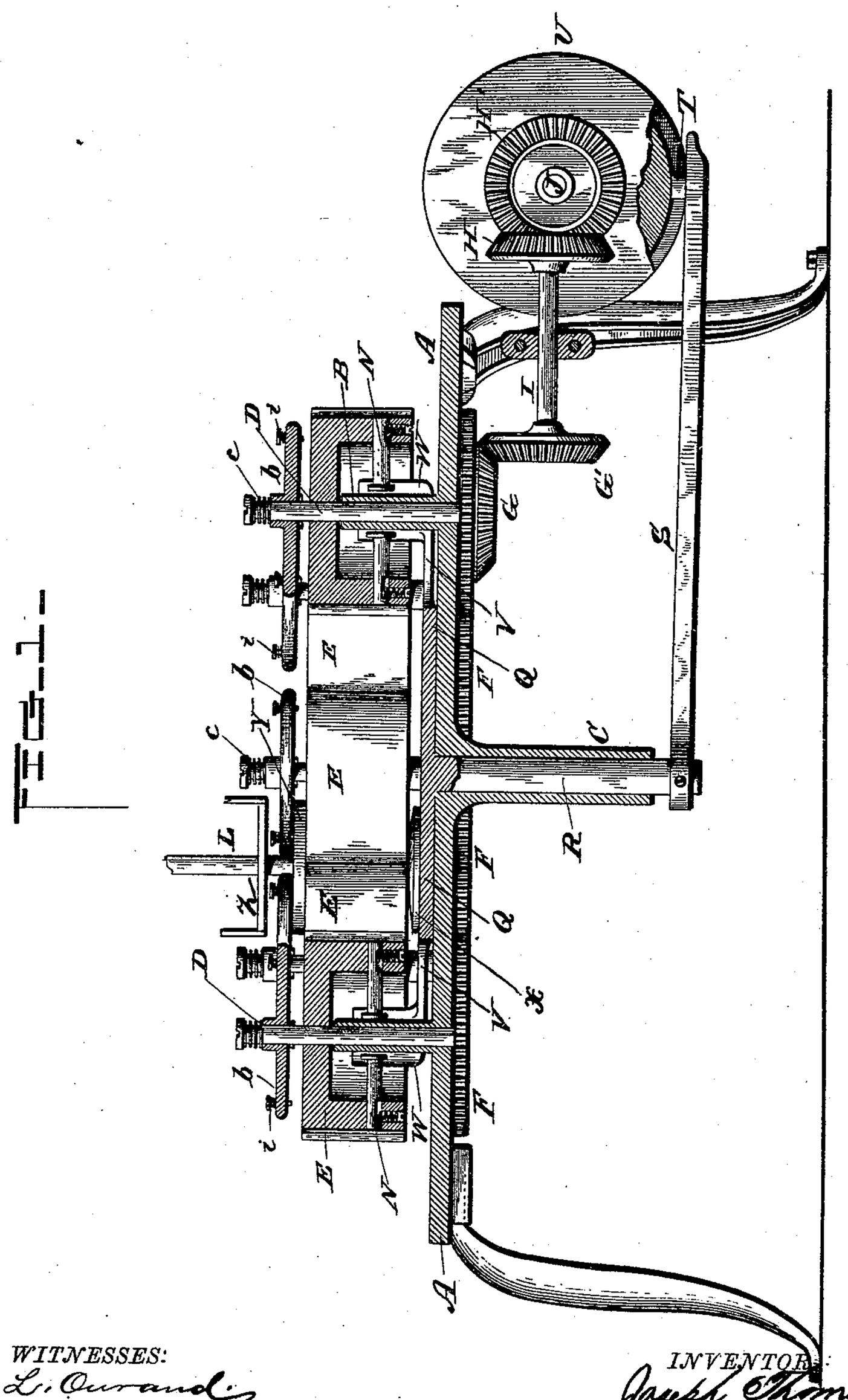
(No Model.)

3 Sheets—Sheet 1.

J. THOMAS.

BRAIDING MACHINE.

No. 457,170. Patented Aug. 4, 1891.



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(No Model.) 3 Sheets—Sheet 2.

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FIG. 3.

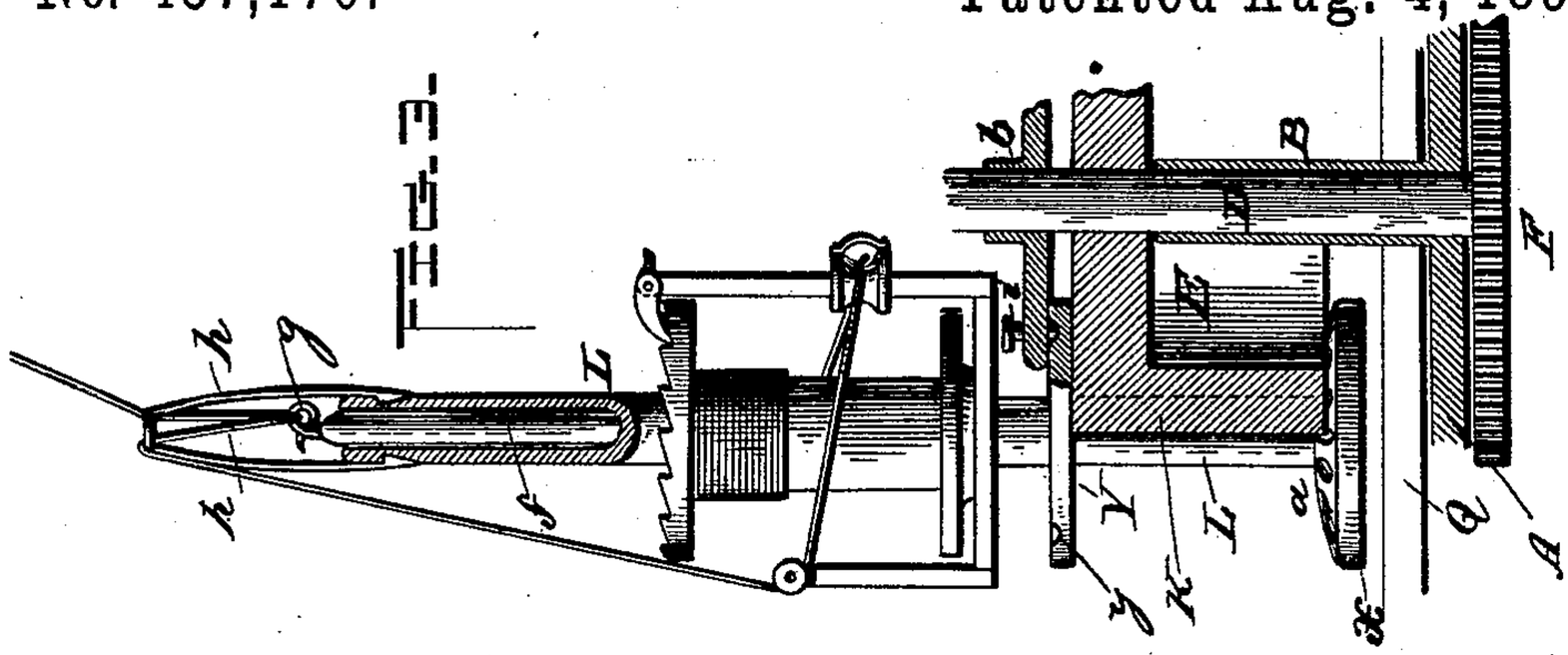


FIG. 4.

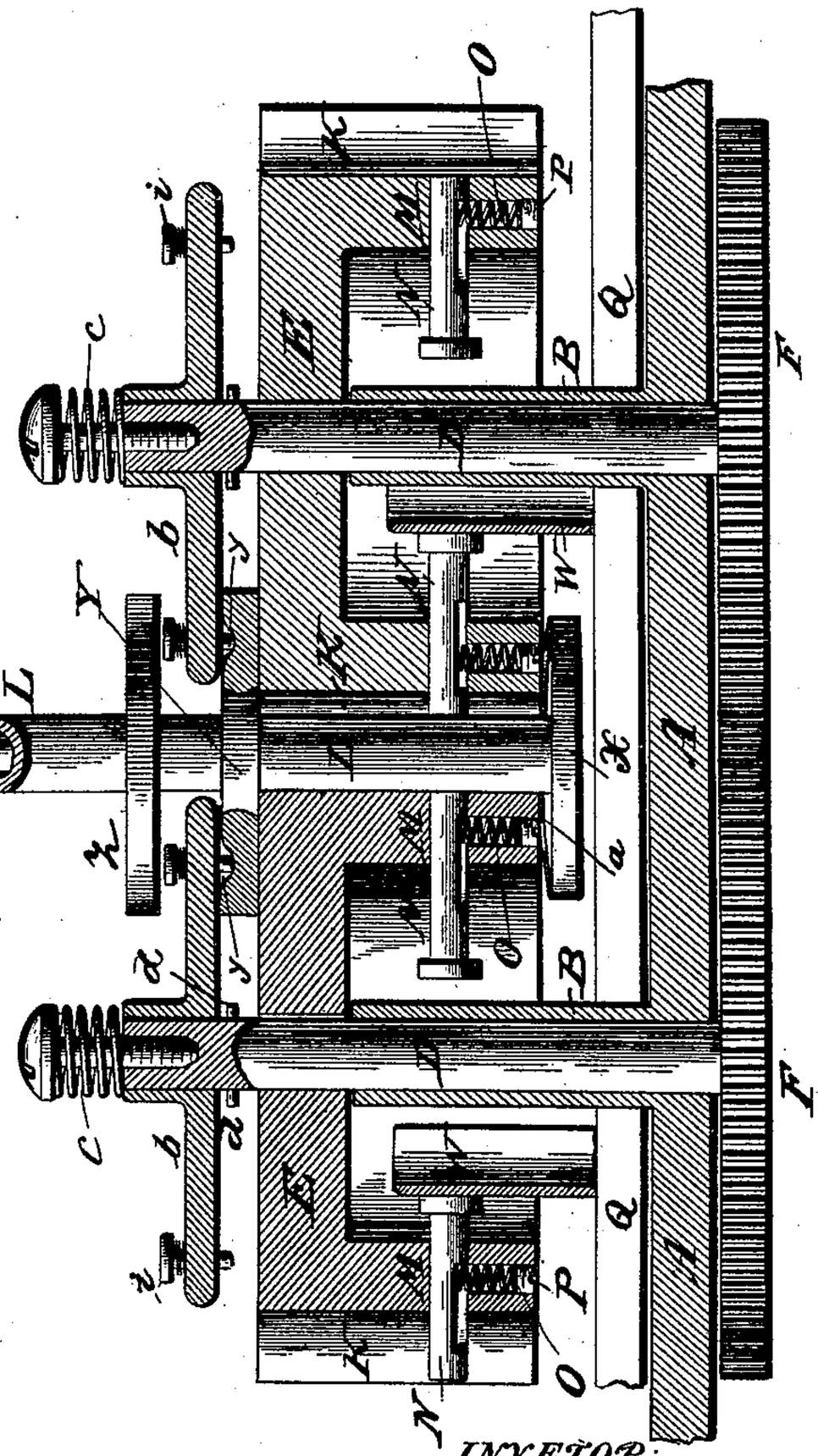
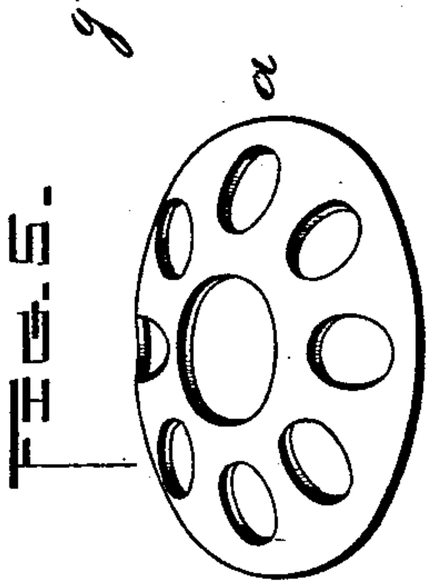


FIG. 5.



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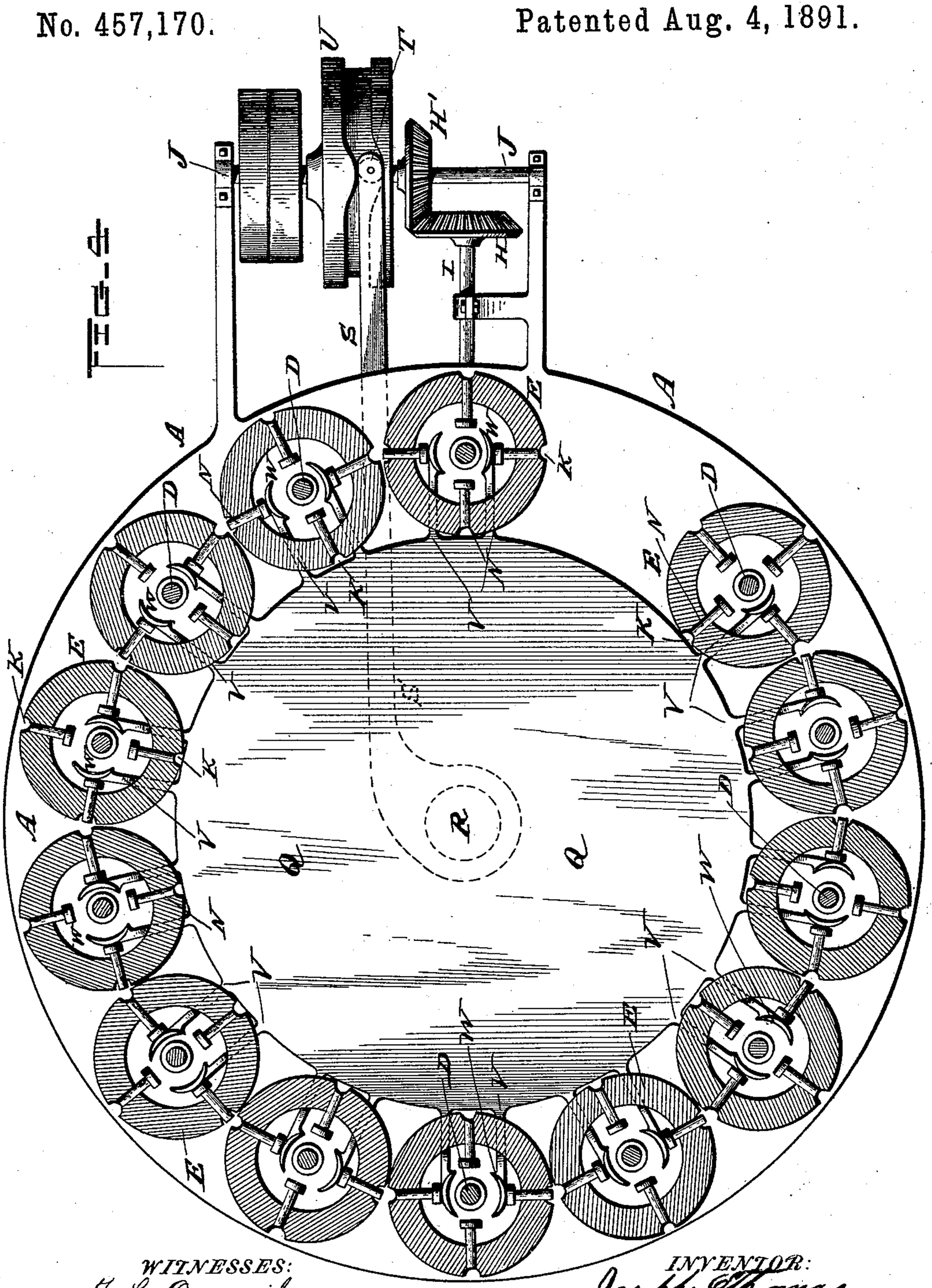

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UNITED STATES PATENT OFFICE.

JOSEPH THOMAS, OF NEW YORK, N. Y.

BRAIDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 457,170, dated August 4, 1891.

Application filed November 21, 1890. Serial No. 372,145. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH THOMAS, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Braiding-Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

In braiding and plaiting machines for manufacturing flat, round, or tubular braid, or covering an inner core with braid, as heretofore constructed, a number of spools or bobbins are caused to run in a zigzag course and intersect one another alternately in a curved guide-track or race-course in such a manner that the threads on the bobbins will be plaited together so as to form a braid of the required style and pattern. As the bobbins or spools depend for their zigzag motion through the race-course upon the friction of their spindles against the sides of the track, and as (in that type of machines) a number of independently-operating switches, or so-called "latches," have to be employed to shift the spindles from one notched carrier to another, it is obvious that considerable friction and retardation is unavoidable, which necessarily results in loss of power as well as in great wear of the sides of the track when it is attempted to run the machines at a high speed, so that after a comparatively short period of continuous running the jacks or spindles which support and carry the spools will commence to wabble or oscillate in their course through the track, resulting in uneven tension on the threads and a loose and unevenly plaited braid.

The object of my improvement is to overcome these drawbacks and to construct a machine which may be run at a high speed with a minimum of friction, and in which the spindles will be held in the carriers in such a manner that they will not work loose through wear, but always be held in a fixed and straight position; and with these objects in view my improvement consists in dispensing with the curved friction-track or race-course altogether, as well as with the customary individual switches or latches for shifting the spindle from one carrier to another, and substituting in lieu thereof peculiarly-constructed carriers operating in conjunction with spring-actuated spindles, which may be instantly removed from or replaced in the carriers.

My invention further consists in an improved switch mechanism.

On the accompanying three sheets of drawings, Figure 1 represents a side elevation, with certain parts shown in section, of so much of a braiding-machine as is necessary to illustrate my invention. Fig. 2 is a sectional view, on a vertical plane and on an enlarged scale, of two of the revolving carriers and a spindle of my improved construction. Fig. 3 is a detail view, partly in section, of my improved spindle with its appropriate carrier and holding springs and bolts. Fig. 4 is a plan view of the switching-disk with its operating mechanism, illustrating the method of switching or shifting the spindles alternately from one carrier to another throughout the entire series; and Fig. 5 is a perspective detail view of one form of the bottom holding-spring or spring-disk employed in conjunction with the spindles and carriers.

Like letters of reference designate corresponding parts in all the figures.

My improved machine consists of the usual main frame or bed-plate A, mounted upon legs or supports of suitable height and provided with a series of hollow posts B, arranged in a circle or the segment of a circle, of which the downwardly-projecting hollow stud or bearing C in the middle of the bed-plate forms the center. These circularly-disposed hollow posts B form vertical bearings or journals for the shafts D of the driving heads or carriers E, which revolve with the shafts, a rotary motion in alternately-opposite directions being imparted to the latter in the usual well-understood manner by means of a train of intermeshing cog-wheels F, bevel-gears G G′ and H H′, and drive-shafts I and J, or some equivalent mechanism operated by belts, gears, or friction-pulleys, as may be desired.

The driving heads or carriers E are hollow cylinders having their sides notched vertically, as shown at K, with equidistant semicircular notches or recesses adapted to fit the depending cylindrical stem of the spindles L,

as usual in this class of machines. The hollow body or shell of each carrier is bored through radially and horizontally, forming bores or cylindrical apertures M, which open from the inner hollow port or chamber of the carrier cut into the side notches K, there being one of these horizontal apertures M for each of the semicircular side notches or spindle-recesses K. Into each of the apertures M is inserted from the inside a headed pin N, a portion of which is cut away on the under side, forming a flat bearing for the upper end of a helical friction-spring O, which is inserted into a vertical bore in the shell of the carrier, intersecting the bore or aperture M at right angles, said friction-spring being held in place within its recess by means of the bottom screw P. By turning this screw right or left, so as to move it some distance up or down within the lower screw-threaded part of the spring-recess, it will be observed that the tension of the friction-spring may be regulated at will, so as to adjust its pressure upon the under side of the sliding pusher-pin N.

Each spindle L is pushed during the operation of the machine from its proper notch K in one of the carriers into the registering notch in the opposite and adjacent carrier by the pin N appertaining to the notch in which the spindle is for the time being inserted by the following mechanism: A circular plate or disk Q rests loosely upon the top of the bed-plate A, and is provided with a central downwardly-projecting shaft R, which is inserted through the depending hollow bearing C. Fastened at right angles upon the projecting lower end of shaft R is a lever S, the free end of which has a stud and friction-roller T, which plays in a circumferential serpentine groove in the cam-wheel U, so that when the latter (which, by preference, is fastened upon and revolves with the main drive-shaft J) is rotated an oscillating or laterally vibratory motion will be imparted to lever S and disk Q. The periphery of this disk is provided with radiating projecting fingers V, the outer ends of which are bent in an upward direction and formed into a crescent shape W, with their swell or convex side facing the inner headed ends of the pins N, while the recessed or concave side faces the hollow post B, around which the carrier revolves, this concavo-convex shape of the fingers V W permitting of their having sufficient play forward and back in the space between the central post B and the inner cylindrical wall of the carrier E to operate the sliding pusher-pins N, while at the same time it serves to strengthen them and make their mode of operation more effective.

From the foregoing description, taken in connection with the drawings, the *modus operandi* of this part of my machine will, it is believed, be readily understood. The carriers being so adjusted and timed as to revolve in unison with the intermittent vibrations of the finger-carrying disk Q, (which for convenience I call a "switch,") one set of the fingers V W—*i. e.*, every other one—will, on each "throw" or motion of the switch, push from the inner side against the pusher-pins N in the respective carriers, which are then immediately opposite said fingers, shoving their forward ends out into the notches K in the carriers. At this junction the whole set of carriers will have one of their notches K, carrying a spindle, registering with a corresponding notch in the adjacent carriers on both sides, as illustrated in Fig. 4, and at this precise moment one set of fingers V W (which I call "switch-cams") will, by the throw of the lever S and switch Q, press against the pusher-pins N from the inside, as above stated, thereby pushing or shoving the spindle sidewise from its notch K in one carrier into the opposite and registering notch in the carrier next adjacent, from the aperture of which the outer end of pin N is at that moment withdrawn, thus shifting the spindle from one carrier to another. On the next throw of the switch the other set of cams V W comes into play, pushing against the pins on the opposite side of the carriers and shifting the other set of spindles, with their spools, from one carrier to another. In this manner at each throw or movement of the switch Q, with its cams V W, the whole set of spindles is shifted, so that each spindle will progress in the usual zigzag or "figure-eight" course common to all braiding-machines throughout the entire series of carriers and back to the starting-point, which performance is repeated so long as the machine remains in motion.

As I do not employ any slotted frame or grooved track to guide and hold the spindles in place as they progress from one carrier to another, other means must be provided for fastening the spindles in the notched carriers with sufficient firmness and stability to hold them steady during their zigzag travel at the great speed of which my machine is capable. To this end each spindle is provided with two disks X and Y, (besides the usual spool-supporting disk Z,) and upon the bottom disk X is placed a concavo-convex spring-plate *a*, (shown removed from the spindle in the detail view, Fig. 5,) having a central aperture for the insertion of the spindle. When the spindle is inserted sidewise into its appropriate notch in the carrier to start on its travels, the central convex part or swell of plate *a* will bear with considerable spring-pressure against the under side of the rim or bottom of the carrier-shell, thus retaining the spindle in position within its appropriate notch. As an additional safeguard, however, the upper flange or disk Y, which overlaps the top of the carrier, receives spring-pressure from above by means of a circular plate or disk *b*, which has a limited up-and-down motion upon the projecting upper end of its appropriate carrier-shaft D, with which it revolves. These disks *b* are forced downwardly by means of spiral springs *c*, the lower ends

of which bear against the central annular rim or flange of the disk, the play or downward motion of the disks being limited by studs or stop-pins *d*. As the rims of the presser-disks *b* are rounded or beveled, the upper disk Y of the spindle may readily be inserted sidewise into its proper position between the disk and the flat top of the carrier, and when in this position it will be seen that the spindle, after it has been once inserted into its appropriate notch, will be clamped firmly against the top and bottom of the carrier by means of the spring-disks *b* and *a*, yet in such a manner that it may readily be switched or shifted from one carrier to another through the medium of the pusher-pins N, as hereinbefore described; but as the centrifugal force of the rapidly-revolving carriers has a tendency to dislodge the spindles, notwithstanding these means of fastening, I provide an additional or auxiliary holding device by constructing the spindle-disk Y with a concentric circumferential top groove *y*, adapted to receive the lower end of a spring-bolt *i*, which is inserted vertically through the rim of the presser-disk *b*, one on each side—diametrically opposite to each other, so that one of these bolts will engage the groove *y* in one of the spindle-disks, while the other and opposite bolt will similarly project down into and hold the top disk Y of the spindle opposite.

Instead of constructing the bottom holding-spring in the form of a concavo-convex disk, as herein described, and illustrated on the drawings, it is obvious that a flat disk may be employed, actuated by a spiral spring pressing against it from the under side—in other words, a modified duplication of the upper spring-disk *b*.

The spools or bobbins *e* are placed upon the spindles in the usual manner, the thread from each bobbin being held taut by the automatic tension device illustrated in Figs. 2 and 3. This consists simply of a weight *f*, inserted loosely within the tubular spindle L, within which it is free to slide up and down, and having a wire eye *g* at its upper end for the insertion of the thread. The thread as it comes from the spool is first guided over and around the usual guide-sheaves, (illustrated in Fig. 3,) and is then carried up over the wire top guides *h* and down through the eye in the inside weight. By this construction and arrangement of the sliding tension-weight it will not be affected by centrifugal action, as when arranged upon the outside of the central revolving spindle, and will be practically out of the way. These features, however, form no part of my present invention and are not claimed by me.

By the construction of my machine, as hereinbefore described, I am enabled to run it at a very high rate of speed with a minimum of power, as there is little or no friction against the spindles as they are switched from one carrier to another. The absence of the usual curved friction-track or race-course for guiding the spindles also greatly reduces wear and tear of the spindles and of the machine as a whole, and by the peculiar construction and combination of the spindles and carriers the spindles or any one of them may be removed by the operator in a moment of time simply by slipping it out of its notch sidewise. While the spindles are going through the machine they are held firmly in place by the pressure of the top and bottom spring-plates and the spring-bolts, so that they will not oscillate or wabble in their bearings, no matter how fast the machine is run. This feature of inserting the spindles into the notched carriers sidewise and from the outside I consider of the greatest importance, as it permits of any one of the spindles being removed or replaced in an instant, besides doing away absolutely with all friction except at the moment when one spindle is shifted from its notch in one carrier into that of another.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. A braiding-machine having a series of carriers working above the bed-plate and provided with notches or recesses in their peripheries, said carriers being provided with interior pusher-pins operated substantially as described, whereby each bobbin-spindle is at the proper moment pushed out laterally from its appropriate recess in one carrier into the registering recess in an adjacent carrier during the progress of the spindles in plaiting the braid.

2. In a braiding-machine, the combination of a bed-plate, a series of carriers mounted above the bed-plate and provided with notches or recesses in their peripheries, the bobbin-spindles, the interior push-pins located in said carriers and projecting through recesses in the peripheries of said carriers, so as to push the spindles laterally out from their appropriate recesses in one carrier into corresponding recesses in the adjoining carriers, and the switch, substantially as described, for operating said pusher-pins.

3. In a braiding-machine, the combination of the carriers provided with sliding pusher-pins, a switch mechanism for operating said pins, the spindles, and spring-actuated clamping or locking devices whereby the spindles are clamped and locked removably against the top and bottom of the carrier, substantially as set forth.

4. In a braiding-machine, the combination of the hollow carriers provided with sliding pusher-pins, the switch mechanism having radially-projecting switch-cams V W, the switch-lever, the grooved cam-wheel for vibrating said lever, the spindles, and the spring-actuated clamping or locking devices whereby the spindles are clamped and locked removably against the top and bottom of the carrier, substantially as described.

5. In a braiding-machine, the combination, with the carriers having notches or recesses in their peripheries, of the interior laterally-reciprocating pusher-pins working in recesses in said carriers, and the helical springs located in vertical bores in the carriers intersecting said recesses and pressing against said pins at right angles, substantially as described.

6. In a braiding-machine, the combination, with the carriers having notches or recesses in their peripheries, of the interior laterally-reciprocating pusher-pins working in radial apertures or recesses in said carriers, the helical springs located in vertical bores in the carriers intersecting said apertures or recesses and pressing against the pusher-pins, and the retaining and regulating screw-studs bearing against the outer ends of said springs, substantially as described.

7. In a braiding-machine, the combination, with the carriers having central shafts and notches or recesses in their peripheries and the radially-reciprocating pusher-pins, of the bobbin-spindles provided with top and bottom disks Y X, the top disk Y having grooves *y*, the concavo-convex spring-plate mounted upon the spindle intermediate of disk X and the bottom of the carrier, the spring-actuated disk mounted upon the carrier-shaft, and the the spring-bolts *i*, carried by said disk, substantially as described.

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

JOSEPH THOMAS.

Witnesses:
WM. V. A. POE,
LEWIS R. HILL.