TEXTILE MACHINERY AT THE PARIS EXHIBITION.

The cotton fibre has now passed through the series of operations which fit it for the final process that will convert it into yarn. The last drawing operation has reduced it to the desired fineness, a much more extended twisting process will give it the necessary strength; the yarn has then to be rewound in such a way as to make it convenient for the various operations of weaving. Up to this stage, all the machines which were seen at the Exhibition were constructed on the same principle, and without any very great variations or modifications in detail, by the various manufacturers. But it is otherwise with the spinning frame. Messrs. Plati Brothers and Co. construct the self-acting winding machine; Messrs. Dolson and Barlow do so likewise; Messrs. Brooks and Doxey make the continuous ring machine; and the Société Alsacienne de Constructions Mécaniques also make the continuous frame on the Vinmont-Bezin type. The self-acting machine, as it is made to-day, is certainly one of the most complicated and ingenious of machines. The whole of its functions, that is to say, drawing and twisting of the roving, and then the building of the yarn into a cop, is done by mechanical means. The self-acting machine being essentially a draw frame, has three pairs of draw rollers between which passes the cotton roving coming from the previous process. The bearings of the rollers are fixed to supports, which are bolted to a long beam of cast-iron E, Fig. 12; this beam is supported at frequent intervals by frames. The spindles upon which depend the operation of twisting and rewinding are mounted on a carriage, which can travel to and fro, approaching and receding from the drawing rollers. This carriage is mounted on wheels R R, and runs upon the rails M N. If we consider a thread held at one end by a pair of delivering rollers, and at the other by some point on the spindle R, which is inclined towards the rollers (see Fig. 12), if the spindle is made to revolve, the thread will be wound around it spirally until it reaches the top of the spindle; if the thread is properly stretched between the rollers and the top of the spindle, as this latter continues to revolve, it is evident that at each revolution the thread will slip off the top and will always remain in the same position; the thread will be obliged to turn around the top of the spindle, and for each revolution of the latter, that part of the thread comprised between the rollers and the point of the spindle will be twisted. The same thing will take place if the rollers, instead of being fixed, feed the thread forward while the spindle recedes at a speed equal to that of the delivery; the twisting will commence near the spindle and be transmitted towards the rollers; whilst the latter feed the thread forward, the carriage travels back, always keeping the thread stretched at the same time the spindle is winding it by their revolutions. When the carriage has travelled to the outer end of its stretch, it and the rollers are stopped; the spindle, however, continues to turn to complete the torsion. When this is completed, the spindles are stopped in their turn; the whole of these movements are included in the two periods which are automatically completed by the self-acting machine: first period, formation of the thread, outward movement of the carriage, commencement of the second period, completion of this latter operation. The mechanism has now to wind up the twisted yarn upon the spindle. To accomplish this, the operator possesses a thread guiding device I, which is free to turn around an axis; to bring this guide, and also the yarn, to the point at which it will commence to wind, it is necessary that the length of the yarn between the rollers number of transmission pulleys, and then over a pulley H mounted in the carriage in such a way that whatever might be the position of this latter, the cord is always properly stretched. Movement is thus transmitted to a horizontal shaft, running the whole length of the carriage, and called the spindle shaft; on this shaft are mounted tin rollers, which control the movement of the spindles by means of transmission bands.

The degree of twist given to the thread is carefully regulated; it depends on the number of the thread and the use to which it is to be put. Provision has to be made, therefore, to limit the amount of torsion, which depends on the number of turns of the rollers in relation to those of the spindles. When the driving shaft has made the requisite number of revolutions, it has to be stopped; this is effected by means of a wormwheel gearing into an endless screw, which, when it has made one revolution, stops the pulley V. By this means the amount of torsion can be accurately regulated. The horizontal travel of the carriage is controlled by means of a grooved pulley placed near the feeding rollers; at the other end of the frame is a transmission pulley, from which a cord passes to the carriage. As an exact degree of control has to be maintained on the thread between the cylinders and the spindle, it is necessary that the movement of the carriage be perfectly regulated and synchronised with the movement of the cylinders.
Such are the principles of the various cotton spinning machines which are shown at the Exhibition.

If we wish to make a classification in order of merit, we should say that those machines which appear to us most carefully worked out in detail, and which are best arranged as a whole, are exhibited by the German makers. The German machines exhibit very admirable machines, which appear to work excellently, although their construction appears somewhat too light. The Swiss builders have made great progress during the last few years in details of construction, and hold a very close position in regard to their competitors. We should therefore, classify the countries in the following order:

1. Great Britain.
2. Germany.
3. Switzerland.

We may now cast a rapid glance over the machines exhibited for wool spinning, and on this section we shall be much more brief, because only carding machines, frames, and spinning frames, similar in principle to those for cotton spinning, are exhibited. They are shown by the various manufacturers whose names have already been given. It is desirable, nevertheless, in order to understand the purpose of these machines to refer very briefly to the operations which precede the processes of spinning.

The first process to which the wool is subjected is that of washing, in order to free it from grease and other impurities. It is a curious thing, since the constitution of the wool fibres is naturally opposed to any nature of lay; and as these fibres cannot be transformed into regular threads, except by an infinite and successive series of sliding movements, this is necessary in spinning to replace by another oil substance—generally olive oil—the natural grease which has been washed out. This operation of saturating the oil is performed mechanically. This operation is followed by carding, in which the principle of which is precisely the same as those for cotton, although the details differ considerably.

After having been carded, the drawing process commences in a machine called a gill box, a kind of draw frame of a special type. Like all the other machines of the same kind, it consists of a pair of feeding rollers, followed at a distance slightly greater than the length of the wool filaments, by a pair of draw rollers, driven somewhat faster than the first pair, and which produce, by the extension of the ribbon, the lay of the filaments one upon the other. Between the feeding and the drawing rollers the ribbon is guided by bars furnished with sharp points or gills, which give their name to the machine; these hold the filament and prevent them from spreading under electrical and other influences produced by the friction. The bars are guided by screws, which give them a shifting movement a little greater than that which the feeding rollers impart to the ribbon. The drawing rollers are always, as in cotton industry, combined with double rollers. After passing through this process, the wool is wound upon bobbins. The ribbon is then wound with the wool, which has been saturated follows this operation. This is simply a washing process, in which the ribbons are washed in one or two vats of hot water with soap, the surplus water is squeezed out by passing the yarn between two cast-iron cylinders clothed with an elastic woolen covering. After having been treated in this way, and the ribbons are dried by passing them over a series of copper drums heated by steam, the wool is then ready to be wound upon bobbins. If after this operation the wool passes to the drawing frame and thence, in the cotton industry, to the spinning frame, of any class, it is carded wool.

The Exhibition affords examples of each of these classes of machines, sent by different manufacturers.

It should be observed here that in the series of operations the wool is only passed through one carding machine if it is to be combed and formed into combed yarn, whilst if it is passed through three carding machines when it is not to be combed and is to be formed into carded wool. Of these three carding machines, the dimensions and arrangements of which are dissimilar, the first is called the breaker, the second the presser, and the third the finisher. The constructors, whose names we have already mentioned as exhibitors of carding machines, have shown several types of these series, and we are able to give an account of them.