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—Ecru 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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A Silk Doubler and Twister.—The purpose of this machine, as previously mentioned in this article, is the doubling and twisting together of several single silk threads (after the latter have been previously cleaned, or cleaned and twisted as the case may have required) into one thread. The amount of twist to be put into the yarn is regulated by the fabric the yarn is intended for, some fabrics requiring more, some less, again, some hardly any twist.

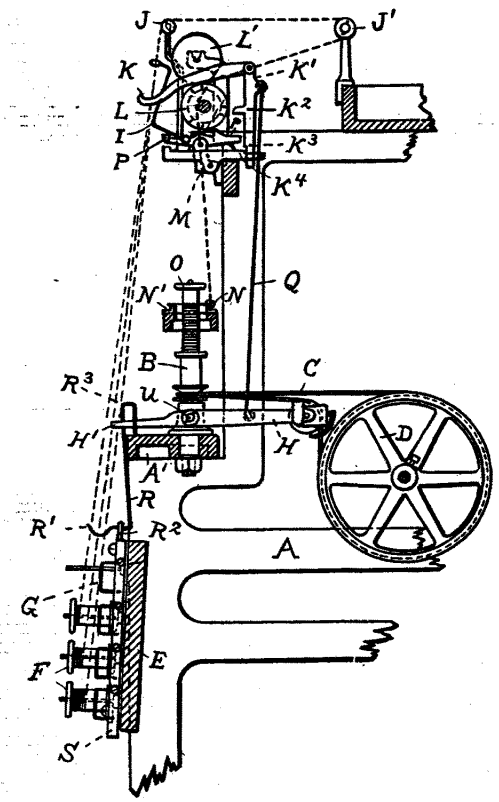

FIG. 4.

A uniform count (*i. e.*, size) of the yarn with an equal amount of twist (turns per inch) throughout said yarn, and this without any imperfections (technically known as "kinks," caused by loose-running supply ends) in the yarn, are items of the greatest importance to the manufacturer, since only then can he produce perfect fabrics. To accomplish these results, is the object of the doubler and twister shown in diagrams Figs. 4, 5 and 6, the machine being provided with a stop motion, which stops the revolution of the spools from which the several supply threads as to be twisted are drawn, simultaneously with the stopping of the rotation of the spindle of the machine, caused either by the breaking or running out of one of the supply threads, doffing, etc. In other words, the motion of every part of the machine is arrested at the same moment. Illustrations given refer to the machine patented by Mr. Joseph E. Tynan of Paterson.

Of the three illustrations given Fig. 4 is a vertical cross section of the machine, showing the threads being drawn from spools placed upon a creel, said threads, after passing over guides and feed rolls, being twisted and laid upon the spool on the twister spindle. Fig. 5 is a front elevation, enlarged compared to Fig. 4, of the creel with the supply spools, the brake bar and the spool brakes. Fig. 6 is a plan view, slightly enlarged compared to Fig. 5, showing the action of the brake mechanism upon a supply spool.

Examining illustration Fig. 4, we find on the frame A of the machine the spindle rail A^1, in which the spindles B are mounted, said spindles being driven by means of driving band C from driving pulley D. On the frame A is also mounted the creel board E, upon which are mounted, as required, one, two, three, or more banks of supply spools F, said spools being acted upon by brakes G.

Each thread, as to be in turn doubled with one or more similar threads, after leaving the spools F, passes up and through a faller I, from which they pass as single threads over and partly around guide rollers J, J^1 and feed rolls L, L^1, and thence through a guide eye M to the traveler N (as adjusted to ring rail N^1), and in turn onto the spool O as carried on spindle B. The rolls L L^1 revolve, and feed the threads to the traveler N, which puts the required amount of twist into the yarn. The roller L is provided with mortices adapted to be engaged by a claw formed on the rock lever P whenever said lever is rocked by the dropping of a faller I on account of its supply thread breaking.

Above this rock lever P is situated a lever K, having a latch K^1, which is supported by a shoulder K^3 resting on the back end K^4 of the faller stand, a lug K^2, limiting the drop of said latch K^1. To this latch K^1 is pivoted one end of a wire link Q, the other end of it being connected to the movable lever H, over which the driving band C passes.

When a faller I drops, the lever P is rocked, causing the claw as formed on the rock lever P to engage one of the mortices on roller L, thereby causing the lever P to be moved back so that it engages the latch K^1 and causes the shoulders K^3 to be pushed from its support. This causes said latch K^1 to drop and the lever H to be tilted, in turn slackening the driving band C and stopping the rotation of the spindles B.

For applying the brake to the spools simultaneously with the stopping of the spindles, the outer end of the lever H is provided with a fork H^1, which passes through a hook R^3 of a support R, connecting the end of lever H with the brake bar S (see Fig. 5). To this brake bar S are secured the brake wires G, which are bent at right angles at their end, as shown at T, in Fig. 6, for conveniently engaging the head of the spools.

The brake bar S is slidably mounted in slots S^1 on the creel E; thus it will be seen that when the lever

H is tipped on account of the stopping of the machine, the front end H^1 of said lever H, as it raises (on account of the rear end of said lever dropping—see fulcrum U), will also raise the brake bar S (through support R), thus bringing the brake wires G into engagement with the heads of the spools, and at once stop the rotation of the same.

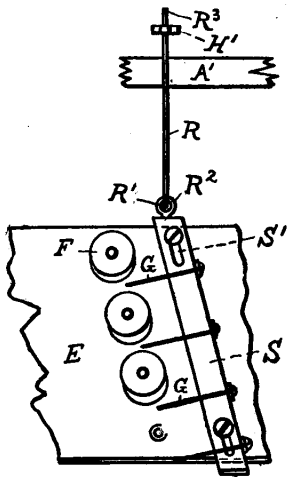

FIG. 5.

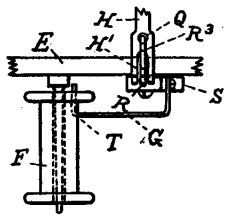

FIG. 6.

When the stop motion has thus operated, and the operator has to piece broken ends, he simply presses the support R inward, allowing the eye R^2 of the brake bar S to drop into the hook R^1 of the support R, thus removing the brake wires G from engagement with the heads of the spools F, permitting the operator to piece any broken end.

When the machine has to be started, the operator presses down the lever K, thus raising the lever H, which in turn tightens the driving band C and starts the machine running, the hook R^1 at the same time springs automatically back into place and allows the brake bar S to assume its normal position.

Defects met with in thrown silk. With reference to the first twist, *i. e.*, the twist imparted to the minor thread, defects met with are: soft twisted ends, and kinks or snarls. The first may be the result of slack spindle bands, sticky spindle bolsters or spindles out of true. Such a soft twisted thread can be readily detected by the attendant, since the spools containing such silk will handle soft. Such yarn should not be used in this state in connection with perfectly spun yarn, since if used, it will clearly reveal the defect after passing through the boiling-off process, and finally may be the cause of spoiling the face of the fabric. Kinks or snarls in the first twisting process can be generally traced back to improper working of the stop motion, *i. e.*, when the latter fails to operate when the spindle stops. Kinks should either be stretched, rubbed or pieced out, previously to again starting up the machine.

In connection with thrown silk, *i. e.*, no-throw, tram or organzine, defects we may come across are: (1) Minor ends running out or breaking, caused by the stop motion being out of order and this trouble not noticed at once by the attendant; (2) Uneven tension given to some of the minor threads as fed to the twisting machine, which will give to the twisted thread a spiral effect, technically known as corkscrew; (3) Uneven counts or sizes of minor threads put up for twisting into one end, may also be at the bottom of corkscrew, and so also (4) the union of minor threads containing a different percentage of moisture, which in turn will cause an uneven contraction of the thread when dry.

Corkscrew of the thread will cause trouble at the weaving, the short minor thread of the organzine, not being able to stand the strain of weaving, will break, and when the loose end will form itself into a bunch, which will catch either in the mail of the harness or in the dents of the reed, and thus be the cause of the end breaking during weaving.

Singles. These consist of the single threads of the raw silk, as received by the mill, and in which state—single ends—they are used in the production of cloth. Silk, after being rewound from its skein and cleaned, as previously fully explained, is then known as single, and in this state is still covered with the saliva of the silk worm. This gum adds strength and elasticity to the yarn, but hides its luster, for which reason said gum or saliva must be removed, before the full brilliancy of the silk is brought out. On account of the greater strength of silk in this single state, after first adding some slight twist, if so required, to such thread as will be used for filling, more twist to such as is destined for warp, the yarn in some instances, is then woven into plain and figured pongees, some kinds of satins, etc., and the gum boiled off afterwards from the woven fabric.

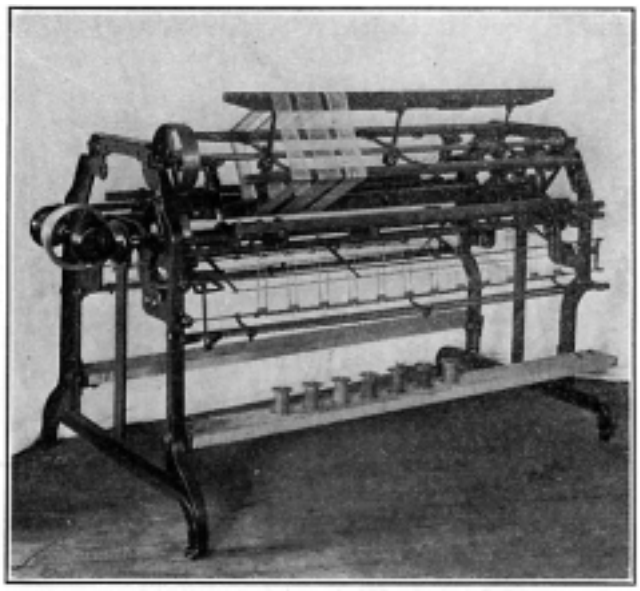

FIG. 7.

In some instances, such single silk is also dyed without boiling-off the gum, which, however, is done at the sacrifice of some of its luster, but the additional strength left to the yarn will not only result in better weaving, *i. e.*, in more production to the mill, but at the same time the woven cloth will gain both in strength and weight.

With reference to silk throwing, as practiced in connection with no-throw, tram or organzine, we now come to the process of

Reeling. The spools of doubled, or doubled and twisted silk are then taken to the reeling frame, also called the reel, to be rewound in skeins so that the silk can be handled in the processes of scouring or boiling-off, dyeing, bleaching, weighting, shaking, glossing and lustering. This reeling process is simply the reverse from that of the winding process previously explained, *i. e.*, the silk on the spools being, in this instance, rewound on skeins.

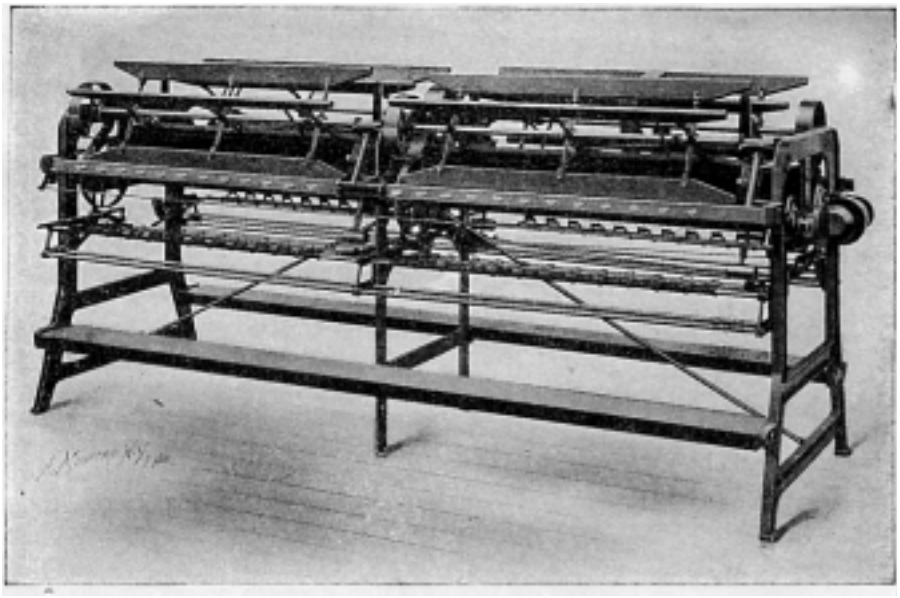

FIG. 8.

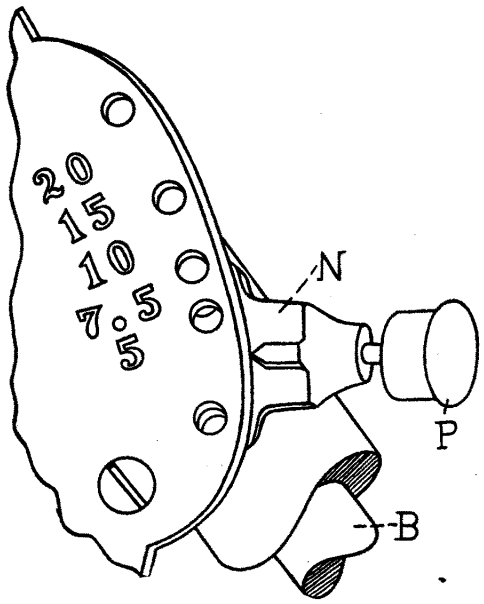

FIG. 11.

Fig. 7 shows a single fly reeling frame for accomplishing the foregoing purpose, with spools in position, also showing silk wound on the reel. This machine is built with the reel bearings detachable; stop motion for each end, operating instantly, the action of starting the reel lifting the drop wires of the stop motion into position. It is provided with a quick or slow traverse motion, to produce any style of skein crossing desired. As will be seen from the illustration, the bottom shelf holding the feeding spools is adjustable in the head framings. The reel-flies are strongly built and well balanced, thus allowing a high speed; as a rule, the dimensions of the reel-fly and the machine being such that the skeins wound are spaced four inches apart from centre to centre. The counting or registering device is of two styles, quickly adjusted; one style can be set each 50 yards up to 25,000 yards by an indexed register; the other style is locked for the required length of skein and the reel cannot be removed, or the counter changed in any way until the skein is completed, thus preventing any tampering with length of skein by the operative.

Fig. 8 shows a specimen of a four-fly reeling frame, as built by the Sipp Electric and Machine Co. This machine, if required, is also built three flies long, and is the outcome of careful study of the necessities of this very important branch of silk throwing.

Amongst the improvements characteristic to this reel is a lock joint for the fly arm, which acts automatically after the reel is stripped, and is readily unlocked when required. The fallers are substantially mounted on a heavy steel rod and accurate alignment and ample stiffness is therefore attained. Wear of the fallers is avoided by a proper arrangement of the parts traversed by the silk. The stop motion is quick and by test, a fly has been known to stop in less than three turns after the breaking of an end.

One of the most important features of this power reel is its measuring clock, by means of which the most accurate length of skeins are obtained. All the vital parts of the clock are enclosed in a dust proof case, and a knob and dial on the outside enables the length of the skein to be varied, as follows: 5,000, 7,500, 10,000, 15,000 and 20,000 yards. No changing of gears, no loose pins, no calculations are required, all the operator has to do is simply to move the knob, (which is not loose but fastened) to the length of skein

desired and as per the figures provided. The clock may be locked if desired. Resetting the clock for each skein is not necessary and the skein is made with any cross (traverse) desired and any width. On account of the importance of this clock to the silk industry, a special description of it is herewith given.

Registering Clock. The counting or measuring device referred to in the preceding paragraph is used in order to regulate the action of the reeling frame, so that a desired length of silk may be wound on the skein. This secures skeins of uniform length and consequently is a step toward securing more uniform results in the scouring and dyeing process. The object knock-off cam in position. Fig. 11 is a detail illustration of the setting knob, by which the clock is set for the required length of skein.

The clock is bolted by its three feet directly to the frame of the machine, and is driven by means of a bevel gear *A*, which is in turn driven by a pinion on the fly shaft. Motion is given to the mechanism of the clock by a worm gear B^1 on the driving shaft *B* to a gear wheel *C*. The cylindrical cam *D* and which is an integral part of the gear wheel *C*, is eccentrically mounted on the centre clock-shaft *F*. This cylindrical cam *D* moves in the cam lever *G* which moves on its fulcrum *H*.

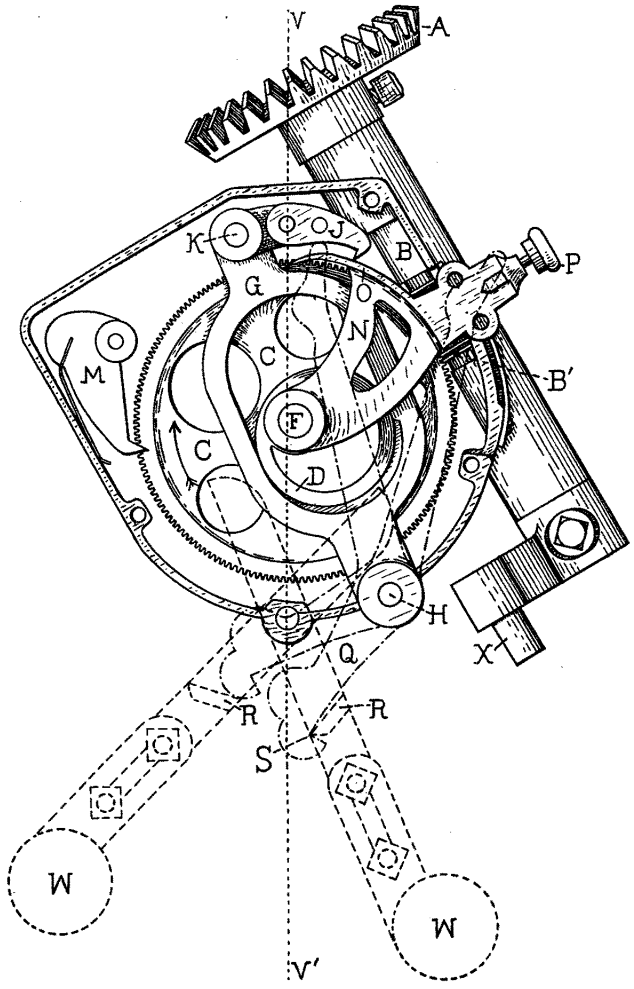

FIG. 9.

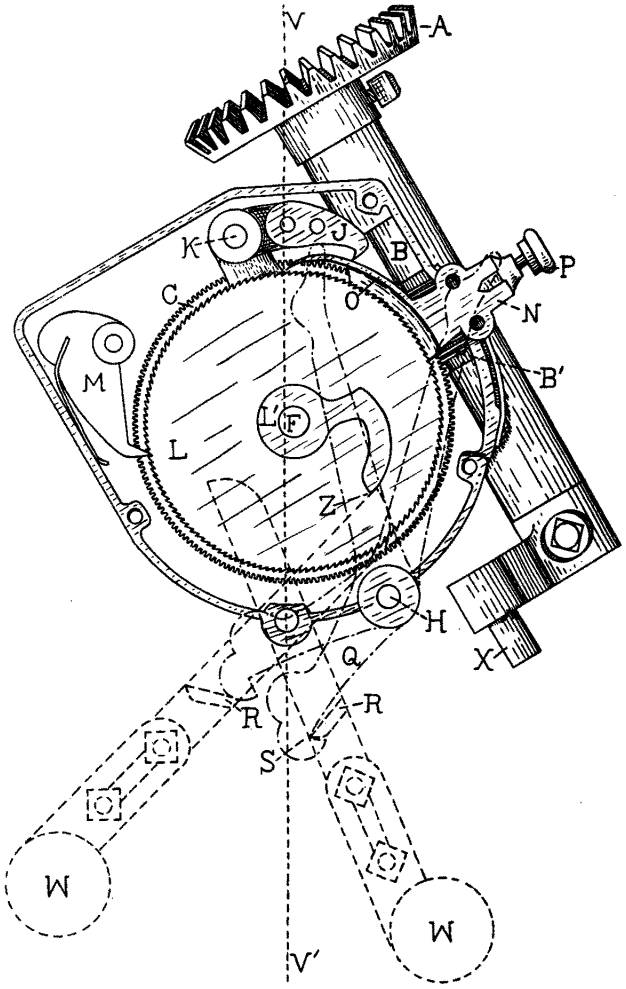

FIG. 10.

of the clock is accomplished by an automatic knock-off motion which stops the winding, *i. e.*, the revolving of the flies of the machine when the desired length of silk has been taken up by the flies of the reel. In order to give a thorough understanding of the construction and operation of this clock, the accompanying three illustrations Figs. 9, 10 and 11 are given; of which Fig. 9 shows the interior parts of the clock, minus the ratchet wheel with its knock-off cam which is a part of the ratchet wheel, and which could not be shown. For this reason Fig. 10 has been given, showing this ratchet wheel with its

The pawl *J* slips on the pin *K*, which is a part of the cam lever *G*, the latter providing nothing more than a slot for the motion of the cylindrical cam *D*. It is evident that by the turning of the cylindrical cam *D*, a to and fro motion of the pawl *J* will be the result; this motion being in an arc of a circle with *H* as the centre. The cam lever *G* of course comes to rest at some part of its journey, and which occurs when the common diameter of the cylindrical cam *D* and the centre clock-shaft *F* become parallel to the side pieces of the cam lever *G*.

(*To be continued.*)