WEAVING.—No. XX.

CIRCULAR SWIVELS AND LAPPETS.

The small shuttles called "circles," are an elaborate substitute for the simple swivel, over which they are supposed to have certain advantages. In the first place they can be put into less compass, consequently more can be employed in a given width of cloth. Two sets may also be employed by placing them back to back, thus being able to use two kinds of weft with them. With swivels this would scarcely be possible owing to their greater size, although when first introduced by William Rooke (the inventor of the shaft monture) he placed two sets of swivels, back to back, in this manner. Circles appear to be a French invention, and are generally made in Lyons or Paris. They are sometimes entirely composed of metal—brass and steel—and they are fixed to the front of the batten, opposite to the reed in the same manner as the swivel frame. They are lowered down into the shed in the same manner, and are used in every way the same and for a similar purpose as the swivel.

The principle of their action consists, as their name implies, in moving in a circular path, the shuttle itself being formed something like the shape of a horseshoe, upon the front of which is placed the weft bobbin. The warp threads being raised through the opening and into the centre part of the shuttle, it is then revolved by means of a rack motion, which, when in proper order, works exceedingly easy and is very suitable for the purpose. In addition to this, the bobbins are made to work in a perfect manner, for the weft thread has not only a constant amount of tension put upon it, but the slack is drawn back to the extent of several inches with ease. They are far more costly than swivels, and are more complicated, and require more care in using them, which may be the cause of their not being so generally adopted.

Fig. 177 represents the front of an ordinary batten with fly shuttle, similar to that shown at Fig. 167. At the front and upon the swords *m m* are screwed two brackets through each of which a sliding bolt is made to work freely. At the lower part of the bolts there is a slot or pocket into which the bar *a*, *a*¹ fits. At the end *a*¹ the upper part of the slot is open to allow of the bar being taken completely out or to be moved laterally, and there is a knife edge at the bottom of the slot *b*¹ upon which the notches in the bar at *a*¹ may rest. These notches are simply for the purpose of adjusting or regulating the lateral position of the circles when weaving the spots.

The bar *a a*¹ is shown lowered down into the shed, by means of the two levers *d d*. The cord *f* is fastened to a hook in the Jacquard, so that whenever the hook is raised it depresses the bar *a a*¹ to the position shown.

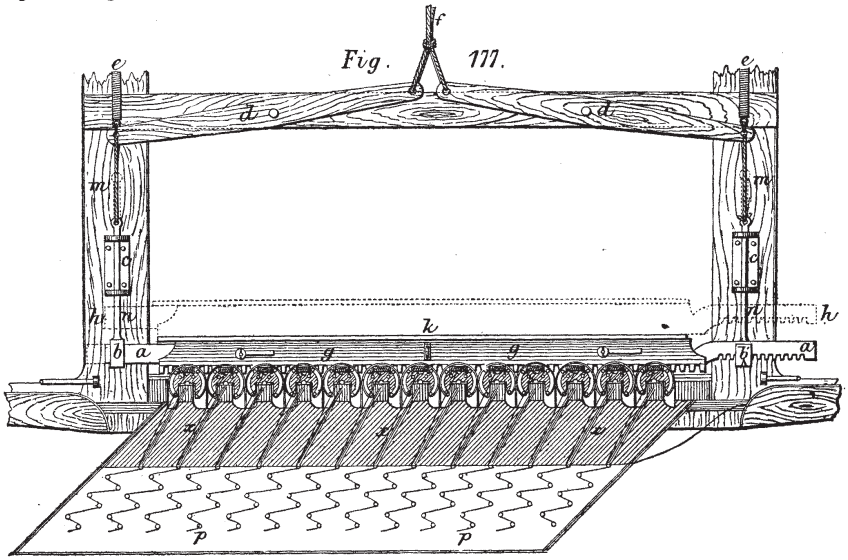
Now by moving the knob *k* which is fixed upon the rack plate *g g*, the circles are made to revolve completely round the raised warp threads *x x*, and when the Jacquard is next lowered the hook attached to the cord *f* is lowered, and then the bar *a a*¹ will be lifted by means of the springs *e e*, clear of the shed ready for the fly shuttle to be used for the formation of the ground of the cloth as before described in the case of the swivels.

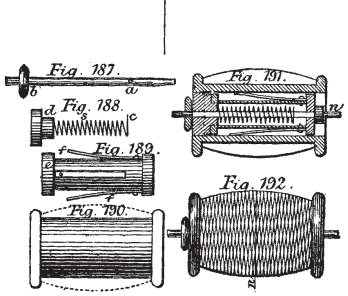
The zigzag or diagonal position of the spots or figures *p p* are the same in this instance as in Fig. 167, and when the bar *a a*¹ is moved laterally to correspond to the shed the particular notch at *b*¹ is selected, and the bar is dropped upon the knife edge before mentioned.

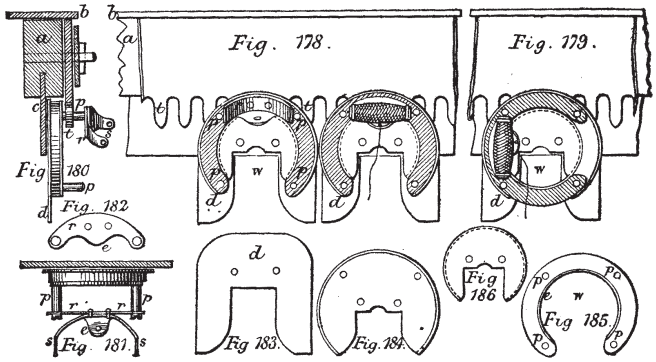
By having a number of notches, as shown, these positions may be made gradually, and thus may produce a running figure, such as shown at B Fig. 163.

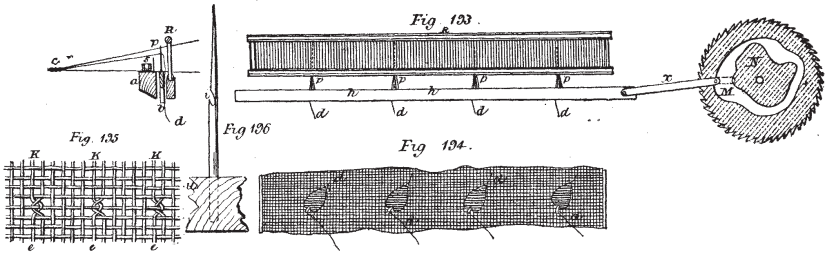
Fig. 180 shows a half-sized section of the bar *a a*¹, upon which the circles are placed. It is composed of a wood bar *a*, upon which is screwed the brass plate *b*. A plate *c* is fitted into the wood *a*, upon which the plates *d d* (see also Figs. 178 and 183) are screwed.

Upon these plates the frame plates carrying the circles are secured, which have flanges turned up round the edges to keep the circles in position, as seen at Fig. 184, which represents a plate, and Fig. 185 a circle or shuttle. There is a rebate *e* sunk in the inside edge of the circle, into which the cover plate, Fig. 186, fits, to hold it loosely in position on the frame, Fig. 184. There are four pins *p*, *p*, *p*, *p*, fixed to each circle as shown in Figs. 180, 178, and 185, which being geared into the rack teeth *t*, Fig. 178, cause the circle to be revolved when the rack is moved. Thus, Fig. 179 represents a quarter revolution of a circle only, but by continuing the motion of the rack a whole revolution









can be made, and in this manner the circle revolves to the right or left, according to the motion of the rack, and when the threads for the formation of the spot are raised, they occupy the centre of the circle, as shown at *w*, Fig. 178, 179, 185, and the bobbin is thereby passed beneath them.

The bobbin spindle is held firm enough to prevent its turning in the bracket *s*, Figs. 180 and 181, which is secured to a plate *r r* fixed upon the pins *p p*, see Figs. 181 and 182, and the thread passes from the bobbin through the eye *e*, which is made in the lower side of the plate *r*, Fig. 182, &c.

The bobbin and spindle is a very neat and ingenious contrivance, and is represented considerably larger than full size in Figs. 187 to 192. Fig. 187 is a spindle upon which is fastened a brass disc *b*, and there is a hole drilled through the spindle at *a*. Fig. 188 shows a double collar to which is attached a thin wire spring. The collar is made to fit loosely on the spindle, Fig. 187, and the end *c* of the wire spring *s* is inserted into the hole *a*. Fig. 189 is a barrel, which is fitted with four weak springs in the manner shown at *f f*, and the collar *e* is bored to fit tightly upon the collar *d*, Fig. 188. Fig. 190 is the bobbin, the dotted lines representing the outline when filled with weft. The bobbin fits upon the barrel, Fig. 189, and the springs have just sufficient power to cause a slight friction when the thread is drawn off.

Fig. 191 shows a section of the bobbin when fixed upon the barrel and spindle, and the barrel is there shown fixed upon the spindle, and held in position by the nut *n*.

Now it will be evident that if the weft thread be drawn as at *n* n^1, Fig. 192, the spring, Fig. 188, will give way to its full extent, but if the thread be drawn beyond the power or stretch of the spring then the friction of the springs *f f* upon the barrel will be overcome and the thread be unwound; but the spring Fig. 88 has the effect of always taking up, and therefore keeping in tension the irregular strain upon the thread caused by the various motions of the circles. The thread may be unwound and wound in this way several inches without the barrel springs *f f* giving way, and thus cause an equal tension of the weft thread during the process of weaving, which is a matter of great importance in the production of all woven fabrics.

In using either the swivels or the circles, the operation being the same, they may be raised or lowered by means of a lever as at *h*, Fig. 167, or by the Jacquard as at Fig. 177. The reed and batten is in no way affected by the application of either contrivance, with the exception that the weaver holds the batten by either an extra cap or by the top piece of the frame *e e*, Fig. 167, instead of the cap over the reed, for it will be evident that the position of the slides, &c., at *d d*, Fig. 167, would prevent him from holding the batten in the usual way.

Swivels have been repeatedly worked upon power looms for the production of silk spots, or figures upon alpaca and stuff dresses, and attempts have been made to work them at the same time that the ground shuttle was being worked. To do so, it requires that two separate sheds should be made by raising the warp threads for the swivels at a higher level than usual, whereby both ground shuttle and swivels could pass at the same time. This subject may be again alluded to.

Before swivels were introduced, a system of weaving was used for producing figures upon the surface of the cloth by means of needles placed in a sliding frame. Each needle was provided with a separate thread, and when the shed was opened for the passage of the shuttle the needle frame was raised so that the threads could be intersected by the weft thread with the body of the cloth. But it is evident that the threads could only be bound at the edges of the figures so formed, and they consequently hung loosely or floated on the surface. Two or more bars could be employed in this manner so as to extend the design. They were placed immediately in front of the reed, so that the shuttle could pass in front of them, a row of wire pegs being placed so as to prevent the shuttle touching them. They were raised when required in a similar, although a reverse manner, to the lowering of the swivels. The pattern was formed by means of a ratchet wheel, placed at the end of the batten, and a groove in the side of the wheel was cut in such a manner, that when it had completed a revolution the pattern was woven. Thus the operation was repeated, and the figure formed without aid of the Jacquard or other machine for producing the figure. This plan was formerly much used and known as lappet weaving.

Fig. 193 will show the principle upon which it was worked, and represents a front elevation and section of the lappet frame with four needles only fitted to a loom. In both figures the letters refer to the same parts.

The needles *p p*, are fixed in the guide or bar *h h*, and each needle has a thread *d d*, passed through the eye near the point of the needle. When the frame is raised, the needles pass through the warp at the back of the shuttle *s* and guide pins, but in front of the reed R, consequently on the passage of the shuttle the needle thread is bound in the cloth by the weft thread. The frame is then lowered, and moved right or left as desired, and again raised, and so the figure is produced; but the threads as before stated are only bound or intersected at the edges of the figure. The lateral motion to form the figure is regulated by the groove M in the ratchet wheel N. The pin upon the end of the connecting lever *x*, being worked alternately from side to side of the groove, regulates the distance of the traverse of the needles; in fact the groove is really the development of the pattern, and a fresh one is required for every new pattern. The rachet wheel moves one tooth for each pick of weft, and contains as many teeth as the extent or length of the pattern.

Grooves may be placed on the circumference of a drum cylinder in like manner, or two or more grooves and needle bars may be used. The threads *d d*, are supplied from a beam or beams beneath the loom, and Fig. 194 will show the kind of work produced—where the threads float from side to side of the figure without any intersection with the cloth—although the pattern may be so arranged as to make intersections to a small extent in the intermediate distances.

At Fig. 195 a modification of the lappet apparatus is shown. In this case the needles were not supplied with separate threads, but when the shed was opened certain threads were left down, so that when the needles were drawn across the under surface of the cloth they came into contact with them, and after carrying them a given distance the needles were then raised and by means of a notch cut in the side of the needle, the threads were also raised out of their normal position. This plan caused a kind of cross weaving something similar to gauze weaving, and the effect produced may be represented in Fig. 195, which shows that the warp threads *e, e, e*, have been raised and occupy the place of the warp threads K, K, K. The needles were formed, as shown in Fig. 196, and were inserted in a slide bar similar to those before described. The notch *i*, during the lateral motion of the needles, taking hold of the warp threads purposely left down for them, carried them laterally the appointed distance, and then raised them to form the crossing of the threads.

In this way one or more threads could be moved and crossed by each needle, according to design made by means of the Jacquard or other similar contrivance, but in the figure only one thread has been moved by each of the three needles used in the space represented.

Numerous modifications of the above systems have been made with more or less success, but the simple swivel and circles as described seem to answer every purpose in a most effectual way, and are generally used.