No. 688,375.

Patented Dec. 10, 1901.

F. ZAPATA.

LOOM.

(Application filed July 31, 1900.)

(No Model.)

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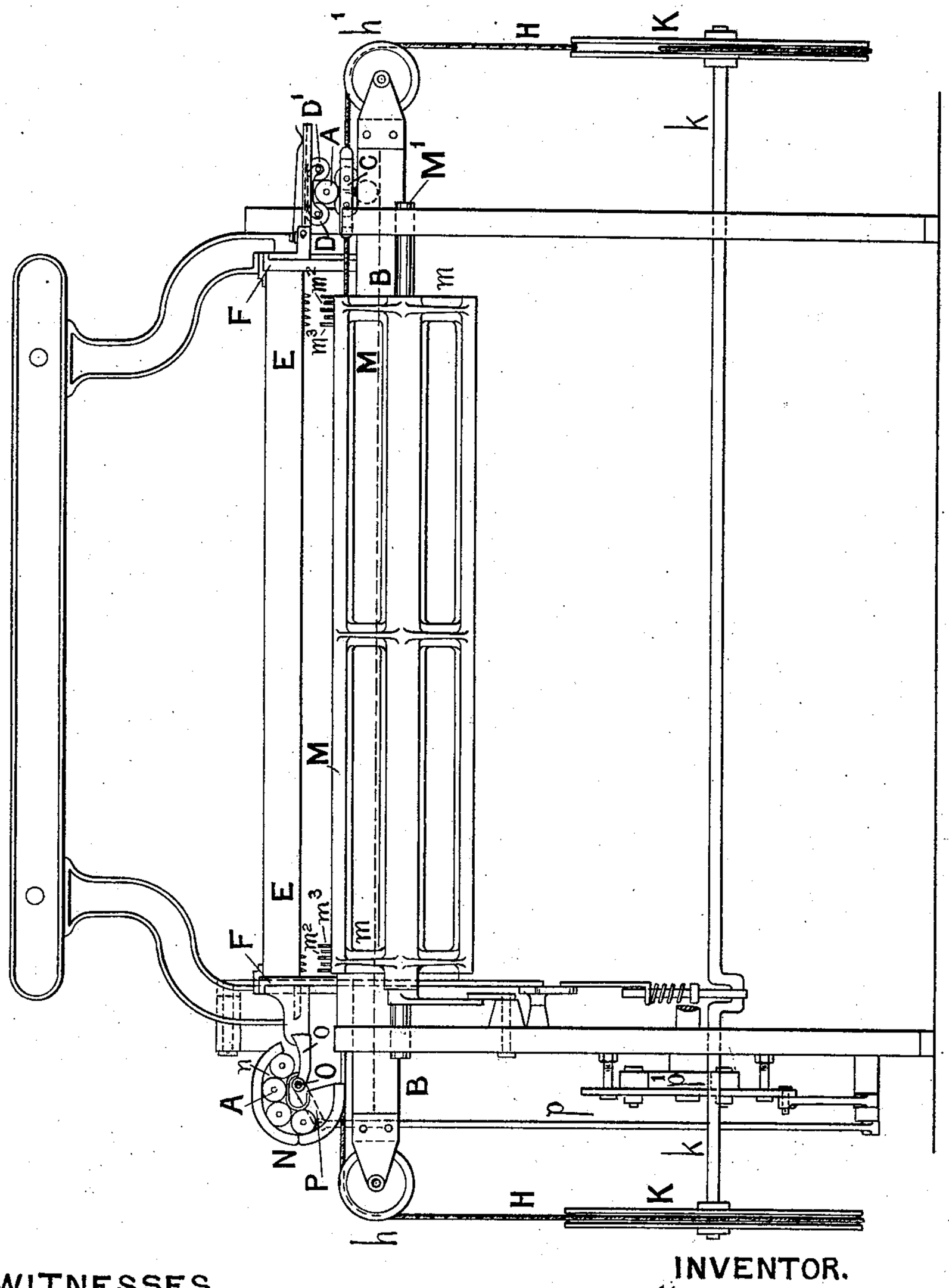

FIG 1.

WITNESSES.

Joseph Bates.

E. Howard

INVENTOR.

F. Zapata

by J. Wallace O'Brien

atty

No. 688,375. Patented Dec. 10, 1901.

F. ZAPATA.

LOOM.

(Application filed July 31, 1900.)

(No Model.) 6 Sheets—Sheet 2.

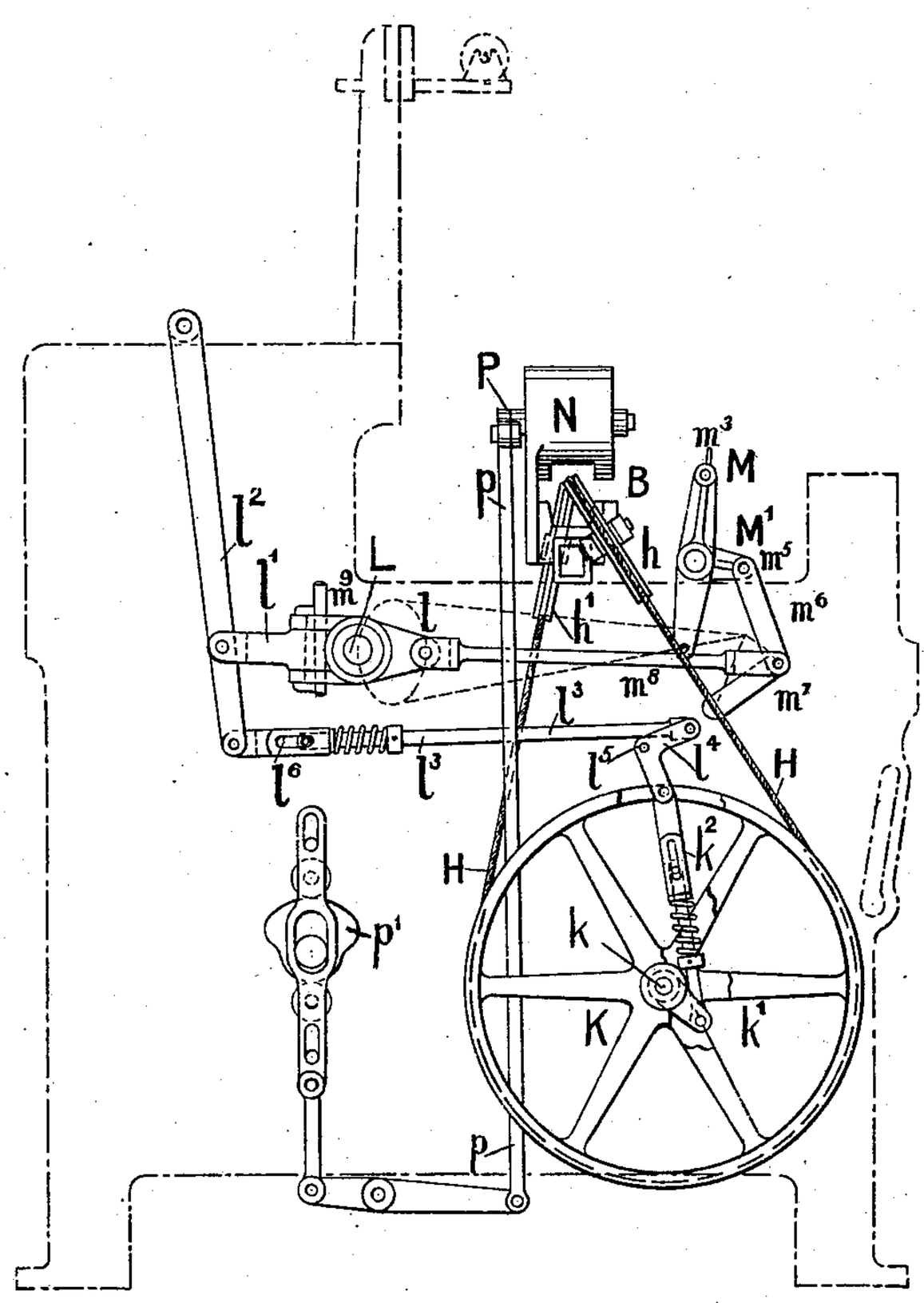

FIG. 2.

WITNESSES.

Joseph Bates.

E. Howard

INVENTOR.

F. Zapata

by Dowson & O'Brien

atty

No. 688,375. Patented Dec. 10, 1901.

F. ZAPATA.

LOOM.

(Application filed July 31, 1900.)

(No Model.) 6 Sheets—Sheet 3.

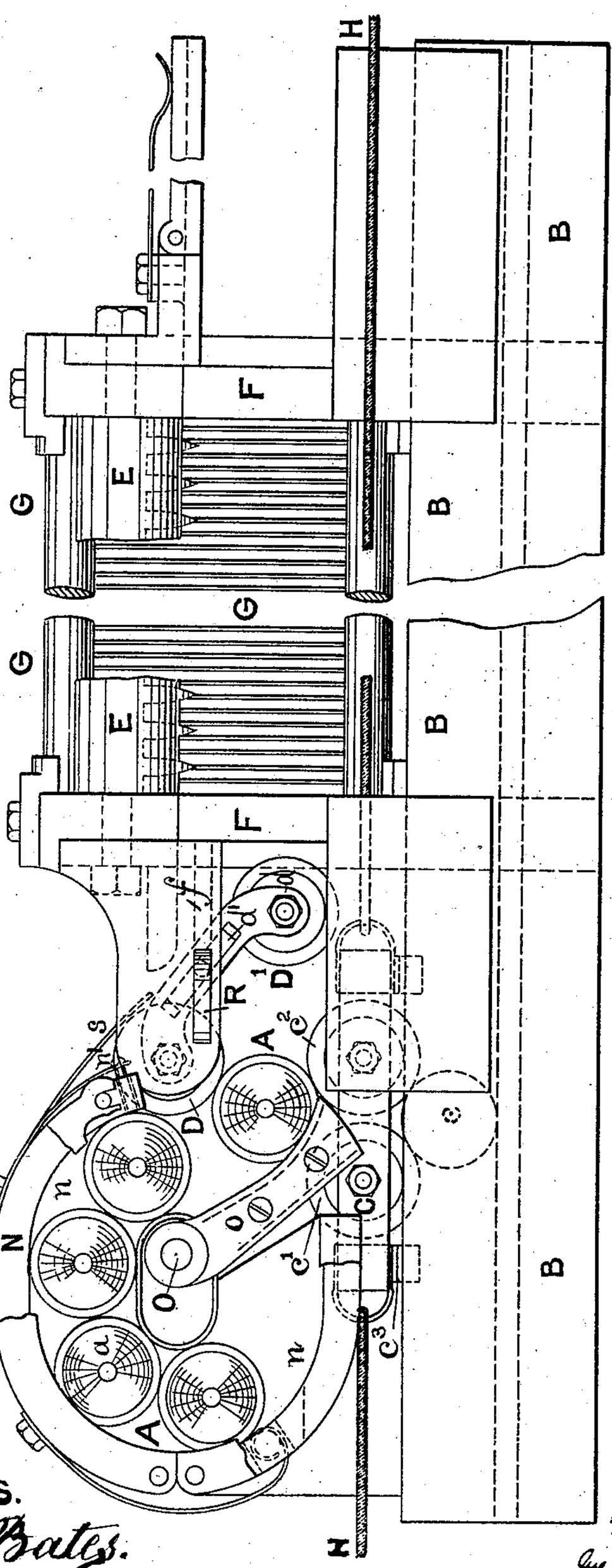

FIG. 3.

WITNESSES.

Joseph Bates.

E. Howard

INVENTOR.

F. Zapata

by Dowell & O'Brien

atty

No. 688,375. Patented Dec. 10, 1901.

F. ZAPATA.

LOOM.

(Application filed July 31, 1900.)

(No Model.) 6 Sheets—Sheet 4.

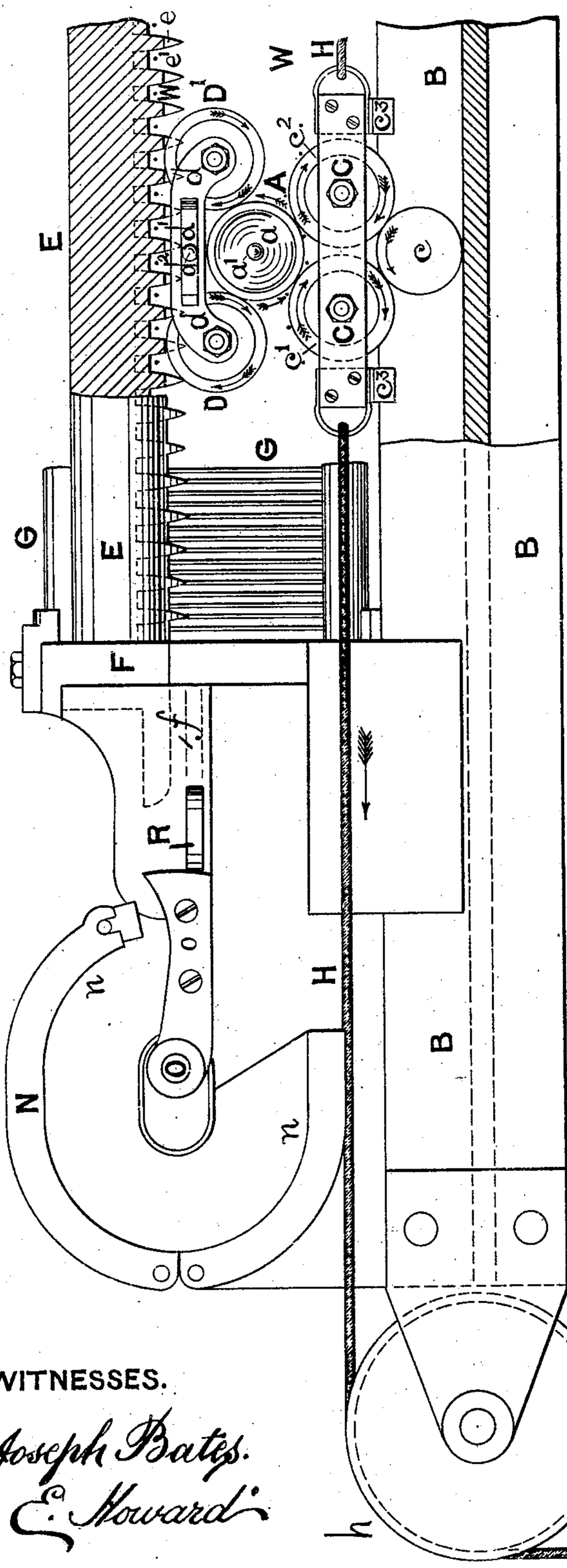

FIG. 4.

WITNESSES.

Joseph Bates.

E. Howard.

INVENTOR.

F. Zapata

by

D. Owen O'Brien

atty

No. 688,375.

Patented Dec. 10, 1901.

F. ZAPATA.

LOOM.

(Application filed July 31, 1900.)

(No Model.)

6 Sheets—Sheet 5.

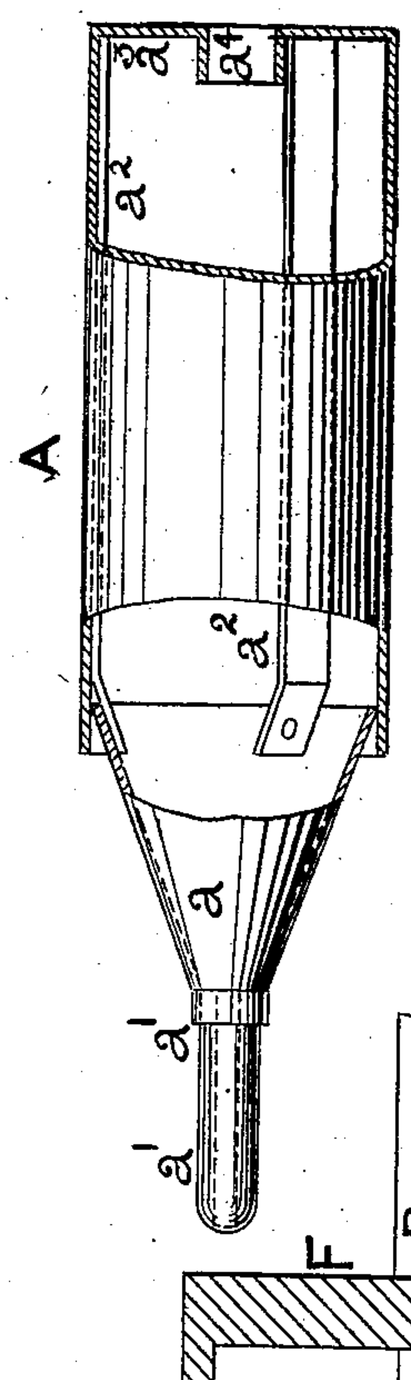

FIG.8.

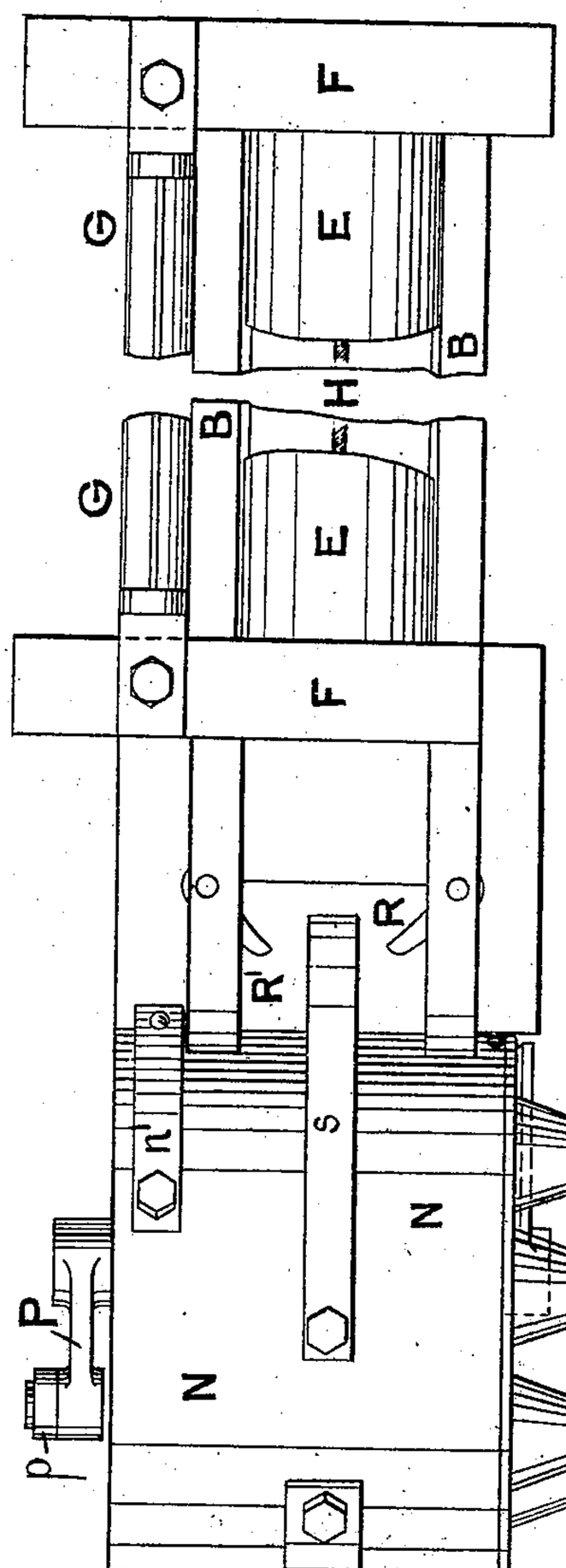

FIG.5.

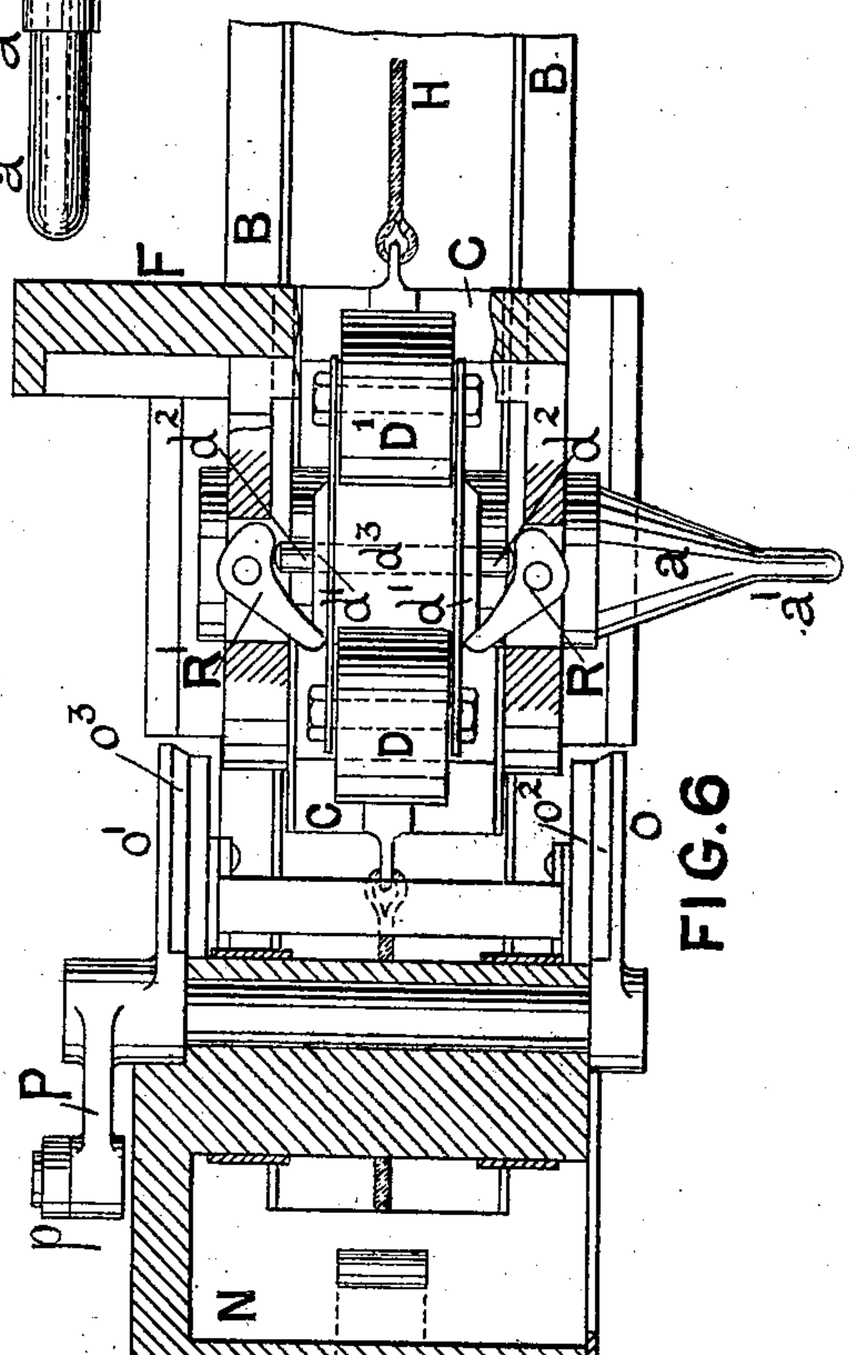

FIG.6

WITNESSES.

Joseph Bates.
E. Howard

INVENTOR.

F. Zapata
by D. A. Sullivan O'Brien
atty

No. 688,375. Patented Dec. 10, 1901.

F. ZAPATA.

LOOM.

(Application filed July 31, 1900.)

(No Model.) 6 Sheets—Sheet 6.

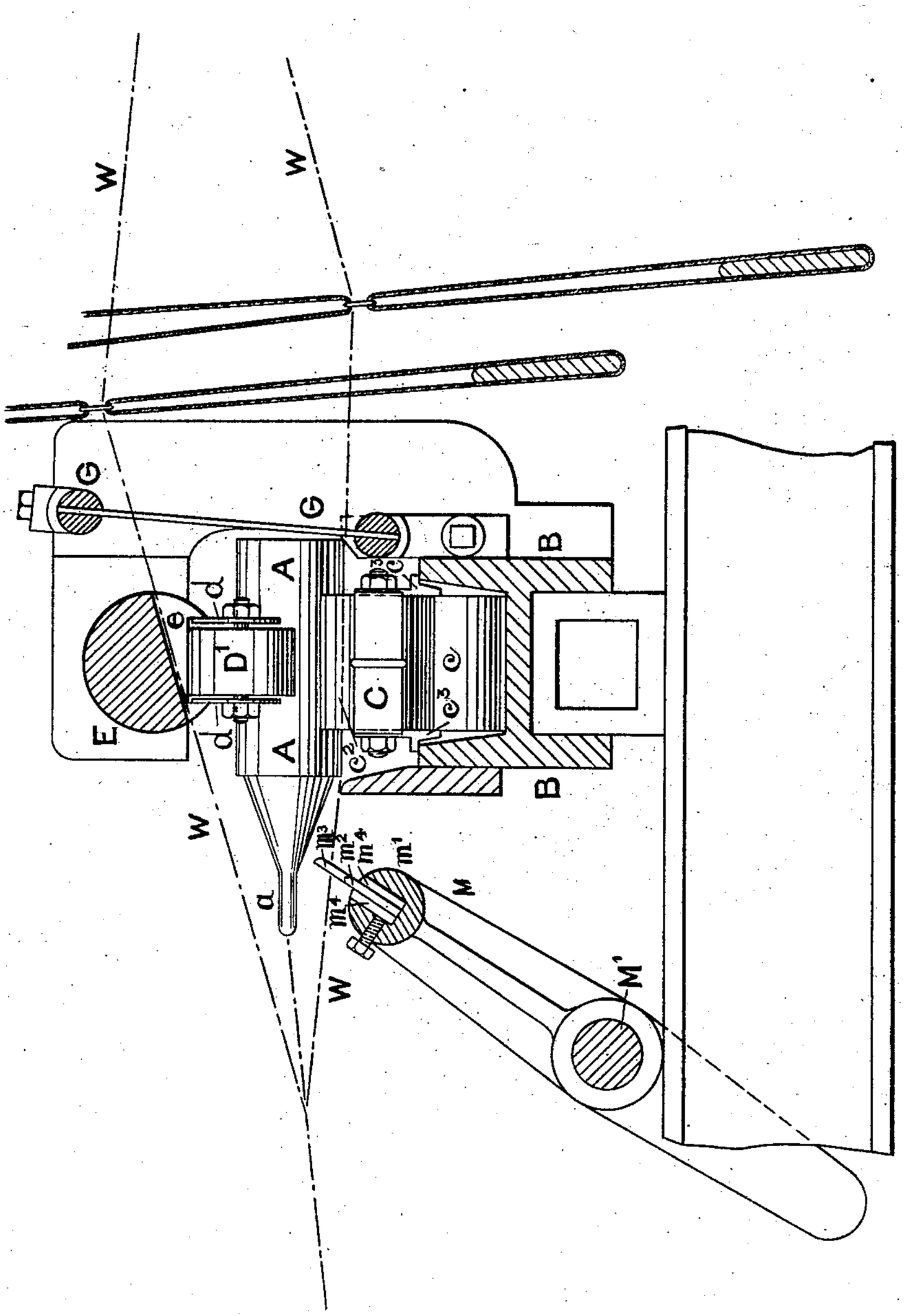

FIG. 7.

WITNESSES.

Joseph Bates.

E. Howard

INVENTOR.

F. Zapata

by Donnan & O'Brien

atty.

UNITED STATES PATENT OFFICE.

FELIPE ZAPATA, OF LONDON, ENGLAND.

LOOM.

SPECIFICATION forming part of Letters Patent No. 688,375, dated December 10, 1901.

Application filed July 31, 1900. Serial No. 25,441. (No model.)

To all whom it may concern:

Be it known that I, FELIPE ZAPATA, a citizen of the Republic of Colombia, and a resident of Chiswick, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Looms for Weaving, of which the following is a specification.

This invention relates to certain improvements in looms for weaving, and is designed to provide a rolling shuttle propelled to and fro by a positive reciprocating motion and in combination therewith a suitable comb for beating up the weft and a shuttle-box for working the shuttles.

The invention will be fully described with reference to the accompanying drawings, in which sufficient of a loom is shown to illustrate the invention.

Figure 1 is a front elevation of the loom. Fig. 2 is an end elevation of loom; Fig. 3, a front elevation, enlarged, of shuttle-race and shuttle-box, showing carriage for shuttle and reserve of shuttle in the shuttle-box; Fig. 4, a front elevation of race and shuttle-box partly in section, showing the shuttle-carriage in the race and the shuttle-box empty; Fig. 5, a plan of shuttle-box and race; Fig. 6, a sectional plan of shuttle-box with shuttle-carriage entering the shuttle-box; Fig. 7, a transverse section through shuttle-race; Fig. 8, a side elevation, partly in section, of improved shuttle enlarged.

The shuttle A is a hollow cylindrical shell of aluminium, steel, or other suitable material to form a casing and carrier for the cop or pirn of weft-yarn. It is formed with a conical end or point a, in the center of which is a hole or tube a', through which the weft-yarn passes. The shuttle is fitted in its interior with lateral springs a^2 to hold the cop when it is desired to unwind it from the interior. These springs a^2 project from the rim of the conical part a and are slid into the hollow cylinder. The shuttle is fitted at one end with a disk a^3 with a central socket a^4, through which a peg or skewer is passed into the interior of the cop to hold it when it is to be unwound from the exterior. The disk carrying the peg, as well as the conical part of the shuttle, may either or both be made detachable. The principal object of the conical part of the shuttle is to support in the center of the cylindrical body the weft-delivering tube a'. The rolling shuttle does not cross the shed lengthwise, like the common shuttle. As it travels by rolling, its length is parallel to the warp-threads. The delivering-tube a' projects toward the fell of the fabric and delivers the weft-thread close thereto to be beaten up. A positive rolling motion is given to the cylindrical shuttle A backward and forward across the shuttle-race. A rail B of channel shape on its upper side extends across from end to end of the loom, being fixed to the frames. This rail forms the support or race for the shuttle. The shuttle is carried upon a small frame or carriage C, upon which are mounted two parallel rollers c' c^2 of equal diameter, rotating on spindles, which are fixed to the sides of the frame or carriage C. The two rollers c' c^2 rest upon a loose roller c, placed in the channel of the rail B, which runs smoothly from end to end of the rail. The sides of the rail are inclined, as shown, and they act as guides for the loose roller c. To prevent lateral movement of the frame C, projecting flanges c^3 are attached thereto to slide upon the edges of the rail B. The loose roller c, with the frame or carriage C and rollers c' c^2, forms the carriage for the shuttle, which, as it is drawn backward and forward over the shuttle-race B, gives a positive reciprocal motion to the shuttle and also a positive rolling motion. The shuttle is maintained in position upon its carriage by a second pair of rollers D D', mounted in a top carriage d, frame somewhat narrower than the frame C. The shuttle A is therefore in rolling contact with the four rollers c' c^2 D D'. The upper rollers D D' run in a rectangular recess e in a top guide E, fixed above the warp and parallel with the shuttle-race B. The top guide is comprised of a bar with a number of spaces e', through which the warp-threads pass out of contact with the rollers D. The recess e, which guides the rollers D D', is cut in the lower edge of the guide E. The top rail or guide E is supported at each end of the loom by a bracket F, fixed upon the end of the shuttle-race. A fixed or stationary reed G is attached to the back of

the shuttle-race B to keep the warp-threads W in their proper position and to form a back guide to the lower edge of the rolling shuttle A.

The carriage C is drawn backward and forward across the shuttle-race B by a cord or rope H, attached to it at both ends, and the shuttle A is rolled across the warp-threads W, which are shown in Fig. 7 by two sets of dotted lines. When the cord H is pulled to the left in the direction of the arrow, all the rollers c, c', c^2, D, and D′ and the shuttle A will revolve in the direction shown by the arrows at a speed equal to their rectilinear advance. The lower threads of warp lifted in succession will pass under the shuttle without being laterally disturbed.

When diminishing the velocity of the shuttle-carriage at high speed, the accumulated energy of the rollers would cause them to fret the yarn if there were no effective brake to control their motions. I prevent such an accident by covering the rollers with elastic bands or tires.

The cord H, which actuates the shuttle-carriage C and by which the desired movement is given to the shuttle, passes over pulleys h h', one at each end of the shuttle-race, and at each end is attached to a wheel or pulley K, placed at the ends of the loom and attached to a shaft k. When the shaft k is turned in either direction, one of the wheels lets off and the other winds up the cord H, giving to the shuttle-carriage a steady traversing motion. The wheels K receive a reciprocating or oscillating motion from the ordinary shaft L by the crank l, the connecting or crank rod l', the swinging pivoted link l^2, the connecting-rod l^3, and bell-crank lever l^4, pivoted on a fixed pin or stud l^5. The second member of the bell-crank lever l^4 is connected to a crank k' on the shaft k by a connecting-rod k^2. The swinging pivoted link l^2 receives a rocking movement from the crank l by means of the connecting-rod l'. This movement is transmitted by the connecting-rod l^3 to the bell-crank lever l^4 and from the bell-crank lever l^4 to the crank k', keyed upon the shaft k of the pulleys K. The lower end of the swinging pivoted link l^2 works in a guide-slot l^6. The action of the bell-crank lever l^4 is to regulate the motion of the shuttle, increasing or decreasing the speed by changing the relative position of the arms and altering, accordingly, the length of the connecting-links.

As the reed G is stationary and could not work past the shuttle-race B, it is necessary to provide an oscillating comb or beater M to beat up the weft after each travel or pick of the shuttle A. The comb or beater M is attached by two or more arms m to an oscillating shaft M′ and consists of a frame or rod m', carrying in its upper part a longitudinal groove to hold the teeth m^2 m^3, which are placed between two strips of metal or wood m^4 and secured by screws. The teeth are set up like printing-type, with spaces between them suitable to the fineness of the cloth. I make the teeth m^2 very short—about three-eighths of an inch; but every half inch, more or less, I place a tooth m^3 about three-fourths of an inch long to catch the weft. The front line of the long teeth m^3 is in advance of the point of the short ones, so that the weft lowered by the upper threads of warp is sure to be caught by the short teeth. To the comb-shaft M′ is attached a crank m^5, by which it is oscillated by means of two links m^6 and m^7, moved to and fro by a connecting-rod m^8 from the crank l of the crank-shaft L, which actuates the shuttle-wheels K.

To reduce the motion of the comb M while the shuttle A is crossing the shed and to increase the speed at the moment of beating up the weft, I employ only one connecting-rod, attached to the crank l to swing the lever l^2 and to vibrate the comb M. The connecting-rod has two parts l' and m^9, and I make the part l', which swings the lever l^2, equal in length to twice the diameter of the circle described by the crank l and the other part m^9 equal to one diameter of the same circle. At the extremity of this part is jointed a link which vibrates the comb by means of the levers m^6 m^7, jointed and acting like toggle-levers, and the crank m^5. The motions are marked in Fig. 2 by dotted lines. The extremity l' of the connecting-rod travels backward and forward, while the extremity m^9, jointed to the link, describes the ellipse shown by dots.

I fit the loom with one or two boxes N, fixed at the ends of the shuttle-race. These boxes are made either cylindrical or oval; but whatever may be their form they have a deep channel n to contain the shuttles, which roll in a circuit, entering one way and going out the other. Fig. 3 is a front elevation of a shuttle-box, and Fig. 6 is a horizontal section of same and a plan of the adjoining parts. The shuttles A are placed in the channel n side by side, touching each other, the conical ends protruding out of the box on the side of the fell of the cloth. They are kept in position by a spring n' and other springs on the front (not shown in the figure) strong enough to withstand their weight, but yielding to any extra force. In the central part of the box is a pin O, carrying on each end lateral arms o o', parallel to one another, with angular recesses o^2 o^3 to support and guide the shuttles. The box N is cut open at its bottom in order that the shuttle-carriage C may enter into the box. The pin O, carrying the lateral arms o o', is fitted with a crank P and connecting-rod p to receive intermittent motion from a cam p', Fig. 2, mounted on the tappet-shaft of the loom. When the two arms o o' are lifted, their lower angular recesses O^2 and O^3 form a guide for the shuttle to run in and out of the box. When said arms are lowered as they appear in Figs. 3 and 6, they form an inclined plane for the shuttle to ascend. At the moment the shuttle begins to ascend this

plane (the shuttle being kept in position by the top roller D and the spring *s*) the arms are lifted and a new shuttle is pushed out on the other side of the channel to be taken by the carriage C on its return. Before the shuttle enters into the box the top rollers are disengaged and kept suspended between the guide-rail flanges for the returning shuttle. The manner in which this is effected is shown clearly in Figs. 3 and 6.

The top carriage *d* has on each lateral side between the rollers D D′ two stopping-pieces *d′* and two studs d^2, formed by the extremities of a steel rod d^3. On getting out of the shed these studs enter the grooves *f*, cut in the lower flanges of the piece F. In the same grooves work the two small levers R R′. The two stopping-pieces *d′* open the levers, causing the shorter ends of same to close, compressing the studs d^2 and stopping the carriage, which is pushed up by the shuttle to the position shown in Fig. 6. Thus after each shot or passage of the carriage across the slay a fresh shuttle is delivered to the carriage C.

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

1. A loom comprising in its construction a cylindrical rotary shuttle set longitudinally of the warp-threads, a traversing carriage to carry the shuttle backward and forward provided with a number of rollers to give a rotary movement to the shuttle, a shuttle-race upon which the shuttle-carriage travels backward and forward, a fixed reed placed at the back of the shuttle-race to divide the warp-threads and an oscillating comb placed in front of the shuttle-race to beat up the weft substantially as described.

2. In a loom for weaving the combination with a rotary cylindrical shuttle A, of a shuttle-race B, a shuttle-carriage C traversing the race, a number of rollers *c c′* c^2 which transmit a rotary movement to the shuttle, cord H and means for actuating the cord whereby the shuttle and carriage are drawn backward and forward across the shed substantially as described.

3. In a loom for weaving the combination with a rotary cylindrical shuttle A, of a shuttle-race B and upper guide E, the shuttle-carriage C provided with rollers *c c′* c^2 traversing the race B, and the upper carriage *d* provided with rollers D D′ traversing the groove of the upper guide E and means for reciprocating the carriage substantially as described.

4. In a loom for weaving the combination with a fixed shuttle-race B and traversing carriage C of a cylindrical shuttle A rotating thereon substantially as described.

5. In a loom for weaving the combination with a rotary cylindrical shuttle, a fixed shuttle-race and shuttle-carriage traversing to and fro thereon of the cord H the wheels K to which the cord is attached the crank-shaft L crank *l* connecting-rod *l′* swinging link l^2 connecting-rod l^3 bell-crank lever l^4 connecting-rod k^2 and crank *k′* by which motion is imparted to the wheels K substantially as described.

6. In a loom for weaving the combination with the cylindrical shuttle A, fixed shuttle-race B, shuttle-carriage C and rollers *c c′* c^2 traversing the race, and the fixed reed G for dividing the warps, of the oscillating comb M to beat up the weft after each shot of the shuttle the crank m^5 attached to the comb and the toggle-levers m^6 m^7 substantially as described.

7. In a loom for weaving the combination with the cylindrical shuttle A the shuttle-race B fixed reed and shuttle-carriage C of the shuttle-box N provided with a channel *n* through which the shuttles pass and mechanism for passing the shuttles through the box after each shot or passage of the shuttle across the slay and returning the next to the shuttle-carriage C substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FELIPE ZAPATA.

Witnesses:

I. OWDEN O'BRIEN,

B. NATHAN WOODHEAD.