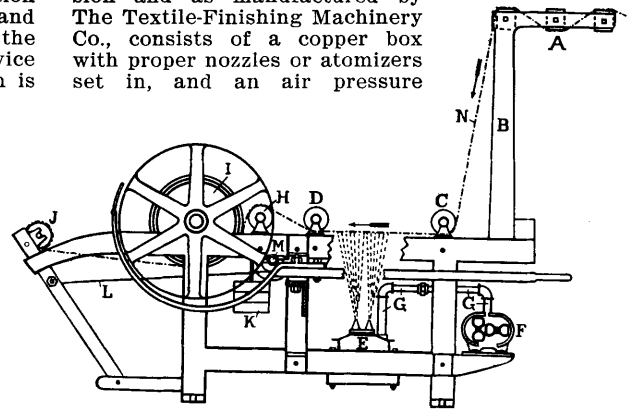


Fig. 31.

blower for forcing the water through the nozzles and spraying it on to the goods. There are also proper devices for regulating the amount of water in the box so that any degree of coarseness from the finest fog to almost a coarse rain drop can be obtained. The pressure of the air is also such that it will throw the spray or moisture against the cloth with force sufficient to drive it into every part of the structure of the fabric under operation, thus insuring the even dampness required for the finest and best results in calendering.

The construction and operation of the machine is thus: The cloth is entered in the machine at A, passing over three overhead tension rails held in two uprights B (one on each side frame of machine). C and D are guide rolls for presenting the cloth to the action of the atomizer E, connected by regular pipe connection to the water supply of the mill; the amount of water in the box being regulated by a regular float valve inside. F indicates the air pressure pump driven by means of a pulley on the other end of the shaft, and which forces the air through pipe connections G into the atomizer E.

From guide roll D, the cloth in turn comes into contact with a spiral groove roll H, for smoothing, *i. e.* stretching the cloth widthways, to take out wrinkles, as well as straighten the selvages. After leaving spiral roll H the cloth passes around a portion of the wooden drum I and onto cloth roll J, which consists of an iron centre mounted upon which is a wooden shell; the cloth being wound upon said cloth roll J by means of the latter being held in contact with the wooden drum I, by means of weight K and strap L as fastened to pulleys on shaft M. The run of the cloth through the machine is shown by means of dotted line N.

Fig. 32 is a sectional diagram in outline of the dampening machine as built by the Arlington Machine Works, and which in its main features consists of a wooden box in two parts, one placed within the other; the bottom part 1 to contain water, the top part 2 to confine the spray or dew within its area. The top box 2 is fitted with two adjustable lids 3 and 4, for regulating the area of exit 5 for the spray, and which in turn regulates the quantity of water, spray, or dew diffused on the cloth during its travel over said aperture 5 of top box, the dew or spray being produced by a quickly revolving brush 6, of which the periphery or tips of bristles or copper wire are slightly immersed below the level of the water line 7. This water level 7 is regulated by overflow for heavy

or light conditioning, *i. e.* damping, as required by the character of the particular fabric under operation.

The cloth enters the machine through tension rails 8, 9, 10, 11 and 12, then passes under and over guide rollers 13 and 14. The interval of time the cloth takes in traveling between these two rollers 13 and 14 is the time when the damping takes place. The cloth is then reeled by means of frictional contact with surface of wood drum 15. The reel of cloth 16,

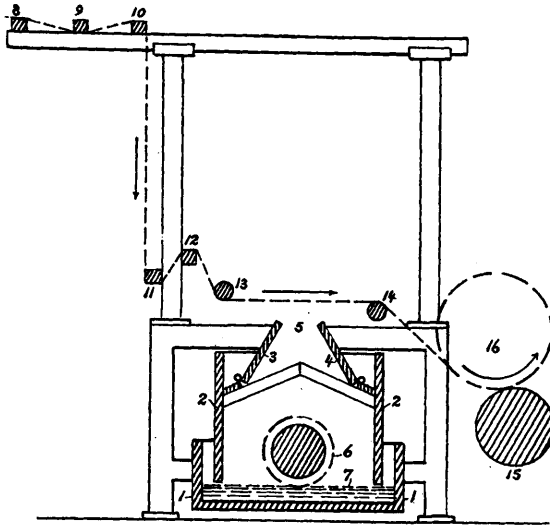


Fig. 32.

thus formed on wood drum 15, is under some pressure, applied by swivel levers weighted at their ends, and which bear on the ends of the rising spear extending through centre of reel, as it gains in diameter by accumulation of cloth. The run of the cloth through the machine is indicated by dotted line.

The revolving brush or sprinkler 6 is made in two different ways, one with ordinary bristles secured to a wooden roll, the other a copper tube with a wood centre forced in, having copper wires tapped on outside surface of copper tube and suitably pitched out. The latter sprinkling device is more advisable to use, since then there is no likelihood of loose wires flying on to the cloth, as is the case with the bristles where they are used, and which loose bristles are then carried away by the cloth, and in turn wound in the reel, and which bristles then in calendering will damage the fabric.

For a description of the construction and operation of the spraying machine as built by the Curtis & Marble Machine Co., see page 350.

Oxidizing machines are also sometimes used for damping, especially where goods are to be only slightly dampened. Such machines are composed of an iron chest, furnished inside with metallic rollers over which the cloth is made to pass, a strong jet of steam being let in, which softens the goods, and when it is then easy to regulate the degree of moisture by opening the steam cock more or less. If it is desired to work with very moist steam, the latter is passed through a reservoir of water where it becomes super-saturated with moisture.

The machine operates quickly, for which reason the cloth may be passed twice or three times through the machine. After finally leaving the machine, the cloth is made to wind on a roll so as to keep it in its proper damp state for perfect calendering.

BRUSHING.

This process is practised by cotton manufacturers for the finishing of goods sent to the market in the "brown" *i. e.* goods requiring no other process of finishing.

Fig. 33 shows in its perspective view, the Cotton Brushing Machine (with Calender Rolling Machine attached), as built by the Curtis & Marble Machine Co.; the same being arranged with one pair of emery rolls and beaters in front, and with two card rolls and one stiff brush on top for each side of the goods, to finish them by once running through. This arrangement of card rolls and brushes however may be varied, to suit special makes of fabrics in a mill; all brushes if desired being also supplied by the builders of the machine. The emery rolls and beaters are valuable additions for a more thoroughly cleaning the goods.

The *emery rolls* do good service in removing motes, leaf, chits, etc., and are used especially for the medium and heavier classes of goods, such as sheeting, drills, shirtings, ducks, etc.; for lighter goods, either brushes, sand rolls, or finer emery rolls may be put on, or only the beaters used in front.

The *beaters* have steel blades with sharp edges which run against the goods and knock off many of the little knots and nubs which it is almost impossible to get off by any other means, as well as loosen much of the other dirt, so that the card rolls and brushes which follow may take it off.

The *brushes* are set with very best quality Russian stiff bristles, softer and cheaper bristles, beyond brushing off loose lint and dirt, being of but little service.

The *card rolls* are covered with tempered steel fillet made expressly for this work, with straighter teeth than usual, and are run with the bend of the teeth pointing backward, making good appliances for removing chits, motes, specks, etc., without raising a nap.

The machine is entirely covered on top and around the emery rolls and beaters (the covers being shown removed in the illustration in order to show the different rolls, etc.), and has a powerful exhaust fan underneath to carry off dust and lint, leaving the room free from anything arising from the machine.

These brushing machines are made either with rolling up brackets attached to the back side of the machine for winding the goods on rolls, or are run in connection with calender rolling machines, as shown in the accompanying illustration, and when the work

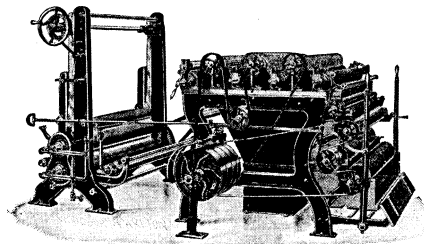


Fig. 33.

of both machines is done in one operation. The iron rolls of the calender head may be made to run either hot or cold, as desired, and with the above arrangement the goods are first thoroughly brushed and cleaned, then passed over a steam vapor cylinder to receive a light vapor of steam, to aid in smoothing out the goods and giving them a softer finish and feel, and then in passing around the iron rolls of the

calender head, are freed from wrinkles and puckers and rolled up in firm, hard and even rolls. After being treated in this way and allowed to stand tightly rolled up for a few hours, or over night, when taken off the rolls, the goods then have a much smoother and better finish and feel. The amount of steam is easily regulated, so that the goods may be dampened in this way without giving them the harsh feeling often occasioned by the use of water. A cut off valve is attached to the steamer, to shut off the steam when the machine is stopped, and thus avoid excessive steaming or wetting in one place. A pair of long racks rests on the ends of the wooden roll on which the cloth is wound, and the requisite amount of pressure for making as hard a roll as desired, is obtained by a friction strap and cam at the top; the amount of pressure being easily regulated as required for different classes of goods.

An adjustable measuring attachment for giving an accurate measurement of the goods as they are rolled up, and also a revolving stretch roll, as shown in connection with Fig. 35, are added by the builders to the machine if so required.

If shear blades are desired, they are also added, and this for shearing either one or both sides of the goods. This arrangement then is the most complete arrangement presented to manufacturers for finishing goods which are sold in the "brown," or that are not further treated or finished. The machine will finish from 25,000 to 35,000 yards of cloth per day, and is built in different widths, for goods from 27 inches to 120 inches wide.

CALENDERING.

This process of finishing cotton goods is done on machines known as Calenders, and has for its object to impart smoothness (flatness) and lustre to all fabrics passed through it.

The simplest calender consists of two rollers or cylinders, one of which is of metal and permits heating, whereas the other is a solid roll made of paper, husk, cotton, etc. (see special article on Combination Rolls pages 382-383.) By means of screws, levers, etc., a pressure is given to these rolls (sometimes termed bowls) between which the fabric passes and the fibres thus become flattened. The amount of flattening and lustre depends (1) upon the material of which the solid rolls are made; (2) the pressure to which the fabrics are subjected; (3) the amount of friction between the rolls; (4) the temperature of the rolls; and (5) the constituents of the starch or filling as has been previously used in starching the goods.

The variety of ways in which a calender may be used, and the variety of finishes which can be produced is very great, and partly dependent on the conditions specified before, as well as the manner in which the cloths are passed through the calender.

When a piece is passed through once it is said to have had "one nip," when twice "two nips," three times through "three nips," and so on. Calenders are built either with two, three or five rolls.

In constructing these machines it is important to ensure that the centres of the various rolls are in vertical lines so that the nips, given to the cloth as it passes between them, are directly downwards and any deviation from this direction will generally lead to damage of the cloth.

In the case of friction calenders for bright finishes, another source of damage to cloths may arise from said friction being liable to be more than the cloths will stand, for in these calenders the cloth is rubbed, by the speed of the rolls being greater than the rate at which the cloth passes through the machine. With such calenders several sets of gearing wheels should

be provided, so that the speed of the friction roll can be varied to suit the strength of the cloth and the amount and character of the starching compound used.

The rolls of friction calenders are liable to be damaged by abrasion if they are run without any cloth passing through them, especially if the speeds be very high, the reason being that in such machines the roll next to the friction roll is usually driven by frictional contact with two other rolls revolving at unequal speeds. This roll, therefore, is acted on by unequal forces, one tending to drive it quicker than the other, with the result that considerable friction ensues at the point of contact, and which friction is liable to cause abrasion of the surface of the middle roll. This is not desirable, and, to avoid it, allow the calender to be driven, only at a low speed, and this only when cloth is between the nips.

The heating of the metal rolls for glazing finishes can be done in three ways.

(1) By bars.—The metal roll is made hollow, and iron bars, from 8 to 12 inches long, and about 1 inch smaller in diameter than the hollow of the bowl, are heated red hot and inserted. In this way the roll becomes very hot. This system however is a very old one and has been practically replaced by either gas or steam heating. The temperature of the roll by means of bar heating could then be raised very high, from 500 to 600° F., and thus very bright glazes were obtained by means of them, on the other hand, the system was troublesome to work, and the high temperature had an injurious influence on the solid rolls—cotton, husk or whatever kind used—of the calender.

(2) By gas.—In this method the roll to be heated is also made hollow. A perforated $\frac{3}{4}$ -inch iron gas pipe traverses its whole length and a mixture of gas and air is forced in. This burns at the perforations in the form of non-luminous flame. By careful regulation of the amount of gas burnt, the temperature of the roll can be regulated with nicety, and every variety of glazing finish can be obtained. The proportion of air and gas requires careful regulation, so that a perfectly smokeless flame is obtained. Too little air and too much gas leads to production of luminous, smoky flames giving comparatively little heat; too great a force of air prevents the gas from burning properly.

(3) By steam.—In this instance the roll is made hollow as before, and is fitted with steam-tight flanges. A supply conveys steam from a boiler and an exit pipe carries away the exhaust steam. This system is the most convenient but can be used only where lower temperatures are required. The solid rolls will last longer where steam is used, the temperature never gets high enough to damage them as it is liable to do with gas or bar heating, and the lower temperature may be counterbalanced any time by higher speed and heavier pressure.

Calenders should be provided with an arrangement so that when out of use the rolls can be separated from one another, since if left in contact, the softer solid rolls, are liable to become flattened somewhat at the nip, and what is rather detrimental to the finish of the cloth. Too much care cannot be taken to keep the rolls of a calender in good condition, because upon the polish of the surface and its smoothness depends the quality of the finish produced by it. Steel and iron rolls require frequent wiping down with dry cloths to keep them free from damp or water which would cause them to rust and pit, in which condition they are useless. The solid rolls, whether cotton, paper or any other combination, are not so sensitive to damp, but still it is advisable to keep them dry, as long exposure to it would injure them by softening their surfaces unevenly in places.