

G. S. COX.  
HAIRCLOTH LOOM.  
APPLICATION FILED JUNE 6, 1908.

931,276.

Patented Aug. 17, 1909.

3 SHEETS—SHEET 1.

FIG. 1.

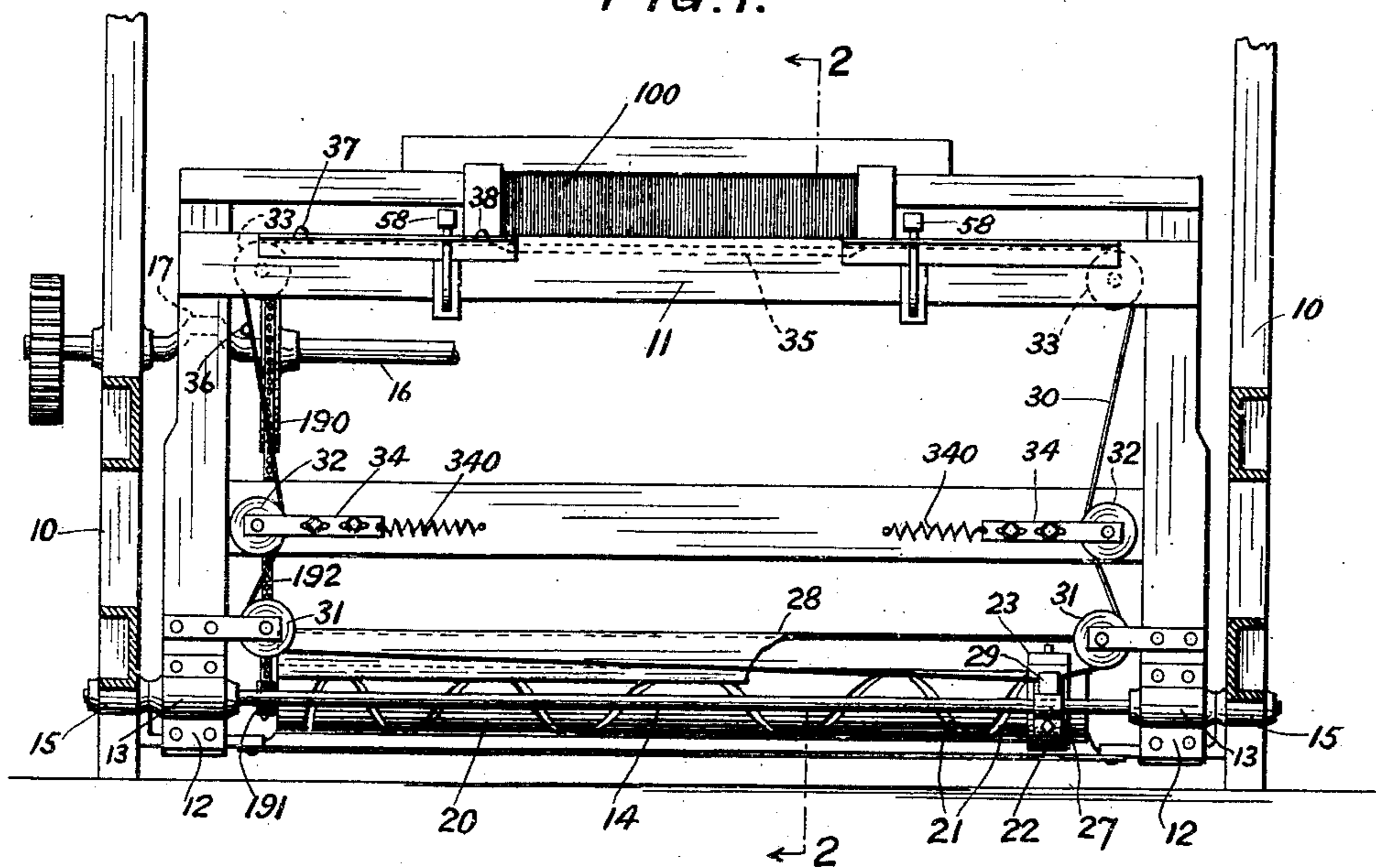


FIG. 2.

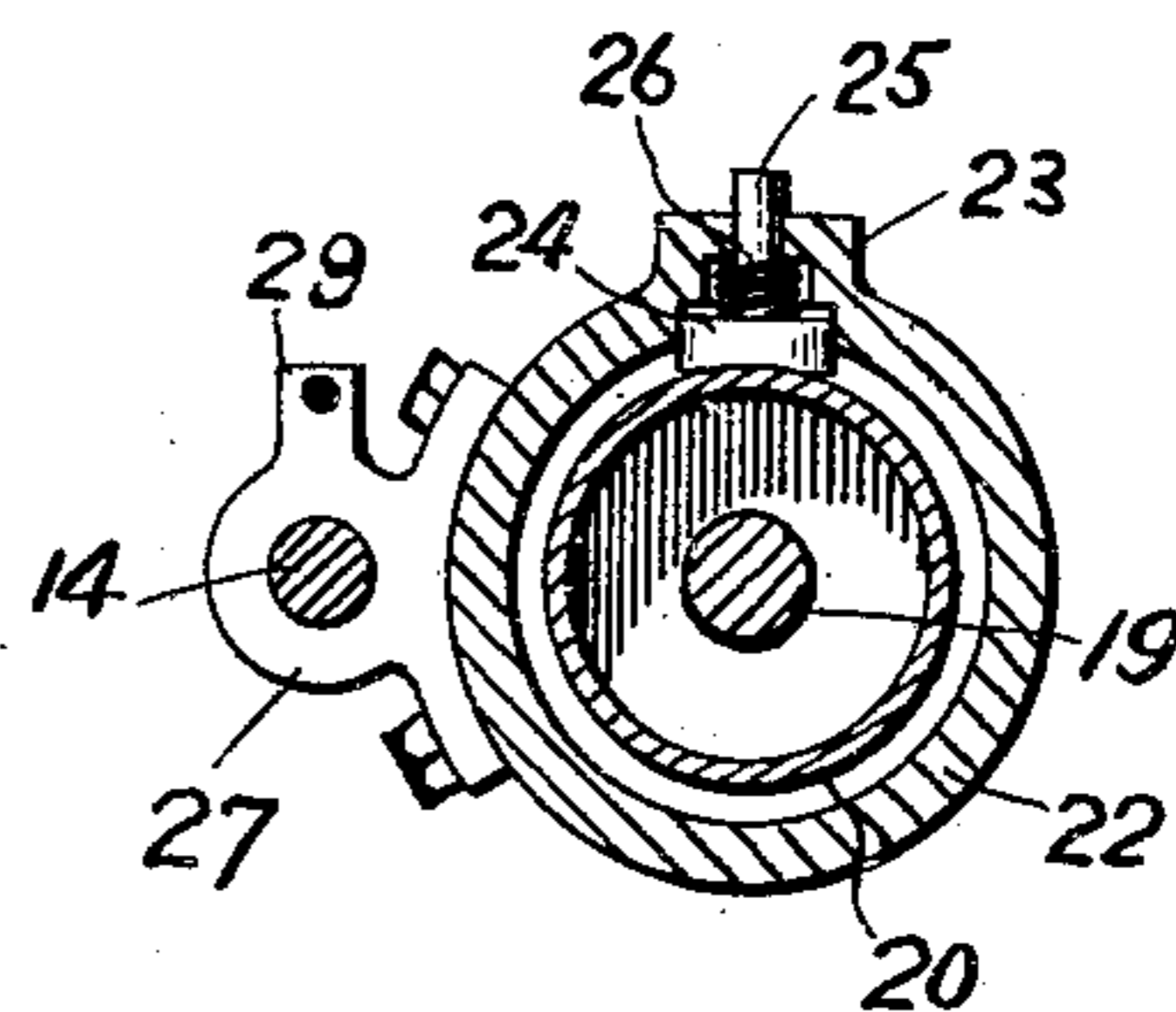
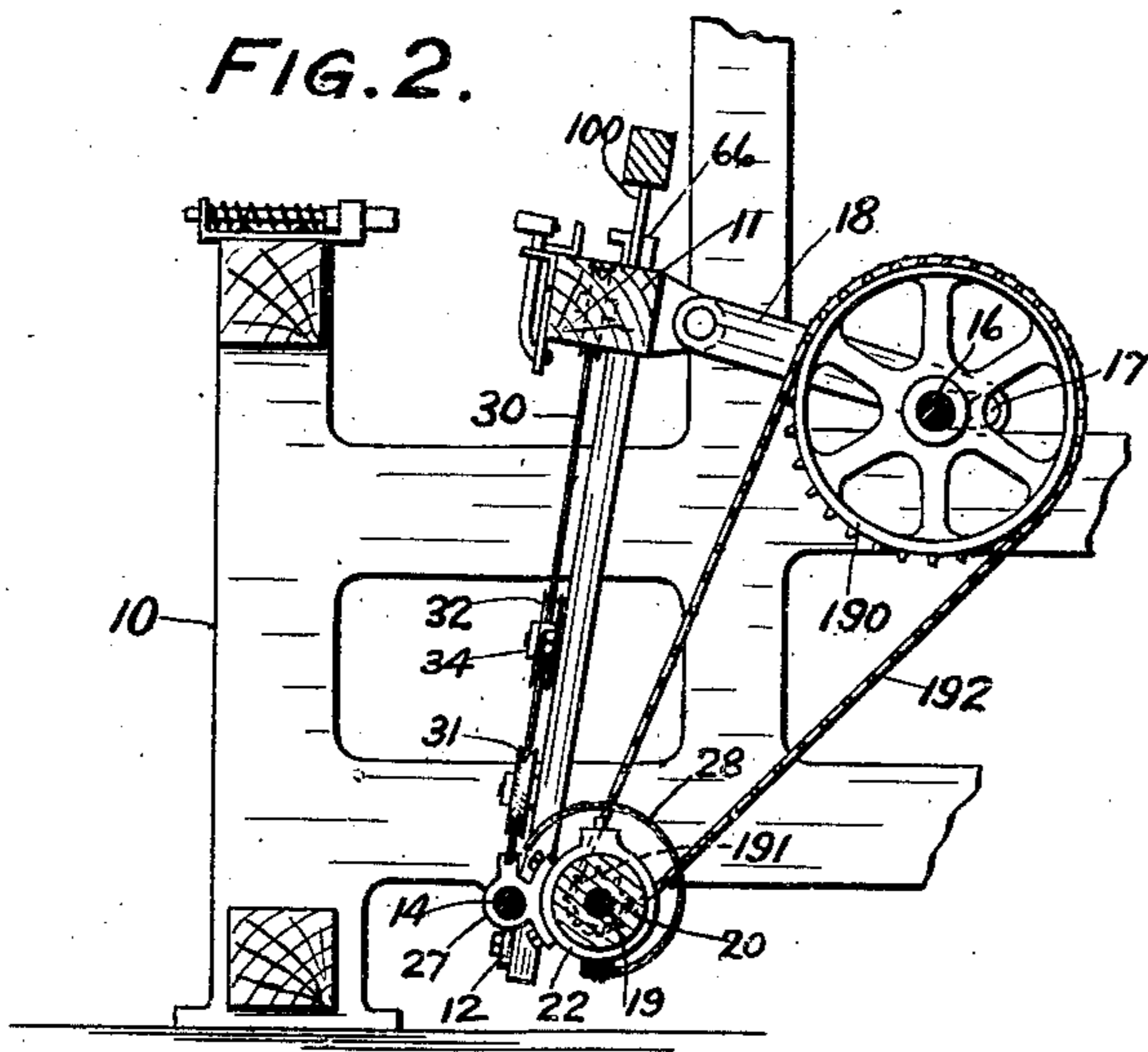


FIG. 3.

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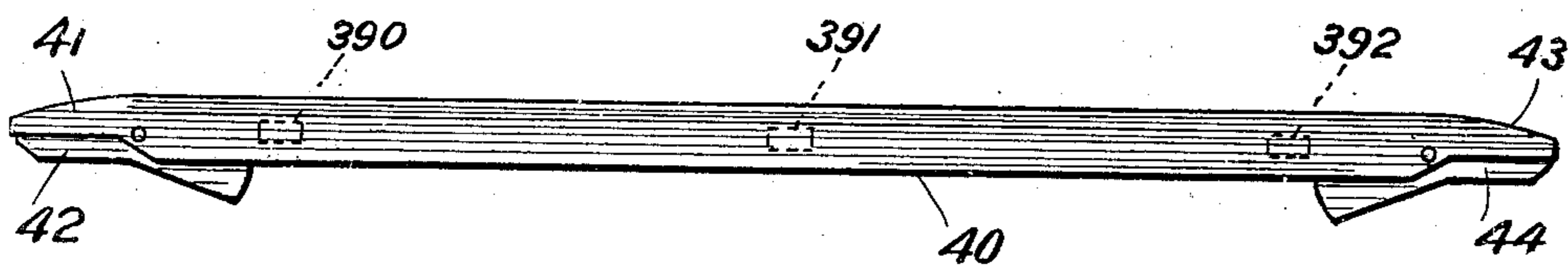
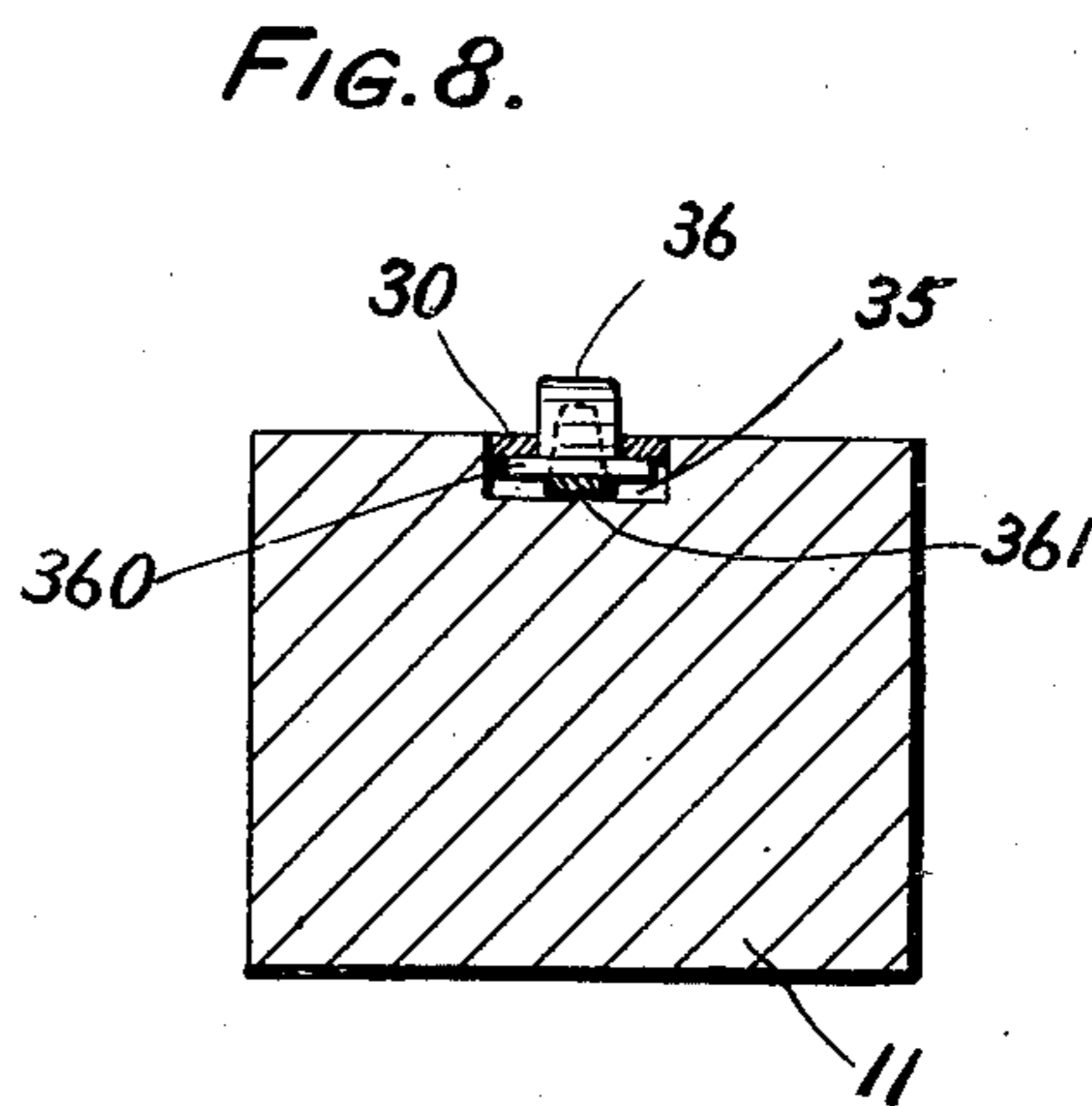
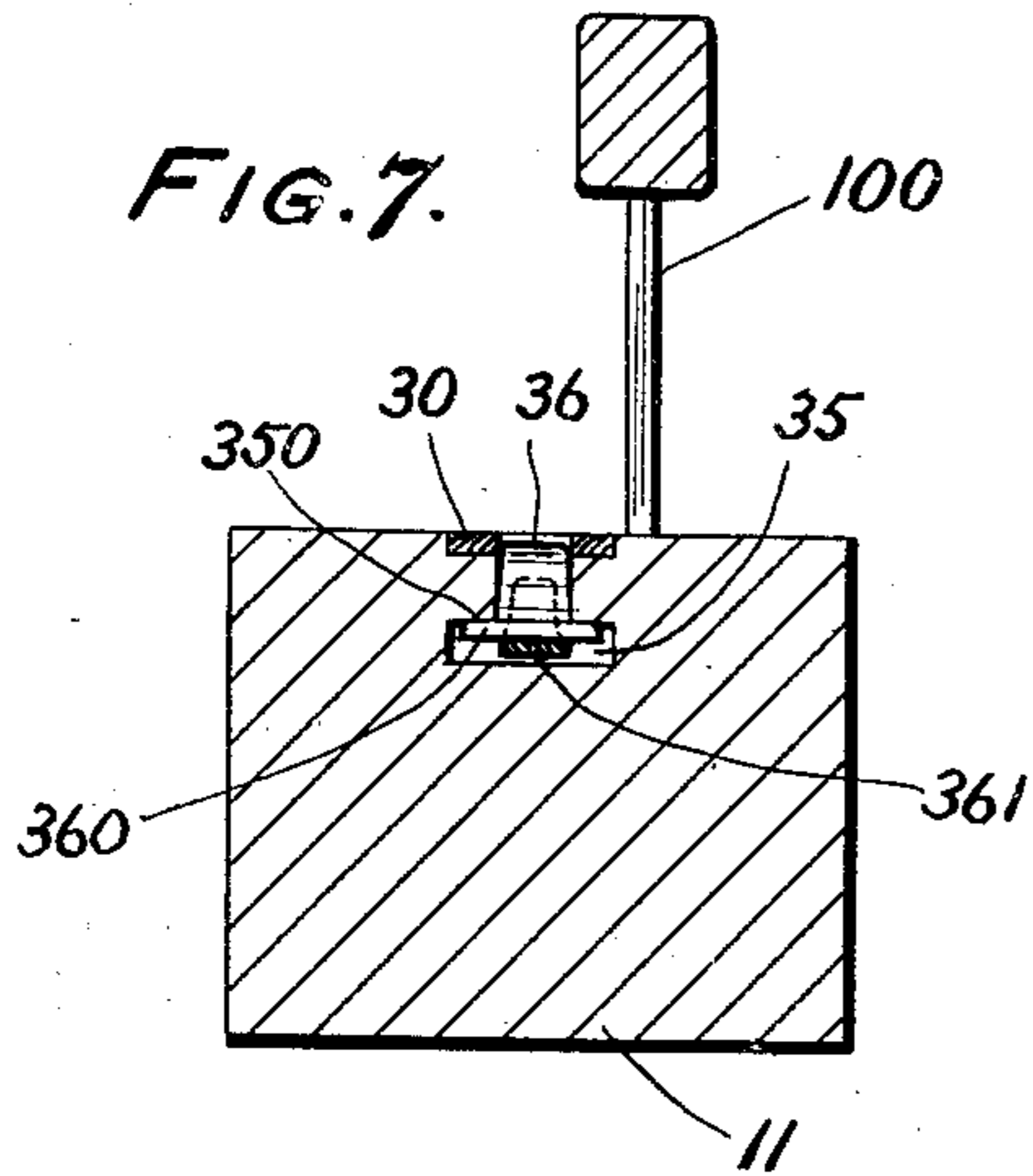
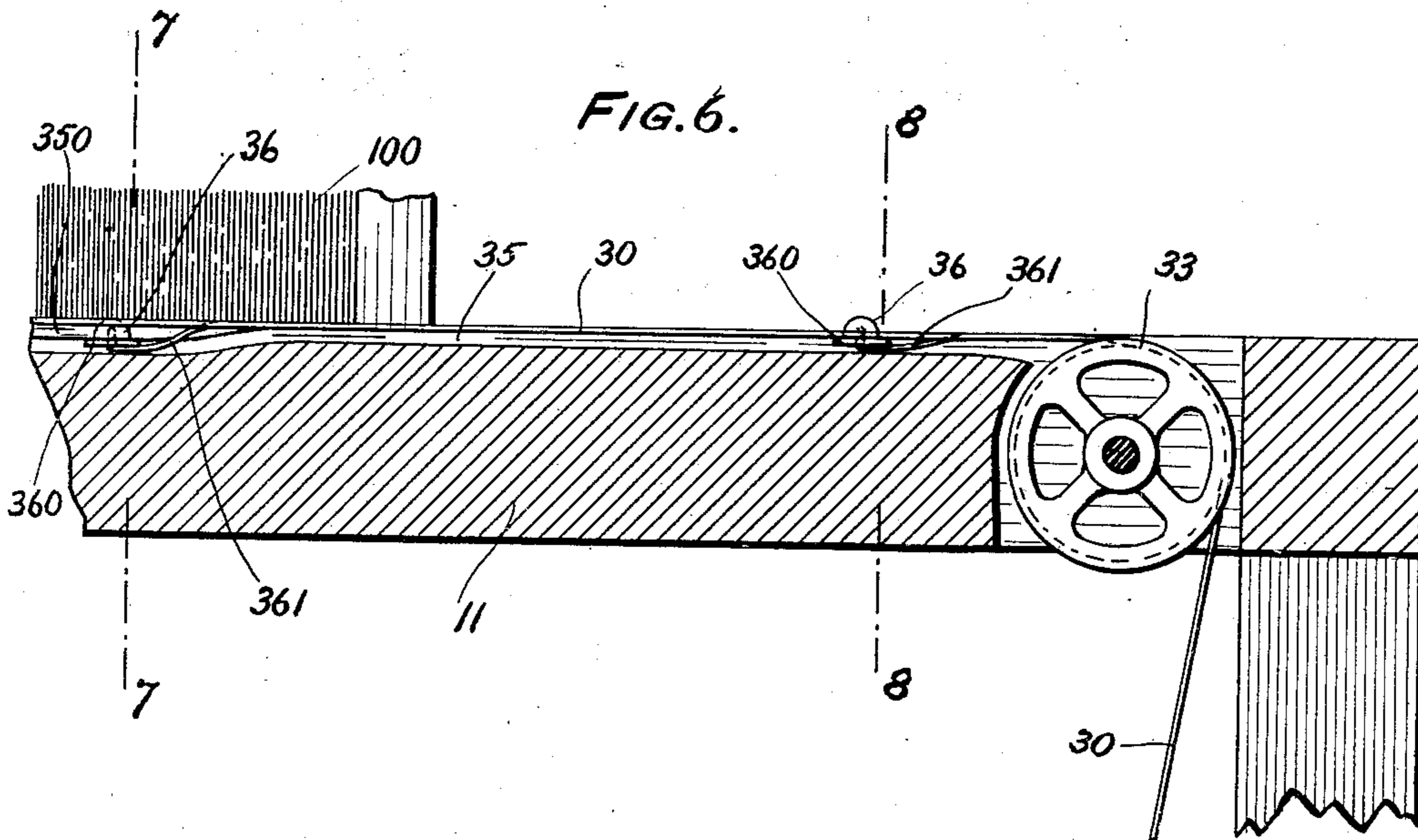


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3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE.

GEORGE S. COX, OF EDGE HILL, PENNSYLVANIA, ASSIGNOR TO HIMSELF, AND WALTER S. COX, OF PHILADELPHIA, PENNSYLVANIA, TRADING AS GEORGE S. COX & BROTHER.

## HAIRCLOTH-LOOM.

No. 931,276.

Specification of Letters Patent.

Patented Aug. 17, 1909.

Application filed June 6, 1908. Serial No. 437,090.

*To all whom it may concern:*

Be it known that I, GEORGE S. COX, a citizen of the United States, residing at Edge Hill, county of Montgomery, and State of Pennsylvania, have invented a new and useful Improvement in Haircloth-Looms, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to looms, and particularly to that type of loom adapted to the manufacture of hair-cloth and similar goods, wherein the weft is prepared in separate strands or picks substantially equal in length or slightly longer than the width of the goods to be woven, and wherein a nipper or shuttle is provided having a pair of jaws at each end by means of which picks of hair are pulled from each side of the loom to the other side at each movement of the nipper or shuttle transversely of the warp-shed.

The invention is also applicable to that more common type of loom in which the nipper or shuttle is provided with a pair of jaws at one end only, which act to pull the hair through the warp-shed from one side only at each reciprocation of the nipper or shuttle.

The object of the invention is to provide means for imparting to the shuttle a differential movement that will cause the gripping jaws thereof to grasp the hair with more certainty than heretofore.

Certain of the loom parts and attachments are omitted from the drawings, as they are not necessary to illustrate my invention.

In the drawings: Figure 1 is a front elevation of the loom. Fig. 2 is a section on the line 2—2 of Fig. 1. Fig. 3 is an enlarged detail view of a part of Fig. 2. Fig. 4 is a plan view of the shuttle-driving cylinder. Fig. 5 is a front elevation of a modification. Fig. 6 is a longitudinal section through one end of the lay and reed. Figs. 7 and 8 are transverse sections on the lines 7—7 and 8—8 respectively of Fig. 7. Fig. 9 is a plan view of the shuttle.

10 is the loom frame, 100 the reed, and 11 the lay having brackets 12 carrying trunnions 13, by means of which the lay is pivoted to a shaft 14 extending across the loom and turning in bearings 15 in the loom frame.

16 is the driving shaft or cam-shaft carry-

ing a crank 17 and link 18, by means of which the lay is reciprocated.

Turning in bearings (not shown) on the frame of the machine is the shaft 19 which is given a continuous rotation by means of a sprocket-wheel 190 on the crank-shaft driving a sprocket-wheel 191 on the cylinder shaft through a sprocket-chain 192. On the shaft 19 is the shuttle-driving cylinder 20. On the periphery of cylinder 20 is a continuous endless spiral cam groove 21. It will be observed, by reference to Fig. 4, that, starting from the center of the cylinder, the groove extends spirally around the same from right to left, the pitch of the groove gradually decreasing in steepness as it approaches one end of the cylinder. Near this end of the cylinder the groove reverses its direction and thence extends toward the opposite end of the cylinder spirally around the same from left to right, the pitch of the groove gradually becoming steeper as it recedes from the first named end of the cylinder and gradually decreasing in steepness as it approaches the opposite end of the cylinder. Near the latter end of the cylinder the groove again reverses its direction and thence extends spirally around the cylinder from right to left, the pitch of the groove gradually increasing in steepness as it recedes from the last named end of the cylinder. The reversely curved or oppositely extending sections of the groove intersect each other at regular intervals, the points of intersection being along two lines parallel to the axis on diametrically opposite sides of the cylinder. The purpose of this groove and its peculiar configuration will be hereinafter explained.

Surrounding the cylinder, and spaced therefrom, is an annular shuttle driving traveler 22 having an interiorly recessed projection 23. Within the groove 21 of the cylinder 20 extends a shoe 24 having a stud extending through a hole in the head of the projection 23. Between the shoe 24 and the inner wall of the projection 23 is confined a spring 26, which presses the shoe with a yielding pressure into the cam-groove.

Secured to the exterior of the traveler 22 is a bracket 27 orificed to fit freely on the shaft 14, which acts as a guide for the traveler. This arrangement prevents the traveler 22 from turning on the cylinder 20, and it will be understood that continued rotation

of the cylinder propels the traveler back and forth along the cylinder with a speed that is greatest while the traveler is moving along the central part of the cylinder and diminishes as it approaches the end of its travel at either end of the cylinder until at either extreme of its movement it is nearly or quite momentarily stopped.

While without the spring 26 the device would not be absolutely inoperative, the advantage of the spring is that it holds the shoe firmly against the cam-way at all times. While the bearing face of the shoe substantially fits the bottom of the cam groove while the shoe is running in that part of the groove at or near the ends of the cylinder, only the ends of the shoe contact with the groove at the middle of the cylinder, as the arc described by the groove is there of very long radius, causing the shoe to be moved away from the axis of the cylinder. Without the spring, the tendency would be for only one end of the shoe to engage the cam-way except at the ends of the cylinder, and the shoe would tend to escape from its desired track at the intersections of the groove. Further, without the spring, the shoe would tend at all times to jump up and down in the groove, rendering the engagement uncertain. While it is necessary, for the reasons stated, to allow for some play of the shoe radially with respect to the axis of the cam-cylinder, the spring prevents the tendency to vibrate in and out, while the outward movement of the shoe beyond what is necessary when it is traveling between the end portions of the cylinder is positively limited by the shoulder on the traveler above the shoe.

28 is a shield secured to and extending between the sides of the loom and partially inclosing the cylinder 20 and traveler 22 and protecting the same from dust and dirt.

The bracket 27 has a projection 29 to which is attached an endless belt 30. At each side of the lay are three idler pulleys 31, 32 and 33, the lower pulley 31 and upper pulley 33 turning in fixed bearings on the lay, while the middle pulley 32 is hung in a slide 34 attached to one end of a tension spring 340 whose other end is secured to the lay. This spring tends to pull the pulley 33 inwardly. The belt 30 extends from the bracket 27 on one side of the loom, thence over the under and outer face of the rim of pulley 31, thence over the inner face of the rim of pulley 32, thence over the outer and upper face of the rim of pulley 33, thence along a groove 35 formed in the upper face of the lay beneath the shuttle-race, and thence down over pulleys 33, 32 and 31 to the bracket 27. The central part of the groove 35, or that part underlying the warp-shed, is of substantially greater depth than the end parts of the groove, and the groove slopes upwardly from

its central portion to each end portion. The belt 30 is provided with three projections 36, 37 and 38 extending upwardly from the outer face of the belt and the shuttle 40 has formed in its lower side three recesses 390, 391 and 392 adapted to be engaged respectively by the projections 36, 37 and 38 on the belt 30. Each projection is provided with a flange 360 and is held in its upper position by means of a leaf spring 361 secured at one end to the belt and at the other end to the projection. Extending inwardly from the sides of the central portion of the groove 35 are the cam-guides 350. These cam-guides are located a sufficient distance below the surface of the lay to allow the belt 30 to travel above them; while at their outer ends they are tapered to an edge, their lower walls being inclined substantially parallel to the inclined bottom of the groove.

It has already been explained how the traveler is given a reciprocatory movement back and forth across the loom, and it is evident that a reciprocatory movement is thereby imparted to the belt 30 and its projections 36, 37 and 38. Assuming the shuttle 40 to be at the end of its traverse on the left-hand side of the loom, Fig. 1, the jaws at the left-hand end of the shuttle will have been opened and closed, by mechanism not herein described, and will have grasped a pick of hair presented to it by a selector not shown but well known in the art. At this time the belt will be in such position that the projections 37 and 38 on the belt will be engaged with the recesses 391 and 392 in the shuttle, while the projection 36 is below the shuttle and disengaged therefrom; and the traveler 22 is at the right-hand end of the cam cylinder.

Rotation of the cam cylinder and the consequent travel of the traveler from right to left moves the upper reach of the belt to the right. The belt carries with it the shuttle 40, due to the engagement of projections 37 and 38 with recesses 391 and 392. After a short movement of the belt, projection 38 is carried downwardly into the deeper central portion of the groove 35, thus withdrawing projection 38 from recess 392. The shuttle continues to be moved by reason of the engagement of projection 37 with recess 391 and is pushed into and partly through the warp-shed by means of projection 37. Before the projection 37 reaches the deeper central portion of the groove 35, the projection 36 enters recess 390. When the projection 37 is carried downwardly into the deeper central portion of the groove 35, thus withdrawing it from its recess 391, the shuttle continues to be moved by reason of the engagement of projection 36 with recess 390. Before the projection 36 reaches the deeper central portion of the groove 35 and disengages from the recess 390, the projection

38 passes beyond the deeper central portion of the groove into the shallower end portion of the right-hand side of the groove and the projection 38 then moves into engagement with the recess 392. In the continued movement of the belt, the shuttle is pulled through the warp-shed by means of projection 38 until projection 37 passes beyond the right-hand end of the deeper central part of the groove and again moves into engagement with the recess 391. Shortly afterward, projection 38 is drawn out of recess 392 by the passage of the part of the belt to which it is attached over roller 33 at the right-hand side of the loom. In the continued movement of the belt, the shuttle is moved by means of projection 37 until just before the shuttle reaches the end of its travel, when the projection 36 passes beyond the right-hand end of the deeper central part of the groove and again moves into engagement with the recess 390.

I am aware that it has been proposed to positively pull a shuttle through the warp shed by means of a belt having two projections adapted to engage holes in the shuttle; but this contrivance requires that both projections shall be at times simultaneously in engagement with the shuttle, while the distance between the projections must be greater than the width of the goods being woven. Consequently, the loom must be substantially three times as wide as the goods to be woven thereon. It will therefore be readily understood that with the old arrangement, only very narrow goods can be woven on a loom of normal width; while to weave wide goods would require a loom of prohibitive width. With my arrangement, however, the number of projections are increased and so arranged that less than the whole number of projections are engaged with the shuttle at every point in the travel of the shuttle and one or more projections are disengaged from the shuttle at every point in the travel of the shuttle. Consequently, the loom as a whole may be made much narrower relatively to the width of the goods being woven than in the prior art and wide goods may be woven on a loom that is not of prohibitive width.

It will be understood that the loom may be narrowed still more than is illustrated in the drawings provided the projections on the belt be increased in number, the only requirement being that at any given time the shuttle shall be engaged by at least one projection. During this operation, the traveler 22 has moved to the left-hand end of the cylinder 20. The shuttle, during the traverse of the traveler from the right-hand end of cylinder 20 to the left-hand end thereof, has made a complete throw. The jaws at the left-hand end of the shuttle are now opened, by mechanism not herein described, to re-

lease the pick of hair just inserted, while the jaws at the right-hand end of the shuttle are opened and closed to grasp a pick of hair. The traveler 22 then moves in the opposite direction along the cylinder 20 (from left to right) during which movement the shuttle is propelled from right to left across the shuttle-race, the projections 36, 37 and 38 being successively engaged and disengaged in an order the reverse of that occurring in the first described movement of the shuttle.

Inasmuch as the traveler 22 is slowed down in speed as it approaches the end of its travel, in either direction along the cylinder 20, it is evident that precisely the same differential movement will be imparted to the shuttle. Consequently, the shuttle will slow down and be nearly stationary at the time its forward jaws are opened and closed to grasp a pick of hair selected by the selector. The result is that the jaws seldom miss a hair; whereas in the ordinary positively actuated shuttle, the speed of the shuttle is unchecked as it reaches the end of its travel and reverses, and the jaws are opened and closed so quickly that they frequently fail to grasp the hair presented by the selector.

Mechanism for opening and closing the jaws of the shuttle, hereinbefore referred to, is set forth in an application filed by me November 10th, 1908, Serial No. 461,879, the same being a division of this application. The invention herein described is not, however, dependent upon any particular mechanism for actuating the jaws.

In Fig. 5 I have shown a modification illustrating the shuttle driving mechanism adapted to a loom in which the shuttle is provided with jaws at one end only and in which only one strand of hair is inserted in the warp-shed at each reciprocation of the shuttle. In this modification, the construction of the shuttle driving cylinder and shuttle driving traveler may be the same as hereinbefore described and these parts are therefore similarly lettered. The endless belt 70 is, however, secured not only to the traveler 22 but also to a slide 710, operating in tracks in the overhanging end of the lay, and secured to the end of the shuttle 71. The belt, from its point of connection to the traveler 22, extends successively around pulleys 72, 73 and 74, thence outwardly underneath and parallel to the direction of extension of the shuttle, and thence successively around pulleys 75, 76 and 77 to the traveler 22, being secured to the end of the shuttle between pulleys 74 and 75. All of these pulleys turn in fixed bearings on the lay, except pulley 73, which is mounted on a spring-pressed slide 78.

It will be understood that the rotation of cylinder 20 reciprocates traveler 22 and that

the latter, through the medium of belt 70, reciprocates the shuttle 71.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:—

1. In a loom, the combination with a shuttle, of a cylinder having a peripheral cam-way, means to turn the cylinder, a traveler, a shoe carried thereby engaging the cam-way and movable toward and from the axis of the cylinder, a tension device tending to press said shoe toward said axis, means limiting the movement of said shoe away from said axis, a guide along which said traveler is constrained to travel, and driving connections from the traveler to the shuttle.

2. In a hair-cloth loom, the combination with the shuttle and the shuttle-race, of a belt underrunning the shuttle-race, means to reciprocate said belt, three or more projections on the belt adapted to engage respectively recesses in the shuttle, and means to

engage one or more projections less than the whole number with their corresponding recesses at any given point in the travel of the shuttle.

3. In a hair-cloth loom, the combination with the shuttle having at each end weft-holding means to pull the weft across the loom, of shuttle driving mechanism comprising three or more shuttle engaging devices, and means to successively engage and disengage said devices from the shuttle while maintaining one or more of said devices disengaged at any given point in the shuttle's traverse.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, on this 27th day of May, 1908.

GEORGE S. COX.

Witnesses:

A. M. URIAN,

M. M. HAMILTON.