Years ago it was thought that the wire clothing of the Napping Machines may sooner or later supplant gigging, but the latter process has and will retain its place in the finishing of our better classes of woolen fabrics, although in connection with medium and cheaper grades of woolens, both systems of raising the nap may be practiced.

Who was the party who first made use of the teasel for the raising of the nap, *i. e.*, the finishing of woolens, is not known. Very likely the characteristics of the teasel were discovered by accident, the hooked spines of the wild teasel catching in a garment, after which teasels were raised in a cultivated state.

The teasel is the fruit of the plant of the genus *Dipsacus*, the flowers of which form a cluster arising from a horny bract, which in time constitutes the head

Fig. 3

Fig. 4

of the teasel of commerce. Each tiny blossom occupies a cell, which is carefully protected by hooked spines; the seeds forming at the base of each flower, occupying the cells when the blossoms die.

A well raised teasel is cylindrical in shape, somewhat tapering at top and bottom, being provided with a mass of curved spines protruding from the central core.

Fig. 1 shows us a specimen of an average teasel, used for the raising of fine napped cloth. Besides these regular teasels and which are grown in various sizes (larger and smaller sizes than the one shown) there is a small, egg-shaped teasel, known as *Buttons* (see Fig. 2) met with, the same being used only for setting along with larger teasels to fill up space in the slats, where so required.

Fig. 3 shows us a teasel head in half bloom, the flowers on its top having died off, the lower portion still remaining on it.

Fig. 4 shows a teasel in section; the white portion indicates the spongy core from which the spines grow, the shaded central portion the canal for the sap.

The cultivated plant *dipsacus fullomun,* full grown, attains a height of about five feet. Although they will grow most anywhere, yet a good rich soil, like with any other plant, is necessary for raising the best quality of teasels; unsuitable soil causing them to return to their wild state, hence become of no value for gigging purposes. Plenty of sunshine is essential at the latter period of the teasels' growth, a wet harvest time being often the cause of a destroyed crop, resulting in a bad curing. The teasel needs two years to come to maturity, requiring after the first year a thinning out, *i. e., spittling,* and when during the second year, the plants throw up (*run*) their long flower bearing stems, the heads being ready for curing, in the autumn, after the bloom has died away.

Teasels are grown in this country more particularly in New York State and in Oregon; abroad, we find them raised in France, in the West of England, and in Austria. Of our domestic teasel, that grown in Oregon, is finding much favor with woolen manufacturers it being of a finer grain than any other teasel grown in this country. Teasels vary considerably as to the strength of their spines, the largest size not always being the strongest. As a rule, they are sorted by the growers according to their sizes and strengths; the former on account of convenience to the teasel-setter in his work, the latter, so as not to waste them, since if medium and strong teasels are mixed, it would mean a waste of the former, their spines not being strong enough to do the class of work the strong ones may be called upon to perform; whereas if the mediums were taken only into consideration when selecting the proper teasels to use for a certain class of fabric, the strong teasels as mixed into the lot, may then be the cause of tender goods.

The most important factor in a teasel is the elastic spring possessed by the spines. They possess a certain rigidity and at the same time a degree of elasticity which no manufactured article that has ever been discovered can attain. If the points of these spines come in contact with a knot or lump on the surface of the cloth, they will be bent back by the velocity of the cylinder, but after the bunch is past, the point returns to its original position and no damage is done. From the nature of the spines, the teasel certainly is particularly well suited for this gigging. Not only is it made up of points similar to a wire or steel point, but all along the edges of the spine there are little teeth or points which add their part to the ease with which the spine is enabled to do its work. It is for these reasons that the teasel seems so much better adapted for working up the felt of the fulled cloth into a nap and in opening up the fibres so that all imperfections and foreign substances are removed.

Why the teasel possesses such a value for gigging, is primarily due to the hook formation of its spines. When carefully examining one of these hooks, it appears as if covered with a brown enamel, a feature which seems to impart strength to the hook, allowing it to keep a point as long as the head retains its form. Thus it will be seen that the life of a teasel on the gig depends upon the elasticity of its spines, since when the latter is lost, the teasel has lost its value.

During the process of gigging, the hooks of the spines in catching hold of single wool fibres in the threads composing the fabric, draw said fibres out until one end becomes separated from the body of the fabric structure, and thus forms the nap or pile. Teasels are used in most cases in a moist condition, for the fact that moisture increases the elasticity of the spines, successful raising, depending upon this elasticity. New teasels are generally wetted the first time when used, this prolonging their life; otherwise, *i. e.,* if used in a dry state, they are liable to break, on account of the sharpness and bite the hooks of their spines have onto the cloth under operation. Hot water has a greater softening action on the teasel than cold, but after wetting with either, and the spines become too limp, they will regain their strength after drying, the slats being placed for this purpose in the open air or in a suitable drying room, or other place provided for this purpose.

In a woolen mill running on Face finished goods, like Beavers, Doeskins, Broadcloth, etc., the stock of teasels set up in slats on hand for ready use on the gig, is aways considerable. After using fresh teasels *(Breakers),* once, twice, or three times, the slats are marked as to the condition of the teasels in them; so that any degree of raising action for a fabric (under operation) may be obtained by a combination of slats holding teasels of different strengths. Slats containing new teasels will generally be found too sharp, for using alone, hence they are mixed in with slats containing teasels which have been used for more or less time, and are thus *broken in.*

Gigging may be divided into the dry and the wet process.

The first refers to handling fabrics where a lofty, thick, woolly pile is wanted, as for instance with Blankets, Flannels, etc. It is also practised in connection with the thread bare or clear face finish, as used with some styles of Fancy Cassimeres, Coatings, etc., the nap as raised by the gig being then cut down short on the shear, in order to show up the weave. In connection with dry gigging, care must be taken that no excessive waste in Gig Flocks is made, neither that the nap is raised in streaks.

Wet gigging is a slower process, giving to the fabric a shorter, denser pile, *i. e.,* a fuller, more lustrous nap is the result; it being the process practised in connection with what is known as *face* finished fabrics, like Broadcloth, Doeskins, Beavers, Tricots, etc. In connection with the finishing process following that of gigging, the nap is then cut on the shear, and although the face of the fabric is covered perfectly, no pile, in the proper sense of the word, is noticed, the fibres as raised by gigging resting parallel side by side on the face of the fabric, being held in that position by means of steam lustering or by decatising. In connection with these face finished fabrics the fibres all rest in one direction on the face of the fabric, from the tail end towards the head end, or the heading, as also termed. The direction of the nap on these fabrics is readily noticed in the finished cloth, the same feeling smooth and soft to the touch of the hand, a pronounced resistance being felt by the touch of the hand when running your hand against this nap.

Coming back to the teasel, when a lot of them are received by the mill, they should be stored in a dry place where they will not absorb moisture and in turn become limp and useless.

(To be continued.)

SILK FINISHING.

In the silk industry, a preliminary finish is in many cases applied to the yarn, previously to the latter being woven into ribbons, dress silks, or any other kind of narrow ware or broad silk fabrics.

Silk, during boiling off or dyeing, as the case may be, has a tendency to contract, which action causes it to lose its smoothness and lustre. In order to give back to the silk these lost properties, the operation of lustring is made use of, and which consists in the application of preparations, which are varied according as to whether the manufacturer desires to give the material a soft handle, or what is called *scroop.*

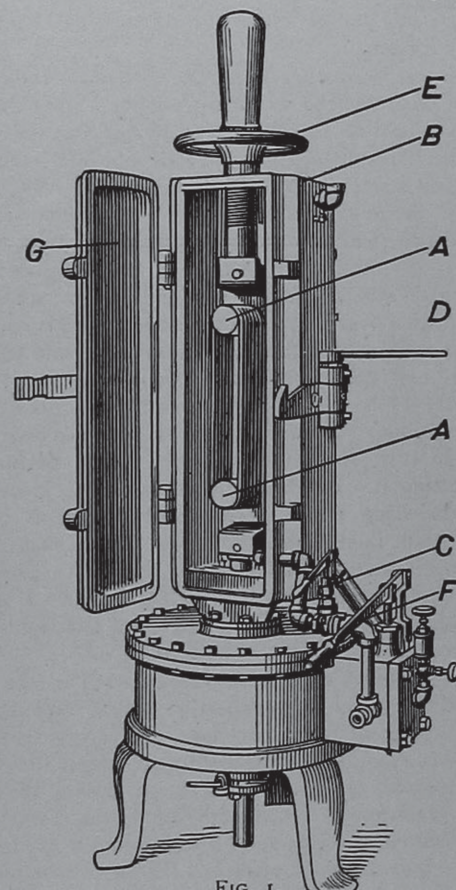

FIG. 1.

Black dyed silk yarn can be softened, and at the same time given *scroop,* by treating the material in a solution of citric acid, olive oil, water and soda or potash; for boiled-off silk, from 1 to 2% of olive oil (reckoned by weight of yarn), for soupled silk from 5 to 15%, and for fringe silk from 5 to 20% of olive oil, is used. The proportion of oil should be varied according to the nature of the silk and the use to which it is to be applied, *i. e.,* whether warp or filling. For satin, taffeta or other fabrics the olive oil is emulsified in double quantity of water with a 65% soda solution. If the scroop effect is desired, from 20 to 25% of citric acid is added, and the mixture cooled to 95° F. The silk is immersed in this solution, and afterwards extracted and dried. In place of citric acid, which is best adapted for giving a soft handle to the silk, there may be used either 10% of acetic, 9% of hydrochloric acid, or a dilute sulphuric acid solution. A certain proportion of glue or gelatine is sometimes added to the emulsion to improve the handle of the goods.

When the yarn is intended for goods which are to receive a moiré or watered finish, it is treated in a sulphonated olive oil, well diluted with water, and dried without being extracted. This serves to soften the silk. Another process consists in handling the silk half an hour in a soap solution consisting of from 20 to 30% of white soap, at a temperature of 85° F.

The mechanical part of the finishing process consists chiefly in stretching the silk, in the shape of skeins, while damp, either to its original length or slightly longer.

The wet skeins are hung on horizontal rods in an upright position; the workman pushes a stick through the lower part of the skein, and by jerking the skeins with this stick brings the threads parallel with each other, and stretches the silk from 2 to 3%. By drawing the skein sideways as well as lengthways, the threads are made to rub against each other, which serves to give the silk a lustre. A much higher lustre is given to silk by means of machines in which the silk is drawn over metal cylinders, and which maintain said skeins in a stretched condition from one to three minutes and causing them to be rotated or turned gradually while so stretched; together with the action of steam under pressure upon it during the operation, which in turn aids in making the lustre permanent, *i. e.*, setting it. By this process the silk is prevented from shrinking while drying, every portion of the skein of silk during the revolution of the skein being acted upon and a uniformity in the lustre produced throughout the whole skein. Lustring is of special advantage when applied to black dyed silk, and in all instances dry steam should be used.

Fig. 1, shows us a specimen of such a Silk Lustring Machine, in its perspective view, showing also the arrangement of its interior. Referring to the illustration, A indicates the hooks on which the skeins to be lustred are hung, said hooks being made of forged steel and covered with brass, the lower hook being secured to a piston of a small engine at the bottom, the pull of which stretches the skein to effect the lustring. The piston is capable of exerting a pull of 19,000 pounds, but as the length of the stroke of the piston is under control of the operator, through the lever F, the tension on the silk can be exactly regulated to suit the requirements.

The hooks work in slides, the upper hook being made adjustable, through a hand wheel E at the top of the machine, so that the same can be set to operate on skeins of different lengths up to 54 inches; or by special construction, 60 inch skeins can be treated in the machine. The chamber B is made of cast iron, and has a double back and sides, the spaces between these inner and outer walls forming a steam chamber. The object of this arrangement is to keep the interior chamber continually hot while the process is in operation, which does away with the necessity of suspending operations from time to time to heat up the interior, as must be done in connection with some of the other types of lustring machines met with in the market.

An inlet arrangement at C, into the box, is provided, so that the skeins can be moistened by steam, when required, *i. e.*, when taken to the machine in a dry condition.

When in operation, the door of the machine is closed, being equipped with a powerful locking device D, operated by a single movement, said door being packed around the edges with rubber gaskets, so

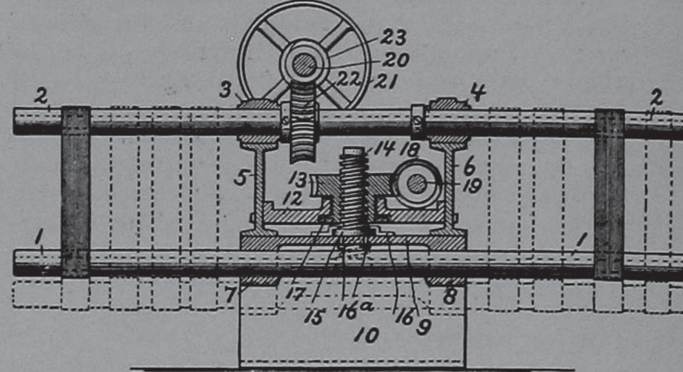

FIG. 2.

that it is practically steam tight when closed. A safety valve in the door at G obviates all danger from accident, should the steam pressure in the chamber exceed the set limit for the safety of the compartment. Care should be taken not to overstretch the material in the operation.

The process of lustring takes from one to three minutes, and one person can lustre, with this machine, upwards of 500 pounds of silk in ten hours.

Another make of lustring machine is shown in its sectional view, partly in section in Fig. 2. In connection with this make of machine, the skeins of damp silk spread out on and around a pair of hollow metallic nickel plated rollers 1 and 2 adapted to turn in their respective bearings, the silk while being maintained in said stretched condition and rotated, being at the same time subjected to a dry air temperature of about 120° F.

The upper roller 2 is mounted in bearings 3 and 4, which are secured to the upper part of the I-shaped beams 5 and 6, while the lower roller 1 is mounted in bearings or journals 7 and 8 in the downwardly projecting portions of the inverted U-shaped bridge 9, which is adapted to slide vertically between the legs 10. The bearings 7 and 8 of the lower roller 1 are raised or lowered by means of the screw 14, which passes through a worm gear wheel 13. The screw 14 has a head 15 secured by means of screw 16^a to the bridge 9, and when the worm gear wheel 13 is rotated by means of the worm 18 on the driving shaft 19 the screw 14 is raised or lowered, and with it the bridge 9 and the bearings 7 and 8, according to the direction in which the worm gear wheel 13 is turned. The worm gear wheel 13 is provided at its lower end with a lock nut 17, which prevents it from rising, but permits it to turn in the support 12, which is secured to the beams 5 and 6. In addition to the head 15 on the lower end of the screw 14 being secured by the screw 16^a, it is secured also by means of clamps 16 on the upper part of the bridge 9.

When the skeins of silk have been placed around and spread out on the upper and lower rollers, and the stretching mechanism has been put into operation, forcing the lower roller down until the skeins are stretched to the desired extent (shown in dotted lines), they are left in that position, thereby being prevented from shrinking, and the upper roller 2 is caused to rotate. Power being communicated to the driving shaft 20 by pulley 21, a rotary motion is communicated through the worm 23 to the worm gear wheel 22, thereby causing the roller 2 to turn in its bearings. Owing to the stretched condition of the silk around the two rollers, both are caused to turn in the same direction, thereby giving the skeins of silk a continued revolution around both rollers, so that during the successive revolutions of the silk every portion of the skein is brought in contact with the smooth heated surface of the rollers.

(*To be continued.*)

How to Ascertain the Count of Silk Yarn.

Editor of Posselt's Textile Journal. I read with interest the article on "Number of Cocoon Ends for Different Counts of Silk," in your March issue, and herewith send you my views on the subject, as they are practised here in Lyons, and which you may publish. J. P. Redou.

When a large-sized sample is available, ravel out a certain number of threads of equal length from the warp or filling of the fabric, measuring them, and multiplying the length by the number of threads. These threads are then carefully weighed. The resulting length and weight form the data from which the size of the yarn can be readily calculated.

Suppose, for example, that the warp consists of an organzine, and that 140 threads, each measuring 33.8 cm., or 47.32 metres, weigh 113 grains.

From these factors we can readily calculate that 500 metres weigh 1,194 grains, which corresponds to 21.40 deniers (476 metre system).

The finish and dyeing materials remaining on the goods must often be removed before proceeding by this method.

Scales have been constructed by which the number and count are indicated, without resort to the calculations mentioned.

To ascertain the weight of a square metre of cloth, a piece of 10 cm. square is cut and weighed. From this weight, that of any given surface can be calculated.

The count of the single silk filament as it comes from the cocoon averages $2\frac{1}{4}$ den. If the number of such filaments of which the yarn examined is composed is known, the count of the thread can be approximated. Each filament is separated from another by boiling, and each is resolved into two separate strands. These strands are first counted; one half of them represents the number of cocoon filaments, which, multiplied by $2\frac{1}{4}$, gives the approximate count of the yarn. This is the general principle of the method, but its application is subject to various modifications.

One method consists in counting, by the aid of a microscope, the filaments in different parts of the thread, and taking the average as the basis for the calculation. This method, however, is not reliable, because two or more threads may lie on each other, and thus escape observation.

By another method, a short length of the thread is secured to a surface of a contrasting color. The filaments are then separated by a needle, and counted. In this case too the filaments should be counted in a number of different places in the thread, and the average of the results taken.

With twisted threads, the twist should be removed by a twist counter. This method has been recommended as a basis for estimating the amount of weighting material in a silk thread.

The actual count of the colored yarn is determined by reeling and weighing. That of undyed yarn is then estimated by the method described. A comparison of the two counts gives the estimated quantity of weighting material in the yarn.

A small notched plate, placed under the silk thread on which the filaments are being counted, will facilitate the operation. Each filament, as it is separated, is placed in one of these notches. Even with the best facilities, the operation is fatiguing and difficult, and should not be resorted to if any other means are available.

The size of the cocoon filaments varies with the kinds of silk, therefore, to ensure greater accuracy, the quality of the silk should be known. The following table gives the approximate size of filaments of mulberry silk from various countries:

COUNTRY OF ORIGIN.	WEIGHT OF 500 METRES in *Derniers.*	in *Milligrammes.*
Spain	3.0	163
France	2.6	138
Italy	2.4	128
Syria	2.4	128
Caucasus	2.3	125
Brousse	2.2	117
Japan	2.1	113
China	2.0	108
Bengal	1.2	64

Artificial Silks.

The manufacture of this fibre forms a most important industry in France, and since an immense amount of it is consumed in this country, a description of the various methods practised abroad, may be of interest to our readers.

There are three varieties of artificial silk, viz: *Chardonnet,* or nitro-cellulose; *Givet,* or cuproammoniacal; and *Viscose* or Xanthate cellulose. There are five prominent mills in France in which these three methods are employed, viz: the Chardonnet, at

Besançon, which produces from 1,763 to 2,204 pounds per day; the Givet process, at Givet, in the Vosges, which produces 1,763 pounds per day—this company has a smaller factory at Izieux, Loire, which turns out about 440 pounds per day of silk hair (crin)—and the viscose company, at Arques-la-Bataille (Seine-Inferieure) which produces 1,763 pounds per day, and which is expected by this time, to have a capacity of 2,645 pounds—this company has another viscose mill at Vals, which produces 440 pounds per day, and will soon turn out 771 pounds per day.

There is no important manufacturer of artificial silk in our country, although we consume about 882,000 pounds per year.

The Givet is an improvement on the Chardonnet process and the Viscose is an improvement on the Givet. It may be roughly stated, considering the quantity of production, consumption, freight, and wear and tear of machinery, that the cost of production is $2.70 to $2.90 per kilo (2.2 pounds) for the Chardonnet, $2.30 to $2.50 for the Givet, and under $2 for Viscose.

The Viscose method embodies as far as appearance, quality, touch, and cheapness are concerned, all the finest and best qualities. Instead of employing the expensive raw material, such as cotton, at 20 cents per kilo, ordinary wood pulp is used at 5 cents per kilo. Instead of using expensive dissolvents, such as alcohol or ether, ordinary water is sufficient.

Artificial silk is employed in France usually as filling in goods manufactured for the Orient, where brilliant coloring is admired; it is also used as linings, for scarfs, skirts, mixed cottons, and for upholstery. It has been employed in taffetas and as umbrella covers. At present there is a demand from here, in France, for a sort of heavy tulle made of ovale of 500 deniers of artificial silk. This material will be fashionable next season, being used on dresses as a trimming over a foundation of satin or taffetas.

The actual daily production of artificial silk in France, amounts to about 44,000 pounds. About 30,000 hands are employed in the works manufacturing this material. It is exported chiefly to the United States and Germany, and it is reported that some is sent to Japan. This refers to the exportation of the thread and not the manufactured article.

The total annual demand for artificial silk from here, and purchased in France, Germany and Italy is about 882,000 pounds, but it may be half again as large, for this silk is employed in many kinds of textiles.

The average price of artificial silk, at present, is from $3.28 to $4.25 per kilo (2.2 pounds), according to the quality. When producers will be satisfied with a reasonable profit, or when the demand will not be far ahead of the production, the price, it is expected, will fall to $2.30 or $2.90.

New Looms for the "South." 208 Northrop looms are installed by the *"Louise"* of Charlotte, and 320 by the *"Cowikee"* of Eufaula; 200 Crompton & Knowles looms, by the *"Belle-Vue"* of Hillsboro, and 24 by the *"Pine Creek"* of Camden.

COTTON SPINNING.

The Ring Frame.

(Continued from page 144.)

The action of the traveler, as well as the principle of winding on empty and full bobbin, is readily explained in connection with illustrations Figs. 268 and 269, and in which the spindle is indicated by letter of reference *A*, the empty bobbin by *B*, the upper flange of the spinning ring by *C*, the traveler by *D*, the yarn, between the traveler and bobbin, by line *E*, the rotation

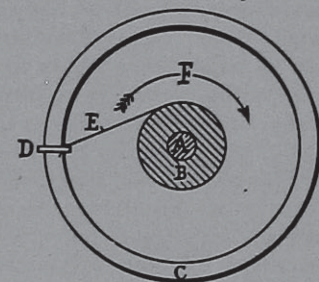

Fig. 268.

of spindle and traveler by arrow *F*, and in Fig. 269 the full bobbin by *G*. From these two illustrations it will be readily seen that with the full bobbin *G*, the pull of the yarn *E* is nearly parallel with the spinning ring *C*, permitting in turn the traveler to rotate with ease, whereas with the empty bobbin, see Fig. 268, said pull of the yarn *E* runs at a sharper angle, which must result in more strain on traveler (consequently also on the yarn) and more friction to traveler and ring, hence will not rotate traveler as freely as a full bobbin will do.

This has been one of the reasons why it is impossible to spin yarn on a bare spindle the same as done in the mule, and is the reason why a wood or

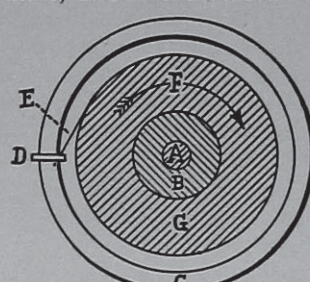

Fig. 269.

paper bobbin is used, *i. e.*, to thus make the angle of the direction of the pull of the yarn between traveler and bobbin less acute. Traveler would not stay on over an hour if the bobbins were empty, and not over half an hour if the bobbins were full. On the empty bobbins the traveler would pull so hard that it would soon become heated, thereby drawing the temper, causing it to become soft and quickly wearing out. On the full bobbin the centrifugal force of the yarn in ballooning, when the ring rail was down, would cause the traveler to wear out half way up to the circle or bow.

The angle which the yarn forms in traveling from traveler to bobbin with the ring, consequently regulates the ease with which the traveler can be pulled around the ring, since it needs no elaborate mathematical calculations to prove that in consequence of the small angle formed by the yarn between *D* and *G* in Fig. 269, the traveler is pulled rather easily round the spinning ring, since the line which the traveler has to follow (the ring) almost coincides with the line formed by the yarn pulling it, see arrow *F*. On the other hand, the pull of the yarn *E*, between traveler *D* and bobbin *B*, shown in Fig. 268, if compared to the direction the traveler has to revolve (the ring), it is pulling it at a rather sharp angle and consequently a large portion of the force centered on the traveler is spent in binding the latter against its spinning ring, in turn resulting in a higher tension for the yarn to make it revolve (pull) the traveler round its ring.

The difference between the speed of the traveler and the speed of the bobbin equals the surface speed of the pair of front drafting rolls divided by the respective circumference of the bobbin, and since the bobbin in building up increases in diameter, this difference between the speed of the bobbin and traveler, *i. e.*, the lag of the latter to permit winding to take place, must decrease. The traveler, therefore, has a variable speed, increasing as the diameter of the bobbin increases. This has, of course, some slight effect upon the amount of turns of twist per inch, since the amount of twist depends upon the speed of the traveler. Hence, there is slightly more twist in the yarn wound on a full bobbin than in that wound on an empty bobbin.

To explain difference in wind between empty and full bobbin, let us consider for example that the diameter of *B* in Fig. 269 is $\frac{5}{8}''$ diameter and that of $G=1\frac{1}{2}''$ diameter. $\frac{5}{8}''$ diameter $(\frac{5}{8}\times3.1416=)$ $1.9635''$ circumference of empty bobbin, and $1\frac{1}{2}''$ diameter $(1\frac{1}{2}\times3.1416=)$ $4.7124''$ circumference of full bobbin. Now suppose the traveler is held stationary and *B* given one turn, then there would be 1.96" of yarn wound, whereas if this case were considered with *G*, it would mean that 4.71" were wound. Provided the traveler in its revolution around the bobbin would not lag behind the revolution of the latter, the former would then travel around the ring a distance equal to the particular circumference of the bobbin, and which in our example quoted would vary all the way from 1.96 inches to 4.71 inches, and since each rotation of the traveler gives one turn of twist to the yarn, a considerable difference in the turns of twist per inch will be produced; which, however, is equalized and consequently hardly noticeable on account of the lag of the traveler behind its mate bobbin, and only enough to wind the yarn on its bobbin. However, it must be remembered that the difference, no matter how little, in amount of twist in the yarn, between empty and full bobbin is present.

We will now explain the difference in turns of twist per inch in connection with an example. Suppose bobbin makes 90 revolutions, by the time the front drafting rolls deliver 10 inches of yarn and when the twist then practically is called $90\div10=9$ turns per inch.

Considering circumference of empty bobbin, as quoted in the preceding example, as 1.96 inches, the same will have to make $(10\div1.96=)$ 5.1 revolutions, in order to permit winding on of the 10 inches of yarn delivered by the front drafting rolls. The traveler, considered with speed of bobbin, will consequently make only $(90-5.1=)$ 84.9 revolutions to every 90 revolutions of the bobbin, in order to wind the 10 inches of yarn then on the bobbin.

Since, however, only at every revolution of the traveler the yarn actually receives one turn of twist, the actual twist then put in the yarn will be obtained by dividing the revolutions of the traveler thus obtained by the inches of yarn delivered by the front drafting rolls during the same time, and $84.9\div10=8.49$ turns actual twist.

Now let us ascertain actual twist put in the yarn when bobbin about filled and which in the preceding example we then quoted at $1\frac{1}{2}''$ diameter$=4.71''$ circumference, and when we will find that the same will have to make $(10\div4.71=)$ 2.12 revolutions. The traveler will make $(90-2.12=)$ 87.88 revolutions to every 90 revolutions of the bobbin, in order to wind the 10 inches of yarn then on the bobbin. The actual twist then put in the yarn will be $87.88\div10=8.78$ turns, actual twist.

This will clearly demonstrate that although there is a difference in turns of twist per inch between the empty and filled bobbin, the same is very little, and actually of no consequence, since this difference $(8.78-8.49=0.29$ turns, or about $\frac{1}{4}$ turn in the present example) is distributed gradually from the empty to the filled bobbin. For all practical purposes, this difference in turns of twist can be ignored, since it only will amount to about one or two per cent. more twist on a bobbin nearly full as compared with the same bobbin when just started.

In connection with spinning filling, it will be less than this, since on account of the constant change in the diameter of bobbin in this wind, the twist will equalize itself more or less uniform throughout the entire bobbin, on account of the length of yarn between the front drafting rolls and the traveler and into which the twist runs.

The quick revolution of the traveler will in turn exert a centrifugal action to the thread, between thread guide and traveler, technically known as ballooning, forcing in turn the traveler towards the outside of the ring, and what will counteract to some extent the pull of the yarn inside the ring, and to a considerable extent reduce the friction of the traveler on the ring, as the traveler is thus subject to two tensions, the result of the two tending to some extent to lift the traveler on its ring, or at any rate to press less on the ring. This advantage to less wear on the traveler, however, is counteracted again to some extent by the action of the separator blades, if such are used, which have for their object to reduce this ballooning of the yarn. If the yarn is allowed to balloon, a heavier traveler can be used, which for several reasons is desirable.

(*To be continued.*)

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We will always be glad to receive articles of a practical nature relating to the textile industries, and will publish such as are available.

EUROPEAN AGENTS: Sampson Low Marston & Co., Ltd., 100 Southwark Street, London, S E., England.

The Prince of Wales, in the name of the King, opened the International Congress of Applied Chemistry in London, May 27.

He was accompanied by the Princess and was escorted to the platform by Whitelaw Reid and other members of the Diplomatic Corps. The Prince spoke enthusiastically of the important part that chemistry had played in almost every branch of modern industry.

Dr. Hamey W. Wiley replied for the United States. His invitation to hold the next congress in the United States appears certain of acceptance.

Big Dry Goods Combine.

The world's greatest dry goods combination was launched May 21st, with a capital of $51,000,000, three times that of the Associated Merchants' Company, up to this time the largest aggregation of capital in the dry goods business. John Claflin, president of the Associated Merchants' Company and of the firm of H. B. Claflin Company, it is reported is at the head of the new company, which has been named the United Dry Goods Companies of New York.

We are pleased to announce that Mr. H. P. Page has associated himself with us as Business Manager of the Journal. He is a practical Textile man, knows the trade personally, having been formerly connected with Joseph R. Forster and Sons of Philadelphia, leaving them to accept the Secretaryship of the Philadelphia Mercerizing Co.

Mr. Page will give his undivided attention to the outside business of the Journal, doing everything in his power to increase its efficiency and value to all interested in the textile trade.

Obituary.

Colonel Frank Woodbridge Cheney died suddenly at his home in South Manchester, Conn., May 26, after an illness of only a few minutes, at the age of 77.

For many years Col. Cheney had been the recognized head of *Cheney Brothers,* though for a long time his position had been that of treasurer.

He was the son of Charles Cheney, one of the founders of the firm, and was born in Providence, June 5, 1832. In 1858 he went to Japan to make a study of the silk business, he having been one of the first business men to enter the then almost unknown country.

He returned at the outbreak of the Civil War, enlisted in the Sixteenth Regiment, Connecticut Volunteers, August 16, 1862, and was mustered into service August 24 and appointed Lieutenant-colonel. He took part in the Battle of Antietam, in which he was so severely wounded that he was discharged the following December. He was life President of his regimental organization, also life President of the Connecticut Army and Navy Clubs.

The Cheney industry at South Manchester dates from the time Timothy Cheney, who died in 1795, established a grist mill on the stream which passes through that place. His house is still preserved as the Cheney homestead. George Cheney, his son, lived in it after him, and the *Cheney Brothers* were the sons of the latter. Charles Cheney, the father of Col. Frank W., was one of these brothers.

Col. Cheney was the third President of the Silk Association of America, having been elected to succeed his uncle, Ward Cheney, when the latter died in 1876. He held this position until 1898—a period of twenty-two years, by far the longest term of office of any president of the organization. Since that time, he had been one of the board of managers of the Association, and for several years chairman of the Committee on Revenue Laws.

He visited the New York office of Cheney Bros., almost every week and was active in the management of the corporation up to the last.

In his home State he was respected as one of the State's leading citizens as well as a great industrial leader. He was a dominant figure in the silk trade, and his opinion on almost every subject connected with business carried with it the weight of finality.

His cousin, Frank Cheney, is President of the Company, Charles Cheney, Col. Cheney's eldest son, the Assistant Treasurer, Horace Cheney attending to the practical management of the Concern.

Japan now holds second rank as a silk-producing country, China standing first, Italy third and France a very bad fourth.

No country, however, has shown such phenomenal progress within recent years as Japan, due to the extreme attention and solicitude with which the industry has been fostered by the Government. Japan depends on the silk crop for its prosperity, raw silk constituting more than one-fourth of its exports.

The past month developed two important phases of international patent complications.

Great Britain exercised her right under a law passed two years ago and has canceled an important American patent because the goods were not manufactured in Great Britain. The American company is without redress, since to establish a factory in Great Britain would be to expend more money than the patent is worth, seeing that in any event it had not many more years to run. Other patents are soon to be canceled and there is some uneasinesss among Americans. The British law is a protective measure pure and simple. It is based on the same theory as our protective tariff laws, Great Britain only taking a roundabout method to accomplish the same thing.

The other instance was a denunciation of our patent and copyright laws in the German Reichstag. Last winter we made a treaty with Germany on the subject, which was duly ratified, and now the Germans are complaining that we got the best end of it. Germany now wants the whole subject of patents and copyrights to be settled by a new international agreement. Academically this is a good proposition, but it seems unlikely that any nation will give up present advantages until it gets compensation elsewhere, as the diplomatists used to say.

The finally revised figures for the crop of 1908, according to Bulletin 100 just issued by the Bureau of the Census, expressed in equivalent 500-pound bales and including linters, show a total production of 13,587,306 bales. This represents an increase over 1907 of 2,211,845 bales, or 19.4 per cent. It is the third largest crop ever produced, being exceeded only by the crops of 1904 and 1906, and is 978,751 bales larger than the average crop of the last five years.

The crop of 1908 is remarkable for its excellent spinning qualities and cleanliness. Measured by its yarn producing qualities, the crop of 1908 is believed to be the most valuable ever grown. The value of the crop to the growers is estimated at $681,230,956, of which $588,814,828 represents the value of the lint and $92,416,128 the value of the seed.

In spite of these facts, more and better cotton, has been disposed of by the growers at approximately $20,000,000 less than that of 1907.

The world's production of cotton for mill consumption in 1908 is estimated at 19,574,000 bales of 500 pounds net. The production in the United States represents 66 per cent of the total commercial cotton produced. British India, which ranks second, producing 15 per cent; Egypt, 7 per cent, and Russia, 4 per cent. Most of the remainder is produced in China and Brazil, while smaller quantities are contributed by Mexico, Peru, Turkey, Persia and several other countries.

Not less than 9,000,000 persons are employed in producing, handling and manufacturing American cotton, of whom some 6,000,000 are farmers and farm laborers, 1,000,000 otherwise engaged with the fibre in this country and about 2,000,000 are concerned with it in foreign countries. The value of the goods manufactured from the average American cotton crop is estimated at $2,000,000,000.

ARTIFICIAL WOOLS.

(*Continued from page 148.*)

Points on the Dyeing of Shoddy.

For this purpose the ordinary open dyeing kettles are convenient and low in cost to install, while the repairs are merely nominal. On the other hand, the revolving dyeing machines of the well known *Klauder-Weldon* type, although apparently at first consideration seeming somewhat complicated, are a great deal more economical, saving in dyestuff and steam, besides producing better results in dyeings; hence any mill contemplating to manufacture and dye its own Shoddy Mungo or Extract, will find this mechanical dyeing process more satisfactory than the old fashioned open kettle.

In most instances, the shoddy is to be dyed a darker shade than that which it already has, in which case no other treatment is necessary than to boil it up, to remove oils, etc., previously to dyeing it. This boiling or scouring is omitted by many dyers, they proceeding at once direct with dyeing.

If shoddy has to be dyed a somewhat lighter shade or color than that which it possesses, stripping must be resorted to previously to dyeing. Stripping means to reduce the shade or density of the color the shoddy possesses, so as to permit it being dyed much lighter shades than would otherwise be possible. In no case can we remove all the color, but results obtained in this way by the experienced dyer are in most cases quite satisfactory. For stripping before dyeing, boil a small sample (a few ounces) of the shoddy to be thus treated, in a suitable vessel, containing about 5% of sulphuric acid. If this does not give the desired result, make a trial with 3% bichromate of potash, and 5% sulphuric acid. If this chrome treatment does not remove the color, or if the color of the stock is too yellow for subsequent dyeing, then make a trial with hydrosulphite of soda, prepared as follows: Take 10 gallons of sodium bisulphite, 35°B., and dilute with an equal volume of water, and gradually add 10 lbs. zinc dust, with constant stirring; allow to settle, and decant from 4 to 6 gallons of the clear liquor, which add to 100 gallons of water, together with ½ gallon acetic acid. This gives the stripping bath, in which the shoddy is worked for 20 to 30 minutes at a temperature of 140°F., after which it is removed, washed well, and made ready for dyeing. Try to accomplish result with one treatment, *i. e.,* do not calculate on repeating the process, remembering that repeated treatments will weaken the fibres.

For shoddy that has been stripped with acids, etc., no acids need be added to the dye bath, the coloring of the shoddy being done quite regularly at the boil.

In order to obtain good level results at dyeing, work the stock regularly during the process, adding in connection with light and medium colors the previously dissolved dyestuff gradually. After the dyeing is completed, the stock must be well washed previously to drying, otherwise the latter process will tender the fibres, besides more or less depreciating the general appearance of the finished fabric in the construction of which such unwashed shoddy has been used.

Testing Shoddy.

Testing Shoddy for Cotton Present: When buying a lot of shoddy, and you are not positive that it is *all wool,* a test should be made to ascertain if any and what percentage of cotton is present, for which reason a sample is taken out of one of the bales, and after weighing, is boiled for fifteen minutes in an 8°B. caustic soda solution, in which the wool will be dissolved, leaving cotton fibres, if any present, unchanged. These cotton fibres are then collected on a linen filter, and after washing with hot water, until all traces of caustic soda are gone, the fibres are dried and weighed, and the percentage calculated from the original weight. If the shoddy contains many impurities, the sample must be first washed with slightly acidified water, and afterwards with pure water, in order to remove these impurities, which, otherwise, would have been undissolved and consequently weighed as cotton. This estimation, however, gives only approximate results.

Testing for the presence of Shoddy in a lot of Wool. The chief characteristic test for shoddy in the presence of new wool, is its color, which is seldom uniform when seen under the microscope, the same always containing fibres of different shades and colors, especially in the cheaper grades of shoddies, whereas in the better grades, this difference is not so pronounced.

In testing for the presence of shoddy, it is advisable to treat the sample beforehand with warm hydrochloric acid, which will remove from the shoddy the color due to the second dyeing and leave the original dye clearly exposed, and as the new wool present was stripped of its color at the same time, leaving it more or less white, the two classes of wool fibres are easily distinguished.

Another microscopical test for shoddy is afforded by the appearance of the ends of the fibres, these being usually unbroken in the case of natural wool, whereas in shoddy, they are always more or less torn or ragged.

HOW TO TEST THE VARIOUS FINISHES OF COTTON GOODS.

When required to ascertain how a fabric, of which a sample has been submitted, had been originally finished, examine its external or physical properties, since a practical eye can detect at once if the fabric in question has been only calendered, or if starched on the back only or through the structure, etc.

Examining the fabric against the light it will show whether it has been starched or not. A heavily weighted cloth will lose much of its stiffness by rubbing it between the fingers. If, in tearing the sample, a lot of dust flies off, this indicates a weighted finish, (the more dust the heavier the weighting), and by the aid of the microscope we then may be able to detect whether the starching has been done only superficially or whether it has penetrated into the body of the structure, also if the same contains weighting substances.

The next point of value is *to ascertain the amount of moisture* in the sample, and which is done by carefully weighing a sample of a known size on a pair of fine scales and after recording this weight then drying the sample in a stove for some time, until there can be no further loss of weight, and when the sample is weighed again, and this weight subtracted from the first weight, the difference then indicating the amount of moisture in sample before it was tested, and from which answer it then will be easy to ascertain by means of proportion the percentage of moisture.

For example:

First weighing to be 6 grains.
Second weighing to be $5\frac{1}{2}$ grains.

Loss: $\frac{1}{2}$ grain.

and $6 : 5\frac{1}{2} :: 100 : x$; $\dfrac{5\frac{1}{2} \times 100}{6} = 91\frac{2}{3}$

and $100 - 91\frac{2}{3} = 8\frac{1}{3} = 8\frac{1}{3}\%$ amount of moisture in sample.

Although this test and calculation will not show us the kind of finish, yet it is better to make it, since cellulose by itself is less hygrometric than starches, thus if there is a great percentage of moisture present it is a sure sign of the cloth being heavily starched.

To ascertain exactly how much foreign matter a fabric contains, treat as large a sample of the fabric under discussion, as can be conveniently handled, after first weighing it with distilled water, containing malt; let it diaggregate, then wash, dry and weigh it. With this experiment the difference in the two weighings indicates the quantity of foreign substances deposited on the fabric; however there may be certain insoluble soaps (softeners) still in the fabric, and for which reason the sample must then be boiled in a weak acid solution in order to remove any fatty substances still adhering to the structure. After this boil, dry sample, weigh again and subtract this weight from the first weighing, the difference between both weighings being the amount of dry finishing matter in the sample and from which, by following calculation given before, it will be easy to ascertain the percentage. However we must also remember that when testing printed or dyed goods, that all colors are more or less attacked by acids.

The next procedure will be *to ascertain the constituents used for starching, weighting or finishing* and for which treat with boiling water for a few hours, which will remove the feculæ, starches, thickenings, gums, soluble salts, alum, sulphates, chlorides, etc., as well as all mineral or earthy matters, after which, by means of filtering, separate the soluble from the insoluble substances.

In order to ascertain the nature of those soluble substances, evaporate part of the liquid, treat a few drops with tincture of iodine, which will reveal starchy substances by turning blue. If no starch present, concentrate the whole solution adding two or three times its volume of alcohol and when glue, dextrine and gum are precipitated. A tannin solution in turn will reveal the presence of gelatine by precipitating the same.

In order to distinguish *gum* from *dextrine* use the polariscope, and when dextrine is diverted to the right, gum to the left. The mixture of the two can be sufficiently indicated by basic acetate of lead, which when cold will precipitate gum but not dextrine, whereas when warm, both. If no precipitation is obtained, but an organic substance still shown by the incineration on the platinum blade, then this indicates the presence of mosses, lichens, etc. Sugar is found by Fehling's liquor, before and after interversion; add to the tolerably concentrated aqueous liquor, a few cubic centimetres of pure hydrochloric acid, ordinary concentration, warm in water bath in an apparatus with reflux refrigerator and treat with copper solution. If desired to more closely examine the soluble mineral substances, employ the usual methods of analytical chemistry.

China clay or any other matter as was used for weighting purposes in the sample will be found in the residue insoluble in water, alabaster, gypsum and talc or French chalk, provided such should have been used, in the weighting compound, being also found in this residue.

Resin is detected by boiling the sample of cloth with carbonate of soda, which will dissolve it, its presence then being shown by the precipitate of sylvic acid as is obtained from the liquor when treated by an acid. Other fatty substances do not give any precipitate, but an oily fluid which swims on the surface of the liquor.

Glycerine, if present will be also found in the watery solution and is detected, after evaporation by treating with sulphate of potash.

To ascertain the quantity of fatty matters used in a finishing compound dissolve the latter by means of ether, and when after evaporation the weight of the residue expresses the quantity of fatty matter. By treating this residue with boiling water we then can ascertain if any soluble substances are in the water.

It certainly will be next to impossible to ascertain the exact proportions of the various substances as have been used in finishing a certain fabric submitted for analysis, however having obtained the nature of the substances used, and obtained a fair idea of about the proportions of each used, it then will be an easy matter for the practical finisher to judge on what substances to use on his part and the proper proportions of each, in order to duplicate said finish.

WOOL SCOURING AND DRYING.

(*Continued from page 146.*)

Drying, The "Table" Dryer, The "Continuous" Dryer, The "Stone" Dryer, The "Proctor" Steel Dryer, The "Hurricane" Dryer, etc.

Wool is very hygroscopic, quickly absorbing moisture from the atmosphere, and which it holds with considerable energy. Under ordinary conditions the wool fibre contains about 14% of its weight of moisture; which however is greatly influenced by the

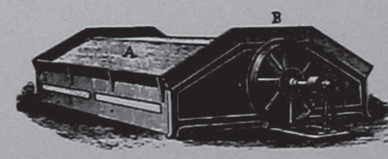


FIG. 9.

hygrometric condition of the atmosphere. In addition to surface condensation the moisture is in all probability, according to Prof. W. M. Gardner, located actually within the individual cells, since the membranous cell walls are permeable to water. This is no doubt the reason why it is so difficult to drive off the whole of the water, it being in fact impossible to remove the last portion of the moisture without partial disintegration of the fibre.

By drying wool at 120° F., a loss in weight of from 7 to 10% takes place, and on raising the temperature to 212° F., a further loss of 5 to 8% occurs. After drying at 120 deg. the wool will again absorb moisture from the atmosphere up to the original amount, but when dried to 212 deg. only part of the loss is regained, showing that some change has taken place apart from the mere loss of moisture. This view is supported by the fact that wool, heated for a long time at a temperature considerably below 212

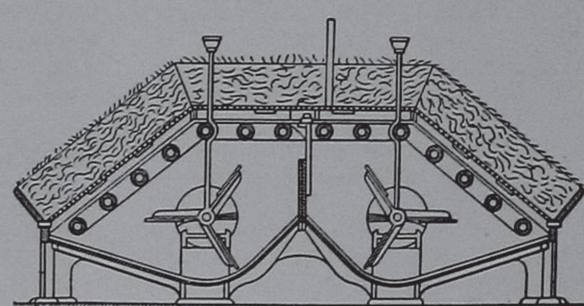


FIG. 10.

deg., gradually acquires a yellow color, becomes lustreless and brittle, and is much reduced in tenacity and strength. The question of the drying of wool is one of much greater practical importance than is generally supposed by textile men. Wool dried in the open air will always yield an article of higher quality than can be obtained from the same wool, when dried by means of artificial heat.

Although it is important that wool should be dried at as low a temperature as possible, it is of much greater importance that the fibre should *not be submitted to* the action of *dry* heat; that is to say, the drying process should *not* be continued after the moisture has all been evaporated. In fact, to put it another way, one may say that practically no injury is sustained even with a considerable degree of heat, *so long as moisture is being given off*, but immediately after moisture ceases to be evolved, the deterioration mentioned, commences. This naturally suggests a consideration of the methods in vogue for drying wool, and from what has been stated, the advantages and defects of the different forms of wool drying machines, illustrated and explained in this article, will be apparent.

In some mills, after scouring, the Hydro-extractor is employed to extract the rinsing water from the wool, whereas in most mills the rinsed wool is delivered directly from the squeeze rolls of the rinsing bowl into the automatic feed of the dryer.

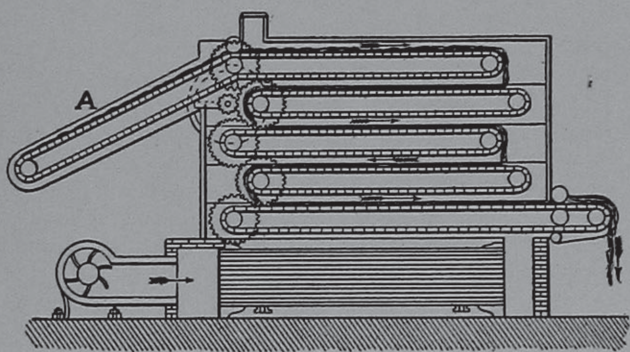


Fig. 11.

Wool drying machinery has met with more radical changes during the past twenty years than probably any other machine in a woolen or worsted mill. The table or screen may yet be met with in some of our smaller mills, but as a whole, the same has been superseded by machines of the continuous type, *i. e.*, machines of modern construction.

The Table or Screen Dryer is a large, flat or sloping table, covered with wire netting, and having wooden sides, with suction fan, adapted for either hot or cold air currents, passing either downward or upward through the wool, which is placed by hand on the screen table, and when dried, removed in the same way.

Fig. 9, shows us such a dryer in its perspective view. The wool to be dried is laid evenly on the entire surface of the wire netting *A*. The fan *B* is then started, drawing the air downward through the wool and forcing it outward through the fan opening in the end of the dryer.

Another method of using this dryer, with the previously referred to direction of air currents, is to enclose the upper surface in a chamber by casing around and above it, and carrying a circular steam coil around the inside of the enclosure thus formed, drying the wool with a current of air warmed by the steam pipes.

Fig. 10 shows in sectional end elevation another make of such a table dryer, hot air being forced in this case through the mass of wool, from underneath, by means of the fans shown in the illustration.

It is evident, that in connection with any style of these drying tables, some portions of the lot of wool under operation, will dry more quickly than others which may not be so favorably situated, the hot air naturally finding its way through the most thinly covered places, the drying thus being far from regular, some parts of the lot being dried too much, some too little.

Recognizing this disadvantage as well as the fact that in large mills this system of drying wool kept many men employed, and what's more, that these tables occupied a great deal of floor space, and that the process was a slow one, different styles of dryers have been designed to take the place of these old-fashioned table dryers, to save the expense of hand work and besides do the work more uniformly. To dry wool quite evenly throughout, it is necessary to change its position frequently, but this must be done in such a way that no rolling or matting takes place.

A good machine must get all the wool uniformly dry, regulate the amount of moisture in the wool exactly, avoid matting, result in production with as little expense in labor as possible, require as little floor space as possible, and finally use as little steam and power as possible.

These requirements gave rise to the contsruction of what is known as

Continuous Wool Drying Machines, and of which Fig. 11 shows us a specimen in its section. In this machine, the wool (shown shaded) is carried by the feeding-apron *A* to the top of the drying chamber, traveling along from which it falls on to a lower endless apron, which is moving in the opposite direction. In this manner the wool gradually travels down the machine, presenting a fresh surface to the current of hot air each time it passes from one apron to another, and thereby the drying is considerably equalized. A current of warm air is forced through the apparatus by means of a fan.

(*To be continuea*)

AIR CONDITIONING FOR TEXTILE MILLS,

Giving also a Description of the Construction and Operation of the Most Important Systems of Humidifiers in Use.

By H. P. Page.

The importance of this subject is explained by the fact that, for instance, previous to the adoption of artificial means for the conditioning of the air in our cotton mills, it then was out of question to spin the fine qualities and high counts of yarn spun at that time in Europe, for the fact that the atmospheric conditions in our country are not so suitable to Cotton Manufacture, as compared to those of Europe. Even now, with all the various makes of Humidifiers, *i. e.*, Air Conditioning Apparatuses, at our disposal, it is difficult, at times, to maintain the air in mills in suitable condition for successful manufacture, both as to production and quality of work, all the year round.

All persons engaged in, and in charge of one or the other department of a textile mill, cannot help but have noticed changes in the condition of their work, retarding the latter; and for which no satisfactory explanation can be given.

Free electricity is given off in all the various departments of Textile Manufacture, Cotton—Wool—Silk, the same being still more increased by the continual higher speed of textile machinery aimed at in order to push production, a feature which in turn increases friction, generating larger quantities of atmospheric electricity. The latter will not only dry the air, but at the same time affect the yarn in process of manufacture, resulting in what is called *oozy* yarn, excessive waste by *ends* more frequently breaking down, excessive *fly*, a yarn of a reduced strength, *i. e.*, a yarn inferior in quality.

For this reason, we must try and produce in the work rooms, artificial atmospheric conditions of the right degrees so as to counteract this free electricity as well as to condition the fibres for perfect work. G. B. Wilson in his Work on Air Conditioning states:

"The question therefore resolves itself into producing artificial conditions, where natural ones are unfavorable, which will enable the processes of textile manufacture to be carried on under the most favorable conditions, both to the materials and to the operatives.

The problem presents three distinct points for consideration, and these should be solved collectively in order to obtain the most perfect conditions.

They are as follows:

(1) In all seasons to be able to maintain in all parts of a building an elevated degree of humidity appropriate to the fabrication, and the ability to vary this humidity when necessary.

(2) To renew the air in a room in such manner as to conform to the hygienic requirements, and appropriate to the style of work.

(3) To maintain the temperature within certain limits; to heat in winter as economically as possible, and to cool in summer.

Mr. Wilson further mentions that the second point requires more than a little consideration, and although more attention has been paid to power ventilation here than in any other country, textile mills seem to have paid little or no attention to its advantages, even in the face of the fact that process after process has been invented and put on the market abroad, which combine ventilation with humidification.

Operatives who are constantly working in a mill get used to an average temperature of 80 deg. to 90 deg. F., and complain if this temperature is reduced, and this feature must be borne in mind by the owner in ventilating his mills. In installing ventilation, the aim must therefore be to give sufficient air to produce good hygienic conditions and at the same time not reduce the temperature to too low a degree; if, however, the operatives can be made to see the advantages of cooler rooms, it seems to be to the advantage of the proprietor to do so.

It will be readily understood that if a certain number of human beings are shut up in a room for hours, without ventilation, a great quantity of CO_2 will accumulate, and as a room is more or less sealed, the hygienic conditions will become very unfavorable, as will at once be noticed by anyone entering the room from the fresh air outside. Seeing that the specific gravity of CO_2 is greater than that of the air, it has a tendency to drop down and means must be found to keep the room in good hygienic conditions, to either force the air out or extract it.

Leaving the question of ventilation for the moment, a description of the hygrometric conditions may be of some interest.

Air always contains a certain proportion of water vapor, but in extremely variable proportions. The absorbent capacity of air for water varies with the temperature, and the two factors of humidity and temperature are directly interdependent. For example, at 60 deg. F., air can only absorb 5.8 grains of aqueous vapour per cubic foot of air, whereas at 86 deg. F. it can absorb 13.2 grains per cubic foot, and so on to a greater degree in proportion to every degree rise in temperature. It follows, then, that when saturated air is cooled, there is a separation of water in the form of fog or condensation. If saturated air is cooled from 86 deg. F. to 60 deg. F. there is $13.2 - 5.8 = 7.4$ grains of water per cubic foot separated, and yet the air at 60 deg. F., still remains saturated. This is the reason why it is advisable before stopping work evenings, to reduce the hygrometric condition of the room by 0.8 grains or more of water per cubic foot of air, *i. e.*, to counteract the drop in temperature, since if the latter came too sudden and no provisions made for it, the condensation would take place on the machinery in the room, whether looms or spinning machinery, whether a cotton, worsted or silk mill.

(To be continued.)

Important to Manufacturers.

SULPHUR DYES AND SILK. The sulphur dyes are most useful on silk, specially for mode shades, giving dyeings fast to light and washing. Silk having no very pronounced affinity for these dyes, dark shades require dyeing at the boil, whereby both the strength and the lustre of the silk suffer, unless glucose is added to the bath in quantities twice as great as those of sodium sulphide used. Dyeing at the boil is best done on bent sticks, and is to be followed by a thorough rinsing and brightening with acetic acid.

NOVELTIES IN DRESSGOODS.

FROM ABROAD.

Cheviot Diagonal (Piece Dye).

Warp: 2460 ends, 2/30's worsted cheviot, in the grey.
Weave: See **Fig. 1;** Repeat 12 by 12; 12-harness straight draw.
Reed: 13 @ 3 ends per dent; 39 ends per inch; 58" wide in reed.
Dress: 5 Sections @ 492 ends.
Filling: 42 picks per inch, 2/30's worsted cheviot, in the grey.
Finish: Cheviot finish, full slightly at scouring, dye dark green or any other fashionable color, clear face on shear, press, 52" finished width.

Fig. 1

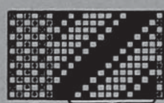


Fig. 2 x6

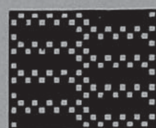


Fig. 3

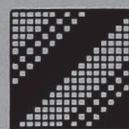
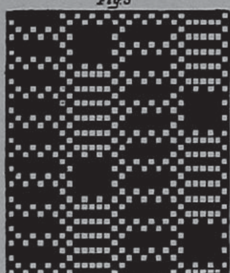
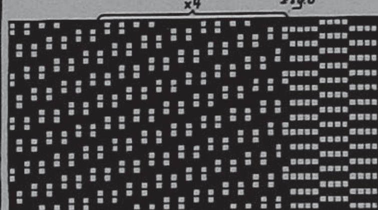


Fig. 4

Fig. 5



x4 Fig. 6



Diagonal Dressgood (Cord effect).

Warp: 3888 ends, 1/10's and 1/48's worsted, in the grey.
Weave: See **Fig. 2;** Repeat 81 by 12; 14-harness fancy draw.
Reed: 19½ drawing 1 dent 1 end
1 " 3 ends
1 " 1 end
19 dents 4 ends
—
22 dents carrying 81 ends or one pattern; 54½" wide in reed.
Dress: 1 end 1/10's worsted, extra hard twist.
3 ends 1/48's worsted, regular twist.
1 end 1/10's worsted, extra hard twist.
76 ends 1/48's worsted, regular twist.
—
81 ends, repeat of pattern.
8 Sections @ 486 ends; 6 patterns to section.
Filling: 57 picks per inch, 1/48's worsted, in the grey.
Finish: Scour well, dry, singe, dye light gray or any other fashionable color, clear face on shear, press, 50" finished width.

Plain Bedford-cord (Piece Dye).

Warp: 4520 ends, 2/64's worsted, in the grey.
Weave: See **Fig. 3;** Repeat 20 by 4; 10-harness fancy draw.
Reed: 22 @ 4 ends per dent; 88 ends per inch; 51⅜" wide in reed.
Dress: 10 Sections @ 452 ends.
Filling: 80 picks per inch, 1/48's worsted in the grey.
Finish: Scour well, dry, singe, dye salmon or any other modern color, clear face on shear, press, 48" finished width.

Dressgood (Two Color Diagonal).

Warp: 5036 ends, 2/64's worsted, bleached.
Weave: See **Fig. 4;** Repeat 16 by 16; 16-harness fancy draw.
Reed: 21 @ 4 ends per dent; 84 ends per inch; 59¾" wide in reed.
Dress: 11 Sections @ 454 ends.
Filling: 85 picks per inch, 1/48's worsted, light green mix.
Finish: Scour well, dry, clip on shear, press, 48" finished width.

Figured Bedford-cord (Piece Dye).

Warp: 4576 ends, 2/64's worsted, in the grey.
Weave: See **Fig. 5;** Repeat 30 by 18; 10-harness fancy draw.
Reed: 22 @ 4 ends per dent, 88 ends per inch; 52" wide in reed.
Dress: 10 Sections @ 458 ends.
Filling: 85 picks per inch, 1/48's worsted, in the grey.
Finish: Scour well, dry, singe, dye navy blue or any other modern color, clear face on shear, press, 48" finished width.

Corkscrew Suiting (2-color cord effect).

Warp: 5376 ends, 2/64's worsted.
Weave: See **Fig. 6;** Repeat 128 by 26; 15-harness fancy draw.
Reed: 22 @ 4 ends per dent, 88 ends per inch; 61⅛" wide in reed.
Dress: 116 ends 2/64's worsted, black.
4 " " " , medium green.
4 " " " , navy blue.
4 " " " , medium green.
—
128 ends repeat of pattern.
14 Sections @ 384 ends, 3 patterns to section.
Filling: 95 picks per inch, arranged thus:
1 pick 2/64's worsted, black.
1 " 2/64's worsted, medium green.
—
2 picks in repeat of pattern.
Finish: Scour well, dry, clear face on shear, press, 56" finished width.

RIBBONS, TRIMMINGS, EDGINGS, ETC.

By O. Both.

Velvet and Plush Fabrics.

(*Continued from page 98.*)

(b) WARP VELVET AND PLUSH.

Two systems of warp threads are used in the construction of these fabrics.

(1) the warp for the body or ground structure.

(2) the pile warp.

The body or ground warp threads form, by interlacing with the filling, a solid fabric structure.

The pile warp threads are interwoven with an easy let-off, interlacing off and on into the body structure. After a certain number of picks have been interlaced, all the body warp threads are then made to remain in the lower shed, and when in connection with smooth (plain) plush structures, all the pile warp threads are raised, and in connection with figured velvet or plush fabrics such of the pile threads are raised as is then required to be done by the design. At this pick no filling is entered, a brass or steel wire being in its place inserted between the body structure and the raised pile warp threads, the latter thus forming loops, their height depending upon the height of the wires used. These pile warp threads are in turn afterwards interlaced into the body structure of the fabric.

Two kinds of pile wires are used, destined respectively either for uncut or cut pile.

The first are either round or rectangular in their section, resulting in what is termed loop piles in the fabric.

The other kind of pile wires are again of two constructions; either they have one of their ends formed, *i. e.,* enlarged and shaped, into a knife, which severs the loops when the wire is pulled out, or they are plain wires, provided on their top with a groove into which extends the knife of the *trevette* and which knife travels therein across the width of the fabric. Either kind of wires used results in what is known as cut, velvet or plush pile.

Using cut and uncut pile wires in one fabric, the cut loops are frequently produced by raising said pile warp threads above two wires, a cut and an uncut pile wire, this procedure resulting in a somewhat higher cut pile, permitting a clipping of the cut pile later on, on the shear, without the revolver blades of the latter touching the uncut pile.

An interesting feature to note is the fact that in connection with uni-colored fabrics, figured with cut (velvet) and uncut (loop) pile, the first will show a darker shade.

The number of wires to use per inch at the loom, depends upon the character of the fabric structure.

In connection with Double Plush, two body fabric structures are woven on the loom, one situated above the other. The pile warp threads interlace in both structures, traveling between said points of interlacings, from one fabric structure to the other. The pile thus woven is in turn automatically severed during weaving by a knife traveling near the breast beam of the loom, most accurately in the centre of the pile, thus severing said double cloth structure into two single cloth fabrics. Two small grindstones are provided and over them the knife travels thus keeping itself automatically sharp, for a perfect severing of the pile warp threads. One of these grindstones acts, *i. e.*, comes in contact with the one side of the knife, whereas the other grindstone (as located on the other side of the loom) keeps the other side of the knife's edge properly sharpened.

In connection with ribbon weaving, warp pile weaves are used with velvet ribbons, belts, etc.

Fig. 98 shows us a *pile-up* weave, using one system of pile warp (see *cross* type) in connection with two picks ground and one wire. At the right hand side of the weave, the scheme for the filling is given, ground picks being indicated by *full* type, wire, by *dash* type.

Fig. 99 illustrates a double plush weave, using one system of pile warp with a *pile-up* interlacing.

Fig. 100 shows us a *pile-through* weave using one system pile-warp, (see *cross* type) in connection with four ground picks to alternate with one wire. At the right hand side of the weave, the scheme for the filling is given, the ground picks being indicated by *full* type, the wires, by *dash* type.

Fig. 101 shows us the weave for a carriage border, constructed with two ground picks, two figure picks, using every time as the fifth pick a wire. The back warp interlaces with taffeta, the face pick is bound by three ends taffeta, of which every time the first and third interlaces with the back structure. One stuffer warp thread rests in every repeat of the weave, between face and back structure.

The four pile threads, considered in rotation from left to right in our weave, interlace respectively in:

1st end, *pile-through;*

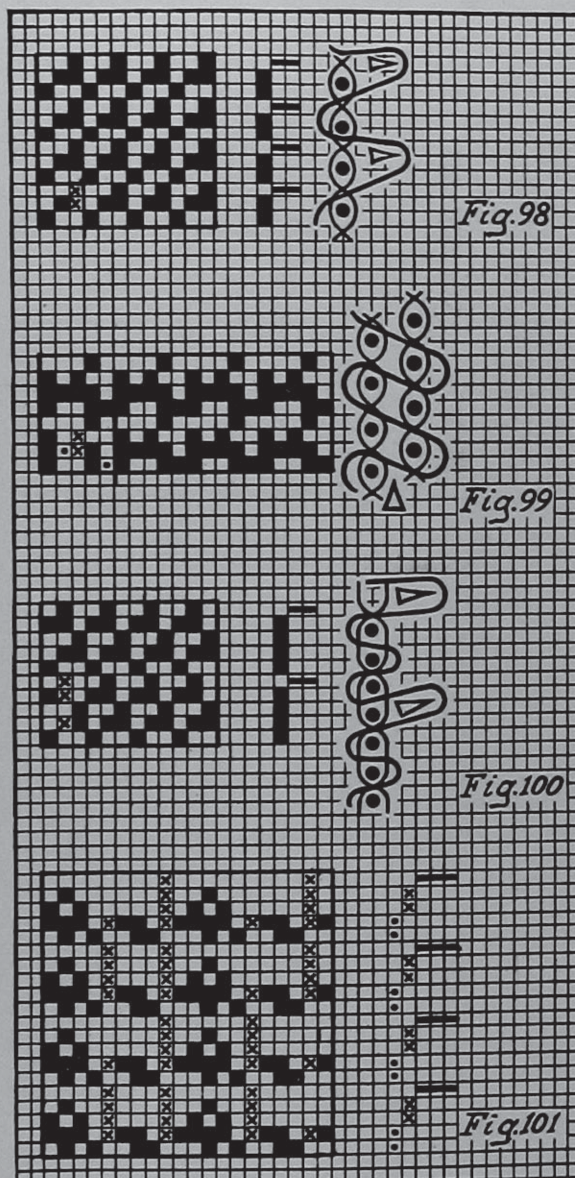
2nd end, *pile-up,* and

3rd and 4th end, part the time *pile-through,* the other time *pile-up.*

In order to accommodate the varying take-up, either pile warp comes from a separate beam.

Threads 4, 6, 8, 10, 14, 16, 18, and 20 are back threads; threads 7 and 17 are stuffer threads; threads 1, 3, 11, 13, 2 and 12 regular warp threads; rows of squares 5, 9, 15, 19 (see *cross* type) indicate the interlacing of the pile warp threads.

At the right hand side of the weave is given again the scheme for the filling and the wire; the back picks being indicated by *dot* type, the face picks, by *cross* type and the wires, by *dash* type.



Double velvet ribbons are frequently woven with two fold picks, both bobbins traveling in the same direction through the shed, and not, as is the case with Rubber Elastics, in opposite directions.

For such entering of the filling, a double shed must be formed. The warp threads of the lower structure rise from the bottom to centre (height of the lower single shed); the warp threads of the upper structure rise from centre to top of upper shed (*i. e.*, the height of the upper single shed). The pile threads travel, the same as the binder threads in Elastics do, from one structure to the other, through the centre, hence have doubled the amount of distance to travel as compared to the ground warp threads of either ply of the double plush.

A loop pile effect, minus the use of wires, is occasionally produced in connection with ribbon weaving by using a heavy count of a cheap yarn, two picks in a shed, to interlace in place of a wire. In order that these two picks do not draw out of the fabric structure, they are made to interlace around a wire at the edges of the fabric, in the same way as is practised in connection with pearl edges. After the fabric comes from the loom, this waste filling is then pulled out of the fabric structure, re-wound and in turn re-used.

(*To be continued*)

A PRACTICAL TREATISE ON THE KNOWLES FANCY WORSTED LOOM.

By E. P. Woodward, *Master Weaver*.

(*Continued from page 104.*)

Setting the Brake.

When desired, the Knowles loom is equipped with a brake for the purpose of causing the lay to stop immediately after the filling stop motion has caused the release of the driving power.

The whole brake arrangement is of very simple construction. There are a few things concerning it, which it may be well to think about when adjusting it, so as to get the desired results, methodically and quickly.

The desired results should mean a brake which will be prompt in its action as soon as the filling stop motion calls it, and a mechanism so adjusted as to set the brake as early as possible and apply it as lightly as the timing of the harness cylinders and the lay momentum will permit.

The farther ahead of the beat or front centre of the crank shaft the harness cylinders are set, the earlier the brake must stop the lay, since the lay at the latest timing must stop just before the cylinders have finished moving the vibrator gears. When acting thus, it has accomplished its work, *i. e.*, stopped the loom on the same pick or shed as the filling broke on. This defines a loom stopping as late as it can and yet stop on the pick. This brake, commonly used, can now be described and also the setting and timing of the different parts.

It consists of the following parts:

(1) A brake band, which acts upon a flat friction ring, upon the back of the friction disc.

(2) A lever fulcrumed about twelve inches from the end to which the brake band is fastened, and the other end of this lever reaching to the front of the loom being arranged so as to be convenient for the weaver to release the brake, by means of the foot.

(3) An upright rod, carrying a collar and an open wound spring, the lower end of the rod connecting with the foot lever. At a suitable height, there is placed on this rod an adjustable cam, designed to come in contact with the shipper lock casting.

The upper end of this upright rod is drilled out to receive a locking bar (part of the brake lock), which is then set screwed to its position in the rod.

This part of the brake lock is held yieldingly (by a flat spring) against a plunger pin, fixed in the upper bracket through which the upright bar slides.

This locking bar, flat spring, and plunger pin comprise the brake lock.

(4) A protector lever, working against the plunger pin to cause the release of the brake; the end of this lever extends the necessary distance towards the stop motion (from the fulcrum point of the lever) to connect with a knock off device consisting of a bar running parallel with the shipper rod and placed above it.

(5) This bar extends from the stop motion to the tail of the protector lever and carries on the end. nearest the stop motion, a curved lever, designed to engage with the lug on the knock off lever or hook of the stop motion. The other end of this bar carries a toggle casting which acts upon its mate, as is mounted loosely upon the shipper rod. When properly adjusted this engages with the tail end of the protector lever.

(6) An arm adjustably fastened on the shipper rod: By means of this arm, the curved arm is made to act upon the knock off lever of the stop motion bringing it to the desired position when the complete shipping device is locked. By so doing, it leaves the knock off lever in proper position to engage with the stop motion dagger upon the absence of the filling, with the following results:

The knock off lever of the stop motion by means of the boss or lug, causes the curved arm to be thrown down and this, acting on the lever fastened to the shipper rod, releases the power from the face friction. At the same time (and by means of the same curved arm being thrown down by the stop motion dagger) the bar on which this curved arm is fastened is compelled to turn partly around in its bearings. By so doing, it causes the toggle casting, on its opposite end, to engage with its mate, loosely mounted on the shipper rod. This casting in turn acts upon the tail of the protector lever, causing it to swing on its fulcrum, in turn making its opposite end operate so as to release the brake lock (in the upper end of the upright brake bar) by means of the plunger pin. This releases the foot lever causing the setting of the friction brake and the stopping of the loom. The cam on the upright bar will now be found to be in the way of the shipper lock casting, thus preventing the operator from starting the loom until the brake has been released by means of the foot lever. This prevents a careless hand from making the loom fight the brake and also the possibility of making a shuttle smash at the same time.

So far, this article has treated of the brake parts involved, describing at the same time their motions. We will now discuss the setting and timing of the parts.

(1) Set the stop motion cam as late as possible and yet allow the wires to raise in time for the passing of the shuttle.

(2) Draw on the shipper handle and leave it locked.

(3) Set the curved lever against the boss of the stop motion knock off lever until the end of the lever is about $\frac{3}{16}''$ from its check lug. With these parts so adjusted, bring up the knock off lever on the shipper rod to an engagement with the curved lever and set screw of the shipper rod lever to this position. The locked shipper rod is now holding these parts to their desired positions.

(4) Turn the toggle casting on the short bar until it holds its mate against the tail of the knock off lever of the protection, being careful at the same time to have this knock off lever properly positioned to the shipper handle.

(5) By means of the foot lever draw down the upright bar until the brake lock snaps into position and is held there by the flat spring. The plunger pin should now be in position to release the brake. The brake band can now be adjusted to clear the friction ring when the loom is running.

(6) The cam on the upright rod can now be placed in position near the shipper lock casting. This cam can be made auxiliary to the rest of the knock off device in throwing off the shipper and it can also be so set as to prevent the locking of the shipper until the brake is first released.

(7) By means of the collar and set screw, adjust the spring on the upright rod to get the required brake friction.

The brake band should never be treated with any dressing of a sticky or gummy nature, since this would be sure to cause the loom to stop *dead,* and when by stopping the loom in this manner, the strain would be very severe on all its parts concerned. For the same reason, the stop motion should be timed to stop the loom as early as possible, and all parts connected with the stop motion knock off, and brake, be adjusted to follow the knock off lever as closely as they can.

The brake may sometimes act when to all appearances the stop motion has been the cause of it and yet the filling will be found to be intact. This may be caused by the stop motion, or by the protector dagger just *ticking* the protector lever. It can also be caused by the imperfect fitting of the parts comprising the brake lock. It has been referred to here in order to show a simple way of detecting the trouble as well as remedying it.

First, examine the notch in the brake lock and see that it is filed square to the bar and also see that the plunger pin beds properly. With this correct, it will then not be necessary to make the flat spring any stiffer than what is necessary to carry the locking bar home. If the shipper continues to knock off, the fixer can readily tell if the stop motion is the cause, by placing his hand on the end of the protector lever near the shipper handle. If the protector lever acts, when the loom stops, he then knows at once that the trouble rests with the protection. If it stops with no movement by the protector levers, the stop motion or the shipper lock casting must cause the trouble.

If the brake stops, the loom by the time the lay is on the front centre, it should be satisfactory. It may be set to stop the loom earlier than this, remembering however that the quicker the loom is stopped, the greater the risk of breakage and that a slow acting brake, stopping the loom on time, will be more satisfactory in the long run than a brake acting too quickly.

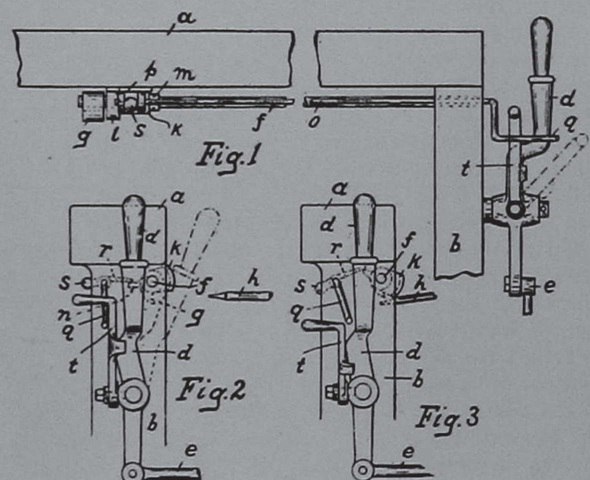
This brake adjusted as described, should do what it is designed for, *i. e.,* stop the loom on the pick, with the least possible brake strain.

(To be continued.)

Ward's Centre, Filling Stop Motion.

The same is the patent of Mr. Daniel Ward, Boss Weaver of the Doherty & Wadsworth Co., the prominent Silk Manufacturers of Paterson, and where the attachment has been used for some time. On account of its simplicity, the device does not get out of order, saving the weaver much labor.

The advantages claimed by Mr. Ward are that the weaver with this device applied to a loom has only to throw over a lever and when then he can use the power to find the pick, making weaving easier for



woman weavers, also stopping any chances for the weaver breaking the dagger shield, which always makes a lot of extra work for loomfixers.

The accompanying three diagrams are given to illustrate the subject, and of which Fig. 1 is a front elevation of so much of a loom and the stop motion mechanism, necessary to be shown, in order to illustrate the invention. Fig. 2 shows the parts in the position where the shipper lever has effected the movement of the shield to the interposed position, and Fig. 3 shows the parts in the position where the shipper lever is *on,* but the shield left in the interposed position.

A description of the working of this stop motion is best given by quoting letters of references accompanying illustration, and of which a is the breast beam, b a portion of the loom framing, d the shipper lever, e its shipper rod, f the rocking knock off shaft and g its toe, h the dagger as carried by the batten (not shown) adapted to engage the toe g and rock said shaft f on the absence of filling when the loom is running in the regular way with filling. k is the shield