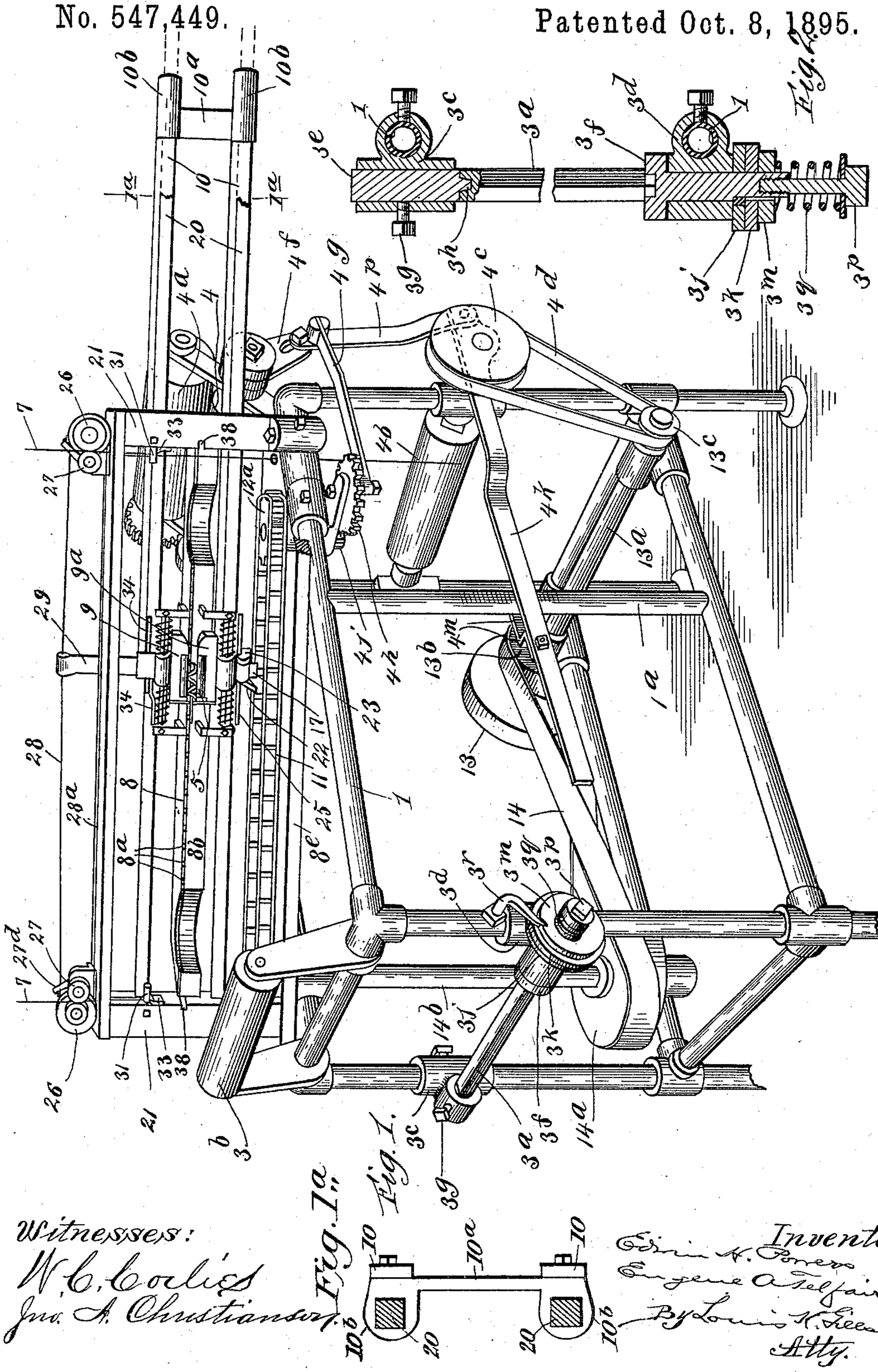
(No Model.) 5 Sheets—Sheet 1.

E. H. POWERS & E. A. TELFAIR.

CANE WEAVING MACHINE.

No. 547,449. Patented Oct. 8, 1895.



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(No Model.) 5 Sheets—Sheet 2.

E. H. POWERS & E. A. TELFAIR.

CANE WEAVING MACHINE.

No. 547,449. Patented Oct. 8, 1895.

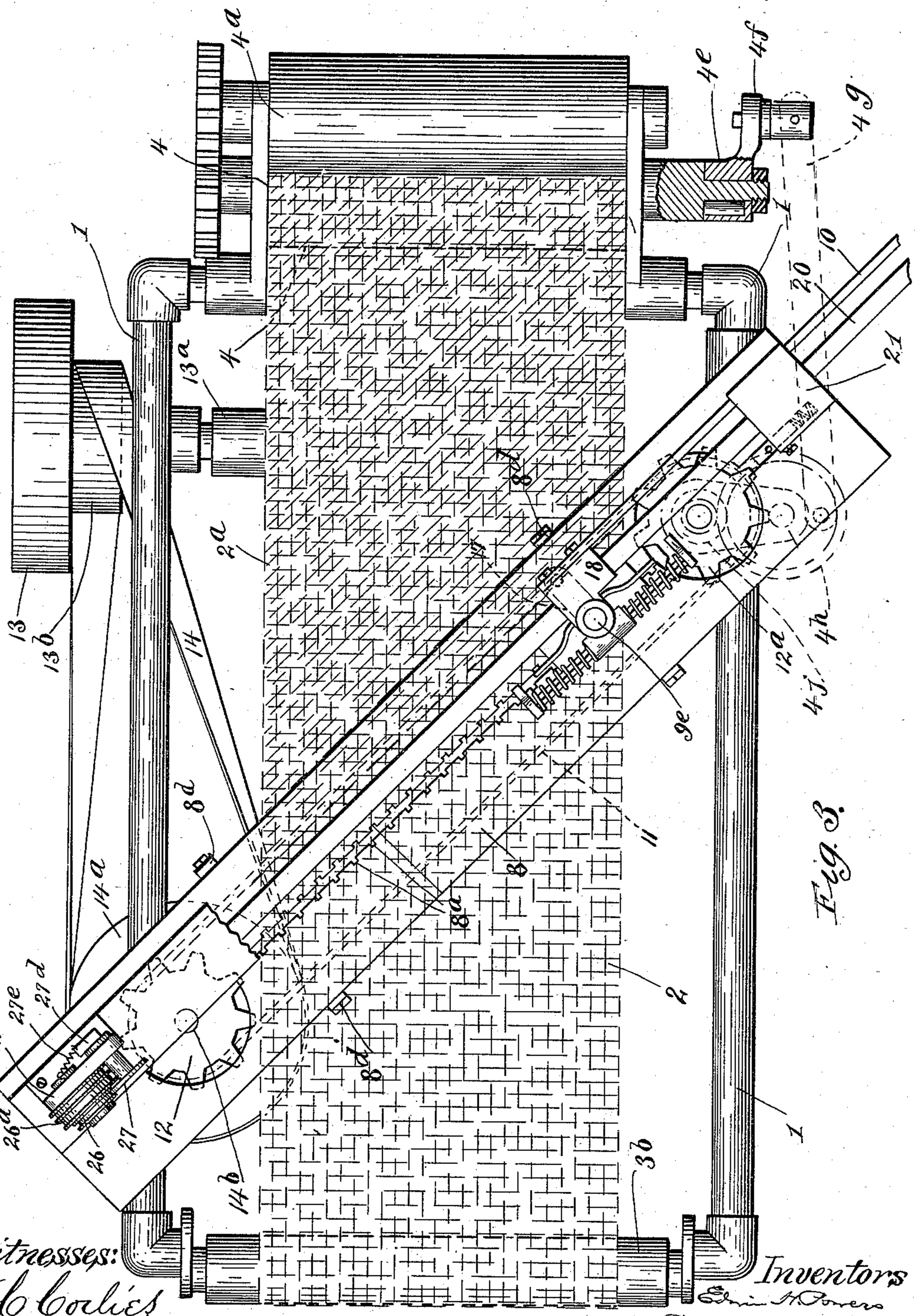

FIG. 3.

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E. H. POWERS & E. A. TELFAIR.

CANE WEAVING MACHINE.

No. 547,449. Patented Oct. 8, 1895.

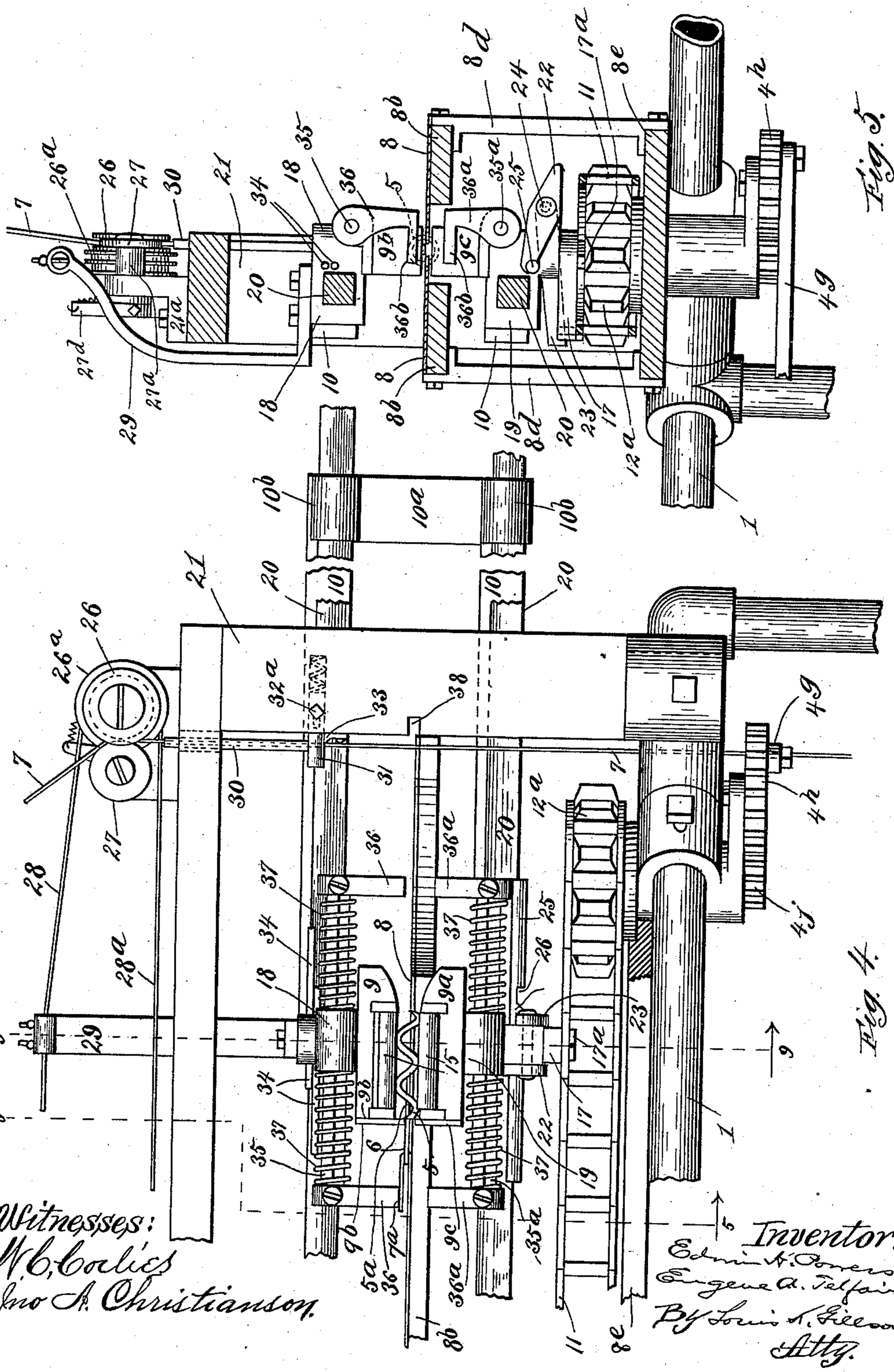

Fig. 3.

Fig. 4.

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CANE WEAVING MACHINE.

No. 547,449. Patented Oct. 8, 1895.

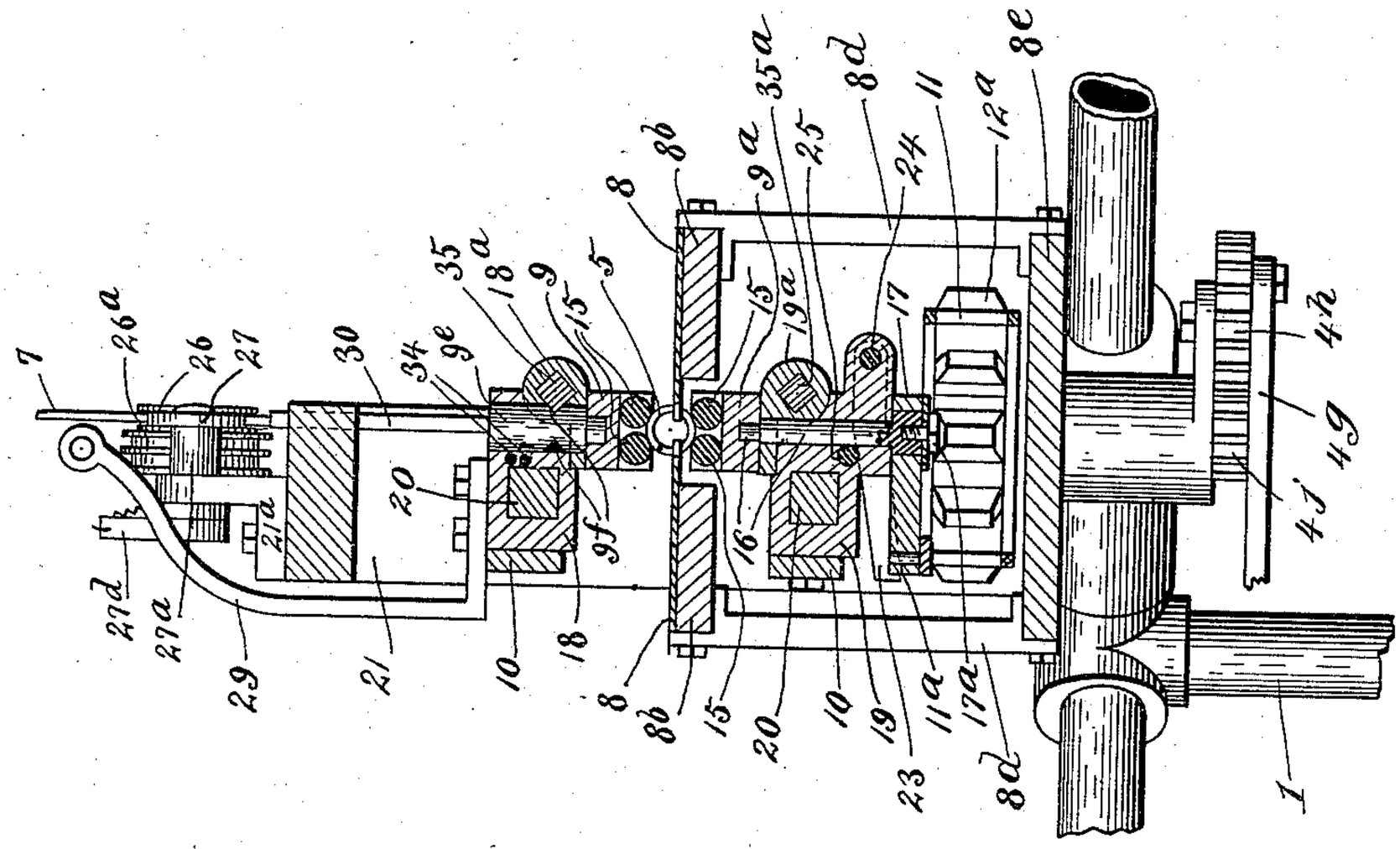

Fig. 9.

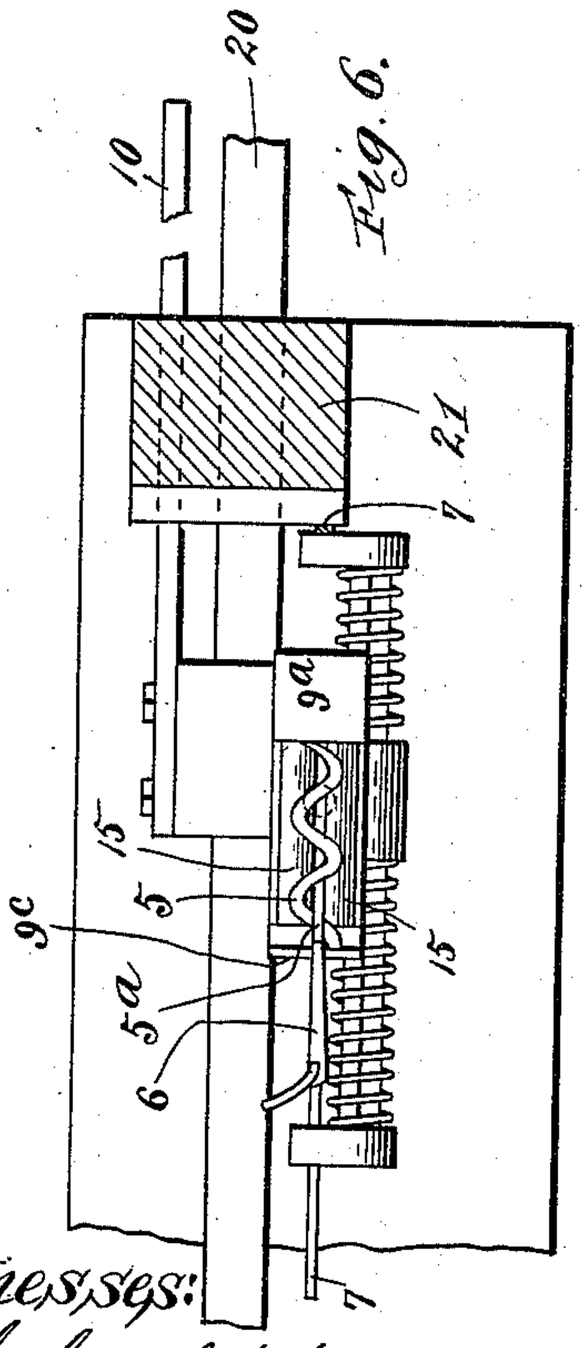

Fig. 6.

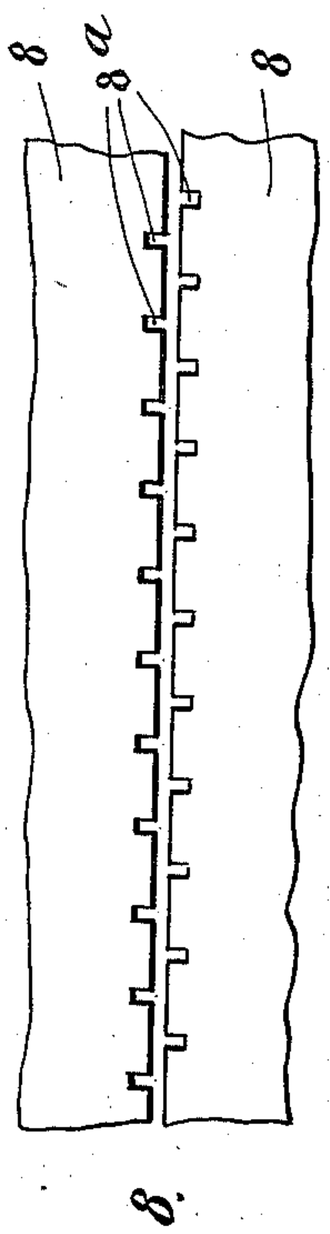

Fig. 8.

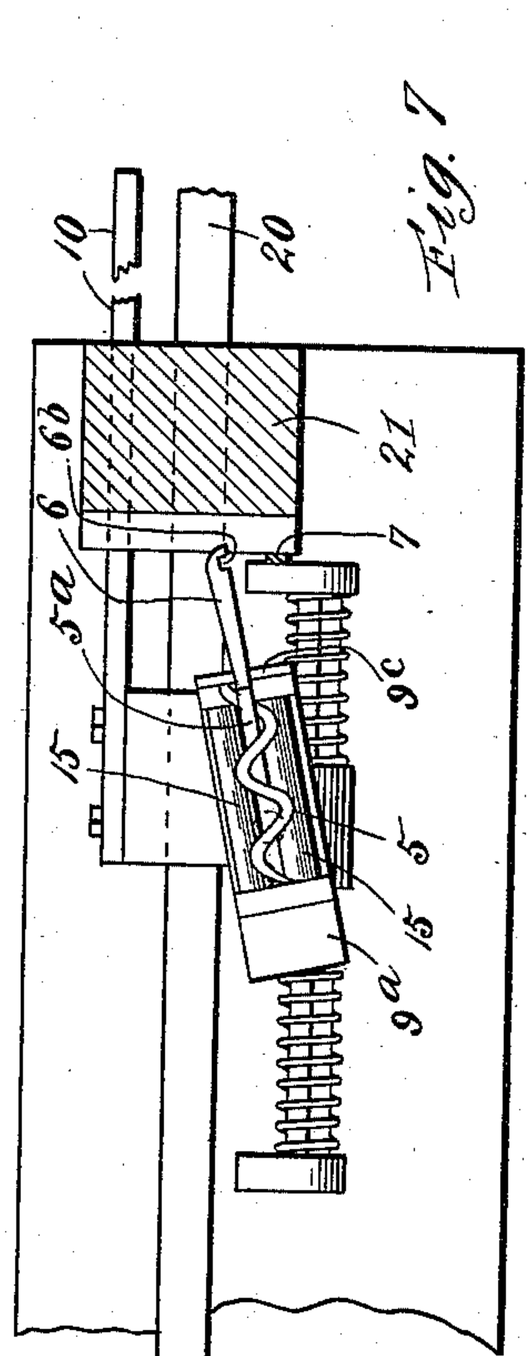

Fig. 7.

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CANE WEAVING MACHINE.

No. 547,449. Patented Oct. 8, 1895.

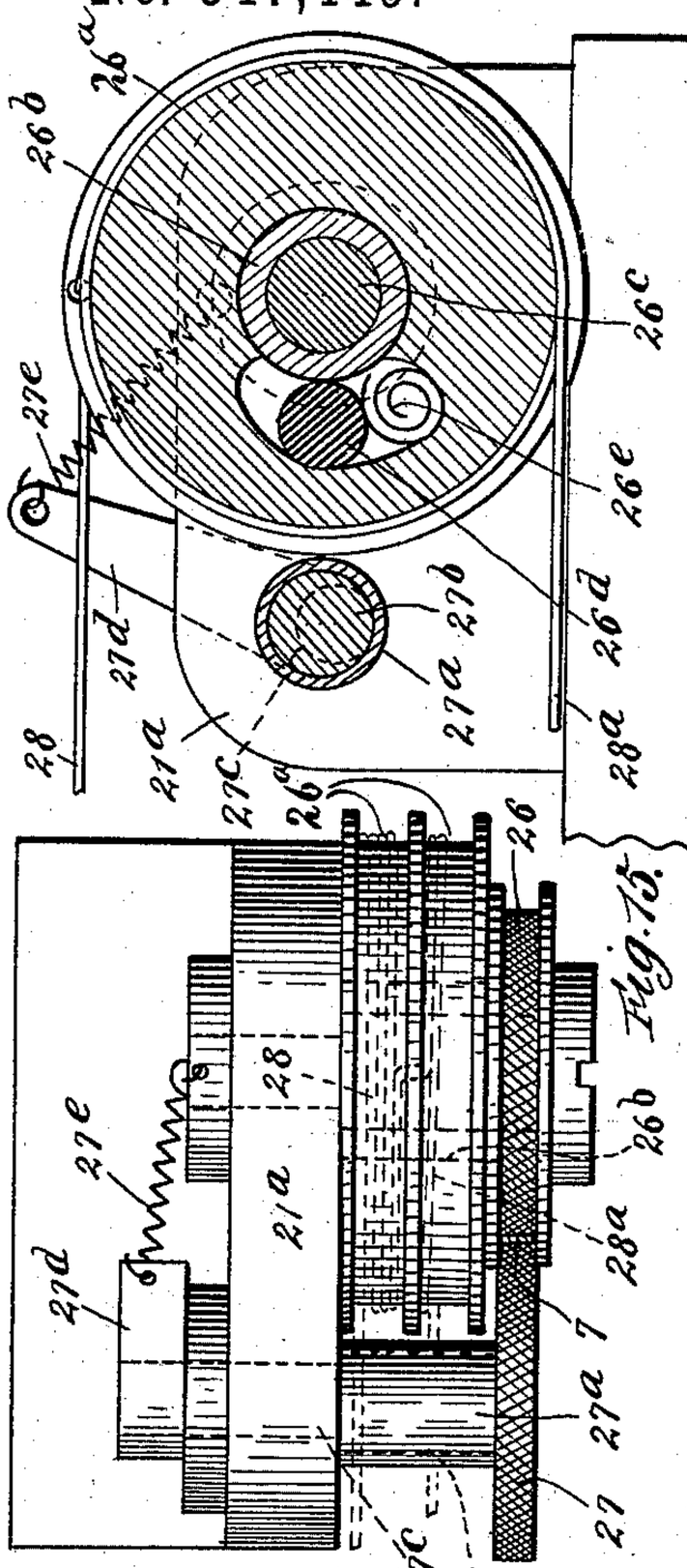

Fig. 15.

Fig. 16.

Fig. 17.

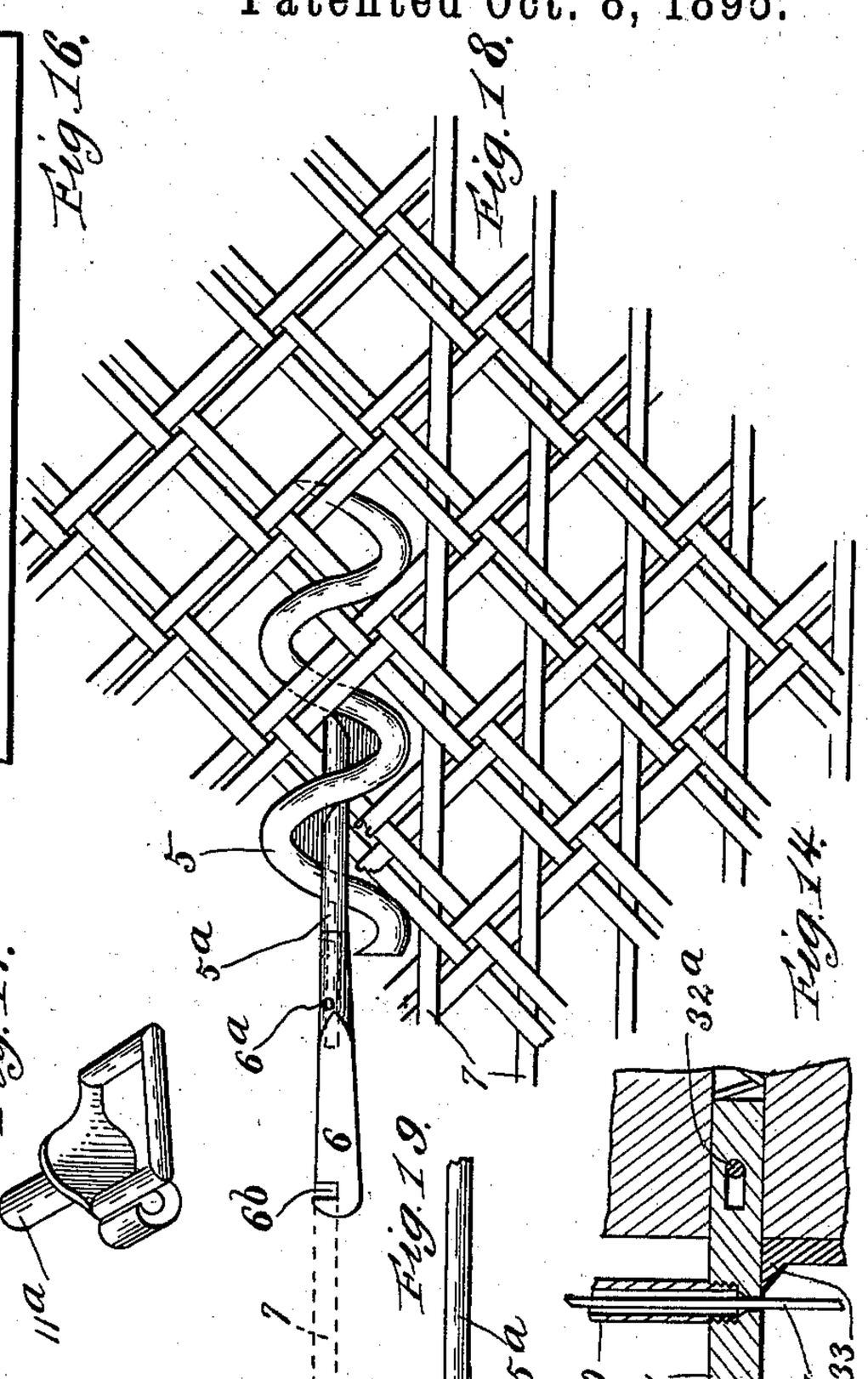

Fig. 18.

Fig. 12.

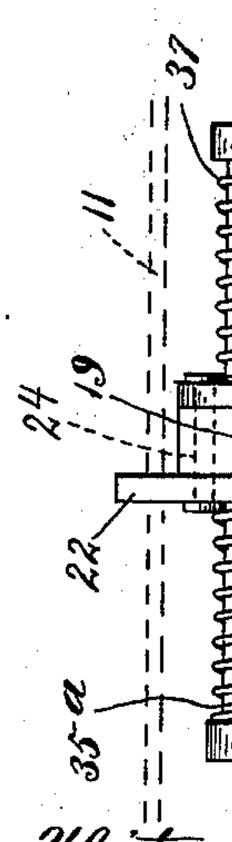

Fig. 10.

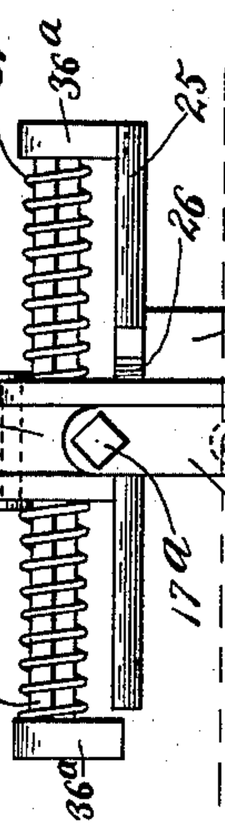

Fig. 11.

Fig. 19.

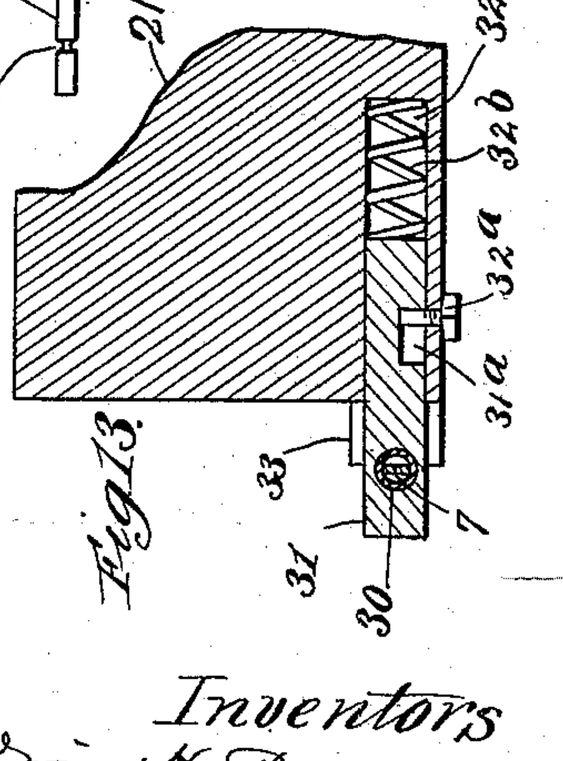

Fig. 13.

Fig. 14.

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UNITED STATES PATENT OFFICE.

EDWIN H. POWERS AND EUGENE A. TELFAIR, OF MICHIGAN CITY, INDIANA.

CANE-WEAVING MACHINE.

SPECIFICATION forming part of Letters Patent No. 547,449, dated October 8, 1895.

Application filed April 3, 1895. Serial No. 544,249. (No model.)

To all whom it may concern:

Be it known that we, EDWIN H. POWERS and EUGENE A. TELFAIR, citizens of the United States, residing at Michigan City, in the county of La Porte and State of Indiana, have invented certain new and useful Improvements in Cane-Weaving Machines; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

Our invention relates to machines for introducing the diagonal strand into the cane fabric used particularly in the manufacture of the seats of chairs, its object being to secure the rapid introduction of such strands in a uniform manner and by means of an automatic machine of simple construction.

The invention consists of a shuttle having a spiral pirn, to which is communicated a positive rotary motion, and which draws the strand into the interstices of the fabric.

It consists, further, of means for measuring off and cutting the strands into suitable lengths and automatically attaching them to the pirn.

It consists, further, in means for reversing the shuttle, so that it operates in both directions.

It consists, further, in various features and details of construction accessory to the several principal features above enumerated.

In the accompanying drawings, Figure 1 is a perspective of the machine. Fig. 1ª is a detail section on the line 1ª 1ª of Fig. 1. Fig. 2 is a detail of the feed-spool-holding device. Fig. 3 is a plan view of the machine with a portion of the strand-feed removed. Fig. 4 is a side elevation of a portion of the head or shuttle-carrying mechanism, partly in section. Fig. 5 is a transverse vertical section on the line 5 5 of Fig. 4. Figs. 6 and 7 are detail plan views of the shuttle in two positions, showing the means for automatically grappling the strand. Fig. 8 is a plan view of a portion of the plates for rotating the pirn. Fig. 9 is a transverse vertical section of the head on the line 9 9 of Fig. 4. Figs. 10 and 11 are details of the mechanism for driving the shuttle, Fig. 10 being a bottom plan view. Fig. 12 is a detail of the mechanism for steadying the shuttle. Fig. 13 and 14 are details of the shears for cutting the strand. Figs. 15 and 16 are details of the strand-feed mechanism. Fig. 17 is a perspective of a link of the sprocket-chain used in driving the shuttle. Fig. 18 is a plan view of a section of the fabric, showing the action of the pirn in operation. Fig. 19 is a detail of the stem of the pirn.

The stand of the machine is a rectangular frame 1, and may be constructed of gas-pipe, as shown. The fabric to be operated upon is shown at 2 as it is being passed through the machine and at 2ª as it leaves the machine, with one set of the diagonal strands introduced. The fabric is fed to the machine from a spool (not shown) mounted upon a rectangular shaft 3ª, carried by blocks 3ᶜ 3ᵈ, secured to two of the end legs of the frame. It is passed upwardly and over a roller 3ᵇ, journaled in a pair of arms extending upwardly from the end of the frame, and then, being carried the length of the frame, passes between a pair of feed-rollers 4 4ª, to which an intermittent motion is communicated, as will be hereinafter described, and is then wound upon a spool 4ᵇ, journaled in blocks secured to the two legs at the opposite end of the table from that at which the feed-spool is located. The shaft 3ª is removably clamped between the blocks 3ᵉ 3ᶠ, the former of which is fixed in a socket in the block 3ᶜ by means of a set-screw 3ᵍ, and has a stud 3ʰ for the engagement of a socket in the end of the shaft 3ª, while the latter is journaled in the block 3ᵈ and has a rectangular socket for the reception of the end of the shaft. The block 3ᶠ is permanently set within its bearing. The shaft 3ª is removed from the frame for changing spools by loosening the set-screw 3ᵍ, when the block 3ᵉ will slide back in its bearing, releasing the haft. The block 3ᶠ has at its inner end a head to prevent it from sliding in its bearing to release the shaft, and upon the opposite end are mounted a fixed collar 3ʲ, a leather washer 3ᵏ, and a loose metal washer 3ᵐ. The outer end of the block 3ᶠ has a screw-threaded

socket, into which is set a screw 3^p, which carries a spiral spring 3^q, which forces the washer 3^m against the washer 3^k. The washer 3^m is notched for the engagement of the catch 3^r, fixed to the post of the frame 1, and is thereby prevented from rotating. The friction between the washer 3^k and 3^m, or between the former and the collar 3^j, prevents the too rapid feeding of the fabric from the spool.

The head of the machine is supported by a frame 21, comprising uprights secured to opposite sides of the frame and a cross-bar uniting their upper ends. This frame 21 is diagonal to the frame 1, and to it are secured horizontal slide-bars, upon which are mounted the shuttle-carriers. The shuttle consists of the upper and lower members 9 9^a, between which the fabric to be operated upon is carried.

The pirn for carrying the diagonal strand into the fabric is carried by the shuttle by being clamped between its two members, is spiral in form, and runs through the fabric, as will be hereinafter described. This pirn is shown at 5 and is made of a round steel rod worked to a spiral form with a pitch to correspond with the mesh of the fabric. Its forward end is pointed that it may more easily find its way through the fabric. It is provided with a central backwardly-projecting stem 5^a, to which is swiveled a tailpiece 6, having a lateral recess 6^b for engaging and holding the strand. The attachment of the tailpiece to the stem is accomplished by providing the latter with a shank 5^b, having an annular groove 5^c and socketing the end of the tailpiece to fit this shank. The tailpiece has a transverse aperture adapted to register with the groove 5^c, and in this is fitted a pin 6^a, which, entering the groove 5^c, holds the tailpiece 6 upon the shank 5^b, but allows it to turn freely. The pirn is given a positive rotary motion by the cam action of a pair of notched plates 8 8, located between the two members of the shuttle, their notches 8^a being of such size and location as to engage the several convolutions of the pirn.

The plates 8 8 are supported by plates 8^b, extending between the uprights of the frame 21, and supported, also, by posts 8^d, standing up from a plate 8^c, secured to the top of the frame 1. The shuttle comprises the two blocks 9 9^a, the one above and the other below the plates 8 8. The faces of these blocks are beveled at their forward ends that they may advance more smoothly and are centrally recessed. Within the recess of each block is journaled a pair of antifriction-rollers 15, which bear against the pirn. Bearing or wear plates 9^b 9^c are secured to the rearward ends of the blocks 9 9^a, closing their central recesses and forming internal bearing-surfaces for such blocks. These plates project beyond the faces of the blocks, their adjacent edges being spaced apart only sufficient to clear the plates 8 8. The pirn is carried forward by the wear-plates 9^b 9^c bearing against its rearward end, which is radially flattened to make a bearing-surface of considerable area, so that as the pirn is turned by running in the notches 8^b its flattened end slides upon the inner faces of the plates 9^b 9^c and does not leave one of them until after it has engaged the other.

The shuttle-blocks 9 9^a are carried by slide-blocks 18 19, to which they are secured by means of trunnions 9^e and 16. Wear-blocks 18^a 19^a are interposed between the blocks 18 and 9 and 19 and 9^a and are preferably of brass.

The blocks 18 19 are apertured to slide upon rectangular bars 20 20, set in the upright members of the frame 21, and are united by means of a U-shaped frame 10, whose arms are of sufficient length so that its bow or transverse portion 10^a always extends beyond the end of the supporting-frame 21. The bars 20 20 are also prolonged beyond this frame, and the frame 10 has at its outer end loops 10^b 10^b, adapted to slide upon these bars.

The shuttle is caused to reciprocate by means of a sprocket-chain 11, carried by horizontal sprocket-wheels 12 12^a, located below the plate 8^b. Motion is communicated to the machine by means of a drive-pulley 13, mounted upon a shaft 13^a, journaled in suitable blocks carried by the lower portion of the frame 1, and which carries, also, a belt-pulley 13^b, from which a belt 14 leads to a pulley 14^a, mounted upon the vertical shaft 14^b, which carries the sprocket-wheel 12.

The sprocket-chain 11 has one of its links (shown in Fig. 17) provided with an upwardly-projecting stud 11^a. A link-bar 17 is mounted upon this stud and projects inwardly between the two turns of the chain and is in rigid connection by means of the set-screw 17^a within the trunnion or arbor 16, rigidly attached to the shuttle-block 9^a, thereby communicating the motion of the chain to the shuttle and reversing the latter as the studded link is turned around the sprocket-wheels. The block 9 is caused to turn with the block 9^a by reason of the engagement of the pirn with the friction-rolls 15 15 of the two blocks.

The notches 8^a of the plates 8 8 terminate at the end of the travel of the shuttle, and the plates 8 8 and 8^b 8^b are recessed, as shown, to admit of the turning of the shuttle. As it turns the tailpiece 6 slides over the surface of the plate 8, and is thus prevented from being accidentally turned.

The shuttle-block 9^a is held in proper position during its movement across the fabric by means of the latches 22 23, pivoted upon the opposite sides of the block 19 by means of a pin 24, upon which both are fixed. The latches 22 23 are adapted to be thrown down alternately below the block 19 in front of the link-bar 17. The latch 22 is in the form of a rock-lever. The latch 23 is in the form of a swinging lever. A slide-bar 25, having on opposite sides cam-notches 26 27, reciprocates through the block 19, bearing against the top of the latch 23 and the lower side of the in-

ner end of the latch 22. As the shuttle reaches the limits of its travel, the end of the bar 25 strikes the vertical members of the frame 21 and is thrust back in its bearing in the block 19, the cam-notches 26 27 shifting the latches 22 23, so as to raise the one which was in advance of the link-bar 17, and thus allow this bar to swing around as the link to which it is attached turns the sprocket-wheel, and to lower the one which was behind the link-bar, so that it will be engaged by it as it starts upon its return across the fabric.

The spool 4^b, upon which the fabric is rolled after being operated upon by the machine, is rotated by means of a belt 4^d, leading from a pulley 13^c upon the shaft 13^a to a pulley 4^c upon the shaft carrying the spool, the pulleys 13^c and 4^c being differentiated in size, so as to secure the necessary slow motion for the spool 4^b. It is necessary, however, that the movement of the fabric through the machine shall be intermittent, as it must be stationary while being operated upon by the shuttle. This intermittent motion is obtained by means of the feed-rollers 4 4^a, between which the fabric is passed after leaving the head of the machine. The roller 4 is driven by means of a friction-clutch 4^e, which is of the same form as is used in connection with the strand-feed, as shown in Fig 16, which will be presently described. This clutch is incorporated into the hub of a crank-arm 4^f, which is oscillated by means of a pitman 4^g, leading from a crank-pin set in a gear-wheel 4^h, journaled in a suitable bracket attached to the frame 1 and driven by a gear-wheel 4^j, mounted upon the shaft of the sprocket-wheel 12^a. The rollers 4 4^a are connected at one end by intermeshing gears, as shown.

The action of the clutch 4^e is so timed by suitably proportioning the gears 4^h 4^j that the feed-rollers are actuated while the stud 11^a, by means of which the shuttle is connected with the sprocket-chain 11, is turning about either one of the wheels 12 12^a, so that the fabric is stationary while the shuttle is operating upon it, and is moved by the feed-rollers while the shuttle is being turned or reversed. The length of each step of the fabric feed is controlled by the point of attachment of the pitman 4^g to the crank-arm 4^f, and as the cane fabric is made with different sizes of mesh it is important that provision be made for varying the feed. This is accomplished by making the connection between the pitman 4^g and the crank-arm 4^f of the pin-and-slot form, as shown, and in order that the feed may be changed from the side of the machine this connection is controlled by a lever 4^k, pivoted upon the shaft of the spool 4^b, its free arm bearing against the vertical post 1^a, forming a part of the frame 1, and is held in engagement therewith by a leaf-spring 4^m, attached to the arm and bearing against the farther side of the post. The post 1^a is transversely notched or serrated for the purpose of increasing the friction and preventing the accidental shifting of the arm 4^k. The short arm of the lever 4^k is connected with the pitman 4^g by means of a link 4^p. It is of advantage that the feed mechanism be under easy control by the operator for the reason that the mesh of the fabric is apt to be irregular, so that the feed needs to be varied a little from time to time.

The material for forming the strand 7 is fed to the machine from any desired source of supply above, which we have not deemed it necessary to show, and is fed to each side of the machine by means of a pair of friction-wheels 26 27, mounted upon and at each end of the frame 21, the strand 7 being carried downwardly between them, the faces of the wheels being knurled to increase the friction.

The wheel 27 is carried by a sleeve 27^a, mounted upon a stud 27^b, having an eccentric stem 27^c, which is journaled in a block 21^a, mounted upon the frame 21. A crank-arm 27^d is fixed to the shaft 27^c and its outer end is connected by means of a spring 27^e with the block 21^a in such manner as to tend to draw the wheel 27 downwardly and toward the wheel 26, thereby adapting the feed mechanism to any irregularities in the material while insuring a grip of the strand however thin it may be. The wheel 26 is carried by a sleeve 26^b, mounted loosely upon a stud 26^c, set in the block 21^a, and a two-channel drum 26^a is mounted upon the sleeve 26^b and is provided with the roller friction-clutch 26^d, adapted to lock the drum and sleeve together for rotation in one direction. At 26^e is shown a spring for holding the roller 26^d in such position in its race that it is instantly engaged when the drum turns against it.

The drums 26^a at opposite sides of the machine are united by cords 28 28^a, each wound oppositely upon the two drums, both with reference to each other and with reference to its own ends. The cord 28 is attached to an arm 29, projecting upwardly from the shuttle-carrier, so that as the shuttle travels it unwinds this cord from one of the drums and, winding the cord 28^a onto the same drum, unwinds it from the drum at the opposite end, thereby winding the cord 28 onto that drum. The clutches 26^d are so disposed that the wheels 26 are rotated so as to draw the strand 7 downwardly and are motionless when the drums 28^a turn in the opposite direction. The strand after passing between the wheels 26 27 enters a guide-tube 30, which leads to a vertical aperture in a reciprocating slide-bar 31. This bar is carried in a socket 32, from which it protrudes and within which it slides in the post of the frame 21 and is held within this socket by means of a bolt 32^a, set in the frame and projecting into a longitudinal recess 31^a in the side of the bar, this recess being of sufficient length to allow of the reciprocation of the bar within the desired limits. A spiral spring 32^b is placed within the socket 32 behind the bar 31 and tends to expel the latter. The aperture of the bar 31 continues

the passage formed by the tube 30, but is contracted approximately to the shape in cross-section of the strand 7. A blade 33 is fixed to the side of the post of the frame 21 immediately below the socket 32, so as to cut off the strand projecting through the aperture of the bar 31 when the latter is forced into the socket. A rod 34 projects in each direction from the shuttle-carrier 18 in the direction of its movement and is adapted for contact with the outer end of the bar 31 as the shuttle-carrier reaches the limit of its travel, thereby forcing the bar within its socket and cutting off the strand 7, which has been fed down. It is necessary that the strand thus cut off be held by some form of clamping device until engaged by the tailpiece of the pirn. The mechanism provided for this purpose comprises rectangular rods 35 35ª, mounted, respectively, to slide in suitable apertures in the wear-blocks 18ª 19ª, parallel with the line of travel of the shuttle. These bars 35 35ª are provided at each end with rigidly attached and laterally-projecting arms 36 36ª, the arms projecting in each instance toward the plates 8 8. A spiral spring 37 is mounted upon each end of each of the bars, being interposed between its lateral arm and the block by which it is carried and being normally under slight tension. At the outer end of each of the arms 36 36ª there is a horizontal offset 36ᵇ, in each instance projecting across the slot between the plates 8 8, within which the pirn 5 travels. The length of the bars 35 35ª is such that their lateral arms 36 36ª come into contact with the vertical portion of the frame 21 before the rod 34 actuates the shears, and they are thereby forced backwardly through their bearings, the springs on the forward ends of these bars being compressed. This action securely clamps the strand 7 between the offsets 36ᵇ of the arms 36 36ª and the frame 21, preventing it from falling when cut off by the shears. A recess 38 is formed in the inner face of the upright portion of the frame 21 to receive the tailpiece 6 of the pirn 5 when the shuttle is reversed for its return movement. The recess 6ᵇ in the tailpiece 6 of the pirn is on the forward side as the shuttle turns and automatically engages the strand 7 as the shuttle is brought into its proper position. As the shuttle starts upon its next trip across the fabric the expanding springs 37 hold the arms 36 36ª firmly against the frame 21, and in the meantime the tailpiece of the pirn has traveled with the shuttle and doubled the strand as it has been drawn between the offsets 36ᵇ, so as to secure a firm grip upon it. The springs 37 having resumed their normal tension, the arms 36 36ª leave the frame 21 and the strand 7 is free to be drawn into the fabric by the shuttle. As indicated in Fig. 4, the folded end 7ª of the strand 7 is held by the offset of the arm 36, thereby preventing the disengagement of the strand from the pirn. The length of the strand-section as cut off by the shears is regulated by the size of the drums 26ª.

The aperture in the block 18ª, within which the bar 35 is carried, opens to and slightly encroaches upon the socket serving as the bearing for the trunnion 9ᵉ. This trunnion has its surface cut by two transverse V-shaped recesses diametrically opposite each other and parallel with the longitudinal line of the block 9 and adapted to receive an angle of the bar 35. The bar 35 engages with the recess in the trunnion 9ᵉ, serving as a dog to hold the block 9 steady as it advances. The angle of the bar 35, which enters the recess of the trunnion 9ᵉ, is provided with two recesses 9ᶜ 9ᵈ, located upon opposite sides of the trunnion and at such distances therefrom that the movement of the bar 35 within its hub by means of its contact with the frame 21 causes one of these recesses 9ᶜ 9ᵈ to register with the trunnion-socket, thereby permitting the block 9 to be turned.

We are aware that a spiral needle and spiral path-finder or a so-called "shed-former" for a straight needle have been used for introducing the diagonal strand into cane fabric, such implement or combination of implements being operated by a thrust and being necessarily of a length equaling the diagonal width of the fabric. Such construction necessitates the withdrawal of the needle after the fabric has been crossed or it is necessary to draw this long needle through the fabric after the tip of the spiral finder has reached the opposite side.

In using the term "pirn" we intend to distinguish from this long implement and mean thereby a short piece which travels entirely across the fabric, drawing the strand with it, so that when the pirn has once crossed the fabric the operation is complete, the pirn, as herein described, differing from the pirn of a shuttle used in the weaving of textiles only in that it does not carry a supply of the material to be paid out as it advances, but draws the strand after it through the mesh.

We believe we are the first to introduce the diagonal strand into cane fabric by the use of a spiral pirn having a central swiveled tailpiece or strand-holder for the attachment of the strand and rotated by mechanical means and that we are entitled to protection in the manufacture, use, and sale of such a device by whatever mechanism the pirn is rotated.

We claim as our invention—

1. In a cane weaving machine, the combination of a spiral pirn for carrying the strand, with a shuttle for carrying the pirn and means for reciprocating the shuttle across the fabric.

2. In a cane weaving machine, the combination of a spiral pirn having a central swiveled tail piece for the attachment of the strand, with a shuttle for carrying the pirn and means for reciprocating the shuttle across the fabric.

3. In a cane weaving machine, the combination of a spiral pirn having a central swiveled tail piece for the attachment of the strand, with mechanical means for rotating the pirn.

4. In a cane weaving machine, the combi-

nation of a spiral pirn having a central swiveled tail piece for the attachment of the strand, with mechanism moving over the face of the fabric for reciprocating the pirn across the fabric.

5. In a cane weaving machine, the combination of a spiral pirn for carrying the strand, with mechanism moving over the face of the fabric for reciprocating the pirn across the fabric.

6. In a machine for weaving in the diagonal strands into cane fabric, the combination with a spiral pirn adapted to enter the fabric at one margin and to leave it at the other, of a strand carrier attached to the pirn by a swiveled joint, and mechanism moving over the face of the fabric for advancing the pirn and operating thereon intermediate of the margins of the fabric.

7. In a machine for weaving in the diagonal strands into cane fabric, the combination with a spiral pirn whose length is less than the width of the fabric and which is adapted to enter the fabric at one margin and leave it at the other, of a strand carrier attached to the pirn by a swiveled joint, and mechanism moving over the face of the fabric for advancing the pirn and in lateral engagement therewith.

8. In a cane weaving machine, the combination of a spiral pirn for carrying the strand, of a shuttle for carrying the pirn, and means for reciprocating the shuttle across the fabric and means for reversing the pirn at each end of its travel.

9. In a cane weaving machine, the combination with a spiral pirn, and a shuttle for carrying the pirn, of an endless sprocket chain, wheels for carrying the chain and located at the ends of the path of the shuttle, connection between the chain and the shuttle whereby the shuttle is caused to reciprocate by the movement of the chain.

10. In a cane weaving machine the combination with a spiral pirn having a swiveled tail piece and a shuttle comprising an upper and lower member constructed to move together for carrying the pirn, and a pair of plates interposed between the members of the shuttle and having their adjacent edges spaced apart to form a slot for the pirn and notched for the engagement of its several convolutions.

11. In a cane weaving machine the combination with a spiral pirn, of a shuttle for reciprocating the pirn, and notched plates for engaging the convolutions of the pirn, whereby it is caused to rotate as it advances.

12. In a cane weaving machine, the combination with a spiral pirn having its rearward end flattened radially, of a shuttle for carrying the pirn comprising an upper and lower member having their adjacent faces recessed to receive the pirn, and having internal bearing surfaces for pressure against its flattened end.

13. In a cane weaving machine the combination with a spiral pirn having its rearward end flattened radially, and with a shuttle recessed to receive the pirn and having wear plates for bearing against the flattened end to carry it forward, of notched plates constructed and arranged to engage the convolutions of the pirn, whereby a rotary motion is communicated to the pirn as it advances.

14. In a cane weaving machine the combination with a spiral pirn, of a reversible shuttle comprising an upper and lower member having their adjacent faces recessed to receive the pirn, and a pair of anti-friction rollers set longitudinally within the recess of each member for engaging the pirn.

15. In a cane weaving machine, the combination with a spiral pirn adapted to pass through the fabric, of a shuttle composed of two members adapted to travel on opposite sides of the fabric and to embrace and carry the pirn between them, and means for reciprocating the shuttle across the fabric.

16. In a cane weaving machine, the combination with a spiral pirn for carrying the strand and adapted to pass through the fabric, means for reciprocating the pirn across the fabric, and means for reversing the pirn at each end of its path, of feed mechanism for intermittently conveying the fabric and timed to advance the fabric one step as the pirn is being reversed, substantially as described and for the purpose set forth.

17. In a cane weaving machine, the combination with a shuttle, a spiral pirn for carrying the strand and being itself carried by the shuttle, and means for reciprocating the shuttle across the fabric, of mechanism for intermittently feeding the fabric, the action of the feed mechanism alternating with the movements of the shuttle across the fabric, substantially as described and for the purpose set forth.

18. In a cane weaving machine, the combination with a spiral pirn for carrying the strand and means for advancing the pirn, of a plate having a series of apertures spaced apart to correspond with the pitch of the pirn and adapted for engagement therewith, whereby the pirn is caused to rotate as it advances, substantially as described and for the purpose set forth.

19. In a cane weaving machine the combination with a spiral pirn, and with a shuttle comprising the two members, having their adjacent faces recessed and being adapted to rotate in parallel planes, of mechanism for turning one member of the shuttle, a pair of longitudinal anti-friction rollers within the recess of each member, and adapted to impinge upon the pirn whereby the rotation of one member of the shuttle causes the other member thereof to turn with it.

20. In a cane weaving machine the combination with a spiral pirn, a reversible shuttle comprising two members, adapted to clamp

the pirn between them, a sliding block for carrying each member of the shuttle, a trunnion for each member of the shuttle, such trunnions being journaled in the carrying block so that the two members of the shuttle may rotate together, of an endless sprocket chain, wheels for carrying the chain and located at the ends of the path of the shuttle, a link bar attached to the chain and extending inwardly between its two turns, and being rigidly attached to the trunnion of one member of the shuttle, latches secured to one of the sliding blocks and arranged to fall in front of the link bar as it advances in either direction, and means for shifting such latches to admit of the turning of the link bar as its link turns either of the wheels, substantially as described and for the purpose set forth.

21. In a cane weaving machine the combination with a spiral pirn, a reversible shuttle comprising two members, adapted to clamp the pirn between them, a sliding block for carrying each member of the shuttle, a trunnion for each member of the shuttle, such trunnions being journaled in the carrying blocks so that the two members of the shuttle may rotate together, of an endless sprocket chain, wheels for carrying the chain and located at the ends of the path of the shuttle, a link bar attached to the chain and extending inwardly between its two turns, and being rigidly attached to the trunnion of one member of the shuttle, and means for locking the link bar to one of the sliding blocks as it advances in either direction and releasing it from its attachment thereto as it turns either of the wheels, whereby the shuttle may be turned as its movement is reversed and held steady as it advances in either direction, substantially as described and for the purpose set forth.

22. In a cane weaving machine, the combination with the frame of the machine, a spiral pirn, a reversible shuttle comprising two members adapted to clamp the pirn between them, a sliding block for carrying each member of the shuttle, a trunnion for each member of the shuttle, such trunnions being journaled in the carrying blocks so that the two members of the shuttle may rotate together; of an endless sprocket chain, wheels for carrying the chain and located at the ends of the path of the shuttle, a link bar attached to the chain and extending inwardly between its two turns and being rigidly attached to the trunnion of one member of the shuttle, latches for locking the link bar to one of the sliding blocks, a rod sliding through the same block in line with the direction of travel of the shuttle and having inclined or cam faces for contact with the latches, a stop or striker for contact by the sliding rod as the shuttle approaches the limit of its travel, whereby the rod is moved in its bearings and the latches are shifted to disengage the link bar from the sliding block to permit the link bar to turn about the wheel and re-engage the sliding block, substantially as described and for the purpose set forth.

23. In a cane weaving machine, the combination with a reciprocating shuttle, of slide blocks upon opposite sides of the shuttle, trunnions fixed to the shuttle and pivotally engaging the slide blocks, a dog for locking the shuttle against angular movement, and trips for contact with the dog as the shuttle approaches the limits of its travel, whereby the dog is released to admit of the turning of the shuttle on its trunnions, substantially as described and for the purpose set forth.

24. In a cane weaving machine the combination with a reciprocating shuttle having arbors upon which it may be turned, of sliding blocks forming the bearings for such arbors, a slide rod carried by one of the blocks and engaging an aperture in the arbor of the shuttle, such rod having lateral recesses adapted, when registered with the arbor socket to complete its circle to permit the arbor to turn, springs mounted upon the slide rod and reacting against the block and adapted to so hold the rod that its apertures are a predetermined distance from the arbor, such rod being adapted to strike fixed parts of the machine as the shuttle approaches the ends of its path, and to be moved in its bearing to cause one of its apertures to register with the arbor socket, whereby the shuttle is locked against angular movement as it reciprocates and may be free to turn at the end of its path, substantially as described and for the purpose set forth.

25. In a cane weaving machine the combination with a spiral pirn and with a shuttle for carrying the pirn, and comprising two members adapted to travel upon opposite sides of the fabric, of slide blocks for carrying the two members of the shuttle, slide bars for carrying the slide blocks, and a rigid U-shaped frame for uniting the two members of the shuttle, substantially as described and for the purpose set forth.

26. In a cane weaving machine the combination with a spiral pirn and with a shuttle for carrying the pirn and comprising two members adapted to travel upon opposite sides of the fabric, of slide blocks for carrying the two members of the shuttle, slide bars for carrying the slide blocks, a rigid U-shaped frame for uniting the two members of the shuttle, and a sprocket chain for driving the shuttle and in attachment with one of its members, substantially as described and for the purpose set forth.

27. In a cane weaving machine the combination with a reciprocating shuttle for carrying the strand and means for reciprocating the shuttle across the fabric, of a strand feed and strand cutter adapted to measure and cut off a strand of suitable length before it is drawn into the fabric, and mechanism for holding the

strand until engaged by the shuttle, substantially as described and for the purpose set forth.

28. In a cane weaving machine, the combination with a reciprocating shuttle for drawing the strand through the fabric and means for reciprocating the shuttle across the fabric, of feed wheels for carrying the strand to the machine, shears for cutting off the length of strand required, and clamps for holding the strand length until grappled by the shuttle, substantially as described and for the purpose set forth.

29. In a cane weaving machine the combination with a reciprocating shuttle, for drawing the strand through the fabric, and means for reciprocating the shuttle across the fabric, of slide blocks for carrying the shuttle, a frame 21, for supporting the shuttle carrying blocks, strand cutting shears carried by the frame and adapted to be actuated by the contact of the shuttle carrier, a friction feed for carrying the strand to the shears and means for intermittently operating the strand feed, substantially as described and for the purpose set forth.

30. In a cane weaving machine the combination with a reciprocating shuttle for drawing the strand into the fabric in each direction of its movement, a shuttle carrier, a frame for supporting the shuttle carrier, friction feed rollers mounted upon the frame at each end of the travel of the shuttle, drums mounted upon the feed rollers clutch mechanism connecting the drums with the feed rollers whereby the feed rollers are turned in one direction only, cords or cables connecting the drums at opposite ends of the frame and wound oppositely thereon, connection between the cords or cables and the shuttle carrier whereby the movement of the carrier rotates the drums and actuates the feed at one end of the frame, substantially as described and for the purpose set forth.

31. In a cane weaving machine, the combination with a reciprocating shuttle adapted to draw a strand into the fabric in each direction of its movement, a shuttle carrier, a frame for supporting the shuttle carrier, friction feed rollers mounted upon the frame at each end of the path of the shuttle adapted to deliver the strand pendent adjacent to the inner side of the uprights of the supporting frame, drums mounted with the feed rollers clutch mechanism connecting the drums and the rollers whereby the feed rollers are turned in one direction only, cords or cables connecting the drums at opposite ends of the frame and wound oppositely thereon, connection between the cords or cables and the shuttle carrier whereby the movement of the carrier rotates the drums and actuates the feed at one end of the frame, spring clamps carried by the shuttle carrier for clamping the strand against the frame, and shears actuated by the shuttle carrier for cutting off the strand, substantially as described and for the purpose set forth.

32. In a machine for weaving the diagonal strands into cane fabric, the combination with the frame 1, the frame 21, mounted diagonally above the frame 1, the rods 20, the slide blocks 18, 19, mounted upon such rods, the U-shaped frame 10, uniting the blocks 18, 19, the shuttle blocks 9, 9^a, pivotally carried by blocks 18, 19, a spiral pirn carried between the blocks 9, 9^a, and having a hooked or notched swiveled tail piece, notched plates 8, 8, having their notches in engagement with the convolutions of the pirn, the endless sprocket chain 11, for driving the shuttle, a crank arm rigidly connected with the shuttle and whereby the shuttle is turned at the ends of its path, the feed rollers 26, 27, located and actuated as described, the spring clamps carried by the blocks 18, 19, for holding the strand until engaged by the tail piece of the pirn, as the shuttle turns, and shears operated by the pressure of the shuttle carrier for cutting off the strand, substantially as described and for the purpose set forth.

33. In a machine for weaving the diagonal strands into cane fabric, the combination with the frame 1, the frame 21, mounted diagonally above the frame 1, the rods 20, the slide blocks 18, 19, mounted upon such rods, the U-shaped frame 10, uniting the blocks 18, 19, the shuttle blocks 9, 9^a, carried by blocks 18, 19, and adapted to turn therein, a spiral pirn carried between the blocks 9, 9^a, and having a hooked or notched swiveled tail piece, notched plates 8, 8, having their notches in engagement with the convolutions of the pirn, the endless sprocket chain 11, for driving the shuttle and rigidly connected therewith whereby the shuttle is turned at the ends of its path, the feed rollers 26, 27, located and actuated as described, the spring clamps carried by the blocks 18, 19, for holding the strand until engaged by the tail piece of the pirn, as the shuttle turns, and shears operated by the pressure of the shuttle carrier for cutting off the strand, feed rollers 4, 4^a, for drawing the fabric over the plates 8, 8, and clutch mechanism for actuating the rollers 4, 4^a, intermittently substantially as described and for the purpose set forth.

34. In a cane weaving machine the combination with a reciprocating shuttle and a spiral pirn carried thereby, of feed rollers 4, 4^a, clutch mechanism for intermittently actuating the feed rollers, a crank arm 4^f, for actuating the clutch, a pitman 4^g, attached to the crank arm and longitudinally adjustable thereon, a crank wheel 4^h, for causing the pitman to reciprocate, a hand lever 4^k, for shifting the pitman upon the crank arm and means for securing the lever in its adjusted position, substantially as described and for the purpose set forth.

35. In a cane weaving machine the combi-

nation with a reciprocating shuttle adapted to be turned at each end of its path, a spiral pirn carried by the shuttle and having a swiveled tail piece laterally notched for holding the cane strand, feed mechanism for bringing the strand into position to be engaged by the notch of the tail piece as the shuttle turns and spring clamps for holding the strand while being so engaged and until a firm attachment is made as the shuttle starts on its movement across the fabric, substantially as described and for the purpose set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

EDWIN H. POWERS.
EUGENE A. TELFAIR.

Witnesses:
FRANK TALIFARO,
PETER MUTCH.