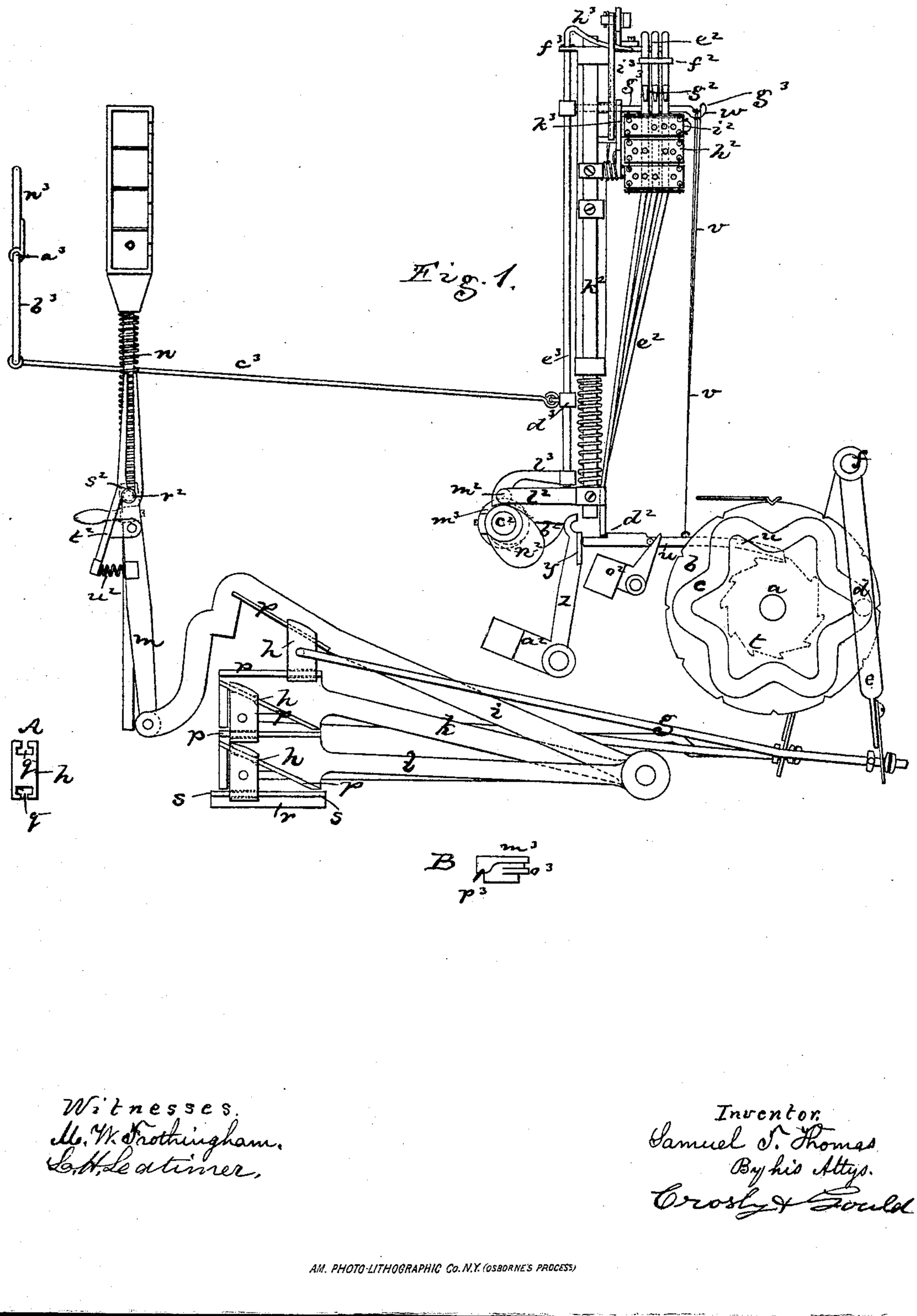
3 Sheets--Sheet 1.

S. T. THOMAS.

Looms.

No. 145,316. Patented Dec. 9, 1873.

Fig. 1.



Witnesses.
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L. W. Leatinner.

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3 Sheets--Sheet 2.

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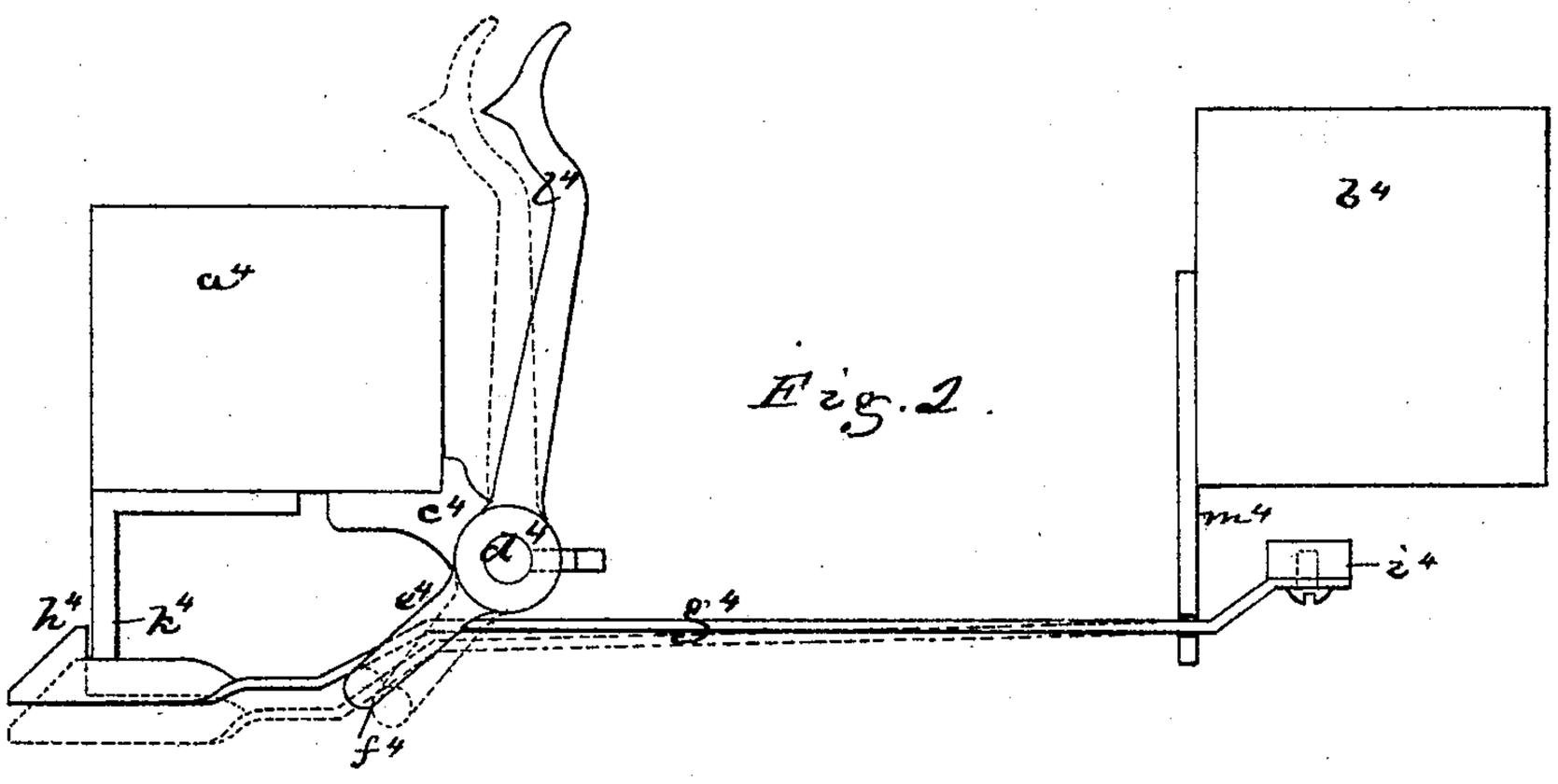

Fig. 2.

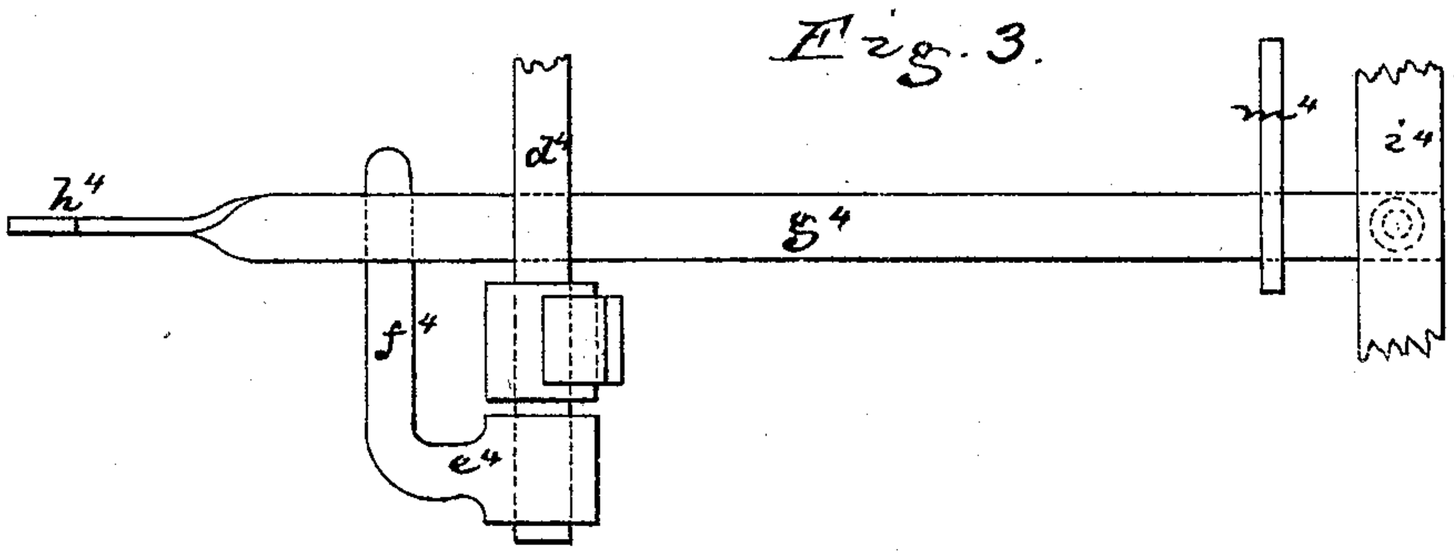

Fig. 3.

Witnesses.
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3 Sheets--Sheet 3.

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Fig. 5.

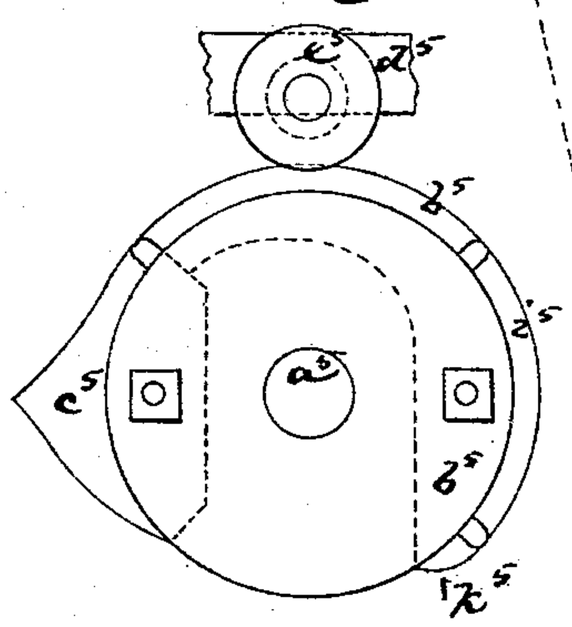

Fig. 4

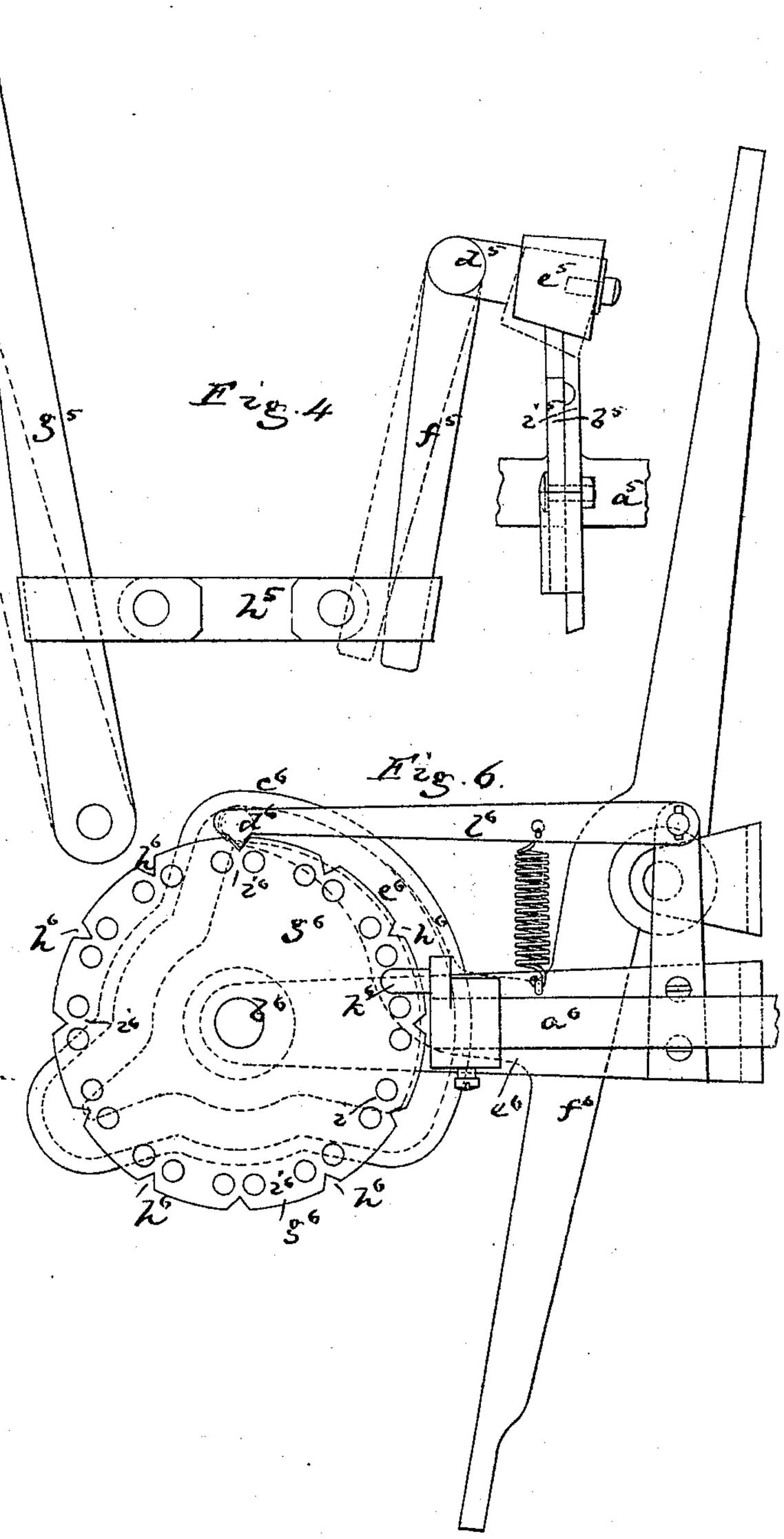

Fig. 6.

Witnesses.
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UNITED STATES PATENT OFFICE.

SAMUEL T. THOMAS, OF GILFORD, NEW HAMPSHIRE.

IMPROVEMENT IN LOOMS.

Specification forming part of Letters Patent No. **145,316,** dated December 9, 1873; application filed August 20, 1873.

To all whom it may concern:

Be it known that I, SAMUEL T. THOMAS, of Gilford, in the county of Belknap and State of New Hampshire, have invented certain Improvements in Looms; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

The invention relates to details of construction of fancy looms.

One part of the invention relates to the arrangement of the drop-box mechanism. In such arrangement the boxes are operated by a series of star or cam wheels, in each of which is a star-groove, having extending into it a pin from a pendent lever, the foot of said lever being connected by a link with a slide, by movement of which in one direction the drop-boxes are raised, and by movement of which in the opposite direction the boxes are depressed. The star-wheels are loose upon a shaft, and each is operated by a pawl acting against the teeth of a ratchet on one side of the star-wheel.

The movement of each pawl is determined by the pattern-chain, the pawl being pressed forward by a cam on a cam-shaft, and returned by a weight, a weighted lever, or a spring. When the pawl moves forward, it turns the star-wheel, the star-groove in which positively carries the pendent lever either outward (thereby drawing outward the wedge-slide connected to said lever and raising the boxes the height of one box) or inward, (thereby enabling the boxes to fall one box,) the series of levers, star-wheels, and wedge-slides effecting the required changes in the boxes, as demanded by the exigencies of the pattern, and the levers being positively locked, so that the boxes can be neither raised nor lowered by them, except as they are directly actuated by the pawls controlled by the pattern-chain.

Furthermore, the boxes are so connected with the levers by which they are directly operated, and the slide which operates such levers, that the boxes are not only positively raised, but are positively drawn down, instead of dropping by gravity, there being thus no opportunity for any box to be out of position under any circumstances, its movement being wholly controlled from the pattern mechanism. In connection with the box-motion, a peculiar stop-motion is used for the boxes, to arrest their movement instantly in case the weft-stop motion is operated.

The invention also embraces an arrangement of mechanism for stopping the loom when a shuttle is not thrown, or when shuttles are in opposite boxes, and an improvement in the cam-motion for cam-levers. Although all these improvements are to be, or may be, embodied in one loom, the improvements are shown in detailed figures for the better description and understanding thereof.

The drop-box mechanism, or that part of it pertaining to this invention, is shown in elevation in Figure 1.

Upon a stationary pin, *a*, are placed the cam-wheels *b*, each of which is made with a star cam-groove, *c*, into which fits a pin, *d*, extending from a pendent arm, *e*, hanging from a stationary pin, *f*, and swinging upon said pin. The foot of each arm *e* is connected by a wire, *g*, with some one of a series of slides, *h*, that are connected to, and by their sliding movement actuate, a series of levers, *i k l*, the upper one, *i*, of which is jointed to the vertical link *m*, upon which the box-rod *n* is supported the drop-box compartments *o* being mounted on the top of this rod. Each lever *i k l* is made with flanges *p*, and each slide *h* is placed between two adjacent levers, and has slots *q*, as seen at A, that embrace the flanges *p* of two adjacent levers, so that the several levers are connected by the respective slides. Beneath the lower slide is a stationary rail, *r*, having a flange, *s*, embraced by the bottom slots of the lower slide, so that such slide only moves horizontally, and the movements of the others are with relation to it. The flanges of each lever are relatively inclined, and as either slide moves forward or back, it moves the lever over it in a vertical direction. The cam-wheels *b* turn loosely upon the pin *a*, and are independent each from the other; and fixed to or forming part of each is a ratchet, *t*, with which engages one of a series of pawls, *u*, said pawls being suspended by wires *v* from a hook, *w*, and their tail ends being in front of a plate, *y*, on an arm, *z*, extending from

the vertical arm of a weighted lever, a^2, the plate being thrown forward by a cam, b^2, on the shaft c^2, and falling back by gravity. The tail end of each pawl has a shoulder, d^2, and over the levers stand rods e^2, having their upper ends hooked and hung in bearings f^2. Under the points g^2 of the hooks is the pattern-card mechanism h^2, hung on a prism or cylinder, i^2, and furnished with the pattern-cards, respectively punched in accordance with the pattern to be woven. The card mechanism is attached to a vertical slide-rod, k^2, having an arm, l^2, a pin, m^2, at the end of which stands over a cam, n^2, on the shaft c^2, the pattern mechanism being raised at each rotation of the shaft c^2. The pawls u are held back to the plate y by the stress of a weighted lever, o^2, except such as are held forward by the ends of the rods e^2, extending back of the shoulders d^2. As the shaft c^2 turns, the cam n^2 lifts the rod k^2 and pattern-cards, and when the card reaches the points g^2 of the hooks, the points of such hooks as stand over holes in the card enter the card, and the pawls are not disturbed, while such points as do not have holes to enter, being struck by the card, are raised, and by their rise free the shoulders d^2 from the lower ends of the rods, permitting the pawls to slide back to the plate y by reason of the pressure of their levers. The continued rotative movement of the shaft next brings the cam b^2 against the arm z, when all the pawls thus let back are driven forward by the plate y, and, by their forward movement, turn the ratchets and the cam-wheels fixed thereto, each cam-wheel being turned sufficiently to carry its pin d from one angle of the cam-notch to the next angle thereof, by which movement of the pin the lever e is positively swung inward or outward, throwing the slide h connected to it in or out, said slide positively moving the lever above it in a vertical direction, thereby raising or lowering the boxes. As the levers are positively connected, no rise or fall of the boxes can take place, except by the direct action of the slides, the extent of up or down movement of the boxes being in accordance with the number of slides moved and their direction of movement, and by this arrangement the boxes can never be misplaced, but must always be in position for movement of the proper shuttle in accordance with the exigencies of the pattern.

To prevent injury to the mechanism in case of obstruction to the descent of the boxes, the rod n is connected to the link m by means of a pin, r^2, that passes under a latch, s^2, on one arm of a lever, t^2, the other arm of which is acted upon by a spring, u^2. The face of the latch in contact with the pin is inclined, and under strain the latch is pressed back by the pressure of the pin, and against the stress of the spring, thus permitting the link to descend unaccompanied by the box-rod.

The weft-stop motion, connected with the box-motion, is as follows, the mechanism constituting this motion being also seen in Fig. 1: a^3 denotes the rod, acted upon by the weft-stop motion. From one end of this rod extends an arm, b^3, connected by a rod, c^3, with an arm, d^3, extending from a vertical rod, e^3, which rod turns in stationary bearings f^3, and has extending from it, near its top, an arm, g^3, (to the end of which arm are hung the wires v, from which the pawls u are suspended,) and from its top a bent arm, h^3, that extends behind the drag-pawl i^3, that actuates the pin-wheel of the pattern-card cylinder. At the foot of the shaft or rod c^3 extends another arm, l^3, that normally rests on the cylindrical end of a cam-wheel, m^3, on the cam-shaft c^2. When the weft-stop motion throws out the arm n^3 of the rod a^3, the arm b^3 is thrown in, and the rod c^3 turns the rod or shaft e^3, carrying the arm l^3 into the plane of a peripheral cam, o^3, on the cam-wheel m^3, and this cam, as it rotates, raises the arm l^3, and with it the rod e^3, arm g^3, wires v, and pawls u; and as the cam b^2 next drives forward the pawls, they have no effect upon the ratchets t and the cam-wheels b, being held above or out of contact with the ratchet-teeth, and consequently no box is moved. To also stop the pattern mechanism from moving, the arm h^3 is used, said arm, as the shaft e^3 is turned by the rod c^3, throwing out the pawl i^3, so that, although the rod k^2 is raised, the pattern-cylinder remains stationary. Thus, although the shaft a may continue to rotate, the boxes and the box-pattern mechanism are stopped. A side cam, p^3, restores the arm l^3 to its normal position.

A detail view of the cams o^3 p^3 is shown at B.

For stopping the loom when a shuttle to be thrown remains in either box, or when shuttles are in opposite boxes, the mechanism shown in Figs. 2 and 3 is used, Fig. 2 showing the mechanism in elevation, and Fig. 3 showing a plan of it. a^4 denotes the lay; b^4, the breast-beam. In brackets c^4, extending from the lay, the protector-rod d^4 is supported, and upon this rod is fixed an arm, e^4, having at its end a pin, f^4, that extends under a spring, g^4. This spring has, at its outer end, a hook, h^4, and at its inner end it is fastened to the knocking-off lever i^4. When the shuttle is in the box, the arm e^4 is raised by the action of the shuttle on the arm l^4 on the protector-rod, as seen by the full lines in Fig. 2, and in this position it holds the hook h^4 in such position that, as the lay beats back, an arm, k^4, extending from the lay, strikes the hook h^4, and, by strain upon the hook, draws over the knocking-off lever, throwing the shipper-handle from its notch and knocking off the lever, while, if no shuttle be in the box, the spring g^4 throws the arms e^4 l^4 into the position shown by the dotted lines, and the hook h^4 is below the path of movement of the arm k^4, extending from the lay. The spring g^4 may be held in place by a slotted plate, m^4, extending from the breast-beam.

The mechanism which relates to the picker-motion is shown in Figs. 4 and 5. a^5 denotes the cam-shaft that operates the picker-cams. b^5 is the cam-plate fixed on the said shaft. c^5 is

the shuttle or picker cam. d^5 is the shuttle or picker shaft; e^5, the shuttle or picker roll, turning on a pin extending from one arm of the shuttle or picker shaft, the other arm, f^5, being connected to the picker-stick g^5 by the picker-strap h^5, in the ordinary manner, all these parts, in fact, operating substantially as in other looms; but to arrest the shuttle before it reaches the end of the box, a peripheral plate, i^5, extends from the cam-plate b^5, as seen at Figs. 4 and 5. When the shuttle is thrown, the roll e^5 rests against this plate, thereby holding the picker-stick in the position shown in Fig. 4, which position it maintains during the rotation of the cam, until the end k^5 of the plate reaches the roll. The roll e^5 will then drop to the cam-plate, thereby permitting the picker-strap to be moved back by the picker-stick spring to the position seen by the dotted lines, so that the points of the shuttles will clear the picker-stick as the shuttle-boxes move up or down.

The mechanism embracing the next part of the invention relates to the cam mechanism for operating the harness-levers, and is shown in Fig. 6.

It is customary in looms of this class to move the cam-shaft and cams continuously, and much of the cam-groove is not effective for moving the levers, and consequently the cam-groove must be much longer than necessary; but with my arrangement the cams are made shorter, and, when moving, are, for the most of the time, effective; but when the levers are to hold the harness stationary, the cam is allowed to remain at rest. This I accomplish by means of a crank-pin on the crank-shaft, which actuates at intervals a pin-wheel on the cam-shaft, giving the cams a partial and intermittent rotary motion at every revolution of the crank-shaft.

In the drawing, a^6 denotes the crank-shaft; b^6, the cam-shaft, upon which are fixed any suitable number of cams, c^6, into the cam-grooves in which enter the pins d^6, extending from the arms e^6 of the several harness-levers f^6. On one end of the cam-shaft is fixed a wheel, g^6, having peripheral notches h^6, and extending from its side, pins i^6, a crank-pin, k^6, on the end of the crank-shaft a^6 intermittently engaging with these pins, so as to impart movement to the wheel g^6, shaft b^6, and cams c^6, leaving the cams stationary after the crank-pin passes out of action with the pins i^6, or during one-half of the rotation of the crank-shaft immediately after the harness-levers have been moved, and the change of shed is thereby effected. The cams are held stationary by a catch-pawl, l^6, which locks into the peripheral notches of the wheel g^6.

I claim—

1. The combination, with the drop-boxes and the pattern mechanism, of the cam-slotted wheel b, levers i, links g, slides h, and intervening mechanism, operating to positively move the boxes to position in each direction, and to positively hold them in position, substantially as described.

2. In combination with the cam-wheels b and pawls u, and with the pattern mechanism, the vertical rod e^3, link c^3, and the mechanism connected therewith, and with the weft-stop motion, to effect the stoppage of the cams and pattern cards and cylinder from the weft-stop motion, substantially as described.

3. In combination with the lay a^4 and breast-beam b^4, and with the lever l^4, operated by the shuttle, the arms e^4 and h^4 and spring g^4, having a latch, h^4, and secured to the knocking-off lever i^4, operating to stop the loom, substantially as described.

4. In combination with the harness-levers, the intermittently-operated cams c^6, wheel g^6, and pins i^6, and the crank-pin k^6 (on the crank-shaft a^6) and catch-pawl b^6, the whole being arranged and operating substantially as and for the purposes described.

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