Improvement in Looms.

We are often called upon to illustrate and describe a more or less new invention than the one shown in the accompanying engraving. The precise date at which the shuttle in the form in which it has been so long was first employed is unknown, though it is clear that it was used in the earliest weavings. It is mentioned in Shakespeare, "My days are fleeter than the weaver's shuttle." In this passage evident allusion is made to the danger of motion of the shuttle when thrown by hand, and it is a most beautiful poetic figure by which the brevity of life is illustrated.

It is certain that the throwing of the shuttle by hand was practiced much earlier than the present invention, and the fact that this method is still retained in the manufacture of many kinds of fine fabrics shows how difficult it has been to substitute any other form of power to this motion, which could adequately perform the functions of the hand, in all kinds of weaving.

The introduction of the picker staff and its arrangements to animate the shuttle as an immense stride in the art of weaving. It and the Jacquard attachment constitute perhaps the most remarkable improvements made in the art of weaving up to the date of the present invention.

Notwithstanding the persistence with which the ancient form and method of performing the shuttle have held their ground, there are always existing serious difficulties, which it was desirable to overcome. Without entering too minutely into details which are perfectly familiar to those acquainted with the art of weaving in all its branches, we shall specify a few important defects that the general reader may understand the importance of the device used to accomplish this desideratum to accomplish.

First, the distance to which the shuttle must be thrown is very great, either by the hand, or by the use of the picker staff, is limited, and the difficulty of weaving wide goods is consequently so much greater that the motion capable of weaving wide goods, as cheaply as narrow, a great desideratum.

Second, the motion of the shuttle, having no positive relation to the other parts of the loom, the operator has no control over it during the time it is traversing the distance between the shuttle box, or, and the motions of the other parts, if by accident they should take place too soon, through the breaking of any of the working parts, the motions of the loom are liable to clash with that of the shuttle. To illustrate this, suppose the shuttle, impelled by its own weight, in passing between the sheds of the loom, in a power loom of the ordinary construction, the shed would then make its beat, and either drive the shuttle through the warps, making an exiguous breakage, or it would spring the teeth of the reed. Both of these accidents may occur at the same moment.

In a piece of fine goods the weaving of the dents is destroyed, which cannot be wholly repaired. They cannot be again perfectly straightened without taking the piece out of the loom, and if the piece is woven to the end with such a defect in the reed, a slack woven streak will appear through the entire remainder of the piece. In order that the shuttle may traverse with certainty, a regular speed must also be maintained, below which it is impossible to work a power loom with success.

Third, the shuttle reaches the shuttle box after its flight in either direction, and comes to rest before the loom makes its beat. An arrangement so perfect that, at this point of the loom, the shuttle shall be firmly drawn up against the exterior threads of the warp oppose the shuttle, is necessary to make a perfect selvedge. This perfect arrangement is difficult of accomplishment, so much so that the character of the selvedge on a piece of linen or silk goods is one of the criterions by which the quality of the article is determined.

To remedy these defects in 

LYALL'S PATENT POSITIVE MOTION LOOM.

would have pronounced impossible had not its possibility been demonstrated by this invention. But the problem is further complicated by another condition which is omitted in the general enumeration, namely, no lateral motion must be imparted to the threads of the warp.

neutral motion without breaking the threads. The problem may therefore be enumerated as follows:

1. To produce absolute, positive, and uniform motion in a shuttle, by means of an external appliance moving exterically to the shed of the warps without absolute and positive connexion between the shuttle and the motion through which it receives its motion. A problem which a majority of mechanics might be tempted to solve.

2. To prevent the shuttle, p, and its carriage, s, and bear in mind that if s is the upper surface of a piece of goods running across the lay beneath the weaver, upon the lower surface of the loom, then the carriage must be taken off the carriage or driver, s, and let this be drawn to the left in the direction of the arrows. It is now evident that the wheels, 2, will revolve in the direction of the arrows drawn upon them, and that the circumferential motion will always be exactly equal to the motion of the carriage, s, upon the lower surface of the loom, 2, allowing the weight of the carriage to be evenly distributed between the pins of the wheels, 3, and those wheels rest on the tops of the wheels, 2, the wheels, 3, must evidently receive a counter motion in the direction of the arrows marked upon them, exactly equal to the motion of the wheels, 2, which is likewise equal to the motion of the carriage across the race-way, 1. If now the sheet of threads be brought into contact with the wheels, 3, it will be seen that while the wheels, 2, are rolling along the race-way, 1, the wheels, 3, are rolling along the under side of the shuttle, 4, causing no more lateral motion of the threads than the wheels, 2, cause in the lay, 4, which is nothing.

We have now seen that the carriage itself produces no tendency to lateral motion in the threads of the warps, let us lay on the shuttle, holding it to its place by a bevelled rail, a section of which is shown at s, 2, and move the carriage in the same direction as before. The wheels, 2, revolve to the left, and the carriage, s, to the right, and the bottom of the sheet of warp threads. Some of these threads will be successively engaging at each moment between wheels, 2, and the carriage, s, which threads may be moved in a vertical direction without conflicting with the object we wish to attain, wheels, 4, also commence engaging the threads, so that each thread of the warp is running between the lower surfaces of the wheels, 4, and the upper surfaces of the wheels, 3, without being pulled laterally, their only motion being a slight vertical one, owing to the relative positions of the wheels. The wheels, 3, do not engage with the wheels, 4, but roll along the under side of the bevelled rail, s, Fig. 3, holding the shuttle down to its work.

The formation of the race-way in which the shuttle carriage rolls, is shown in Fig. 2. The shuttle box, or, is a bevelled rail which holds the shuttle from falling off the carriage in front, is shown at s, and another rail, l, does the same for the carriage. When the shuttle and carriage are in place they can only be removed by drawing them out at the end of the lay, unless the bevel rail be taken off by unscrewing the bolts which hold it in place. With the carriage, and the parts move, is shown by the fact that, in our recent examination, we found we could easily unscrew the bolt and make the shuttle and carriage work freely.

Fig. 1 is a perspective view of a power loom with this shuttle mechanism attached. In this engraving the band, s, which draws the carriage, s, may be traced passing over grooved pulleys fixed to the ends of the lay, down over other grooved pulleys attached to the lower part of the loom, from thence around a horizontal pulley under and a little back of the cloth beam. Motion is imparted to the horizontal pulley, from the main shaft, by means of a belt, driving a short vertical shaft, with crank and pinion at its lower end, actuating a rack and a pinion attached to the shaft of the horizontal pulley. A reversing motion being thus given to the horizontal pulley, the band, s, which draws the shuttle carriage, is alternately wound up on one side, and unwound on the other side, and a reciprocating movement imparted to the shuttle carriage and shuttle. It is obvious now that by putting different sized
pinions upon the shaft of the horizontal pulley, or by speeding up from the neck, any amount of throw may be obtained for the shuttle, so that the width of the piece to be woven, is only limited by other considerations; as far as the shuttle is concerned there would be no difficulty in weaving a piece sixty yards wide, if such a width were required, at precisely the same rate that it travels in narrow goods, and producing a given number of square yards of cloth just as rapidly in one case as in the other. It will be also obvious that any precise rate of speed is not essential, when it is understood that the lay is actuated by a cam motion, and that the cam groove is so cut that the lay must remain stationary until the shuttle has passed entirely through between the sheds, and drawn the shoot of the weft perfectly tight. If a loom were stopped with the shuttle midway between the sheds, and then started, the first thing it would do would be to draw the shuttle out of the way. In short, a breakage resulting from failure of any part of the loom to operate, is a contingency so remote, that it may be considered practically to be nothing.

The loom frame, yarn beam, cloth roller, let-off and take-up motions, together with the bobbins, and the means for operating them, are of any usual or desired kind and do not require description here. The lay swings upon a sword like those of other looms, but as we have stated, is actuated by a cam, instead of a crank motion. As to the relative merits of the two motions for actuating a lay, we are of the decided opinion the cam motion is the better.

We should neither do justice to carelessness nor the interests of our readers, if we failed to state that we have formed our opinions of this improvement, from actual observation of its operation, both on narrow and wide goods. We have seen it weave various textures, from fine dress silk to woolen drapery six yards in width, in each of which its work was of the most satisfactory kind. No power loom ever before used can be relied upon to make a selvage equal to it, and, if we mistake not, many lines of goods produced hitherto only by hand weaving will ere long be successfully woven by power on the positive motion loom.

Instead of complicating the loom, this invention has actually simplified it, reducing the number of parts, and introducing no motions or attachments liable to get out of repair. It is to the loom what the link motion is to locomotive engineering, or the compass to navigation. It substitutes certainty for uncertainty and thus lays the foundation for future development in the textile arts hitherto unattainable. Radical in its character, it may be compared to the invention which placed the eye of the sewing-machine needle at the point, and like that invention, it will, in its proper field, be likely to produce results impossible at present to estimate at their true value.

This improvement was patented in the United States, Aug. 11, 1868, by James Lyall, of this city, and has since been patented in the chief European countries, and is the first and only positive shuttle-motion loom. It is now in operation, in various kinds of work, at 35 and 37 Wooster street, New York, the office of the Positive Motion Loom Company, whom address for further information.