No. 652,998. Patented July 3, 1900.

F. H. DANIELS & C. S. MARSHALL.

WIRE BALE TIE MACHINE.

(Application filed Feb. 19, 1900.)

(No Model.) 8 Sheets—Sheet 1.

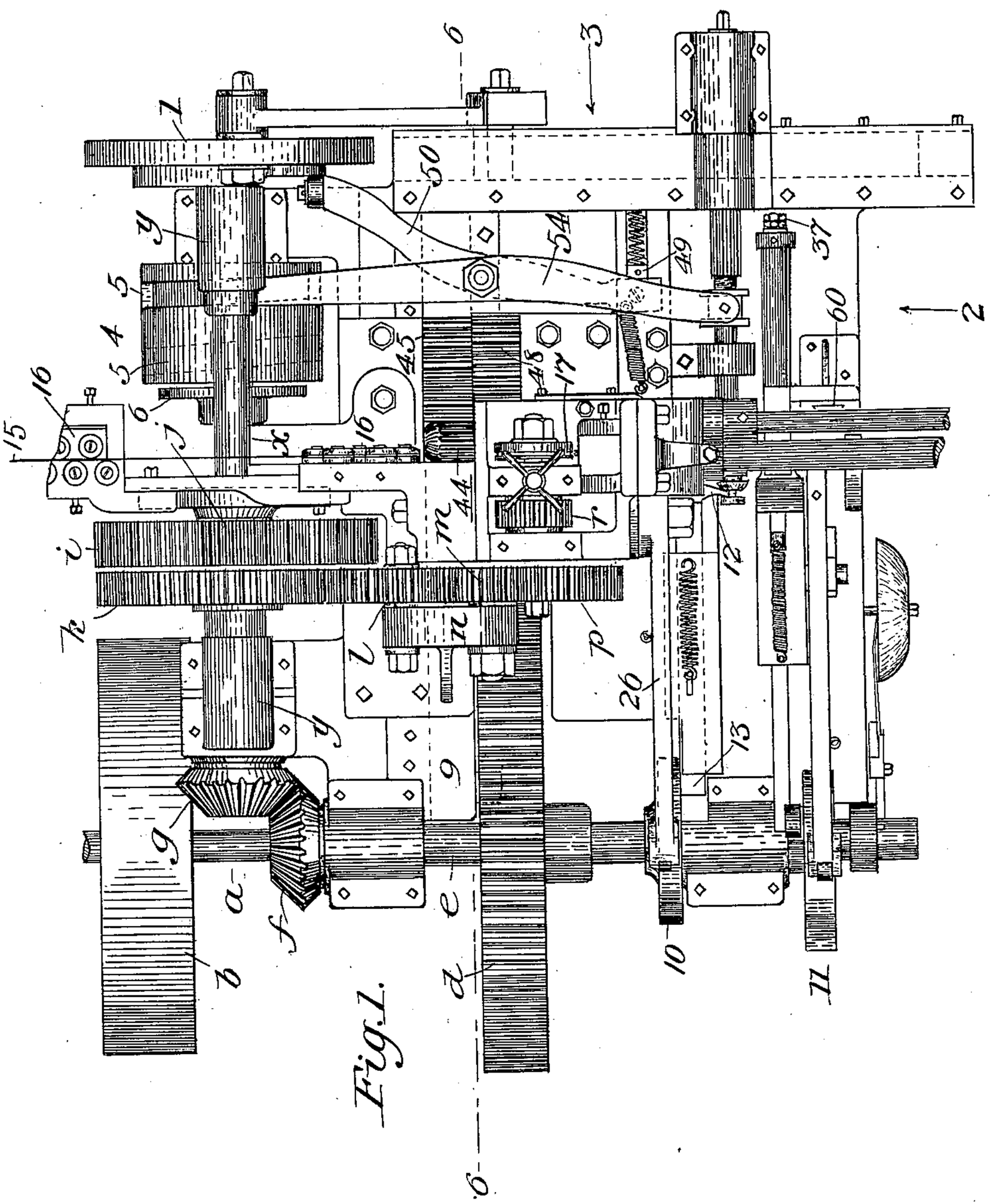

Fig. 1.

Witnesses:
A. E. Grant
D. W. Edelin

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(No Model.) 8 Sheets—Sheet 2.

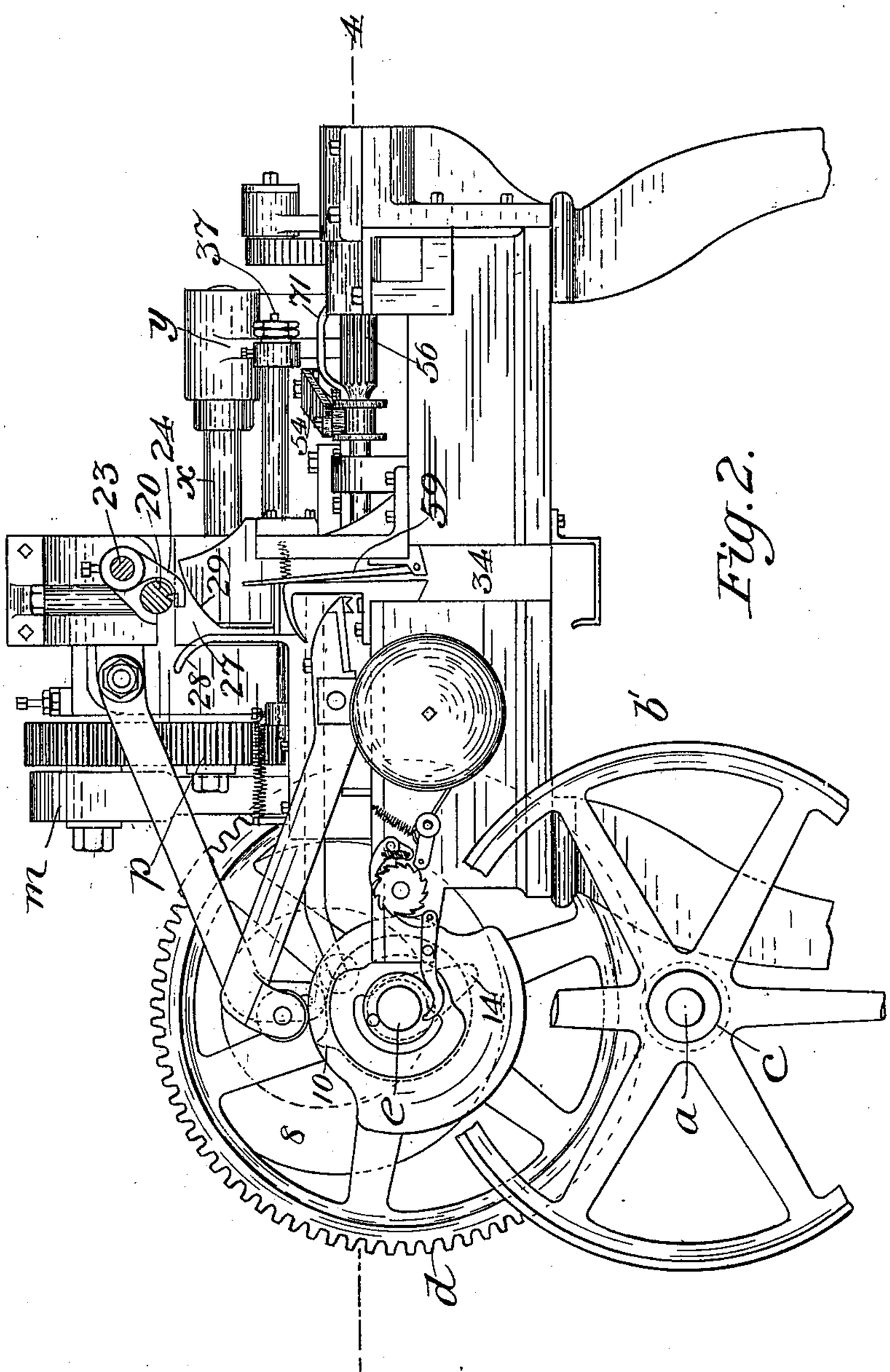

Fig. 2.

Witnesses:
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(No Model.)

8 Sheets—Sheet 3.

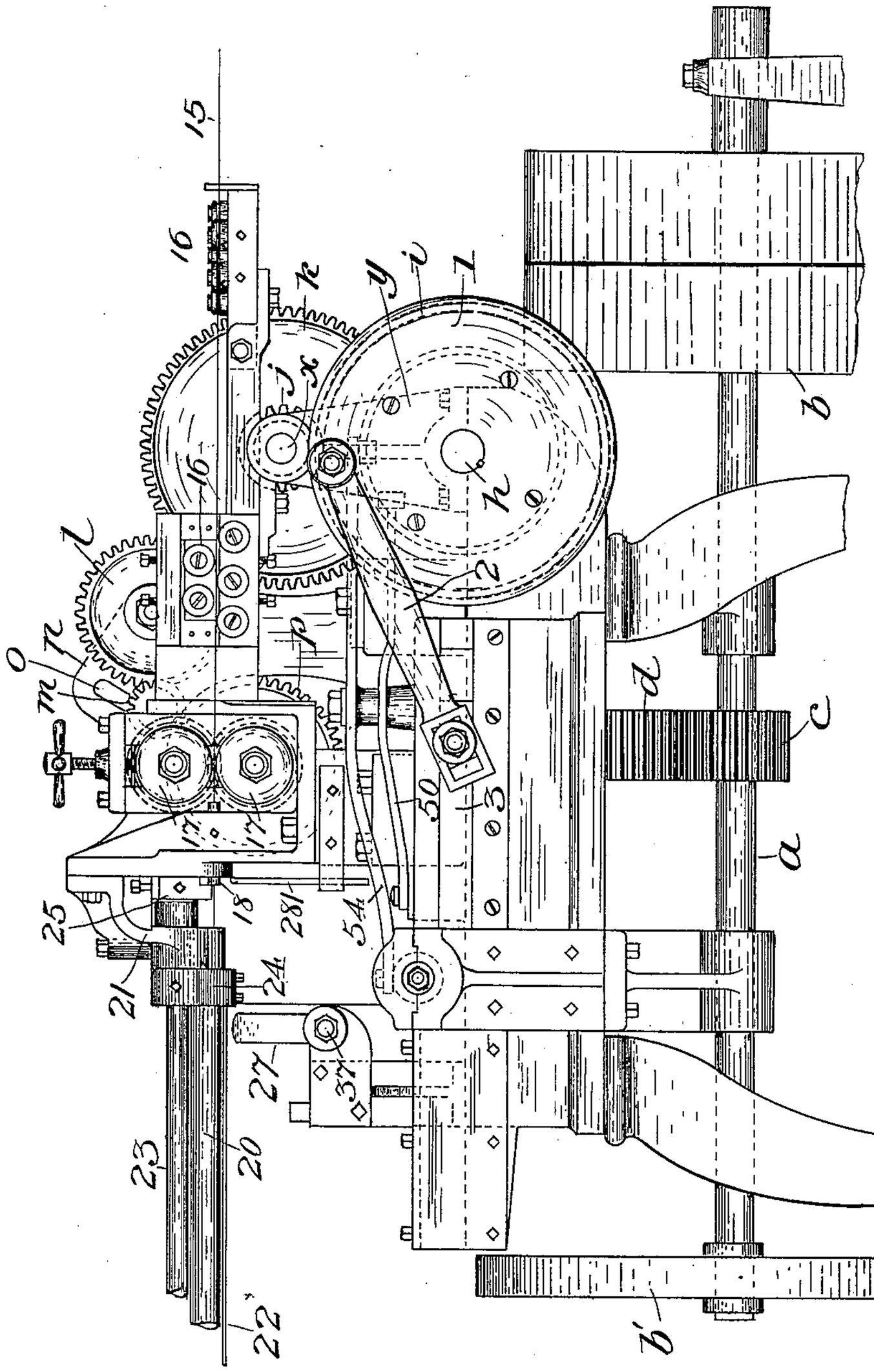

Fig. 3.

Witnesses:
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No. 652,998. Patented July 3, 1900.

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WIRE BALE TIE MACHINE.

(Application filed Feb. 19, 1900.)

(No Model.) 8 Sheets—Sheet 4

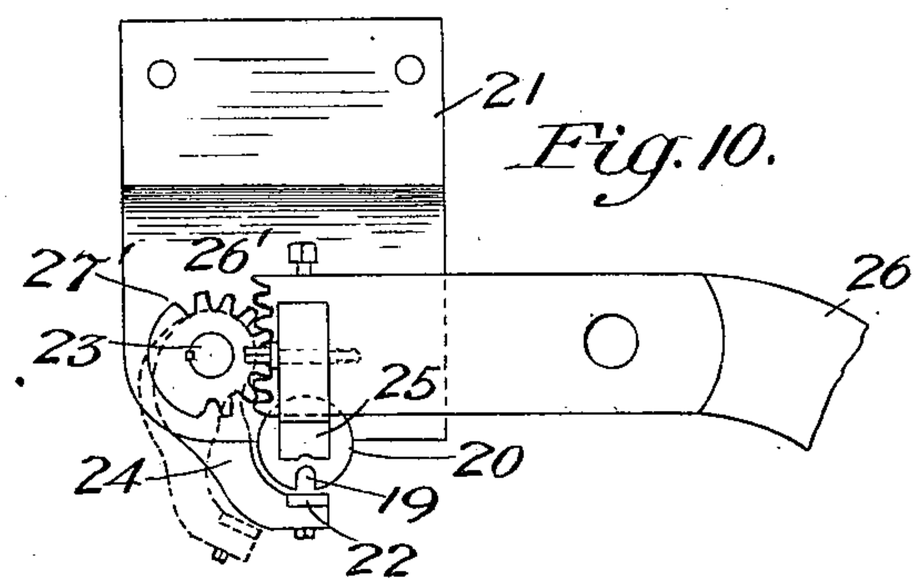

Fig. 10.

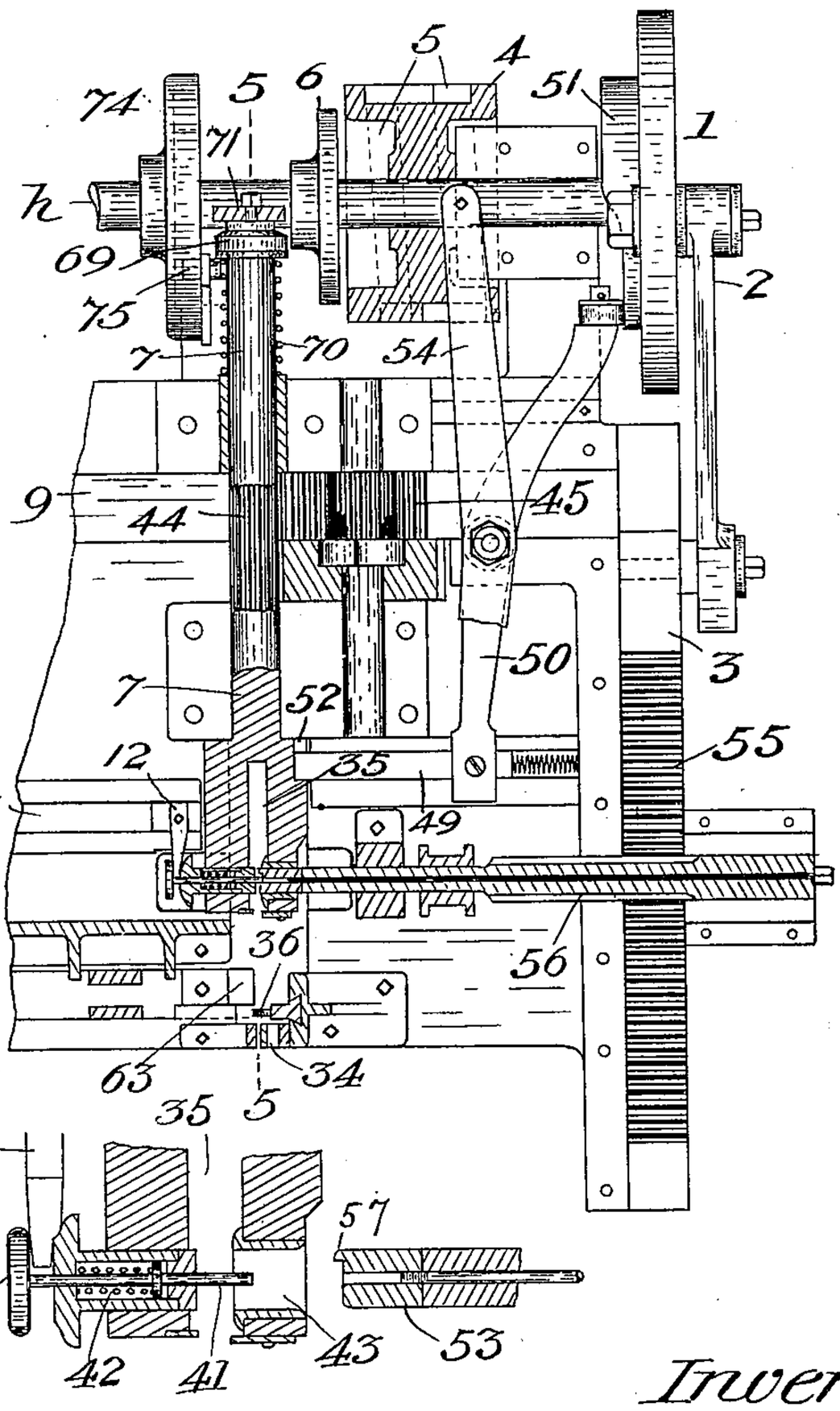

Fig. 4.

Fig. 4a.

Witnesses:
A. E. Grant
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WIRE BALE TIE MACHINE.

(Application filed Feb. 19, 1900.)

(No Model.) 8 Sheets—Sheet 5.

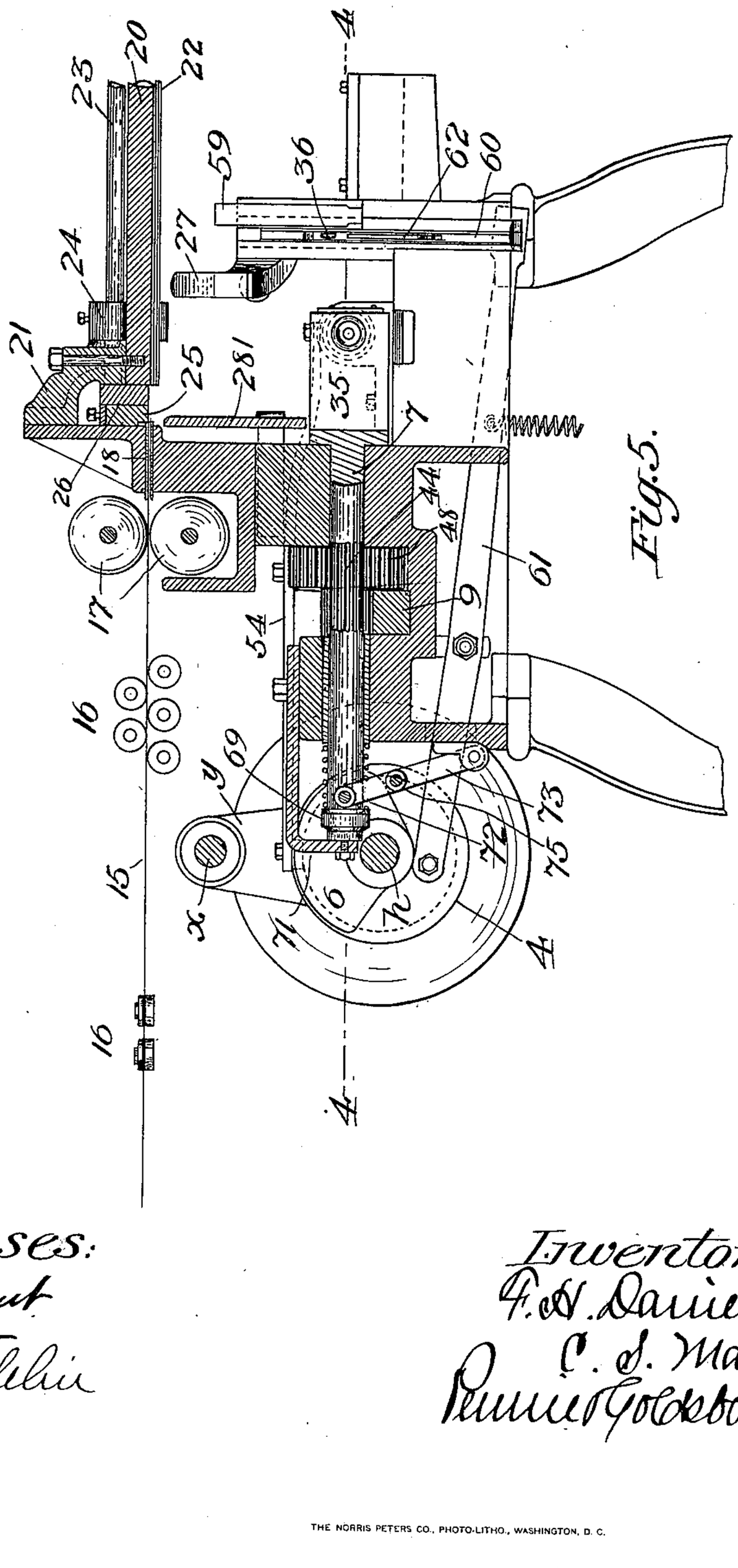

Fig. 5.

Witnesses:
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No. 652,998. Patented July 3, 1900.

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WIRE BALE TIE MACHINE.

(Application filed Feb. 19, 1900.)

(No Model.) 8 Sheets—Sheet 6.

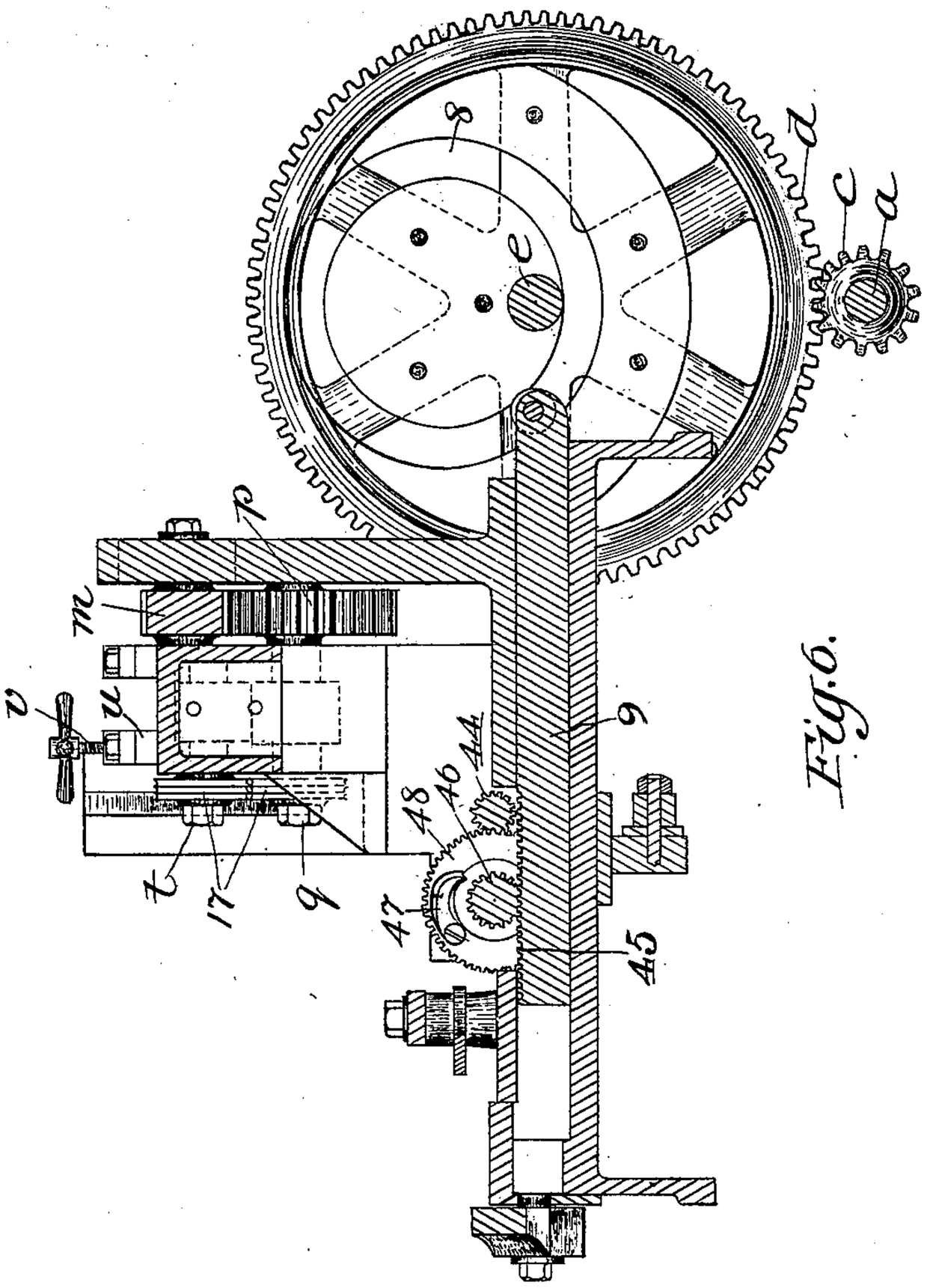

Fig. 6.

Witnesses:
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No. 652,998. Patented July 3, 1900.

F. H. DANIELS & C. S. MARSHALL.

WIRE BALE TIE MACHINE.

(Application filed Feb. 19, 1900.)

(No Model.)

8 Sheets—Sheet 7.

Fig. 11.

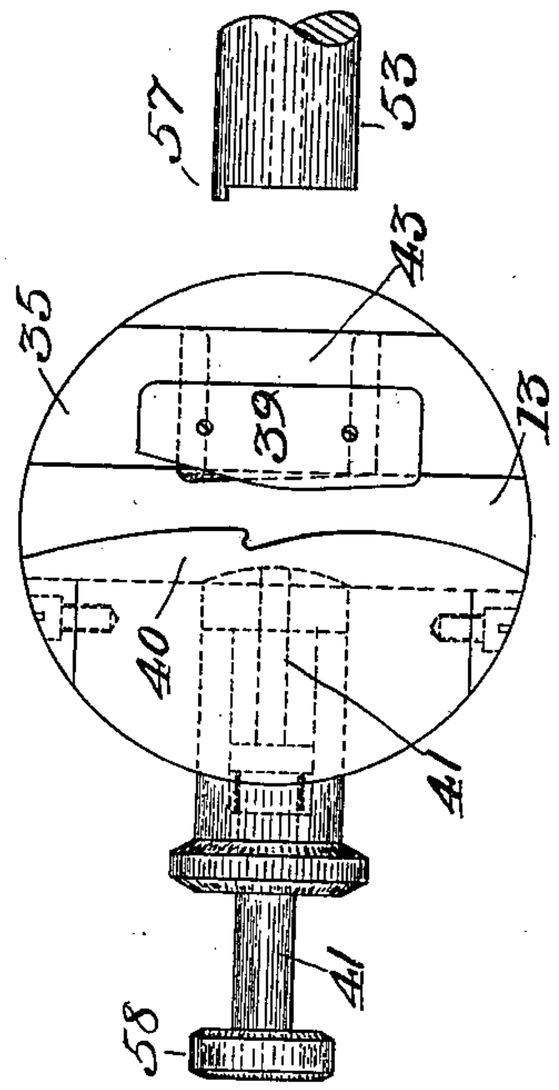


Fig. 6.

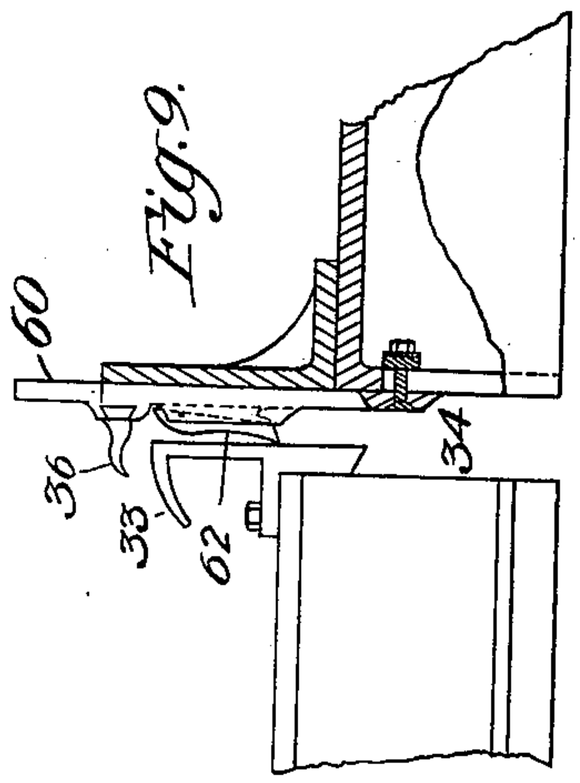


Fig. 7.

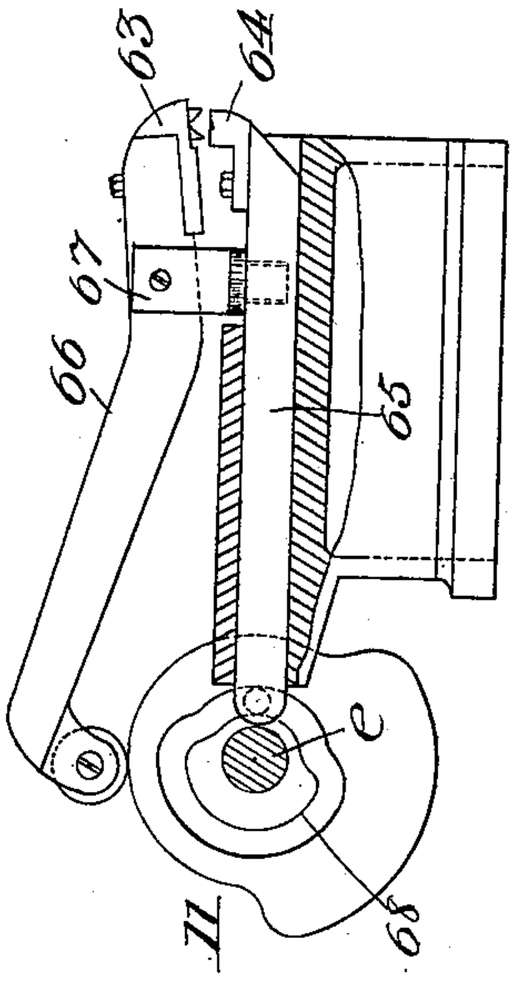
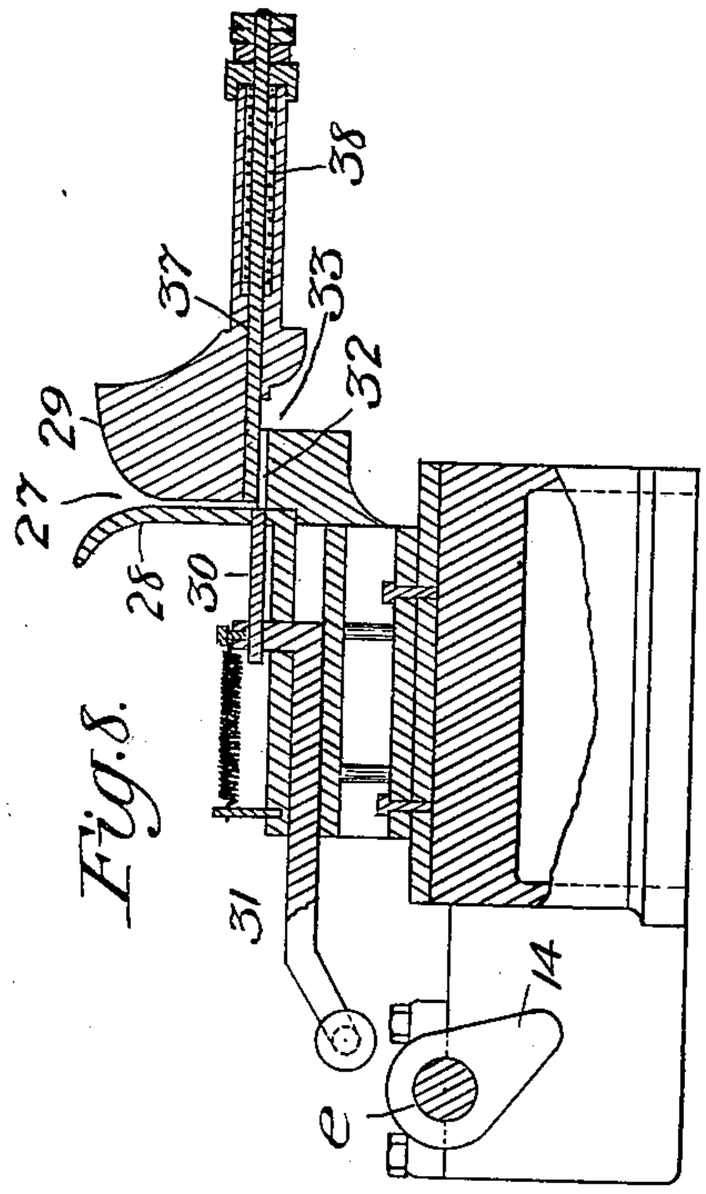


Fig. 8.



Witnesses:
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F. H. DANIELS & C. S. MARSHALL.

WIRE BALE TIE MACHINE.

(Application filed Feb. 19, 1900.)

(No Model.) 8 Sheets—Sheet 8.

Fig. 12.

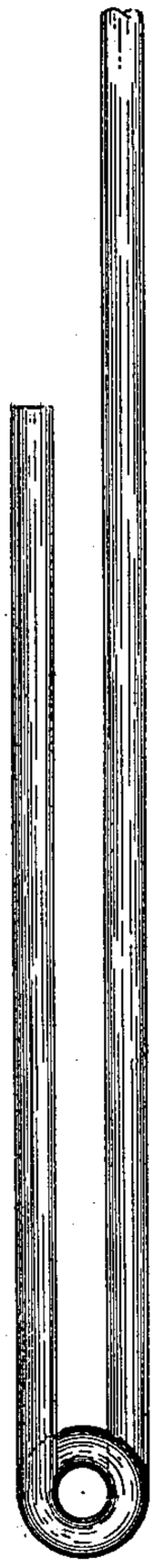

Fig. 13.

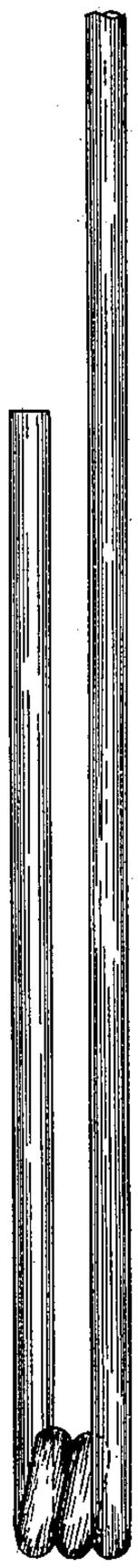

Fig. 14.

Fig. 15.

Witnesses:
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D. W. Edelin

Inventors:
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Attys

UNITED STATES PATENT OFFICE.

FRED H. DANIELS AND CLINTON S. MARSHALL, OF WORCESTER, MASSACHUSETTS, ASSIGNORS TO THE AMERICAN STEEL AND WIRE COMPANY OF NEW JERSEY.

WIRE-BALE-TIE MACHINE.

SPECIFICATION forming part of Letters Patent No. 652,998, dated July 3, 1900.

Application filed February 19, 1900. Serial No. 5,747. (No model.)

To all whom it may concern:

Be it known that we, FRED H. DANIELS and CLINTON S. MARSHALL, citizens of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Machine for Making Wire Bale-Ties, of which the following is a specification.

The object of the invention is to provide an improved machine for making the better class of ties intended more especially for cotton-bales; and the invention consists in the construction and arrangement of parts hereinafter described and claimed, and illustrated in the accompanying drawings.

Heretofore in the manufacture of such ties by machinery it has been customary to feed the tie-wires already cut into suitable lengths and straightened by another machine into the eye-forming machine and to feed them one at a time to the eye-forming mechanism. In the present machine the wire is fed forward into the machine continuously from a conveniently-located coil and is straightened and cut into lengths appropriate for the particular use for which the ties are intended by the machine itself, whereupon the cut lengths are delivered to the eye-forming devices, the wire at all times being under easy control and requiring no handling from the time the strand leaves the coil until the completed ties are discharged from the machine.

The entire machine is illustrated in the accompanying drawings, forming part of this specification, wherein—

Figure 1 is a top plan view, and Figs. 2 and 3 are respective front and side elevations, of the machine. Fig. 4 is a sectional detail on line 4 4 of Figs. 2 and 5. Fig. 4ª is an enlarged sectional detail on the same line, and Fig. 5 is a vertical sectional detail on the line 5 5 of Fig. 4. Fig. 6 is a similar view on the line 6 6 of Fig. 1. Fig. 7 is a detail of the jaws for gripping the tie-wires. Fig. 8 is a sectional detail on the hopper for the tie-wires and its plunger and spring-rod. Fig. 9 is a detail of the hooks for carrying the tie-wire down upon the arbor and for discharging the completed ties. Fig. 10 is a detail of the knife and the arm for releasing the wire from the groove in the receiving-rod. Fig. 11 is a front elevation of the twisting-head. Figs. 12 to 15 are progressive views of the tie in different stages of formation.

Referring to the views, *a* denotes the main shaft of the machine, journaled in suitable hangers from the bed-plate and having a pinion *c* midway of its length, a band-wheel *b* on one end and a hand-wheel *b'* on its other end for turning the machine by hand when occasion requires. The pinion *c* gears with a spur-wheel *d* on a shaft *e*, journaled in brackets at one side of the bed of the machine above the shaft *a* and connected by miter-gears *f* and *g* to a shaft *h*, journaled in bearings at the side of the machine and having a spur-gear *i* on it meshing with a spur-pinion *j* on a short shaft *x*, journaled in standards *y y* above and parallel with the shaft *h*. Fast on the shaft *x*, alongside the pinion *j*, is a speeding spur-gear *k*, which meshes with a smaller gear *l*, mounted on a stud-shaft and gearing with a speed-gear *p* on the shaft of the lower one of the wire-feeding rolls 17 through the intermediacy of the removable pinion *m*, secured in a slot *o* in a yoke *n*, the pinion *m* being interchangeable with others of different size for the purpose of regulating the speed of the feeding-rolls.

On the opposite end of the shaft *h* from the pinion *g* there is a cam and crank-disk 1, which connects, by means of a pitman 2 with a slide 3, having a gear-rack for the purpose of rotating the coiler, which will be described later on. Also mounted upon this shaft *h* there is a cam 4, having a peripheral groove 5, which controls a lever 54 for moving the coiler endwise to and fro during the operation of the rack just referred to. Alongside the cam 4 on the shaft *h* there is an eccentric cam 6, the function of which is to reciprocate a hook for feeding the wires to the coiler and twister, as will be more fully described later on. In the side of the gear-wheel *d* on the shaft *e* there is a cam-groove 8, in which plays a roller on the end of a slide 9, carrying a gear-rack at its opposite end for the purpose of rotating a twister 7, which will be presently described. On the same shaft *e*, forward of the gear-wheel, are located cams 10 and 11, the former

of which operates a knife for cutting the wire into lengths and also has an eccentric groove in its side face for operating the hook or finger 12 on a slide 13 for the purpose of withdrawing the arbor, hereinafter to be described, at the proper time. The cam 11 is for the purpose of operating certain gripping-jaws, to be described later on, and alongside this cam on the shaft *e* there is a wiper 14, which operates the mechanism for discharging the tie-wires from the hopper into the twister and coiler.

The several parts and their joint action will be now described with reference to the passage of the wire through the machine.

The wire is denoted by 15 in Figs. 1 and 3. It comes from a coil conveniently located with respect to the machine, and after passing through ordinary straightening-rolls 16 16 passes between the grooved feed-rolls 17 17, which are positively driven by the gearing, hereinbefore described in connection with other intermeshing gears, upon their respective shafts, which are shown in dotted lines in Figs. 3 and 6. A screw *v* and a slide *u* are provided for raising and lowering the roller end of the upper shaft for the purpose of throwing the wire-feeding mechanism into or out of action. From these feeding-rolls the wire passes straight forward through a guide-eye 18 and is delivered into a groove 19 in the under side of a rod 20, which is mounted in brackets in line with the guide. The inner end of the rod 20 is secured to a head 21, supported by the framing of the machine, and the rod extends forwardly in a direction of the wire to the length of the longest ties it is desired to make on the machine. At its outer end, and, if desired, at different points along its length, it is supported by brackets; but as there is no particular novelty in this device *per se* we have not shown its entire length, but have broken it off in the several views. As clearly shown in Fig. 10, the groove 19 is on the under side of the rod 20, and, except for the holder and dropper 22, would be always open. Mounted in the supports of the rod 20 and parallel therewith is a smaller rod 23, which has at intervals along its length arms 24, reaching down and under the rod 20 and carrying a plate on their outer ends which comes up against the under side of the rod 20 and closes the slot 19. The purpose of this rod is to receive and confine the projected wire and hold the same while the appropriate length for the tie is being cut off. This is done by a knife 25, secured to the end of a pivoted lever 26, operated at its other end by the cam 10 on the shaft *e* before described. On the extreme end of this lever in front of the knife 25 there is a rack 26′, which meshes with a gear-segment 27′ on the inner end of the rod 23, the object of this arrangement being to withdraw the holder and dropper 22 from under the slot 19 and permit the length of the wire which has been cut off by the action of the knife 25 shearing against the end of the wire-guide 18 to drop into the hopper to be presently described. This hopper is denoted by 27, and it is located below and slightly to one side of the holder and dropper 20, and as the wires are released they fall bodily into the hopper with their ends abutting against the stop-plate 28′. The hopper consists simply of vertical jaws 28 29, preferably flared at their upper ends to insure the entrance of the wires and having a space between them sufficient to permit the wires to enter one on top of another, but not wide enough to allow them to pass one another. Preferably the hopper is adapted to receive and hold a number of wires, but in the ordinary operation of the machine the holder and dropper 22 will be so timed and speeded with relation to the other parts as that there shall be only one wire at a time in the hopper.

After the wire has been cut by knife 25 into the proper length for a tie and dropped into the hopper it is pushed laterally by a plunger 30 sidewise along the ledge 32 and delivered into the mouth 33 of a passage-way 34, which will be more fully described later on. The plunger 30 is carried by a slide 31, which is operated by the wiper 14 on the shaft *e*, as before described. The passage-way 34 extends vertically from the bottom of the hopper a little to one side of the ledge 32, and in a plane perpendicular to the passage-way is journaled in suitable bearings on the bed-plate a twister 7, having a slotted head 35 in line with the passage-way. When the wires are delivered into the passage 34 from the hopper by the plunger 30, they are grasped by a vertical sliding hook 36 and carried bodily downward until they rest within the slot of the twister-head. It is important that the wires should always be under control, and for this purpose there is arranged in the jaw 29 of the hopper a plunger 37 in line with the plunger 30 and pressed inward toward the hopper by a spring 38. When the plunger 30 pushes the wire out of the hopper, it is held between the ends of the plungers against escape.

The twister is best shown in Figs. 4 and 11. It consists of the slotted head 35, having a guide-plate 39 on its front end at one side of the slot and a notched plate 40 on the end at the opposite side, the notch being for the purpose of preventing the wire from rising during the action of the coiler. 41 denotes an arbor mounted transversely in the twister-head and pressed by spring 42, so as to stand normally across the slot 35. On the opposite side of the slot from the arbor and in line therewith the head is provided with an opening 43, and this opening is adapted to receive a coiler 53, journaled in bearings in the bed-plate in line therewith at a certain time in the operation of the machine to be presently described. The twister-spindle has an elongated pinion 44 and is driven from the rack 45 on the slide 9 through the intermediacy of

the pinion 46, which gears with the rack and has a ratchet-and-pawl connection 47 with a speeding-gear 48, which gears directly with the pinion of the twister. The rack 45 is operated by the cam-groove 8 in the wheel *d*, as before described, and for the purpose of locking the twister with its slotted head in the correct position to receive wires a slide 49 is operated by a pivoted lever 50 from a cam-flange 51 on the side of the cam 1 for the purpose of engaging a notch 52 in the periphery of the head of the twister.

When a tie-wire is presented to the twister, the slotted head stands in the position indicated in Figs. 4 and 4ª and locked in that position by the means just described. The rear end of the wire having been fed into the slot rests upon arbor 41, and at this moment the coiler 53 is projected into the opening 43 through the intermediacy of the pivoted lever 54 and the cam 4 on the shaft *h* previously described. The slide 3 is then operated to rotate the coiler by means of its rack 55 and the elongated pinion 56 of the coiler-spindle, and the nib 57 on the end of the coiler takes the wire and wraps it around and around the arbor 41, as indicated in Figs. 12 and 13. During the wrapping of the wire around the arbor the coiler is slowly backed off to enable the strands to be laid evenly on the coiler and not pile up on one another. This backing off of the coiler is very gradual and is effected by the lever 54 through the inclination of the groove 5 in the cam 4. After the coiler has wrapped the wire the requisite number of times around the arbor it is entirely withdrawn from the opening in the head by means of an abrupt jog in the cam-groove 5, and the mechanism for locking the twister-head is also released at this time. The rack 45 is then operated to rotate the twister for the purpose of forming the twist in the wires, as illustrated in Figs. 14 and 15, after which the arbor is withdrawn to permit the completed tie to drop out. The finger 12, hereinbefore described as being for the purpose of withdrawing this arbor, slides in ways in the bed of the machine, and when the twister-head is locked in position it stands in the position indicated in Fig. 4ª, ready to withdraw the arbor by means of a button 58 on the end of the arbor. When the twister revolves, it carries the arbor with it and releases the button from the finger 12; but on the completion of the revolution the head comes to rest with the finger 12 just under the button, and at this moment the slide 13 is operated by the side groove in the cam 10, before described, to withdraw the arbor and allow the coiled and twisted tie to drop out of the machine.

The passage-way 34 has a spring-press plate 59 for the purpose of controlling the descent of the wires and preventing them from escaping the action of the feeding-hook. This hook is mounted on a slide 60, which works vertically in ways in the machine-frame and is operated by the cam 6, before described, through the intermediacy of a spring-held pivoted lever 61, and the timing of the hook is such that immediately on the delivery of a tie-wire from the hopper by the plunger 30 it seizes it and carries it downwardly into the slot of the twister-head and upon the arbor. The feeding-hook 36 then immediately returns for a new wire, and there is pivoted on the slide 60 a little below the feeding-hook a spring-press discharge-hook 62, whose function is to eject the completed tie from the machine. As the feeding-hook ascends to receive the tie-wire the discharging-hook slips past the wire which at that time is engaged by the twister, and on the descent of the feeding-hook the discharge-hook catches the completed tie and ejects it.

After the eye has been coiled in the wire and immediately before the twister begins to rotate the ends of the wire are gripped some little distance in front of the twister by the jaws 63 64, whose function is to hold them securely during the twisting operation. These jaws occupy a position perpendicular to the path of the wire and slightly to one side of the passage-way 34. The lower one is carried by a slide 65, moving in ways in the bed-plate, and the upper one is carried by a lever 66, pivoted on a stud 67, seated in the slide 65. There is a roller on the rear end of this slide which works in a groove 68 in the side of the cam 11, and the two jaws are thereby moved into and out of the path of the wire in the passage-way 34. The lever 66 is operated by a riser on the periphery of the cam 11 for the purpose of opening and closing the jaw 63 at the proper time.

As the twister-head revolves it is necessary that it should yield toward the jaws where the wires are rigidly held. To accommodate this movement, the spindle 7 is adapted to slide in its journals and has on its rear end a collar 69, between which and the framing reacts a spring 70, which keeps the head normally in its proper position, but allows it to yield under the straining action of the wires being twisted. A stop-plate 71 is provided to limit the rearward movement of the twister-spindle, and in order to insure its return after twisting a roller 72 acts against the collar 69 to carry it positively backward. This roller is on the upper end of a pivoted lever 73, which is operated by a side groove in the cam 74, a roller 75 on the side of the lever working in the groove.

Having thus described the invention, what we claim, and desire to secure, is—

1. The combination of a rotary twister having a longitudinally-slotted head, mechanism for delivering the wire into the slot, an arbor sliding in the head and crossing the slot, and a coiler adapted to coil the wire around the arbor.

2. The combination of a rotary twister having a longitudinally-slotted head, mechanism for delivering the wire into the slot, an arbor sliding in the head and crossing the slot, a

coiler adapted to coil the wire around the arbor, and mechanism for withdrawing the arbor on the completion of the twist to release the tie.

3. The combination of a rotary twister having a longitudinally-slotted head, mechanism for delivering the wire into the slot, an arbor sliding in the head and crossing the slot, a coiler adapted to coil the wire around the arbor, and mechanism for backing off the coiler as it wraps the wire around the arbor.

4. The combination of a rotary twister having a longitudinally-slotted head, mechanism for delivering the wire into the slot, an arbor sliding in the head and crossing the slot, a coiler mounted on the machine-frame and adapted to be projected into the slot of the head and coil the wire around the arbor, and mechanism for withdrawing the coiler on the completion of the eye to allow the head to rotate to twist the wire.

5. The combination of a rotary twister having a longitudinally-slotted head, mechanism for delivering the wire into the slot, an arbor sliding in the head and crossing the slot, a coiler separate from the head and mounted on the machine-frame, mechanism for locking the twister and projecting the coiler into the slot of the head, mechanism for rotating the coiler to form an eye in the wire around the arbor, and mechanism for withdrawing the coiler and rotating the twister.

6. The combination of a rotary twister having a longitudinally-slotted head, mechanism for delivering the wire into the slot, an arbor sliding in the head and crossing the slot, a coiler adapted to coil the wire around the arbor, jaws for gripping the wire in front of the twister, mechanism for withdrawing the coiler and permitting the revolution of the twister, and mechanism for withdrawing the arbor on the completion of the twist to release the tie.

7. The combination of a rotary twister having a slotted head, a spring-pressed arbor sliding in the head and standing normally across the slot, an opening in the head in line with the arbor on the opposite side of the slot, a coiler, mechanism for delivering the wire into the slot of the head and onto the arbor, mechanism for projecting the coiler into the opening and rotating it to wrap the wire around the arbor, mechanism for withdrawing the coiler to permit the revolution of the head, and mechanism for withdrawing the arbor to release the tie, the twister being adapted to move lengthwise toward the jaws during the twisting operation.

8. The combination of a rotary twister having a slotted head, a spring-pressed arbor sliding in the head and standing normally across the slot, an opening in the head in line with the arbor on the opposite side of the slot, mechanism for delivering the wire into the slot of the head and onto the arbor, mechanism for projecting the coiler into the opening and rotating it to wrap the wire around the arbor, mechanism for withdrawing the coiler, mechanism for rotating the head to twist the wire ends together, and mechanism for withdrawing the arbor to release the tie.

9. The combination of a rotary twister having a slotted head, an arbor sliding in said head across the slot, a coiler adapted to wrap the wire around the arbor, gripping-jaws arranged in front and to one side of the head, mechanism for feeding the wire into the slot of the head, and mechanism for advancing the jaws to grip and hold the wire during the rotation of the head, and returning said jaws after the twisting is completed to permit the feeding in of a new wire.

10. The combination of mechanism for feeding a strand of wire forward and cutting it into lengths, a receiver to hold the projecting wire while being cut, a hopper, a twister and coiler beneath the receiver, mechanism for delivering the wire from the receiver into the hopper, a passage-way beneath the hopper crossing the plane of the twister and coiler, an ejector for delivering the wires one at a time from the hopper into the passage-way, and a feeding-hook working in said way and adapted to feed said wires into line with the twister and coiler.

11. The combination of mechanism for feeding a strand of wire forward and cutting it into lengths, a receiver to hold the projecting wire while being cut, a hopper, a twister and coiler beneath the receiver, mechanism for delivering the wire from the receiver into the hopper, a passage-way beneath the hopper crossing the plane of the twister and coiler, an ejector for delivering the wires one at a time from the hopper into the passage-way, a feeding-hook working in said way and adapted to feed the wire from the hopper into line with the twister and coiler, and a discharge-hook for discharging the completed tie from the twister and coiler.

12. The combination of the hopper to hold the tie-wires, the ledge at the bottom thereof, the ejector for pushing the wires one at a time out of the hopper over the ledge, and the cooperating spring-plunger between which and the ejector the wire is held.

13. The combination of the hopper to hold the tie-wires, the passage-way below and to one side of the hopper, the ledge leading from the bottom of the hopper to the passage-way, the ejector and the coöperating spring-plunger for delivering the wires one at a time from the hopper to the passage-way, and the feeding-hook reciprocating in the passage-way.

14. The combination of mechanism for feeding a strand of wire forward and cutting it into lengths, a receiver to hold the projecting wire while being cut, a hopper beneath the receiver, mechanism for delivering the lengths from the receiver into the hopper, a ledge at the bottom of the hopper, a coiler and twister located at one side of the hopper lengthwise of and below the same, a passage-way leading downward from the ledge across the plane of the coiler and twister, an ejector for pushing

the wires one at a time out of the hopper into the passage-way, a feeding-hook working in the passage-way for delivering the wires to the coiler and twister, and a discharge-hook for discharging the completed tie, said discharge-hook being adapted to yield on its upward movement to pass the wire held in the coiler and twister.

In testimony whereof we have hereunto set our hands this 15th day of February, 1900.

FRED H. DANIELS.
CLINTON S. MARSHALL.

Witnesses:
H. V. DORSEY,
FRANK E. DAVIS.