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J. JUCKER.

LOOM.

No. 422,224. Patented Feb. 25, 1890.

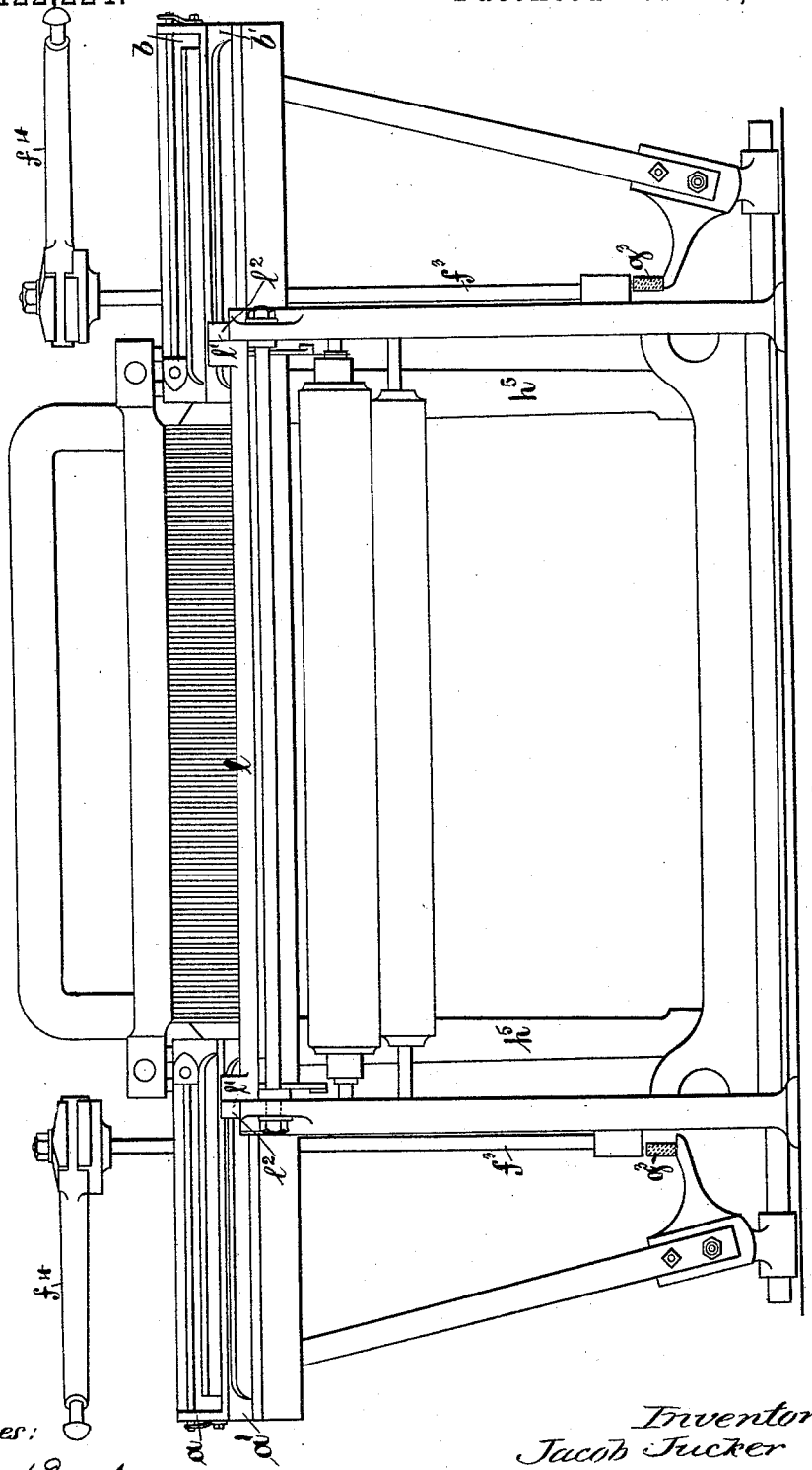

Fig. 1.

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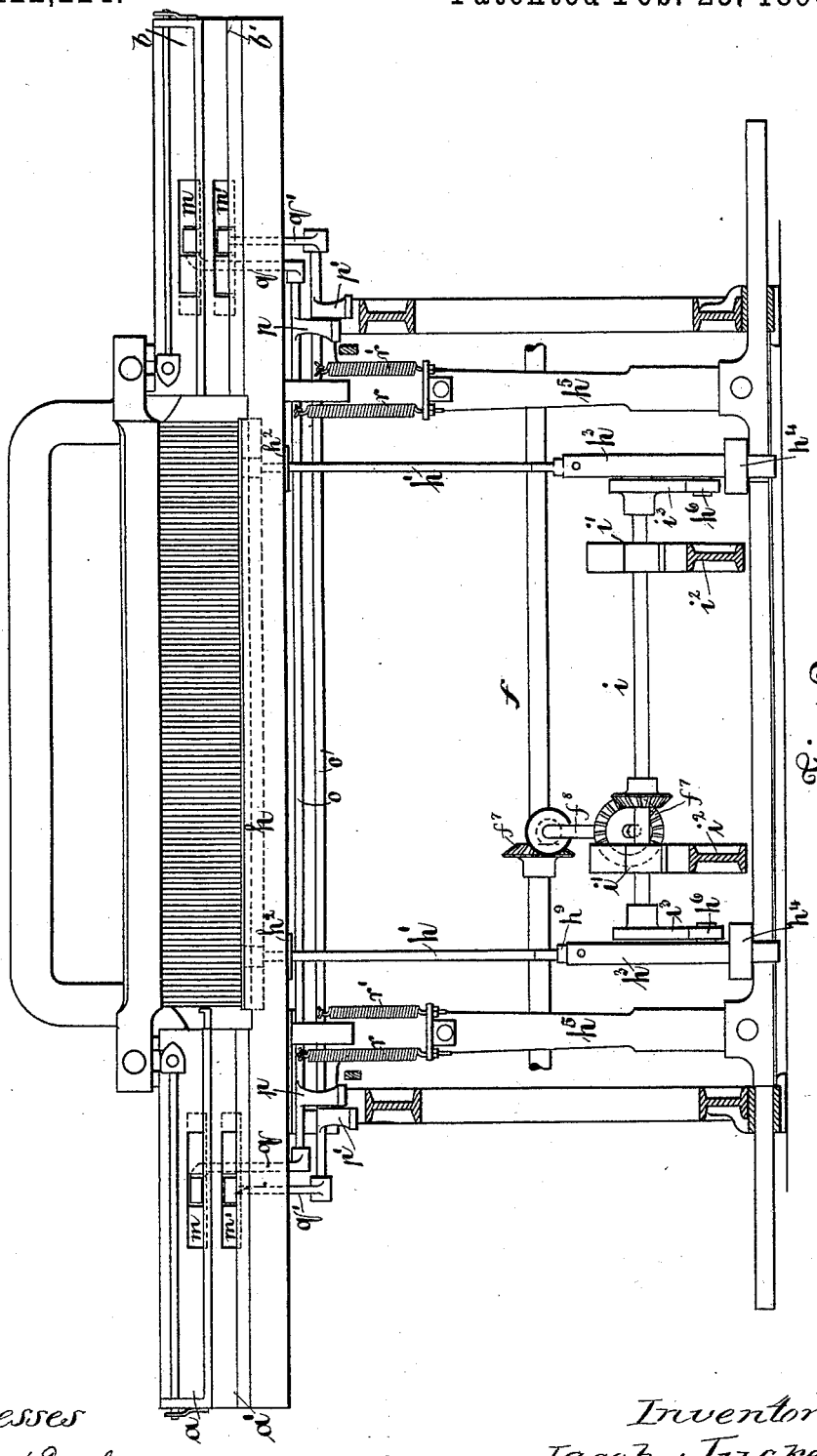

Fig. 2.

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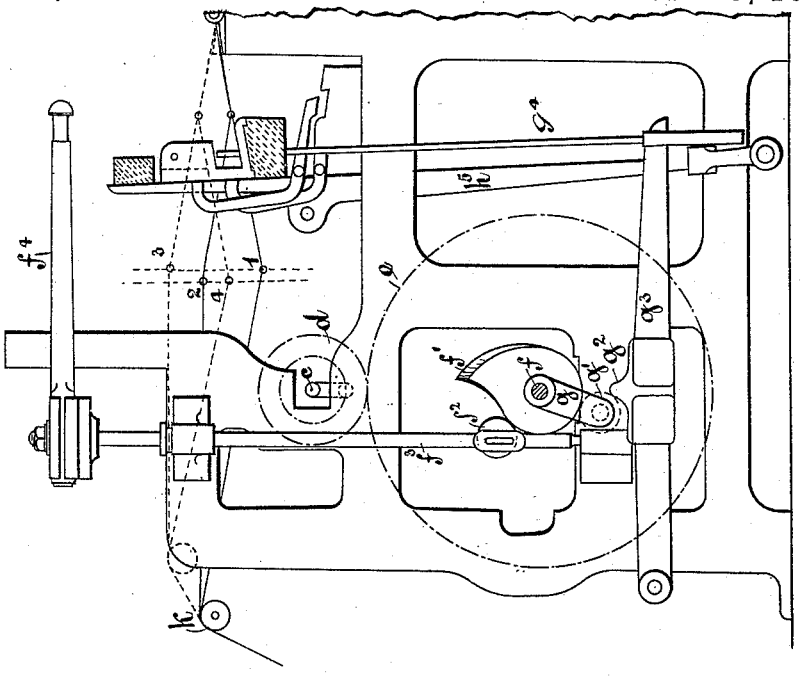

Fig. 4.

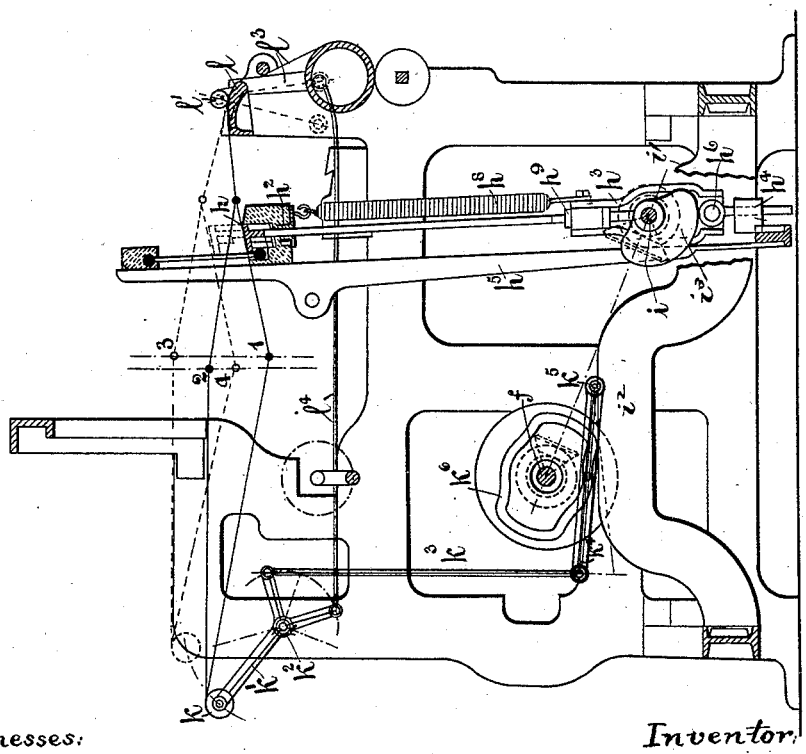

Fig. 5.

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(No Model.) 5 Sheets—Sheet 4.

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LOOM.

No. 422,224. Patented Feb. 25, 1890.

Fig. 5.

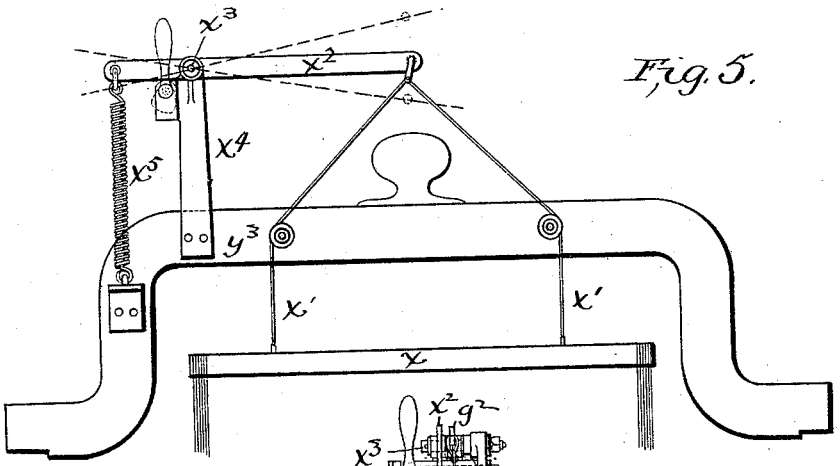
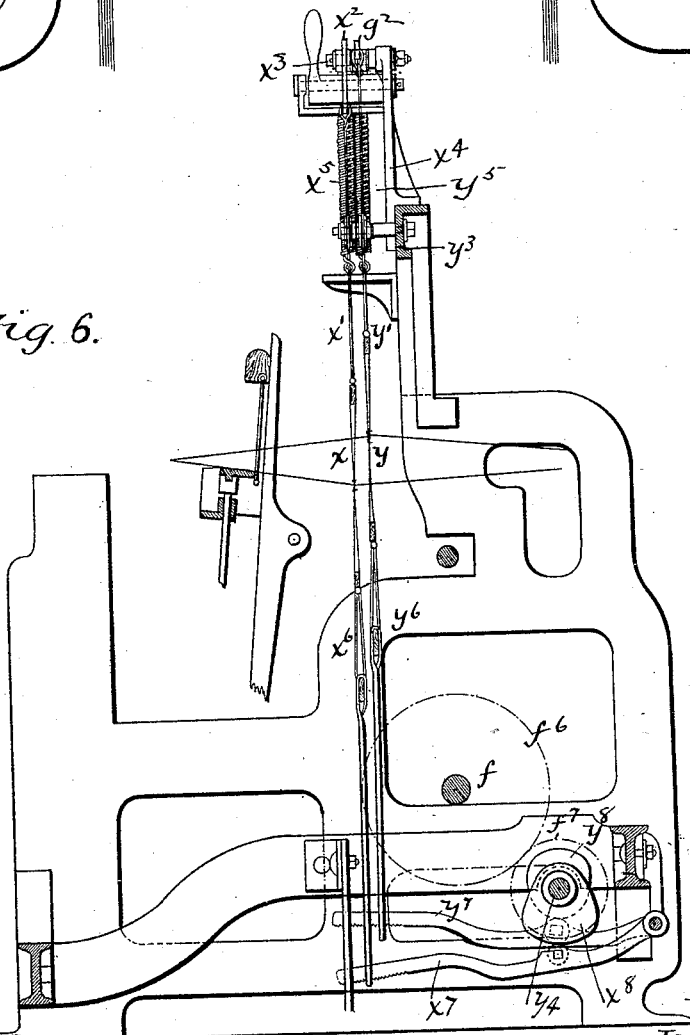


Fig. 6.



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(No Model.) 5 Sheets—Sheet 5.

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LOOM.

No. 422,224. Patented Feb. 25, 1890.

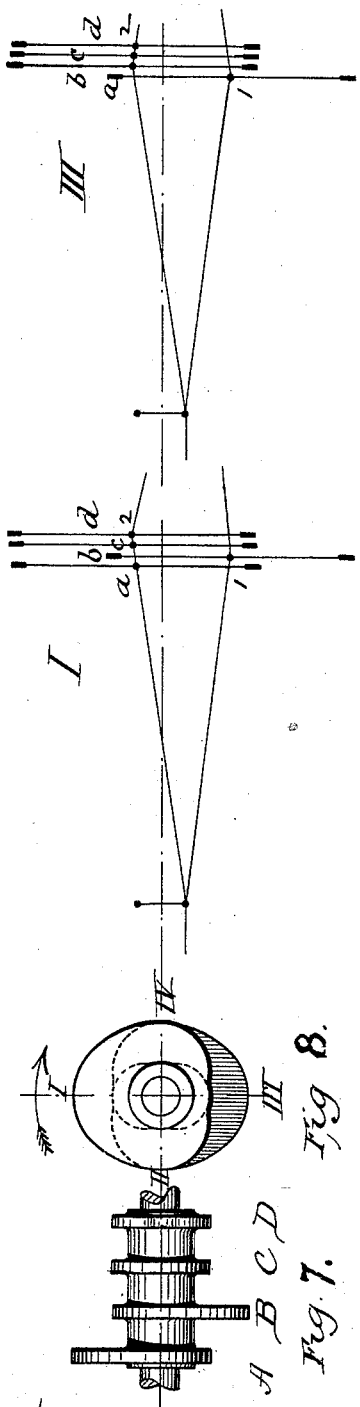

Fig. 8.

Fig. 7.

Fig. 10.

Fig. 9.

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UNITED STATES PATENT OFFICE.

JACOB JUCKER, OF MANCHESTER, COUNTY OF LANCASTER, ENGLAND.

LOOM.

SPECIFICATION forming part of Letters Patent No. 422,224, dated February 25, 1890.

Application filed April 4, 1887. Serial No. 233,674. (No model.) Patented in England December 28, 1886, No. 16,970.

To all whom it may concern:

Be it known that I, JACOB JUCKER, a subject of the Queen of Great Britain, residing in Manchester, in the county of Lancaster and Kingdom of Great Britain, have invented certain new and useful Improvements in Looms, (which were patented to me in Great Britain December 28, 1886, No. 16,970;) and I do hereby declare that the following is a full, clear, and exact description of my invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to looms for weaving; and it consists in a loom having two shuttle-boxes on each side of the sley or lathe and two shuttles picked alternately by two picking-motions arranged on each side of the loom, combined with a movable shuttle-race and movable back beam or whip-roll raised and lowered alternately after each pick.

Figure 1 is a front view of the loom, illustrating the arrangement of the two picking-motions, the other parts being mainly omitted. Fig. 2 represents a section parallel to the front. Fig. 3 is a view of the loom in cross-section, with parts broken away. Fig. 4 is a side view of the loom, partly in cross-section. Fig. 5 is a front view of the upper part of the loom. Fig. 6 is a sectional view of the loom, parts being broken away; and Figs. 7, 8, 9, and 10 are front and side views of the tappets. Diagrams I, II, III, and IV show the positions of the four shafts at the first, second, third, and fourth pick.

Only such parts of the loom are shown as are required to elucidate the nature of my invention, all others—such as the letting-off, taking-up, and shedding motions—being omitted.

Similar letters and numerals of reference denote similar parts in the different figures.

In carrying out my invention I arrange two fixed shuttle-boxes a a' and b b', Figs. 1 and 2, on each end of the sley or lathe, one above the other, and two picker-motions on each side, one of which is preferably an under-pick motion for the lower shuttle-box and the other an over-pick motion for the upper box. These picker-motions may be of any suitable ordinary or known kind. As shown, the pinion d, Fig. 4, on the crank-shaft c drives the wheel e on the tappet-shaft f, so that the latter makes one revolution to four revolutions of the crank-shaft. The tappet-shaft carries at each side of the loom a picking tappet or nose f', Fig. 4, acting on the arm f^2, fixed on the picking-spindle f^3, and thereby actuates the picker-stick f^4 in the same manner as in ordinary over-pick looms. An arm g, with bowl g', is also fixed at each side of the loom upon the tappet-shaft f and acts upon the curved incline g^2 on the picking-lever g^3, Fig. 4, which actuates the picker-stick g^4 in a similar manner as in ordinary under-pick looms. The tappets and levers are so fixed upon the shaft as to pick the shuttles in the order hereinafter described.

On the sley-bottom I arrange a movable shuttle-race h, Figs. 2 and 3, carried by two sliding rods h' h', which are guided at their upper ends by bushes h^2 h^2, let into the sley-bottom, and are connected at their lower ends to open frames h^3 h^3, sliding in brackets h^4 h^4, fixed to the rocking rail, to which the sley-swords h^5 h^5 are fixed. This shuttle-race h is after each pick alternately raised to the position indicated in dotted lines on Fig. 3 and lowered to the position shown in full lines. As shown, a shaft i is arranged to run in bearings i' i', fixed upon the cross-rails i^2 i^2 of the loom. This shaft i is driven from the tappet-shaft f by bevel-wheels f^7 through a slanting shaft f^8, or by any other kind of gearing suitable to the general arrangement of the loom to which my improvements are applied. The shaft i carries at each end a tappet i^3, acting on a bowl h^6, which turns on a stud fixed into the sliding frame h^3. The tappet is formed, as shown in Fig. 3, with two circular surfaces connected by inclines, these surfaces corresponding to the two positions the movable shuttle-race has to occupy while the upper or lower shuttle is shot across the sley. As the shaft i turns round, the leading inclines of the tappets press upon the bowls h^6 and depress them, thereby bringing the shuttle-race into the lower position shown in full lines and expanding the springs h^8, which are fastened at one end to the sley-bottom and at the other to the frames h^3. These springs are omitted on Fig. 2 in order to show the rods h' h', in front of which the springs are

placed. The circular parts of larger radius on the tappets hold the race in its lower position while the lower shuttle is shot across the sley and the latter beats up, after which the bowl comes upon the following inclines of the tappet and the circular parts of smaller radius, when the springs h^8 pull the sliding frames h^3 h^3 and rods h' h' upward and bring the shuttle-race into its higher position, (shown in dotted lines on Fig. 3,) in which it remains while the upper shuttle is picked. With a single-throw tappet, as shown, the shaft i is rotated by the gearing so as to make two revolutions to one of the tappet-shaft f, or one revolution for every two beats of the sley. The frames h^4 h^4 are made open, as shown, for the shaft i to pass through and for allowing the sley to beat backward and forward without hinderance, the bowls running on the surface of the tappets during this movement of the sley, swords, and attachments. The rods h' h' are screwed at the ends and fitted with nuts and lock-nuts h^9 to adjust their length in the frames h^3 h^3. Instead of the single-throw tappet, as described, a double-throw tappet may obviously be used, in which case the shaft i is driven so as to make the same number of turns as the tappet-shaft f.

After each pick the warp has to be raised and lowered alternately and the shed formed at different heights for the lower or upper shuttle to pass through. For the purpose of raising or lowering the warp the breast-beam and back beam of the loom are raised or lowered. This is preferably done by oscillating them on suitably-placed centers. The latter arrangement is shown on the drawings in Fig. 3. The back beam k is supported at each end in a fork of a three-armed lever k', mounted upon a stud k^2, fixed to the loom-side. A second arm of each lever k' is connected by the rod k^3 to a lever k^4, having its fulcrum on a pin in a bracket k^5, attached to the frame-side or the cross-rail. A double-throw grooved tappet or cam k^6 is keyed on each side upon the tappet-shaft f, and bowls on studs fixed in the levers k^4 k^4 run in the grooves, so that during each revolution of the tappet-shaft the levers k^4 k^4 are twice raised and lowered and the levers k' k' and back beam k twice moved from the position shown in full lines to that indicated by dotted lines and back again. The breast-beam l is formed with lugs l' l' at each end, Figs. 1 and 3, having pivots working in corresponding lugs l^2 l^2, formed or fixed on the loom-sides. Two arms l^3 l^3 are attached to or cast on the breast-beam and connected by rods l^4 l^4 to the third arms of the levers k' k'. As the latter are actuated through the mechanism hereinbefore described, they move the breast-beam simultaneously from the position shown in full lines to that indicated by dotted lines and back again. The tappets or cams k^6 k^6 have circular parts, two of larger and two of smaller diameter, so as to keep the two beams in their higher or lower position during the time the shuttle traverses the shed and the sley beats up.

The shedding or shaft motion, which may be of any ordinary or known suitable kind, is so arranged that the shed is formed alternately at the lower level for the lower shuttle, as shown on Figs. 3 and 4 in full lines, and at the higher level for the upper shuttle, as indicated in dotted lines. When weaving plain taffeta weave with two shafts, as shown, the eyes or mails of the healds will be in the positions 1 and 2, Fig. 3, while the lower shuttle is picked. For the next pick the healds of the front shaft have to be raised to position 3, while those of the back shaft are dropped to position 4. One shaft thus will be moved alternately from 1 to 3 and back again, while the other will be moved from 2 to 4 and back again. This may be effected by giving the two treadle-tappets different eccentricity or lift, or by giving different leverages to the treadles or jacks in any known or usual manner. The former arrangement is shown in Fig. 7. The shafts x and y are suspended by cords x' y' to jacks x^2 y^2, oscillating on the pivot x^3 in the bracket x^4, fixed to the loom top rail y^3. The other ends of the jacks are connected to springs x^5 y^5, which pull them down and the heald-frames x and y up. The latter are connected at the bottom to hooks x^6 y^6, embracing the treadles x^7 y^7, which are actuated, respectively, by tappets x^8 y^8, fixed upon the tappet-shaft y^4. The latter is driven from the shaft f of the loom by spur-wheels f^6 f^7, so as to make two revolutions for one revolution of the shaft f, or to make half a revolution for every pick. With the tappets in the position shown in Fig. 8 the front healds will be in the position 1, Fig. 3, and the back healds in position 2, while for the next pick the shaft y^4 and the tappets will have made half a revolution and the spring x^5 will have pulled the frame x, with hooks x^6 and treadle x^7, up against the tappet and brought the front healds to position 3, Fig. 3, while the tappet y^8 will have depressed the treadle y^7 and brought the back healds to position 2, Fig. 3.

Although only two shafts have been indicated on the drawings, any number may be used and the shedding-motions so arranged that the lifted and dropped parts of the warp occupy the positions 1 and 2 alternately with the positions 3 and 4.

The working of the loom is as follows: Supposing both shuttles to be in their boxes on the left side of the loom and the different parts in the positions shown in full lines on Figs. 3 and 4, the lower shuttle is first shot to the right by the left-hand under-pick motion. The shuttle-race, beams, and shed are then raised into the positions shown in dotted lines and the upper shuttle shot to the right by the left-hand over-pick motion. The shuttle-race, beams, and shed are then returned into the positions shown in full lines and the lower

shuttle shot from the right to the left by the right-hand under-pick motion, after which the shuttle-race, beams, and shed are lifted again into the positions indicated by dotted lines and the upper shuttle shot from the right to the left by the right-hand over-pick motion. The motions are then repeated in the same order. Instead of the lower shuttle leading, the upper shuttle may lead. The cloth is wound upon the cloth-beam in the ordinary manner. The loom arranged with two shuttles picked alternately, as hereinbefore described, may, with a modified arrangement of the shedding-motion, be used for weaving two pieces of cloth at the same time from one or more warp-beams. In that case for plain taffeta weave four shafts—two for the warp for the upper cloth and two for the warp for the lower cloth—are used. Each half of the warp-threads for the upper cloth is made to occupy alternately the positions 3 and 4, Figs. 3 and 4, when the upper shuttle is picked, while during this time all the warp-threads for the lower cloth are lowered to the position 4 or to a position below it. Each half of the warp-threads for the lower cloth is made to occupy alternately the positions 1 and 2 when the lower shuttle is picked, and during this time all the warp-threads for the upper cloth are in the position 2. This may be effected by suspending the four shafts by cords from four jacks arranged above in a similar manner, as shown for two shafts and jacks by Figs. 7 and 8 and connecting the shafts to four treadles acted upon by four tappets placed upon the tappet-shaft y^4, which in this case is driven by equal spur-wheels from shaft f, so as to make one quarter-revolution for each pick. On Sheet 6, Fig. 9 shows a front view of these tappets, and Fig. 10 is a side view; Fig. 11, a front view displaced by a quarter-revolution from that shown by Fig. 9, and Fig. 12 a sectional side view sectioned along line x^7 of Fig. 11. Diagrams I, II, III, and IV show the positions of the four shafts at the first, second, third, and fourth picks. One half of the warp-threads for the lower cloth is drawn in through shaft a and the other half through shaft b, while one half of the warp for the upper cloth is drawn through shaft c and the other half through shaft d. The shafts a, b, c, and d are actuated by tappets A, B, C, and D, respectively, A and B being alike, but placed diametrically opposite each other, and C and D being alike, but placed diametrically opposite. Each tappet has four steps. The steps upon the tappets A and B serve to throw the shafts into the positions 1 4, 2 4, as shown in Figs. 3 and 4, while steps of the tappets C and D throw the shafts into the positions 3 2, 4 2. The positions of the tappets at four consecutive picks corresponding with the positions of the sheds shown by diagrams 1, 2, 3, and 4 will be with the parts marked I II III IV on Figs. 10 and 12 at the top. The shedding proceeds as follows: first pick, lower shuttle to the right, a, c, and d at positions 2, Figs. 3 and 4, b at 1; second pick, upper shuttle to the right, a, b, and d at 4, c at 3; third pick, lower shuttle to the left, a at 1, b, c, and d at 2; fourth pick, upper shuttle to the left, a, b, and c at 4, d at 3. After this the action is repeated, and in this manner two separate webs of plain cloth are produced. Instead of two shafts for each warp, any greater number may be used, as required for the kind of cloth to be made, and the movement of the warp-threads from one position to the other may be produced by any suitable known or usual mechanism used for forming the shed in looms. This arrangement is particularly applicable to light or open fabrics containing few warp-threads, so that double the number of threads required for one piece can be conveniently warped and sized instead of two, as is the case when the two pieces are woven in two separate looms.

By picking the shuttles alternately, as hereinbefore described, more time is given to the shuttles to come to rest in their boxes before they are shot back again, and a lighter pick may be given, while at the same time the looms may be run at a higher speed than when only one shuttle is used. The picking-motions, acting each only once at every fourth beat, need not be so violent in their action, and consequently there will be less vibration and less wear and tear in the picking-motions and their parts. This lighter pick also naturally results from the circumstance that the tappet-shaft makes only one revolution for four beats or revolutions of the crank-shaft instead of two, as in ordinary looms.

Having now described my invention, I claim—

1. In looms for weaving, the combination of the sley having two shuttle-boxes on each side with two shuttles and two picking motions or mechanisms on each side of the loom, a movable shuttle-race, movable breast and back beams, and means whereby the said movable shuttle-race and the movable breast and back beams are raised and lowered alternately after each pick, as set forth.

2. In looms for weaving, the combination of the sley having two shuttle-boxes on each side with two shuttles and two picking motions or mechanisms on each side of the loom, a movable shuttle-race and movable breast and back beams, means whereby the said movable shuttle-race and the movable breast and back beams are raised and lowered alternately after each pick, and shedding devices arranged and operated to form the shed alternately at a higher and lower level, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 16th day of March, 1887.

JACOB JUCKER.

Witnesses:

WILLIAM HENRY WHITBY,

CARL BOLLÉ.