2 Sheets--Sheet 1.

R. B. FOWLER.

Narrow Ware Looms.

No. 144,610. Patented Nov. 18, 1873.

Fig. 1

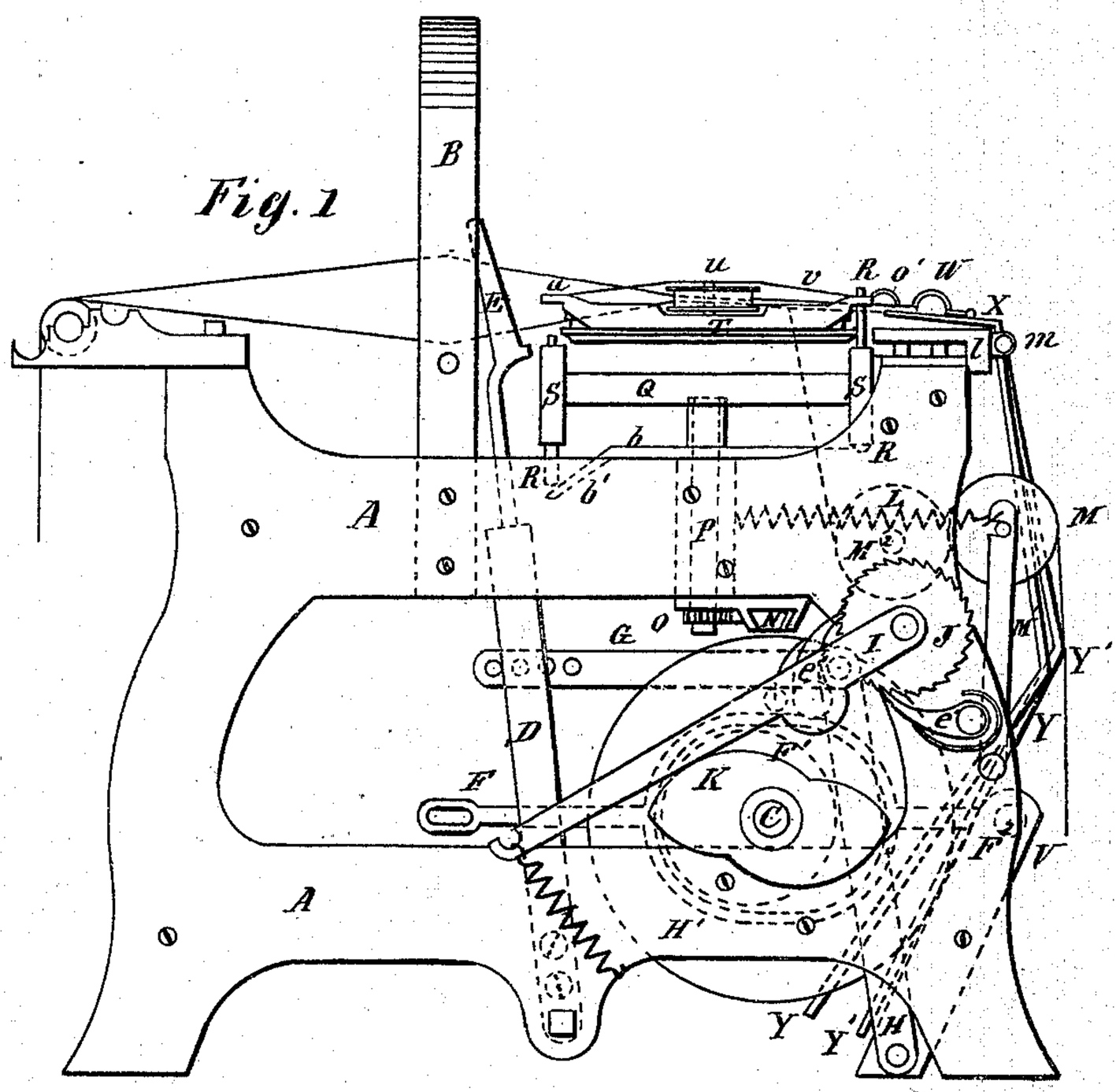
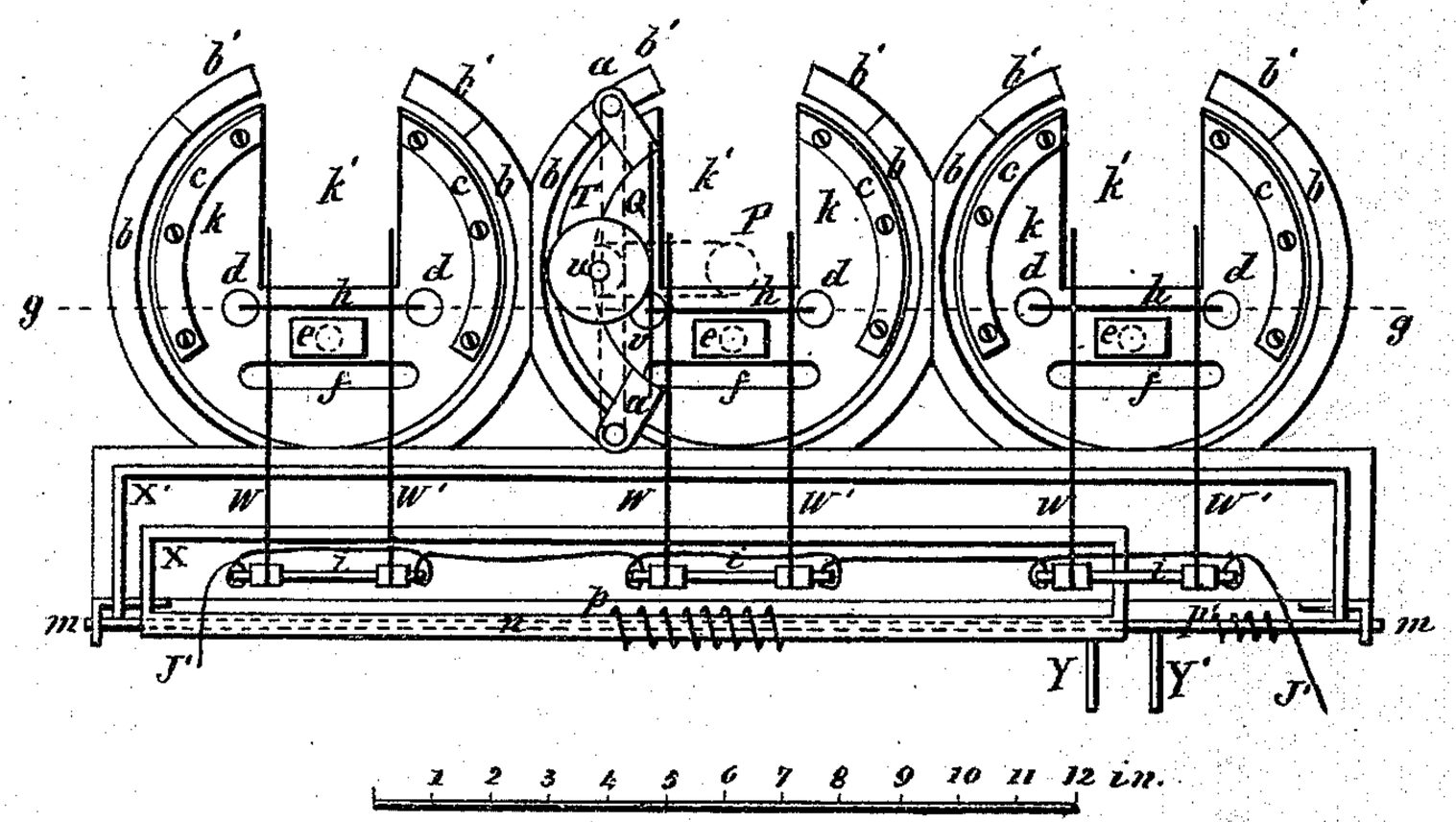


Fig. 2



1 2 3 4 5 6 7 8 9 10 11 12 in.

Scale

Witnesses
Norton L. Cook
F. B. Deane

Inventor
Rufus B. Fowler

2 Sheets--Sheet 2.

R. B. FOWLER.

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Fig. 3

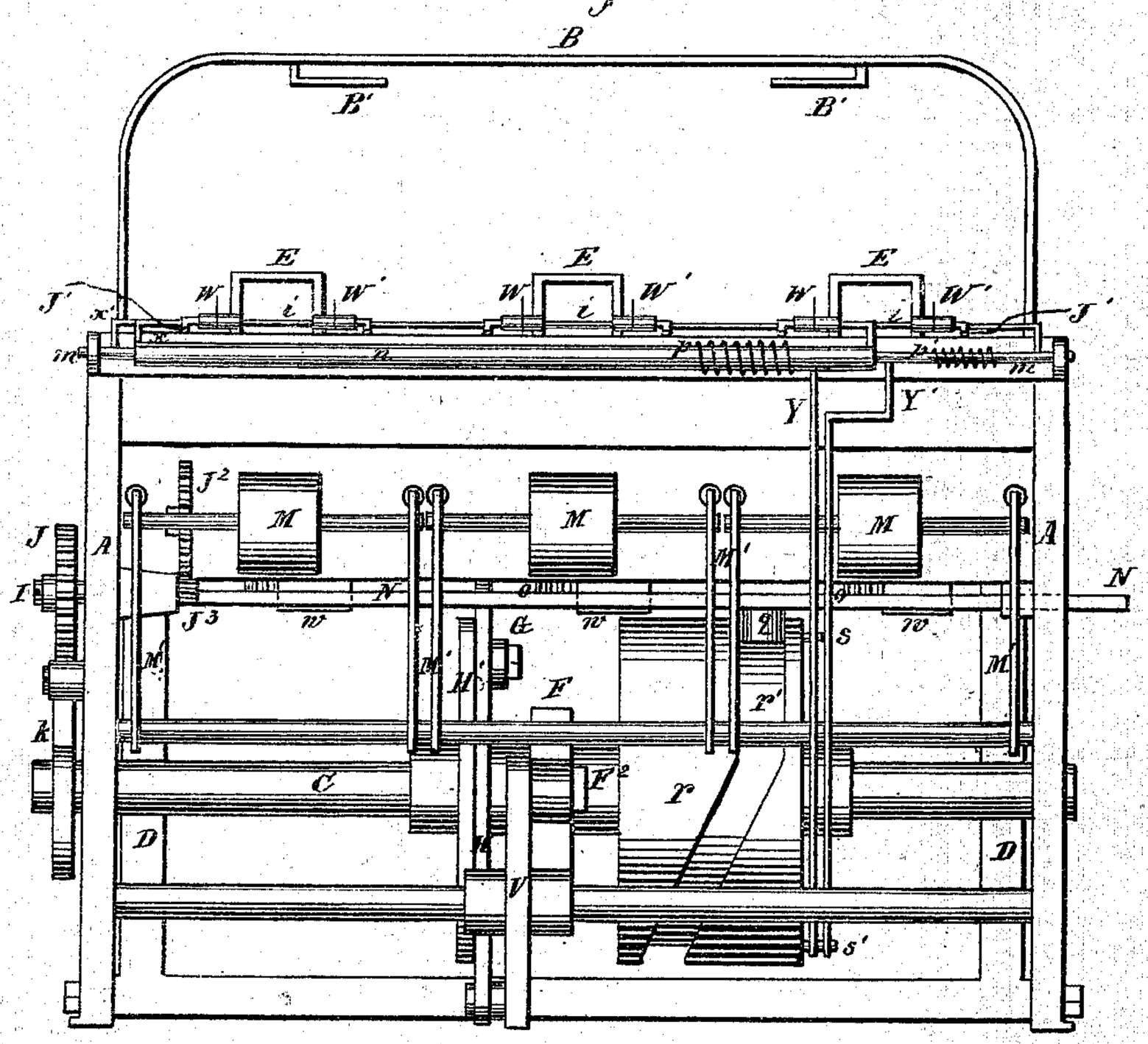


Fig. 10

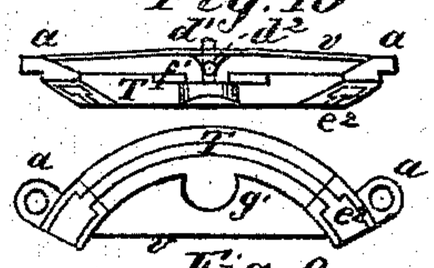


Fig. 9

Fig. 7

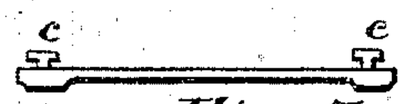


Fig. 8

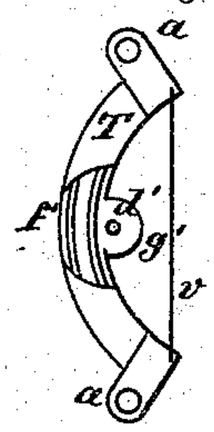


Fig. 6

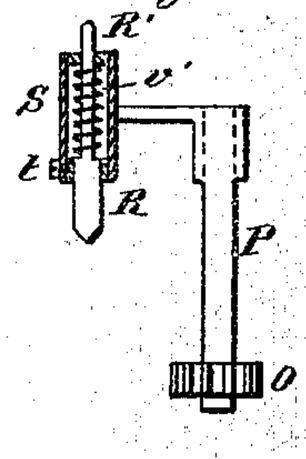


Fig. 5

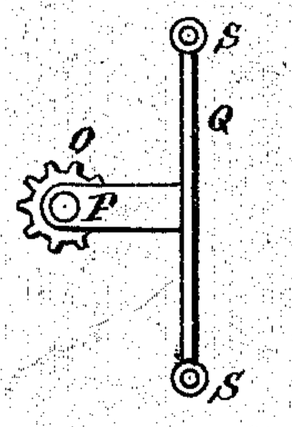
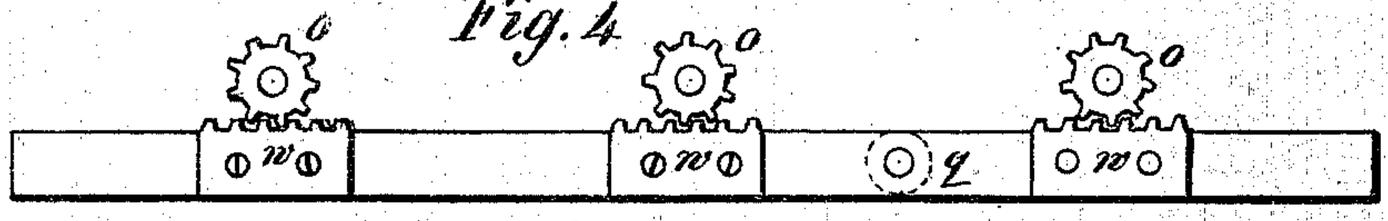


Fig. 4



Witnesses
Norton L. Cook
J. B. Deane

Inventor
Rufus B. Fowler

UNITED STATES PATENT OFFICE.

RUFUS B. FOWLER, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN NARROW-WARE LOOMS.

Specification forming part of Letters Patent No. **144,610**, dated November 18, 1873; application filed August 19, 1873.

To all whom it may concern:

Be it known that I, RUFUS B. FOWLER, of Worcester, in the county of Worcester and State of Massachusetts, have invented certain Improvements in Looms for Weaving Narrow Fabrics, of which the following is a specification:

My invention relates to certain improvements in that class of looms used for weaving narrow fabrics, in which the shuttle runs in or upon a circular shuttle-race; and it also relates to certain devices for detecting the absence of the weft-thread, or the want of a proper tension in the same; and consists, first, of the combination, with a curved shuttle-race and curved shuttle, of the vertical cylinders containing the sliding pins actuated by the annular plates, and connected by means of a radial arm with an operating-spindle, all so arranged and operated that the shuttle is caused to pass through the warp, as hereinafter described; second, of the combination, with a curved shuttle-race, of a series of "weft-detecters," being a pair of metallic fingers for each shuttle, suitably connected with one pole of a galvanic battery; third, of the combination of the weft-detecters with certain devices, hereinafter described, the same being connected with the moving parts of the loom, and operated in such a manner that the weight of the weft-detecters may be sustained, except at such times as the weft-threads are brought under them by the action of the shuttle.

Figure 1 is a side elevation of a loom embodying my invention. Fig. 2 is a plan view of the shuttle-races, showing a shuttle on the center shuttle-race, and also showing a plan view of the device for detecting any breakage in the weft-thread. Fig. 3 is a front elevation of the loom. Fig. 4 shows a top view of a reciprocating horizontal bar with the racks and pinions. Fig. 5 is a top view of the shuttle-carrier. Fig. 6 shows a side view of the shuttle-carrier, with a sectional view of the vertical hollow cylinder, showing the sliding pin and spiral spring in their proper positions. Fig. 7 shows a sectional view of the shuttle-race. Figs. 8, 9, and 10 show views of the shuttle upon the top, bottom, and concave sides, respectively. Fig. 11 is a plan view of a portion of the "stop-motion" device, and shows the lifting-bars as acted upon by a single blade-spring, p^2, instead of spiral springs, as in Fig. 2.

Corresponding letters refer to corresponding parts in the several drawings.

A A is the frame of the loom; B, the head; B′ B′, pins, upon which the harnesses are suspended; C, the main or driving shaft, to which motion may be imparted by means of a belt or gearing, and through it to the other parts of the loom. D is the lay, which swings forward and backward upon pivots at the bottom, which motion is communicated through the link G by the lever H, which receives its motion from the disk H′, having a cam-groove upon its side, (not shown,) and so constructed that, during every alternate quarter-revolution of the disk H′ and main shaft C, the lay D, with the batten E, carrying the reed, is made to advance and retreat, for the purpose of beating up the weft-thread. F is an eccentric bar turning upon a pivot at F^2, the end at F having a rising-and-falling motion, imparted by the revolutions of the eccentric F^1. (Shown by dotted lines in Fig. 1.) The end of the bar F is attached to the harnesses, and a proper motion is thereby communicated to the threads of the warp to form the shed. I is a lever, turning upon the same center as the ratchet-wheel J. A lifting motion is communicated to the lever I by the cam K, which is so formed, as shown in Fig. 1, that the rising motion of the lever I shall be slower than the falling motion. An intermittent rotary motion will be given to the ratchet-wheel J by the action of the lever I and the pawls e^1 and e^1, which is imparted to the take-up rolls M^2 by the spur-wheel J^2 and pinion J^3, Fig. 3. The woven fabric passes around the under side of the rolls M^2, and is firmly held against them by the device shown in Fig. 1, consisting of the friction-roll M, lever M^1, and spiral spring L. N is a horizontal bar sliding in guides at each end, which are securely fastened to the frame A A. Upon the bar N are fastened the short racks *w w w*, Fig. 4, placed at proper distances apart, and meshing into the pinions O O O, which are fastened upon the lower extremity of the vertical spindles P, (shown by the dotted line in

Fig. 1,) of which there is one for each shuttle. The sliding bar N has a small roller, *q*, pivoted upon its under side, and working in the cam-groove *r'* in the drum *r*, placed upon the main shaft C, by which a reciprocating motion is imparted to the bar N. The cam-groove *r'* is so formed that during a quarter-revolution of the drum *r* the bar N will have a lateral movement to the right, and during the alternate quarter-revolution a similar movement to the left, while during the intervening time the bar will remain at rest. A lateral motion is thus imparted to the racks *w w w*, sufficient to turn the pinions O O O each one-half of a revolution forward and backward. At the upper extremity of the vertical spindle P is fixed a radial arm, to which is attached the cross-bar Q, having at each end a vertical hollow cylinder, S S, placed at equal distances from the center of the spindle P, and each carrying a small sliding pin, R. The pins R R are made slightly larger at the bottom, forming a shoulder, and also allowing a space in the cylinder S around each pin, in which a spiral spring, *v'*, may be placed, if desired, for the purpose of thrusting the pin downward. In the larger portion of the pin, and extending from the lower extremity to within a short distance of the shoulder, is cut a groove, (not shown,) in which the end of the small set-screw *t* projects, to prevent the pin from falling out, and also from turning around in the cylinder S. The above-described device, consisting of the spindle P, the radial arm and cross-bar Q, the vertical hollow cylinders S S, and the pins R R, I denominate the "shuttle-carrier."

Directly above the shuttle-carriers are placed circular plates *k k k*, fastened at their sides to that portion of the loom usually termed the "breast-beam." Upon the upper side of these circular plates are secured curved T-shaped rails *c c*, each forming the arc of a circle, whose center corresponds with the center of the vertical spindle P. Between the rails *c c*, and extending back a short distance past the center of the circular plate, is an opening, *k' k' k'*, wide enough to admit the warp to be woven, and also to allow the reed to enter for the purpose of beating up the weft-thread. The shuttle T (shown in Fig. 1, also on the center shutter-race in Fig. 2, and in detail in Figs. 8, 9, and 10) consists of a curved plate, forming an arc of about one-third of a circle, whose curvature corresponds with that of the curved rails *c c*. On the under side of this plate is a T-shaped groove, so formed as to allow the shuttle to move freely upon the rails *c c*, and also to hold it firmly to the shuttle-race. The under side of the plate is beveled at each end, as at e^2, Figs. 9 and 10, to allow it to enter the shed more readily. Upon the concave side of the plate is placed a lug, *g'*, supporting a short spindle, d^1, upon which the bobbin *u*, Figs. 1 and 2, turns. The upper central portion of the plate is cut away, as at *f'*, so as to allow the bobbin containing the weft to rest directly upon the top of the rail *c*, thus reducing the thickness of the shuttle and bobbin, and requiring a less shed to allow them to pass freely, thereby decreasing the strain upon the warp by the operation of the harness. Projecting outwardly from each end of the plate are lugs *a a*, having holes to receive the pins R R, and so placed that when the shuttle-carrier and shuttle are moved simultaneously the lugs *a a* will always remain directly over the vertical hollow cylinders S S. Across the shuttle-frame, from end to end, is stretched a heavy wire, *v*, slightly raised in the center, and so arranged as to receive the pressure of the upper warp-threads of the shed and prevent their being caught by the bobbin *u* as the shuttle passes through the warp. Under the center of the guard-wire *v* is placed the eduction-eye d^2, Fig. 10, for the purpose of keeping the weft-thread in its proper position; and as the weaving should be performed as near as possible in the center of the circle described by the movement of the shuttle, the line of the weft-thread from the fabric to the bobbin will very nearly correspond with the radius of the circle. Any of the known devices suitable for the purpose may be used for the purpose of maintaining a proper and constant tension of the weft-thread. The rotary movement of the shuttle from one side of the web to the other is accomplished as follows: Immediately beneath the shuttle-carrier, and on a plane parallel with that of the circular plates *k k k*, hereinbefore described, are placed annular plates *b b*, whose curvature corresponds with the circle described by the vertical hollow cylinders S S in rotating around the spindle P. These annular plates are cut away in front for a distance equal to and corresponding with the opening *k' k' k'*, in order to allow the swinging motion of the batten E. The ends of the plate on each side of the opening are bent downward, *b' b'*, (more clearly shown by the dotted lines *b'* in Fig. 1,) the whole forming a cam-track, over which the pins R R pass, and by means of which they are pressed upward to engage the lugs *a a* of the shuttle T. The inclined planes *b' b'* allow the pins R R to pass downward as they approach the web upon either side, impelled by their own weight, or by the spiral spring *v'*, Fig. 6. As the shuttle-carrier rotates one-half of a revolution about the spindle P, the forward pin will pass downward and beneath the lower warp-threads, while the following pin will impel the shuttle forward upon the rails *c c*, and through the shed formed to receive it. The forward pin, after passing the web, is pressed upward by the inclined plane on the opposite side to engage the shuttle before the following pin has fallen low enough to clear it. While passing under the warp and over the open space between the two inclined planes *b' b'*, the pins R R are prevented from falling out of the cylinders S S by the small set-screws *t*. Thus, with every semi-revolution of the shut-

tle-carrier forward and backward, the shuttle will be passed from one side of the warp to the other, moving around upon the curved rails *c c*.

Having thus fully described the construction of those parts of the loom which embody my invention, and their mode of operation in the process of weaving, I now proceed to describe the construction and operation of the device forming that portion of the loom called the "weft-stop mechanism."

Upon the breast-beam of the loom I arrange the fingers W W′, made of any material that is a good conductor of electricity. These fingers turn freely upon the pins *i i i*, and extend forward, one upon each side of the opening *k*, a short distance past the center of the circular plate. Journaled in horizontal bearings at the front side of the breast-beam is the spindle *m m*, turning upon which is the barrel *n*. To the spindle *m m*, and to the barrel *n*, are attached the bent rods X′ and X, respectively. Upon these bent rods, which I term "lifting-bars," rest the fingers W W W and W′ W′ W′, and by them the fingers are sustained in a position to allow the weft-thread to pass under the ends of the fingers. These lifting-bars X and X′ are held against the fingers W and W′ by the action of the spiral springs *p* p^1; or, as is preferable, the bars X and X′ may be raised by the action of a single blade-spring placed beneath the bars, and fastened to the breast-beam of the loom, as shown at p^2 in Fig. 11 of the accompanying drawings. From the spindle *m m*, and the barrel *n*, the levers *y* and *y′* extend downward to the side of the drum *r*. Upon the side of the drum *r* are two pins, *s* and *s′*. The pin *s* is shorter than *s′*, and the lever *y′* is bent down lower than the lever *y*, as shown in Fig. 1, so arranged in order that the pin *s* may strike the lever *y*, and not the lever *y′*, and the pins *s′* the lever *y′*, and not the lever *y*. The pins *s* and *s′* are placed at opposite sides in the circumference of the drum *r*, so that a pin will strike one of the levers *y* and *y′* at every half-revolution of the drum *r*. Near the center of the circular plates *k k k* are placed small plugs of wood *d d*, for the purpose of insulating the wires *h h h*, which are charged with electricity by the wire *g g*, which should be connected in a proper manner with one pole of a galvanic battery. The fingers W and W′ are also charged with electricity by the wire J^1 J^1, which is connected with the opposite pole of the battery. The fingers W W W are bent as they pass over the lifting-bar X′, so that they rest only upon the bar X, and the fingers W′ W′ W′ are similarly bent as they pass over the bar X, so that they rest only upon the bar X′. This curvature of the fingers W and W′ is shown at O′, Fig. 1.

The general operation of this device is as follows: When the shuttles have brought the weft-threads under the fingers W W W, the pin *s′* is made to strike the bent lever *y*, pressing it outward, and thus turning the barrel *n* slightly upon the spindle *m m*, and depressing the lifting-bar X, allowing the fingers W W W to fall and rest upon the weft-threads. In case any of the weft-threads are absent or lack the required tension, the corresponding pin will fall until it touches the wire *h*, when the electrical circuit will be completed, and an alarm may be given to attract the attention of the operator; or the loom may be stopped by causing the belt to be transferred from the fixed to the loose pulley by any suitable mechanism known and used for the purpose. As the weft-thread is removed from beneath the fingers W W W, the pin *s′* passes the lever *y*, and the lifting-bar X is then raised by the spiral spring *p*, or by the blade-spring p^2, Fig. 11, and the lever *y′* thrown forward to receive the stroke of the pin *s′* at the next revolution of the drum *r*. As the weft-threads are brought beneath the fingers W′ W′ W′, the stroke of the pin *s* upon the lever *y* depresses the lifting-bar X′, which is again raised at the proper time by the spiral spring p^1, or by the blade-spring p^2, Fig. 11, in the same manner as has already been described. The fingers W and W′ are thus sustained in a proper position to allow the weft-threads to pass beneath them by the lifting-bars X and X′, except at such times as the thread is under them, when, by the depression of the lifting-bars X and X′, the fingers W and W′ are allowed to fall and complete the electrical circuit by touching the wires *h h h*, unless prevented from doing so by the presence of the weft-threads, possessing the proper degree of tension.

When the breast-beam of the loom is made of iron or other metal, a cover of wood, as shown at L, Fig. 1, may be used, to which the horizontal bearings of the spindle *m m* and the pins *i i i* are attached, for the purpose of more freely insulating the fingers W and W′. These fingers and the mechanism in immediate connection with them may be incased with wood or other suitable material, if desired, in order to protect them from dirt and lint.

Instead of arranging the levers *y* and *y′* and the pins *s* and *s′* as described, the levers *y* and *y′* may be made to pass down, one upon each side of the drum *r*, and using a pin on each side, which may be of the same length, and so placed as to strike the levers alternately—one with every semi-revolution of the drum *r*.

I do not claim as my invention the use of a circular shuttle-race, or of a T-shaped rail forming part of the same; nor do I claim a curved shuttle with a T-shaped groove on its under side, adapting it to run upon such a shuttle-race, as these have all been used; neither do I claim the use of sliding pins carried in vertical hollow cylinders, and caused

to move upward by suitable means for the purpose of engaging the shuttle and imparting to it a rotary motion.

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. The stationary curved race, the curved shuttle, constructed and applied to the race as described, the spindle P, the radial vibrating arm Q′, with its cylinders S S and pins R R, and the pin-actuating annular plates *b b*, all arranged, constructed, and operating as set forth.

2. The spindle P, the radial arm Q′, with its cylinders S S and pins R R, and the pin-actuating annular plates *b b*, all arranged, constructed, and operating in the manner described, in combination with a stationary curved shuttle-race and curved shuttle, substantially as described, and for the purposes set forth.

3. The combination of the fingers W W′, wire *h*, and curved shuttle-race, constructed, arranged, and operating in the manner described, and for the purposes set forth.

4. The shuttle T, wire *h*, fingers W and W′, and lifting-bars X and X′, when combined, arranged, connected, and operating substantially as set forth, and for the purposes specified.

RUFUS B. FOWLER.

Witnesses:

NORTON L. COOK,

F. B. DEANE.