Considerable attention has been lately attracted, in America, to a new arrangement of power loom, designed by Mr. James Lyall, of New York. The distinguishing feature of this loom is that the shuttle, instead of being impelled to and fro by the action of the picker staffs as usual, receives what the inventor terms a "positive motion," or, in other words, it is under the complete command of the driving mechanism during the whole of its traverse. The idea of giving a positive motion to a shuttle is, we believe, not new; but the arrangement adopted by Mr. Lyall is not only novel but highly ingenious, and even on this account alone it is well worthy of notice. Quite apart from its ingenuity, however, Mr. Lyall's loom appears to possess many marked practical advantages, and it is certainly peculiarly adapted for the manufacture of very wide fabrics; and under their circumstances we are directed from the Scientific American of the following particulars concerning it. Our contemporary says:—

"It is certain that the throwing of the shuttle by hand was practised many centuries ago, and the fact that this method is still retained in the manufacture of many kinds of fine fabrics shows how difficult it is to devise a substitute for any application of power to this motion, which could advantageously take the place of the shuttle, in all kinds of weaving. The introduction of the picker staff, and its adjuncts to assist to the work, was 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 prestige with which the ancient art of weaving carriage and shuttle hold their ground, there have always existed serious difficulties which have been desirous of being obviated. Without entering too minutely into details which are perfectly familiar to those acquainted with the art of weaving in all its branches, we will specify a few important defects that the general reader may understand:

1. The important advantage the device under consideration is destined to accomplish. First, the distance to which the shuttle will be thrown with certainty, 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 than that of making narrow fabrics of similar materials, that the cost of wide goods per square yard is considerably more than that of the narrow. This alone would render a shuttle mechanism valuable in the highest degree.

2. The motion of the shuttle, having no positive motion on the parts of the loom, the operator has no control over it during the time it is traversing the distance between the shuttle boxes; and the motions of the other parts, if by accident they should take place a little too fast, though the breaking of any of the working parts from any other cause, are liable to clash with that of the shuttle. Third, the shuttle reaches the shuttle box after its flight in either direction, and comes to rest before the loom makes its beat. An adjustment so perfect that, at this point, the thread of the web shall be firmly drawn up against the external threads of the warp opposite the shuttle, is necessary to make a perfect selvedge. This perfect adjustment is difficult of attainment, so much so that the character of the selvage on a piece of linen or silk goods is one of the criticisms by which the quality of the article is determined.

"To remedy these defects in toto, was a reform so radical in its nature, that a motion naturally different was necessitated. It is evident from the nature of the case that an absolute connection between the shuttle and any appliance working exterior to the sheds of the warp, can be made capable of lateral motion without breaking the threads. The problem may therefore be expressed as follows:—

"Required to produce absolute, positive, and uniform motion in a shuttle, by means of an external appliance moving exteriorly to the sheds of the warp without absolute and positive connection between the shuttle and the motion through which it receives its motion—a problem which the majority of mechanics would have pronounced impossible, had it not been demonstrated by the invention. But the problem is further complicated by another condition which is omitted in the general consideration, namely, no lateral motion must be imparted to the threads of the warp.

"The ingenious method by which these conditions are fulfilled is shown by Fig. 2, which represents the shuttle operating in its carriage and through it to the shuttle by means of a stout cylindrical band, a, in a manner to be hereafter described.

"Let the reader now imagine a system of parallel threads stretched between the shuttle, p, and its carriage, a, and bear in mind that a is the upper surface of a race-way running across the lay beneath the warp, upon which the wheel, 2, play their slotted bearings, so that their upper surfaces roll on the lower surfaces of the wheels, numbered 2. Now suppose the shuttle to be taken off the carriage or driver, e, and let it be drawn to the left in the direction of the arrow. It is now evident that the wheels, 2, will revolve in the direction of the arrows drawn upon them, and that their circumferential motion will always be exactly equal to the motion of the carriage, e, upon the race-way, 4, of the lay. But as the slotted bearings of the wheels, 2, allow the weight of the carriage to rest on the pivots of the wheels, 3, and their wheels rest on the tops of the wheels, 2, the wheels, 2, must evidently receive a counter motion in the direction of the arrows marked on them, exactly equal to the motion of the wheels, 2, which is likewise equal to the motion of the carriage along the race-way, 4. If now the shuttle of threads be brought into contact with the wheels, 2, it will be seen that while the wheels, 2, are rolling along the race-way, 6, the wheels, 3, are rolling along the under side of the shed of warp threads, causing no more lateral motion in those threads than would exist if the shuttle, 2, were in the place of the wheels, 3, because the motion of the wheels, 2, is directly transmitted to the shuttle, which is in the race-way, 4, in which the motion of the wheels, 3, is exactly the same. Any thrust of the warp in succession is passed between the inner 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, 2, do not engage with the wheels, 3, but roll along the under surface of the bevelled rail, 5, Fig. 3, holding the shuttle down to its work.

"The operation of the race-way, in which the shuttle carriage rolls, is shown in Fig. 3. The back is the aad, b. The bevelled rail which holds the shuttle from falling off the carriage in front, is shown at c, and another rail, d, 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 bevelled rail be taken off by unsewing the bolts which hold it in place. The extreme lightness with which the parts move, is shown by the fact that, in our recent examination, we found we could easily open the lock of the brake firmly held by a key screwed on to the main shaft; the labour being overcome not by force, but by means of the camb. The wheels, 5, are then turned a grindstone.

"Fig. 1 is a perspective view of the shuttle with its race-motion attached. In this engraving, the band, 10, which constitutes the carriage, m, or traction, o, may be traced passing over grooved pulleys fixed to the ends of the lay, drawn over other grooved pulleys attached to the lower part of the works, and 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 beam, by means of a pair of bevelled gears, driving a short vertical shaft, with crank and pinion at its lower end and 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, a, which draws the shuttle carriage, is ultimately 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 pins upon the shaft of the horizontal pulley, or by speeding up or slowing down from the rack, 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. The shape of the shuttle in consequence would be no difficulty in weaving a piece sixty yards wide, if such a width be required, as precisely the same rate which it travels, 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, that, on the right, and rooling along to the left, it is, in the very nature of the case, stationary until the shuttle has passed entirely through the sheds of the web, when the same continues in the same manner, and then the lay is allowed to roll, the first thing it would do would be to draw the shuttle out of the way and rotate a handle resulting from failure of any part of the loom to operate, a contingency so remote as to be considered practically to be nothing.

"The loom frame, your beam, cloth roller, let-off and take-up motions, together with the beeddes, and the means for
Operating them, are of any usual or desired kind, and do not require description here. The lay swings upon swords 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 our looms nor the interests of our weaving mills by stating 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 silks up 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 soon be successfully woven by power on the positive motion loom."