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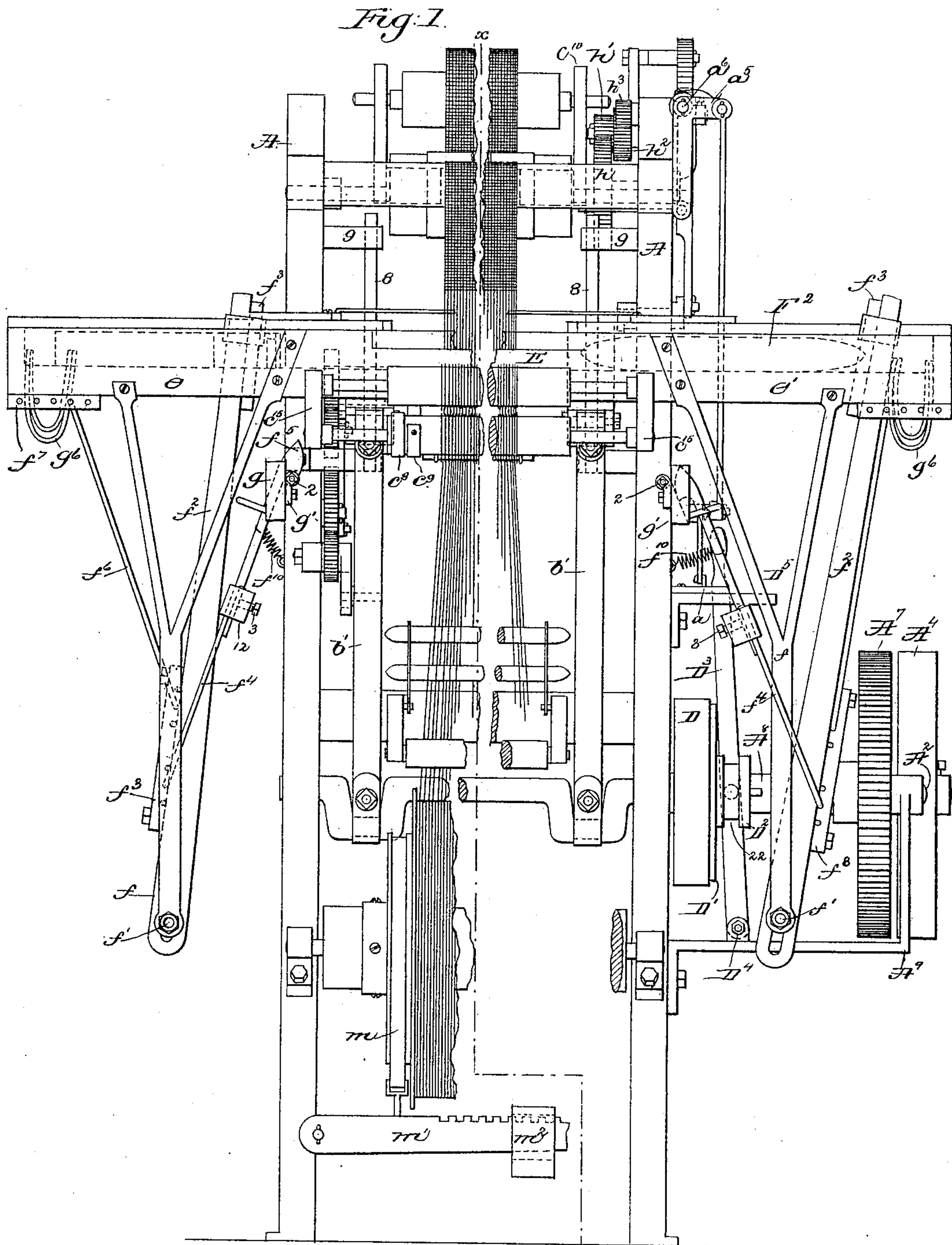
4 Sheets—Sheet 1.

M. F. FIELD.

VERTICAL LOOM.

No. 371,569.

Patented Oct. 18, 1887.



Witnesses
Fred L. Emery.
John P. C. P. P. P.

Inventor
Mildred E. Field.
By Crosby & Gregory attys.

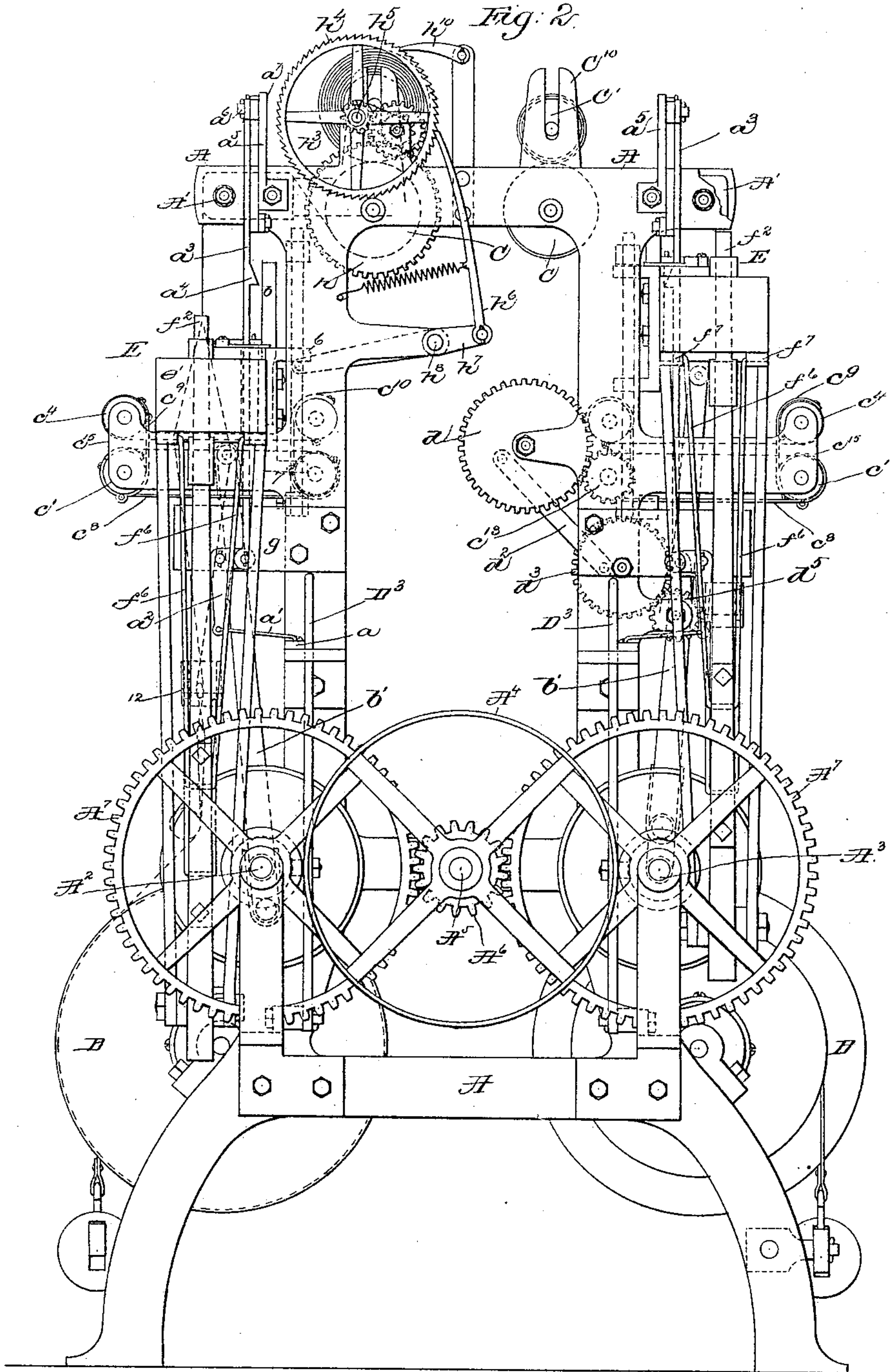
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M. F. FIELD.
VERTICAL LOOM.

No. 371,569.

Patented Oct. 18, 1887.



Witnesses
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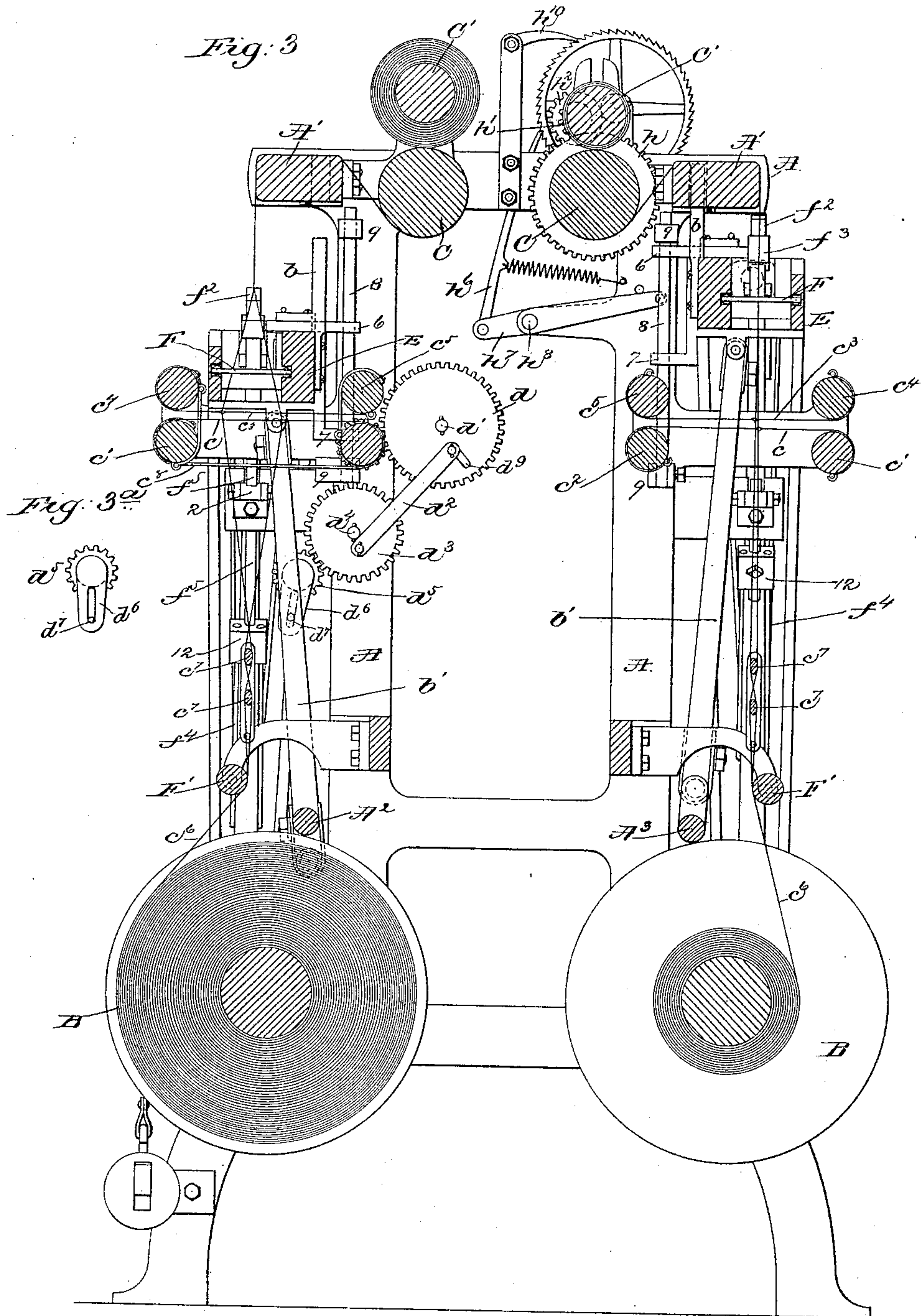
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M. F. FIELD.
VERTICAL LOOM.

No. 371,569.

Patented Oct. 18, 1887.



Witnesses
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Inventor:
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(No Model.)

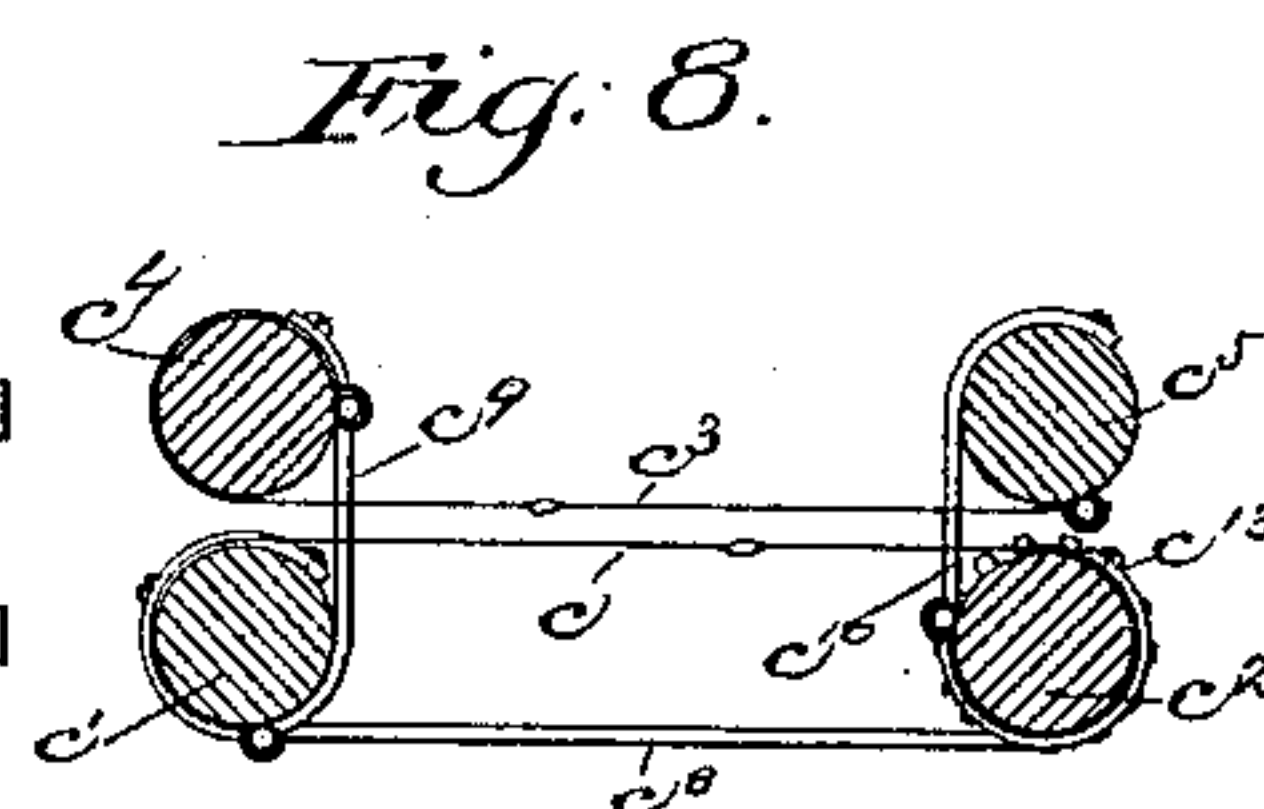
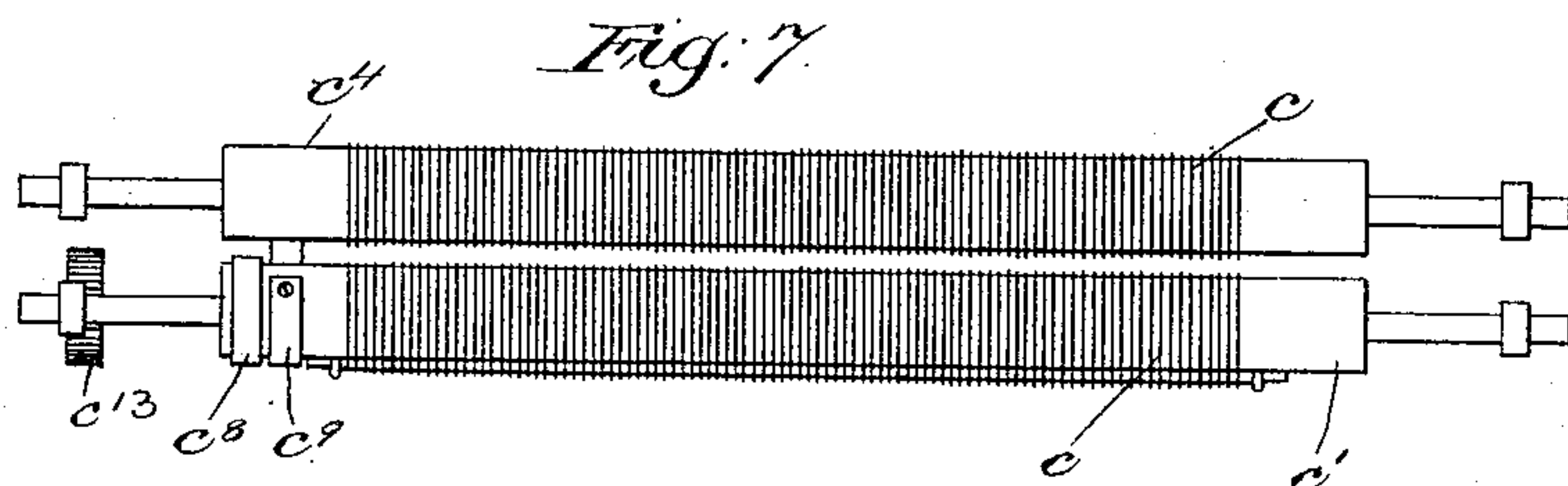
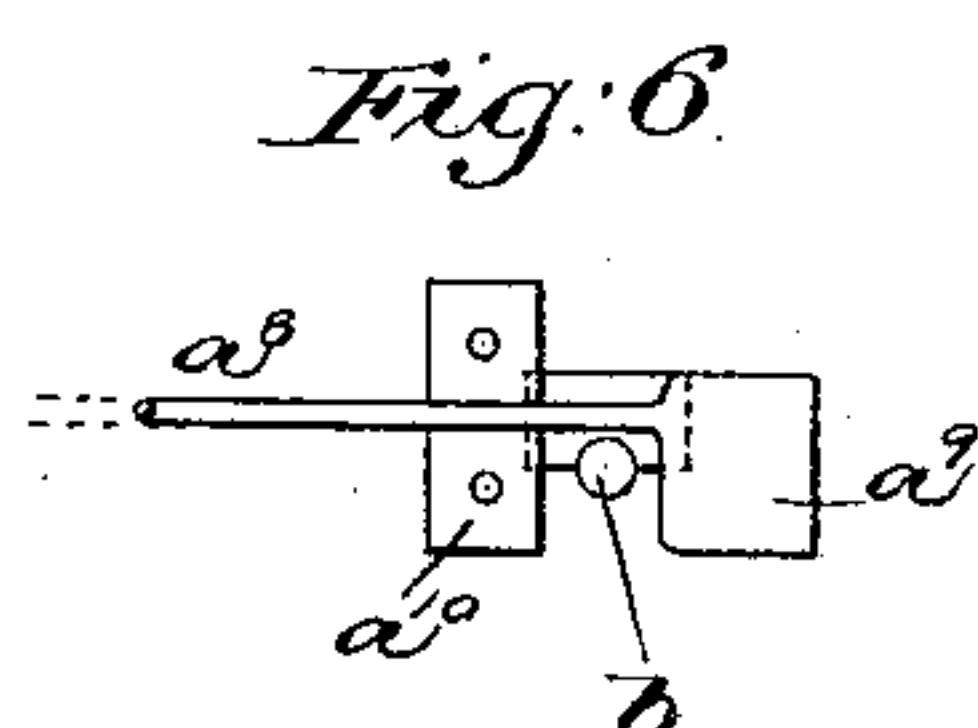
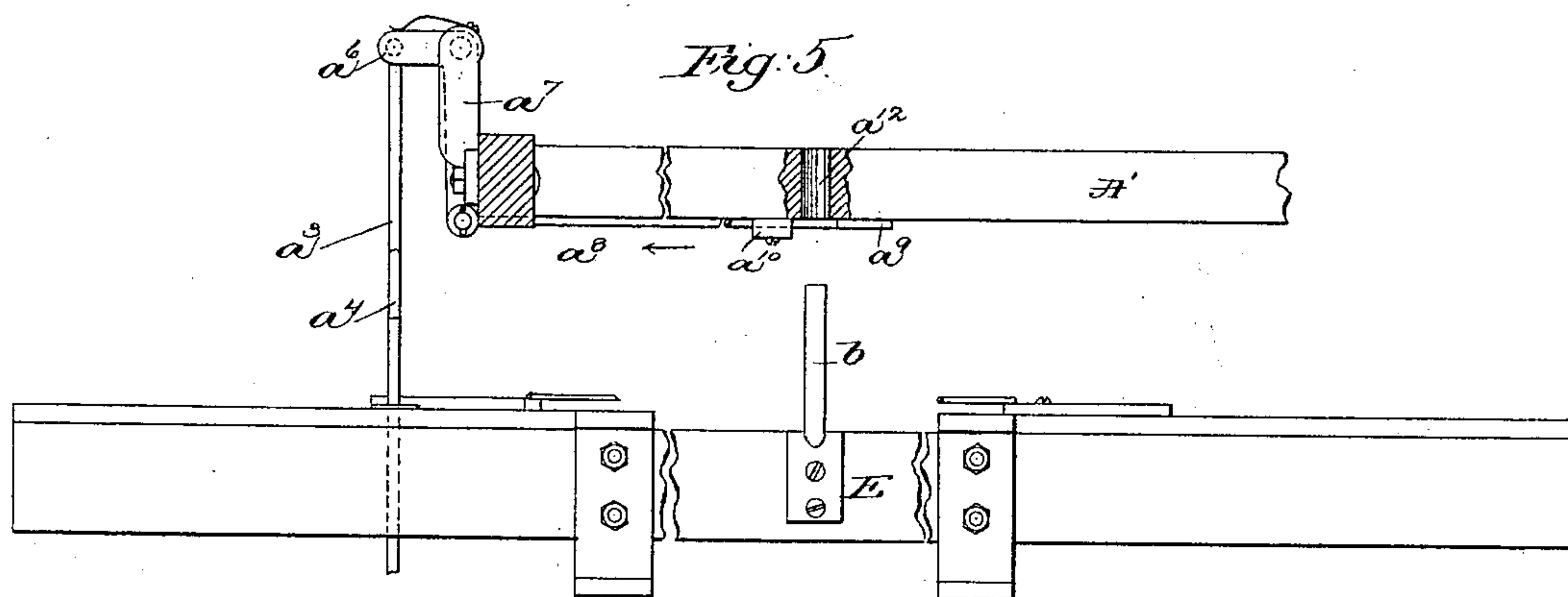
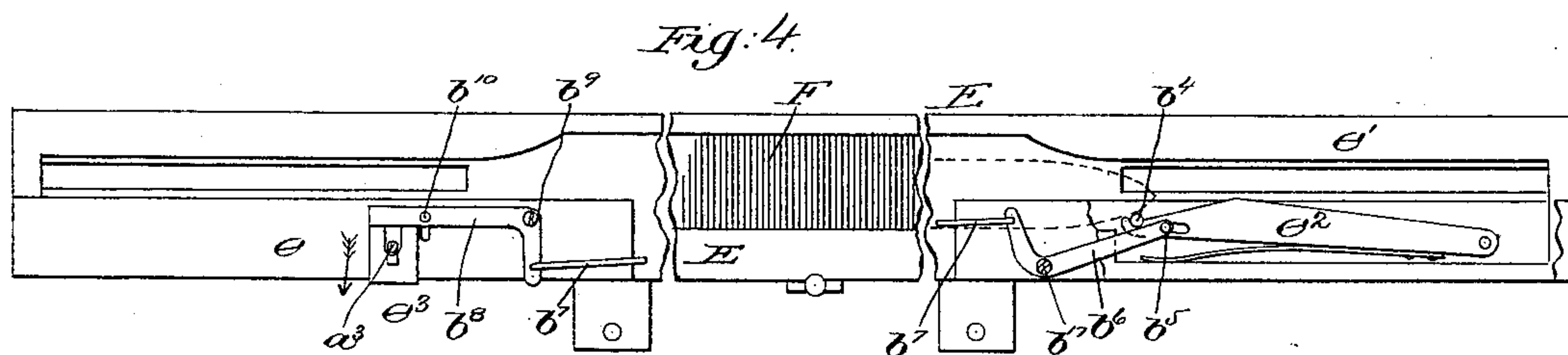
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M. F. FIELD.

VERTICAL LOOM.

No. 371,569.

Patented Oct. 18, 1887.



Witnesses
 Fred L. Curry,
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UNITED STATES PATENT OFFICE.

MILLARD F. FIELD, OF CHELSEA, MASSACHUSETTS.

VERTICAL LOOM.

SPECIFICATION forming part of Letters Patent No. 371,569, dated October 18, 1837.

Application filed July 21, 1886. Serial No. 208,597. (No model.)

To all whom it may concern:

Be it known that I, MILLARD F. FIELD, of Chelsea, county of Suffolk, and State of Massachusetts, have invented an Improvement in Vertical Looms, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object to simplify and improve the construction of vertical looms, or those in which the warp is held in substantially vertical position, that class of looms requiring less floor-space than a loom of like capacity wherein the warp is held horizontally.

In this my invention I have planned to enable the operative parts to occupy the least possible floor-space.

My invention includes improvements in the mechanism for moving the harnesses to form the sheds, picking mechanism, and means for stopping the loom when for any reason the shuttle fails to properly enter its box, as will be described.

Under the first head of my invention I have provided rollers to which are attached both ends of usual thread-harnesses, the said harnesses being moved in the formation of sheds by winding them from one to another roller, these rollers being partially rotated in one and then in an opposite direction, as will be described.

Under the second head of my invention the shuttle-boxes rise and fall with the reed which beats the filling into the shed, the picking-stick rising and falling in unison with the lay, the picking-stick being actuated at the proper time by parallel-motion mechanism, to be described.

Under the third head of my invention the vertically-moving lay-beam has a dagger which is free to enter a hole in the breast-beam when the shuttle reaches and properly enters its box; but in case the shuttle fails to enter its box the binder of the box not entered correctly by the shuttle operates a trigger which engages the shipper-rod, the latter operating, through an elbow or other suitable lever, a stop-plate which closes the opening referred to in the breast-beam and forms a positive stop for the lay, thus effectually obviating the liability, which might otherwise exist, of break-

ing out the warps by the presence of the shuttle in the shed.

Other features of my invention will be hereinafter specified and claimed.

Figure 1 is a front elevation of a loom embodying my improvements, the central part of the loom being broken out to save space on the drawings; Fig. 2, a right-hand elevation of the same parts at the opposite end of the loom, duplicates of those shown in Fig. 1 being omitted to avoid confusion in the drawings; Fig. 3, a vertical section of Fig. 1 in the line *xx*, looking toward the left. Fig. 3^a is a detail view of the crank and pinion. Fig. 4 is a top view of the lay, the shuttle-boxes, and the reed, all attached and to be viewed together, the shuttle-box at the right of the figure being broken out to expose the binder. Fig. 5 is a partial elevation of the front of the loom, the figure showing part of the breast-beam and the lay, and intermediate devices to actuate the stop attached to the breast-beam. Fig. 6 is a detail of the under side of the breast-beam and the stop. Figs. 7 and 8 are details of the harnesses and the rolls to which they are attached.

The upwardly-extended frame-work A, herein shown as adapted for a double loom, has two breast-beams, A', and suitable bearings for the working parts, including the crank-shafts A² A³, the warp-beam B, and take-up roll C, which is a sanded or other rough-coated roll.

The working parts of the two looms are alike; so I need describe specifically but one of them, using like letters for all the parts except the crank-shafts.

The power to operate the loom is applied to the belt-pulley A⁴, mounted on a stud, A⁵, the said pulley driving with it a pinion, A⁶, which, as herein shown, directly engages two toothed gears, A⁷, each fast upon a sleeve, A⁸, each sleeve surrounding loosely one of the crank-shafts A² A³. Each crank-shaft, as herein shown, has its outer end beyond the toothed gear A⁷ steadied by an upright, A⁹, forming part of a bracket bolted to the loom side. Each crank-shaft has fast upon it a conical-faced friction-pulley, D, and co-operating with it is a somewhat cone-shaped disk or plate, D', forming part of a hub, D², provided with an annular groove, 22, (see Fig. 1,) and splined

to the sleeve A^8 , so as to be rotated with it, yet slide thereon, under the action of a shipper-lever, D^3 , pivoted at D^4 , the crank-shafts being rotated only when the two parts $D D'$ of the friction-clutches are forced together, the upper end of the shipper-lever at such time resting in a notch of the handle-holding plate D^5 , of usual construction.

Herein (see Fig. 2) it will be noticed that each friction-clutch part D' on each crank-shaft is under the control of a like shipper-lever D^3 , and by the said lever the clutch part D' operated by it may be made to engage or not the co-operating part D of the clutch fast on the crank-shaft, so either crank-shaft may, if desired, be stopped or rendered inoperative while the other operates.

The plate D^5 , one for each half of the double loom, has pivoted upon it, at one side of the said lever D^3 , a knocking-off plate, a , which, by a link, a' , (see Fig. 2,) is connected to an elbow-lever, a^2 , the short arm of which is pivoted to the lower end of the shipper-rod a^3 , provided with a catch, a^4 , the upper end of the said shipper-rod being pivoted to an elbow-lever, a^5 , having its pivot a^6 on a stand, a^7 , bolted to the frame-work. This lever a^5 has jointed to its long arm one end of the stop-rod a^8 , having a broad end, a^9 , (see Figs. 5 and 6,) the said stop-rod being free to be moved in a guide, a^{10} , attached to the under side of the breast-beam A' .

When the loom is in regular operation, the broad end a^9 of the stop-rod does not cover the open space or hole a^{12} in the breast-beam, and the dagger b , attached to the lay E , is free to enter the said hole as the lay is raised by the usual connecting-rods, $b' b'$. The lay has at its inner side, at the bottom and top, projecting ears 6 and 7, which embrace and slide upon a rod, 8, fixed in ears or lugs 9, attached to the loom side. (See Fig. 3.)

Whenever a shuttle properly enters its shuttle-box e or e' , it pushes out the binder e^2 , there being a like binder in each box, and moves the trigger e^3 , as will be described, outward in the direction of the arrow, Fig. 4, far enough to permit the trigger as the lay rises to pass the catch a^4 on the shipper-rod a^3 ; but should the shuttle not enter its box properly the trigger will remain in the position of Fig. 4, and as the lay rises the said trigger will strike the catch a^4 and lift the shipper-rod, causing it not only to operate the lever a^2 and turn the lever a to knock the shipper-lever D out of its holding-notch, but also to turn the lever a^5 to pull the stop-rod a^8 in the direction of the arrow near it in Fig. 5 far enough to close the opening a^{12} in the breast-beam, so that the dagger b may strike it and form a positive stop for the loom, the dagger striking the stop-plate a^9 just after the two parts $D D'$ of the clutch have been separated.

The binder e^2 in the box e' , acted upon in rear by a suitable spring and having a stop, b^4 , for its free end, has a slot in which enters a pin, b^5 , of a lever, b^6 , pivoted at b^{17} on the lay

E , the said lever being connected by a link, b^7 , to a lever, b^8 , pivoted at b^9 to the lay near or at the opposite side of the loom, the said lever b^8 having connected to it the trigger e^3 . The lever b^8 has a pin, b^{10} , which extends down through a suitable slot in the top of the shuttle-box and enters a slot in the binder under it, but not shown, the said binder and its slot being, however, like the binder shown at the right of Fig. 4.

Instead of driving both the toothed gears A^7 by one and the same pinion I may use one intermediate gear of the same character between it and one of the said toothed wheels, in order that the two crank-shafts may be rotated in opposite directions rather than both in the same direction, as provided for in Fig. 2, such modification being readily perceptible to any mechanic.

I do not desire to limit my invention to the exact means shown for operating the trigger or the stop-rod a^8 , but may use instead any equivalent means.

The harness c , (see Figs. 7 and 8,) composed, preferably, of thread or twine, made in usual manner and having usual head-bands, is attached at its opposite edges by a wire or in other suitable manner to the two cylinders or rollers $c' c^2$, the harness c^3 , of like construction, being attached in like manner to the cylinders or rolls $c^4 c^5$, each heddle employed in the harnesses having an eye for the reception of one of the warp-threads c^6 taken from the warp-beam, the said warp-threads after passing under the whip-roll F (see Fig. 3) having between them usual lease-rods, c^7 , before being passed through the eyes of the heddles, the warp-threads being thereafter led through between the dents of the reed F and thence to the take-up roll C and upon the receiving-roll C' , the warp prior to its arrival at the roll C receiving between it the filling and being made into cloth.

The rolls c' and c^2 are connected together by a strap or cord, c^8 , (see Fig. 8,) the rolls c' and c^4 by a strap or cord, c^9 , and the rolls c^2 and c^5 by a strap or cord, c^{10} , the said straps or cords so connecting the said rolls that when one of them—as, for instance, roll c^2 —is rotated once, or nearly so, in one direction, it will cause all the other rolls to be rotated for a like distance, the reversal of the rotation of the said rolls reversing all the others with it, the straps being so connected to the rolls that when the harness c is being moved by the rolls c' and c^2 , to which it is attached, the harness c^3 , attached to the other rolls, $c^4 c^5$, will be moved in the opposite direction, as it is obvious must be the case to enable the shed to be formed for the passage of the shuttle F^2 . (Shown by dotted lines. See Fig. 1.)

It will be noticed that the heddles employed to make up the harnesses $c c^3$ are connected at their ends directly to the rolls, upon which they are wound alternately in the act of separating the warps to form sheds for the passage of the shuttle, the direct connection of the

heddles to the rolls, instead of by means of straps and bars, as usual, enabling the heddles to be moved more steadily and uniformly and without side strain or vibration; and so, also, attaching the heddles directly to the rolls, as stated, enables me to materially lessen the space required from front to back of the loom.

Prior to my invention wherever straps have been employed to connect the heddles or bars of harnesses to rolls the straps for both sets of heddles instrumental in opening the shed in the warp have been attached to but two rolls, and the eyes of the heddles of the two sets of harnesses thus connected with the rolls have been separated a distance equal to the diameter of the rolls; but by employing four rolls, as will be herein described, and attaching the ends of the heddles to the said rolls, one half to two of them and the other half to two other of the rolls, the heddles are brought close together, the closer the heddles together when the harnesses are moving in opposite directions the greater the slope of the shed under all conditions of movement. So, also, by connecting the heddles with four rolls, as shown, instead of two, as heretofore, it is possible to bring the reed which constitutes the race of the lay closer to the heddles or harnesses.

The journals of the shafts carrying the rolls c' c^2 c^4 c^5 are mounted in brackets c^{15} , connected with the loom side.

Herein the shaft of the roller c^2 is provided with a pinion, c^{13} , which is engaged by a toothed plate, d , which may be either a wheel or a segment thereof, the said plate being pivoted at d' on a suitable stud, and being of such radius that it, by a motion of reciprocation about its pivot, may rotate the pinion c^{13} once or substantially once in one direction, and then reverse its movement for a like distance. Herein the said toothed plate d derives its motion from a link, d^2 , pivoted to it and to a progressively but intermittingly rotated toothed gear, d^3 , having a radius less than the said plate, and mounted to be rotated on a stud, d^4 , fast to the frame-work, the said gear d^3 being engaged and rotated by a pinion, d^5 , always rotated in one direction, but intermittingly, and mounted on a stud also secured to the frame-work, the said pinion d^5 having an attached crank, d^6 , slotted, as best shown by the detail Fig. 3^a, the slot of the said crank receiving a pin or stud, d^7 , attached to the connecting-rod b' of the lay, the said connecting-rods in their movement effecting by the said pin the intermitting rotation of the crank and gear d^5 , the gear d^5 and the devices actuated by it to move the harnesses to form the shed being so proportioned and actuated that the shed remains open and at rest long enough to afford ample time for the passage of the shuttle, the shed being formed on the first quarter of the movement of the crank-shaft, the lay then descending and with it the shuttle-boxes, the picking being commenced during the downward motion of the lay, and being finished, or substantially so, while the latter is in about its lowest position.

The plate d is provided with a slot, d^9 , to enable the position of the link d^2 to be changed to obtain more or less motion for the said plate, and consequently make the shed wider or narrower.

Each shuttle-box connected rigidly to the lay has depending from it a bracket, f , provided at its lower end with a pin or stud, f' , which constitutes a variable fulcrum for the lower end of the picker-stick, f^2 , is provided at its upper end, as herein shown, with a picker, f^3 , of usual construction.

To give to the picker a substantially right-line movement I have attached to the picker-stick, at its rear edge, a holder, f^3 , and between it and the said picker stick I have attached one end of the pulling-rod f^4 , having at its upper end a hook, f^5 , the said holder also serving to loosely connect to the picker-stick the radius-bar f^6 , made as a loop or bail, (see Fig. 2,) adjustably pivoted to the block f^7 , attached to the lay, the upper ends of the said radius bar being bent or hooked (see right of Fig. 2) to enter holes in the said block, the attachment of the said radius bar to the picker-stick being between the lay and the point of attachment of the said pulling-rod to the said stick.

The frame-work of the loom has attached to it, at each side, a small bracket, g , bolted to the loom side, the said bracket practically forming a part of the loom-frame. To the inner side of these brackets g are attached stands g' , provided with a roller-stud, 2.

The pulling-rod f^4 is composed of a loop-like piece which embraces the picker-stick and has its free ends attached to a block, 12, which is secured by screw 3 to the shank of the portion having the hook f^5 . The pulling-rod is normally held toward the loom-frame by a suitable spring, f^{10} , (see Fig. 1,) so that as the lay is descending the hook f^5 catches upon the roll 2 and, stopping the pulling-rod, causes the picker-stick to be moved from the outer end of the shuttle-box toward its inner end, the picker at such time throwing the shuttle, the radius-bar swinging in the block f^7 , the resultant motion given to the picker carried by a picker stick supported as described and actuated by the pulling-rod being substantially what is called a "parallel" motion. In other words, the picker-stick does not swing about a single point—as, for instance, the pivot f'' ; but by means of the devices described and the slot at its lower end the picker travels in substantially a straight line, the adjustment of the upper end of the radius-bar in the holes of the block f^7 enabling the blow of the picker to be delivered with the precision desired to give to the shuttle its proper course across the loom. As the picker-stick completes its stroke during the downward movement of the lay, the pulling-rod at a point just below the hook f^5 meets an inclined surface or projection of the bracket g , and, prying over it, causes the hook to slip from the said roll 2, releasing the picker-stick, so that it is free to

drop from its position shown at the left of Fig. 1 into the position shown at the right of the said figure, it, in its backward position, meeting the picker-check g^6 , which may be a spring of any usual construction.

The take-up roller C has upon its shaft at one end a toothed gear, h , which is engaged by a pinion, h' , fast at one side of a larger pinion, h^2 , which in turn is engaged by a small pinion, h^3 , fast to one side of a ratchet-wheel, h^4 , mounted on a stud, h^5 , in a bracket erected upon the frame-work, the said ratchet-wheel being actuated intermittently by a pawl, h^6 , carried by a lever, h^7 , pivoted at h^8 , the long arm of the said pawl-carrying lever h^7 being acted upon by the ears 6 7, connected to and moving with the lay.

The woven cloth has its end applied to the cloth-receiving roll C', the journals of which are placed, as usual, in guideways C'¹⁰, so as to rise as the cloth accumulates thereon.

The backward rotation of the ratchet-wheel h^4 is prevented by the detent h^{10} .

The tension devices for the yarn-beam, composed of a strap, m , lever m' , and weight m^2 , are and may be of usual construction.

I claim—

1. The warp-beam, the breast-beam, the crank-shaft, the connecting-rods, the vertically-reciprocating lay, guides to control its movement in a straight line, and its attached reed and shuttle-boxes, combined with a bracket depending from the lay, the picker-stick, and means for actuating the stick, the stick and its actuating means rising and falling with the lay, substantially as described.

2. The breast-beam provided with a dagger-receiving opening, the stop-rod having a stop-plate, the crank-shaft, the connecting-rods and the lay actuated thereby and provided with shuttle-boxes, the dagger attached to the lay, the binders in the shuttle-boxes, means to connect them, a trigger, and the shipper-lever and its holder, combined with means, substantially as described, intermediate the stop-rod and the shipper-lever to effect the release of the shipper-lever and place the stop-plate in position to arrest the dagger when a shuttle fails to properly enter a shuttle-box, as and for the purpose set forth.

3. The warp-beam, the breast-beam, the crank shaft, connecting-rods, and lay, combined with two sets or pairs of rolls, $c' c^2$ and $c^4 c^5$, the harnesses $c c^3$, having the ends of the heddles composing the same connected with the said rolls on adjacent sides of the latter, and with means, substantially as described, to operate the said rolls to wind and unwind the heddles of the said harnesses from one to the other roll of the rolls to which they are attached to effect the formation of the sheds, substantially as described.

4. The harnesses $c c^3$, the two sets of rolls $c' c^2$ and $c^4 c^5$, to which they are attached at adjacent sides, as described, and means, substantially as described, to connect the said rolls, whereby they are rotated at the same time in the formation of a shed in the warp, combined with a toothed plate or jack, as d , and with means to reciprocate the said plate or jack, substantially as described.

5. The roll c^2 , forming one of the rolls effective in the movement of the harnesses, the attached gear c^{13} , and the plate d and its connected link and gear d^3 , combined with the gear d^5 and the crank and lay to move it, substantially as described.

6. The lay having the attached shuttle-boxes, the depending brackets, means to move the lay vertically, guides to direct the lay in a straight line, and the picker-sticks connected to the brackets by a slot-and-pin connection, combined with the radius bar to connect the picker-sticks to the lay and with the pulling-rods and means co operating therewith, whereby the picker-stick is actuated to throw the shuttle while the lay is descending, substantially as described.

7. The lay, its attached shuttle-boxes, means to move the lay, the dagger attached to the lay, the shipper-lever, its holder, the knocking-off plate a , the shipper-rod having a catch, means to connect it to the said knocking-off plate, the breast beam provided with a hole, a^{12} , the stop-rod having the stop-plate to cover the said hole, and the elbow-lever to connect the said stop-rod and shipper rod, combined with a trigger made movable with the lay, the shuttle-binders, and means actuated by them to move the said trigger, whereby the failure of the shuttle to properly enter the shuttle-box toward which it is approaching will move the trigger and place it in position to release the shipper-lever and stop the loom, substantially as described.

8. The two crank-shafts and friction pulleys attached to them, and the shaft A⁵, its pinion, the gears A⁷, and sleeves and disks or plates D' carried thereby to co-operate with the two friction-pulleys secured to the said crank-shafts, combined with two shipper-levers to operate the said disks or plates and effect the driving of one or both the said crank-shafts, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MILLARD F. FIELD.

Witnesses:

FRANK E. ALDRICH,
JOHN W. HOBART.