

THE UTILISATION OF SILK WASTE.

ALL who have traced the preparation of silk from the cocoon winding to the spinning and throwing, both for cord or cable laid thread and for "frame" and "organzine" for weaving purposes, will doubtless have noticed that a considerable quantity of waste is made during the process. This waste consists of two classes, firstly, defective, malformed, and double cocoons which cannot be unwound, and also rough and tangled silk which is found on the outside of the cocoon, and of that portion of the inside of the cocoon which is too close for winding; secondly, what is known as "knubs," that is waste in the process of winding. This consists of long pieces of fibre which have been wound from the cocoon and are broken or entangled, and are therefore unfit for use for the throwsters. There is also a considerable quantity of waste made by the throwsters. For many years these various classes of waste were found to be practically without value, as no means of working them into a marketable yarn were then known. During the present century, however, repeated efforts have been made to utilise this waste, and of late years with the greatest possible success. Messrs. Greenwood and Batley are large makers of this waste dressing, preparing, and spinning machinery, and many of our readers will remember that they exhibited in motion a set of such machinery at the International Exhibition held last year at South Kensington. On that occasion the material worked through the machinery, and the operatives, were from the silk factory of Mr. Henry Tucker, at Rochdale. On account of want of space, and the necessity of having large supplies of water and steam, and properly heated rooms, the process of softening, washing, opening, filling, and dressing were not exhibited. These operations, however, are as follows:

The various qualities of waste having been carefully assorted—the being necessary to treat the cocoons differently to the knubs—the process of softening and discharging the natural gum is commenced; this is effected by either one of two methods. The first is the softening or macerating process by which a small portion of the gum is retained in the fibre, thus leaving it of a slightly grey and yellow shade. The second is the discharging or boiled off process, which completely extracts all the gum from the fibre, leaving it almost colourless. Both these operations are performed by the aid of hot water. After discharging, the silk is thoroughly washed, and dried so as to cleanse it from the free gum and other impurities, and it is then ready for the machinery.

In the case of cocoons, they are first taken to an opening machine, which consists of a cylinder clothed with pointed steel cording; this cylinder runs at a considerable velocity, and acts upon the cocoons as they are brought into contact with it by being fed through a series of fluted and porcupine rollers, thus tearing open the cocoons and winding the fibres, which are now comparatively straight, around the cylinder. When a sufficient quantity has been wrapped upon the cylinder the silk, or "lap" as it is now called, is removed and taken to the filling machine. This machine, like the opener, consists of a cylinder having upon its periphery a number of combs fixed from 6 in. to 10 in. apart. The "lap" is fed up to this cylinder, passing through porcupine and fluted rollers, and the combs on the cylinder each in their turn draw out a portion of the silk and break it off into suitable lengths for the succeeding operation of dressing. The other qualities of waste, such as knubs, etc., are passed at once through the filling machine, the operation of opening not being required. All qualities, however, are passed through the filling and succeeding operations in identically the same manner. When the combs on the filling machine cylinder are sufficiently charged with silk the machine is stopped and the material withdrawn and placed in the dressing machine. This machine carries the silk, which is held in presses or books under the action of an endless sheet provided with combs. This combing action straightens out the ends of the fibre, and takes out all knots and foreign matter. When one end of the silk is cleansed, the press is slackened, and the silk twined round, so as to enable the other end to be combed in exactly the same manner. This being accomplished the stricks of the silk are taken out of the presses, and are known as first or longest drafts. These are usually fibres of from 10 in. to 18 in. in length. The portions which have been removed by the combs on the endless sheet are now put into the presses, and the operation is continued. The stricks now taken out are called second drafts, and are usually an inch or two shorter than the first. These combing operations are continued till the silk becomes too short to be worked, and generally from six to eight drafts are taken out.

The silk is now taken to the preparing machinery, to which our illustrations on page 8 refer. This plant of machinery is arranged to work long and intermediate drafts, say from firsts to fourths or fifths, the preparing machinery for the shorter drafts requiring to be slightly modified to suit the lengths of material. The first machine, illustrated by Fig. 1, is called the spreader. The stricks of silk are placed upon an endless travelling leather sheet, care being taken to spread the stricks evenly, so that the ends of the fibre overlap each other. The silk now passes over a porcupine retaining roller, which slightly retains the silk, and prepares it to enter the combs or gills on the fallers of the screw gill-box. The screw gills used are similar in construction to those used in the preparation of flax and worsted. The combs or gills consist of a row of fine-pointed steel pins fixed to a brass stock; these gills are fixed upon steel bars or fallers. The ends of these fallers are placed

in the threads or grooves of two screws, running at right angles to the gills; as these screws rotate the fallers travel forward until they reach the end of the screws. They are then forced down by cams fixed on the screws into the grooves of two other screws running exactly under the first. The bottom screws, however, are made to revolve in the contrary direction to the upper ones, so that the fallers take a backward movement, until they come to the opposite end of the screws. They are then lifted by cams into the threads of the upper screws, and continue their forward movement. This arrangement makes a continued succession of travelling gills, one closely following the other for each thread of the screw receives a faller, always rising into the silk at a certain point immediately in front of the porcupine roller, and carrying the material in the gills forward at the same surface speed as the porcupine roller and endless leather sheet. At the front of this travelling body of gills is placed a pair of fluted rollers. These rollers are driven at a much higher surface speed than the screw gills, so that when the silk fibres enter the bite of the rollers they are drawn through the gills, thus straightening the fibres of the strick into a thin film of silk. This thin film of silk fibre passes upon another endless leather sheet, and is wound around a wooden drum or cylinder. When a sufficient quantity of silk has been wound upon the drum the silk lap is taken off, and is ready for the succeeding machine. In the spreader the silk stricks are usually drawn to something like thirty times their length, that is, 1 ft. of silk, as spread upon the feeding sheet, will, after passing through the gills, make 30 ft. of straightened fibre to wind round the drum. A great regularity is thus obtained. The whole length of the lap should be uniform in thickness, and the fibres perfectly straight. The lap is now taken to the sett or slivering machine, shown at Fig. 2, page 8. This machine is identical in construction with the spreader, with the exception that, instead of the silk being wound around a drum, it is passed through rollers, and delivered into a can in the form of a ribbon or "sliver." The drawing is here made in a rather smaller proportion than in the spreader, say some twenty times; a lap from the spreader measuring 6 ft. in length will be drawn into 100 ft. or 150 ft. of sliver. The remaining operations and the machines for performing them we must leave to be described in a subsequent article.

(To be continued.)

MACHINERY FOR TREATING SILK WASTE.

CONSTRUCTED BY MESSRS. GREENWOOD AND BATLEY, ENGINEERS, LEEDS.

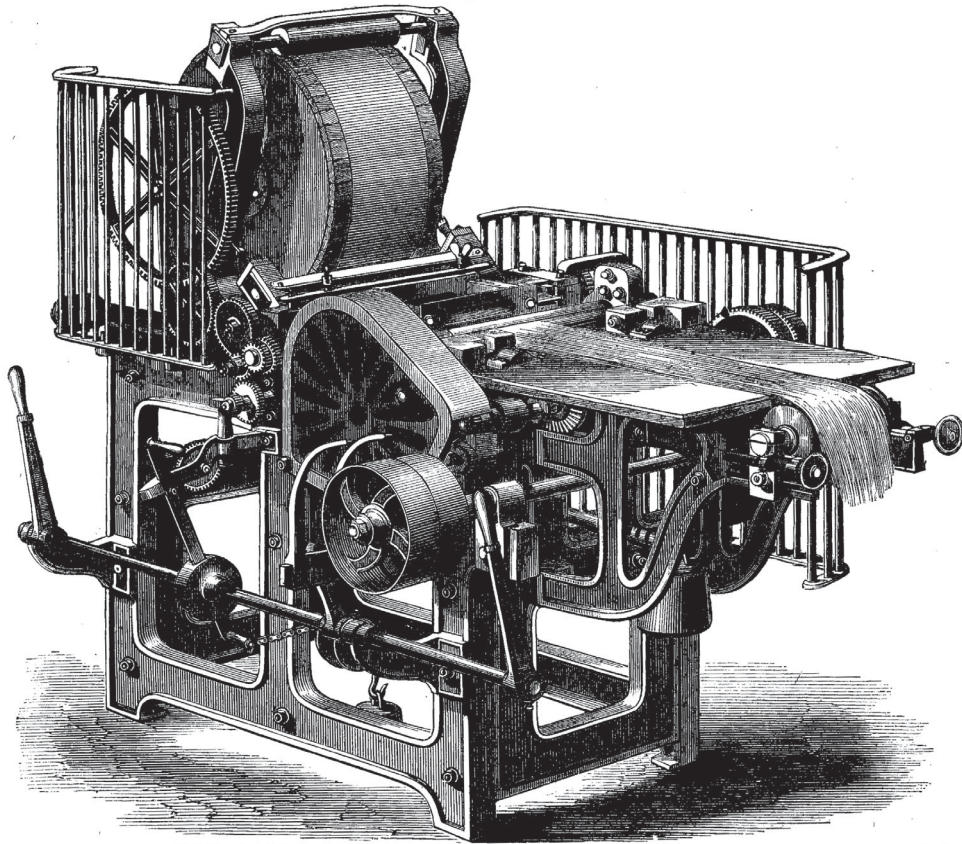
(For Description, see Page 6.)

FIG. 1. SILK SPREADING MACHINE

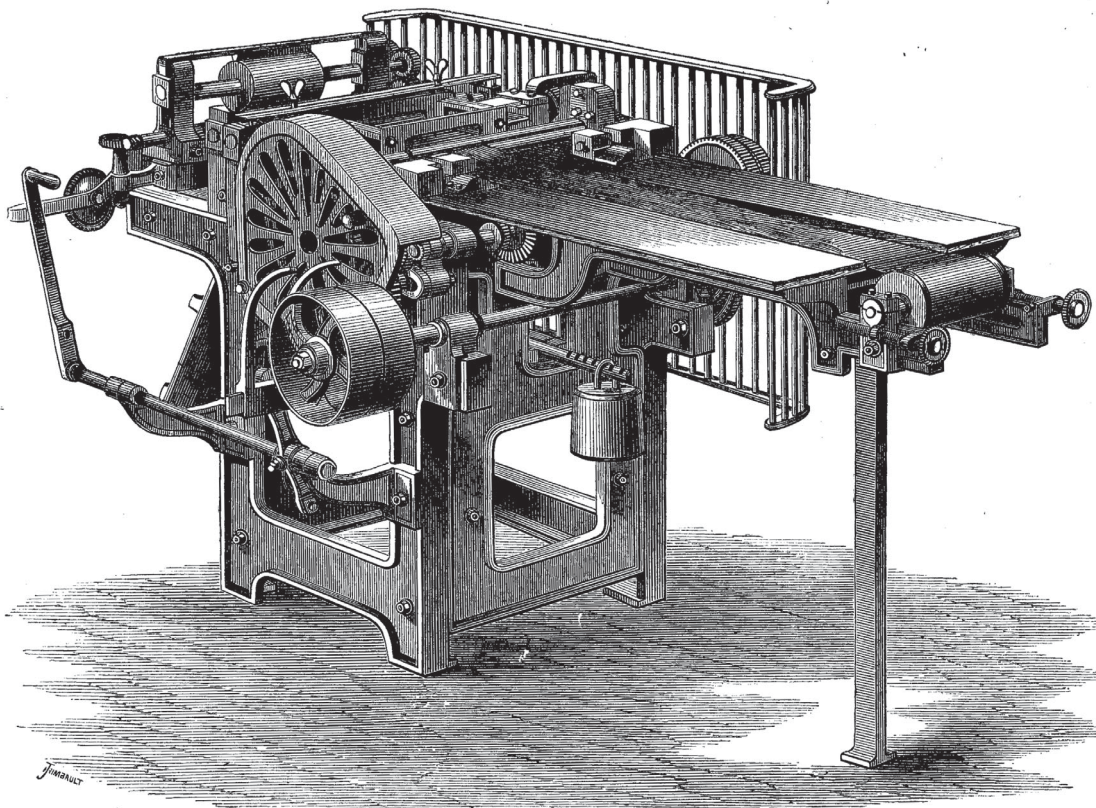


FIG. 2. SILK SETT OR SLIVERING MACHINE.