

SILK FROM FIBRE TO FABRIC.

True Silk—Silk Throwing—Splitting and Sorting—Soaking—Winding—Cleaning—Doubling—Tram—Organzine—A Typical Silk Spinner—A Silk Doubler and Twister—Defects met with in Thrown Silk—Singles—Reeling—Numbering the Silk—The Denier System of Numbering Silk—Dram System of Numbering Silk—The Ounce System of Numbering Silk—Comparison of Denier and Dram—Denier Constant—Testing Silk as to Counts—Conditioning—Scouring—Boiled-off Silk—Tinting—Souple Silk—Ecrú Silk—Bleaching Silk—Soap—Testing Soap—Soap Economy—Water—Weighting—Dyeing—Washing—Lustering—Wild Silk—Spun Silk—Waste Silk—Statistics—Winding—Warping—Drawing-in—Quilling—Weaving—Finishing.

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Winding. The next process to which the washed silk is subjected, as well as silk that is to be thrown bright, is winding, *i. e.*, transferring or winding the silk, then in the shape of skeins, onto bobbins. Winders contain any number of swifts or reels, upon which the respective splits or sections of the mosses or large skeins are stretched, one split on each swift. The girl attending the winder then finds the end of the silk on the outer portion of the split and passes said end through the eyelet of a vibrating guide, which thus

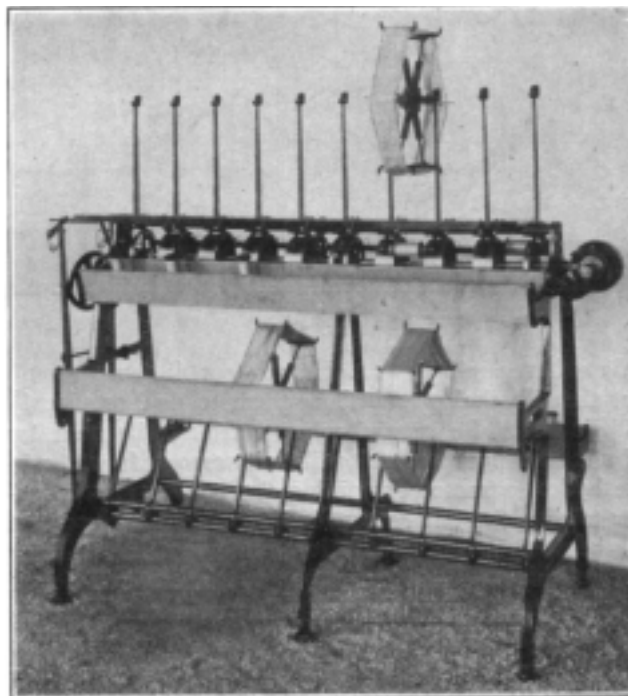


FIG. 1.

guides the thread, to and fro, across the width of the spool, until the latter is filled. When filled, a new spool is substituted, a new split being put on whenever the one being wound runs out. The construction of the winder is such that the silk thread is wound on the bobbin without any friction, *i. e.*, is not flattened in this way. At the same time, it must be understood that finding the outside end of the split is not all the trouble that there is in store for the winder, since the split, *i. e.*, the small skein, will not always run smooth, quite the contrary. The end will break

because of one reason or the other, and when the broken end will have to be found and the same pieced up, at the same time taking any poor lengths of silk out of the split by unwinding by hand, provided this was the cause of the break and not the entanglement of ends in the skein, or a wrong handling of the outside end. Waste thus made in this winding process is known as winder's waste and is kept separate from such waste as is made in the next process, which then will be known as cleaner's waste.

Defects in the winding process met with are: hard spools, long knots and looped ends. The first are the cause of a poor washing, *i. e.*, an inferior quality of soap used, or insufficient drying; the surplus gum covering the threads, in place of being removed being

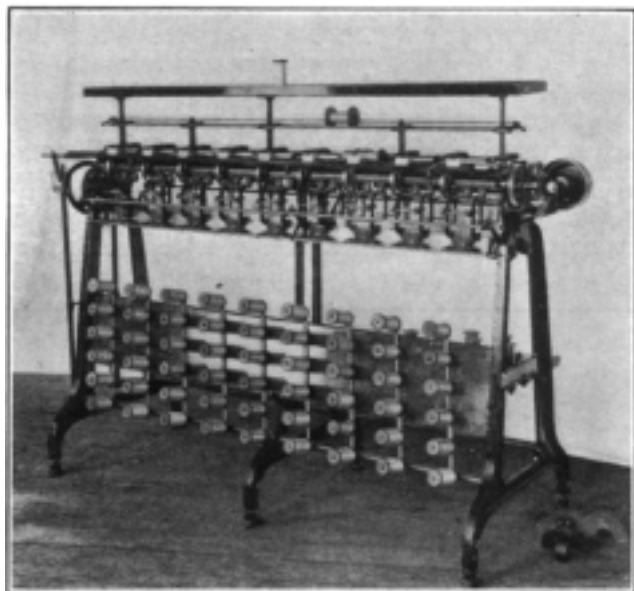


FIG. 2.

only softened into a paste. If such trouble occurs, comb out the silk skeins and allow them to dry, previously to winding. Be careful when washing the next lot of silk and pour several pails of warm soft water in the hydro-extractor containing the washed silk, in order to give the latter a good rinsing, and be sure that all the water is extracted before removing the silk from the machine. With reference to the second defect referred to, *i. e.*, long knots, they will catch during the next processes of throwing, and will be the cause of split ends, more particularly so in "no-throw" or "tram" silk. With reference to the last mentioned defect, be careful that when tying up an end, a previously wound-on length of the thread is not looped over the end to which you tie on, since then the yarn, during the next processes, will unwind with friction, *i. e.*, come off the spool tight and in turn cause loopy yarn. More particularly will this cause trouble in connection with no-throw or tram silk.

A perspective view of a silk winding frame used for the operation just described is shown in Fig. 1. The illustration shows what we might call a sample machine only, showing only a double banked nine-spindle outfit, *i. e.*, eighteen spindles and swifts, whereas a standard frame contains 60 spindles and

swifts complete, measuring 18 feet, 4 inches in length x 2 feet, 10 inches wide and 5 feet, 1 inch from floor to centre of top swift. However, machines are built to any desired length to suit the demands of a mill. By double bank is meant that there are rows of bobbins wound, one on each side; one row of bobbins being fed from the top swifts, the other row, from the bottom swifts. As will be readily seen from the illustration, the swifts are conveniently placed for the operative; the spindles are of the double-head driven type, allowing great speed; the supports for same are fitted with anti-friction bearings. One central shaft drives both sets of spindles, thus reducing the friction and the tension required. The machine is fitted with either pin or friction hub, standard swifts, up to 28 inches diameter, the knee-rail being adjustable to the different sizes of swifts to be used.

Cleaning. This is the next process the thus wound silk is subjected to, although in some cases the cleaning is also practiced in connection with the winding process, previously explained, however, more often it is carried on as a separate procedure in connection with silk throwing. In this process, the silk thread is simply transferred from one spool onto another, passing during this transfer through a cleaning device, which either is a steel plate with a slot in it, or two parallel plates placed close to each other to catch any irregularity upon the silk. When such occurs, at the same time, by means of suitable connections, the motion of the receiving spool is arrested, and then the operator takes out the faulty piece of the thread, pieces up the ends, and the process of winding and cleaning the thread continues. This cleaning process, according to the condition of the silk, in turn, is two or three times repeated, in order to obtain the required quality and cleanliness of the thread. Chinese and Canton silks always require the most cleaning, whereas Italian silks require only very little, and in fact with the best grades, in some instances, no cleaning at all is necessary.

Having thus obtained a clean silk thread, future operations now depend on whether the silk is destined for (a) doubling, (b) tram, or (c) organzine.

Doubling, or as sometimes also called "no-throw," consists in bringing two or more single threads from two or more spools, side by side onto one spool, but without any twist, as we might say, the throwster only imparting sufficient twist to bind the two, three or more threads together to permit re-reeling later on. The greatest of care must be exercised in that process, in order that the threads, as doubled, do not separate and form kinks, which not only are objectionable to the face of the fabric, but at the same time weaken the thread. However, it is essential, on account of the face of the fabrics these yarns are to be used to cover, that not too much twist be imparted. Fig. 2 shows a perspective view of a small sized doubling frame; regular frames being built of any desired length, a standard frame being 60 spindles, 18 feet, 4 inches long, 2 feet wide, 3 feet, 9 inches high to take-up spindle. This machine has hinged reversible jack-

boards fitted for six end-pin doublings, the angle of this jack-board being adjustable, allowing more or less friction on spools.

Tram. In this instance, two or three single ends, and in some cases four single ends, are united into one end, the same as in doubling, the only difference being that somewhat more twist is given to the compound thread, which is chiefly used for filling purposes. If two single threads are thus united into one thread, the latter is known as 2-threads tram, when three are united, it is known as 3-threads tram, and when four are united it is known as 4-threads tram. As a rule, from $2\frac{1}{2}$ to 3 turns of twist per inch are put into tram, although, in connection with such as are destined for the elastic webbing trade as well as hosiery, up to 6 turns of twist per inch are then put in.

Organzine is the union of two or more single threads of silk, which first receive twist in one direction, each thread by itself, and when united into one thread are then re-twisted in the opposite direction. Twisting the individual of the ply first, is only practiced in connection with organzine, no twist being put in the single threads of tram or no-throw silk; at the same time, the amount of twist put in by the second process of twisting into the organzine is considerably more than that put into tram. This is done for the reason that organzine is destined for warp purposes, where it has to stand the strain of warping and weaving, besides the chafing action of the harness and the reed, during the latter process. In judging silk to be made into tram or organzine, a mistake in judgment by the manufacturer may mean considerable loss to him. The greatest of care is required in order to have satisfaction in its after manufacture, it being a fact that some manufacturers can get a better fabric, as to appearance and wear, from a low quality of silk than others can from the best quality.

A typical silk spinner or twister is shown in illustration Fig. 3. This machine is the invention of Mr. Joseph E. Tynan, of Paterson, and has for its object to insert twist into the single silk thread (as destined for organzine) after the same has been cleaned. The process consists in winding the thread from one spool onto another, at the same time putting twist into the thread. This spinner also has two stop motions, one for operating the fallers when a supply thread breaks, the other acting to stop the rotation of the supply bobbins (and this without operating the stop motion first referred to) at the moment when the shipper lever of the machine is shifted onto the loose pulley. Our illustration is an end view of the machine, showing the several mechanisms referred to, one "bank" only being shown; if a double-bank machine, the spinning and twisting devices, with its "faller stop motion" and "kink preventers," are duplicated for the other side of the machine. In this illustration *A* indicates one of the side frames of the machine, on which is mounted the spindle rail *B*. In this spindle rail *B* are mounted the two series of spindles *C* and *D*, one series carrying the supply spools *C*¹ and the other carrying the spool *D*¹, onto which the thread is wound. From the spool *C*¹ the thread passes up and around

guide and feed rollers and thence down to the spool *D*¹, on which it is laid by a ring traveler mounted on the ring-rail *E*, said traveler putting at the same time the required twist into the thread. The fallers *F* of the "faller stop motion" normally remain in vertical position (as shown in the illustration), *i. e.*, resting against the faller stand *G*, but if a thread breaks on its passage from one spool to the other, said faller

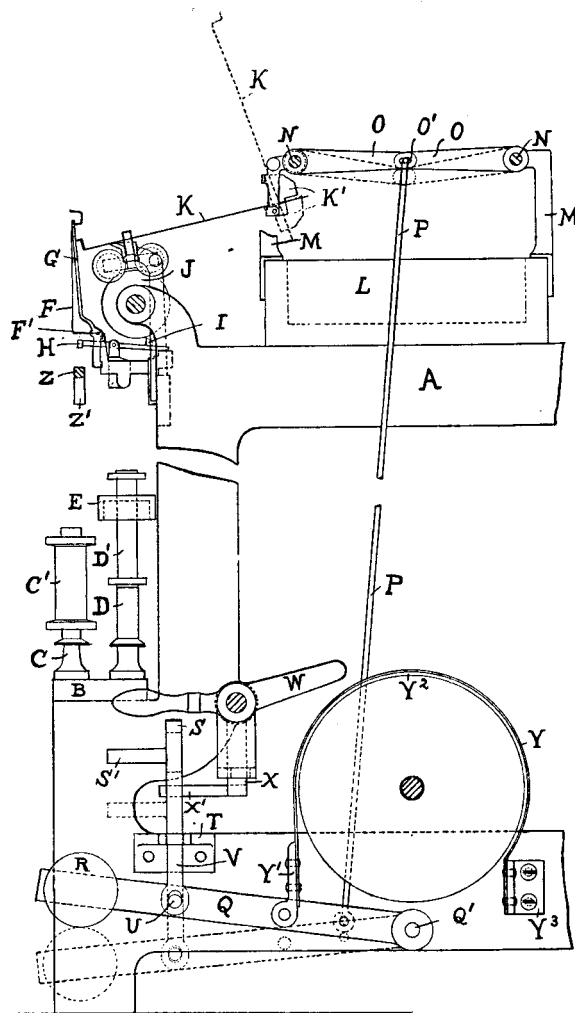


FIG. 3.

drops down so that the portion *F*¹ engages with the end of lever *H*, rocking said lever and bringing its tooth *I* into engagement with the driving roller *J*, and thus (through intermediate connections) stops the machine. With this stop motion is combined another stop motion, acting either in connection with said faller stop motion or independent when the machine is stopped by the operator. This second stop motion arrests at once the rotation of both series of spools and simultaneously throws the lever *K* (technically called a kink preventer) upward, carrying any paid-out supply thread up with it, thus keeping the threads from becoming slack and forming kinks, which always are a disadvantage to perfect yarn.

On each end of the spool-supply box *L*, as mounted on top of the frame *A*, is secured a bracket *M*, in which are formed bearings for a shaft *N*, which ex-

tends the entire length of the machine, and has mounted on it the weighted levers or kink preventers *K*, said shaft having at the driving end of the machine secured to it an arm *O* provided with a hole *O*¹, into which is hooked one end of a rod *P*, having its other end secured to a lever *Q*, pivoted at *Q*¹ to the frame of the machine, and carrying at its outer end a weight *R*. At about its middle portion the lever *Q* is provided with a stud *U*, which enters a hole in a latch *V*; said latch slides in a slotted bracket *T* and has at its upper end a hook *S* and handle *S*¹. On the frame of the machine and above the latch *V*, is mounted the shipper lever *W*, formed with a part *X* and extension *X*¹, the latter being adapted to engage with the latch *V*. A shoulder on the inner end of the bracket *T* holds the latch *V* and, in turn, the lever *Q* in raised position (see full lines in illustration), as is the case when the machine is running, but when the machine is stopped for any cause whatever, the extension *X*¹ of the shipper lever *W* engages the latch *V* and forces the same from its notch in bracket *T*, thus allowing the lever *Q* to drop into position shown in dotted lines.

To the lever *Q* is also secured a brake band *Y*, by means of a buckle *Y*¹, said brake band extending over a brake pulley *Y*² fast to the driving pulley of the machine (not shown), provided the same is driven by means of fast and loose pulleys, or to one of the friction members in case the machine is driven by friction device. At its other end, this brake band *Y* is fastened to bracket *Y*³, thus when the lever *Q* drops, as previously mentioned, the brake band engages the brake pulley *Y*², and thus immediately stops all running parts of the machine. On the dropping of the lever *Q* the rod *P* is simultaneously pulled down, which in turn causes the shafts *N* to be rocked, causing the balanced lever (kink preventer) *K* to be tipped so that the weight *K*¹ is overbalanced and the lever *K* raises (to the dotted line position shown), carrying the thread with it, and thus prevents kinks in the yarn.

In order that the operator is able to stop the machine without the faller stop motion to operate, a bar *Z* is provided, extending all the way across in front of the machine, resting on support *Z*¹ and adapted to be brought in contact with the ends of levers *H* to thus control their operation. To stop the machine, the operator first raises this bar *Z* and next knocks off the shipper lever *W*, which drops the lever *Q*, and in turn operates, as described, to throw the levers *K* upward simultaneously with the stopping of the machine.

(To be continued.)