No. 827,371. PATENTED JULY 31, 1906.

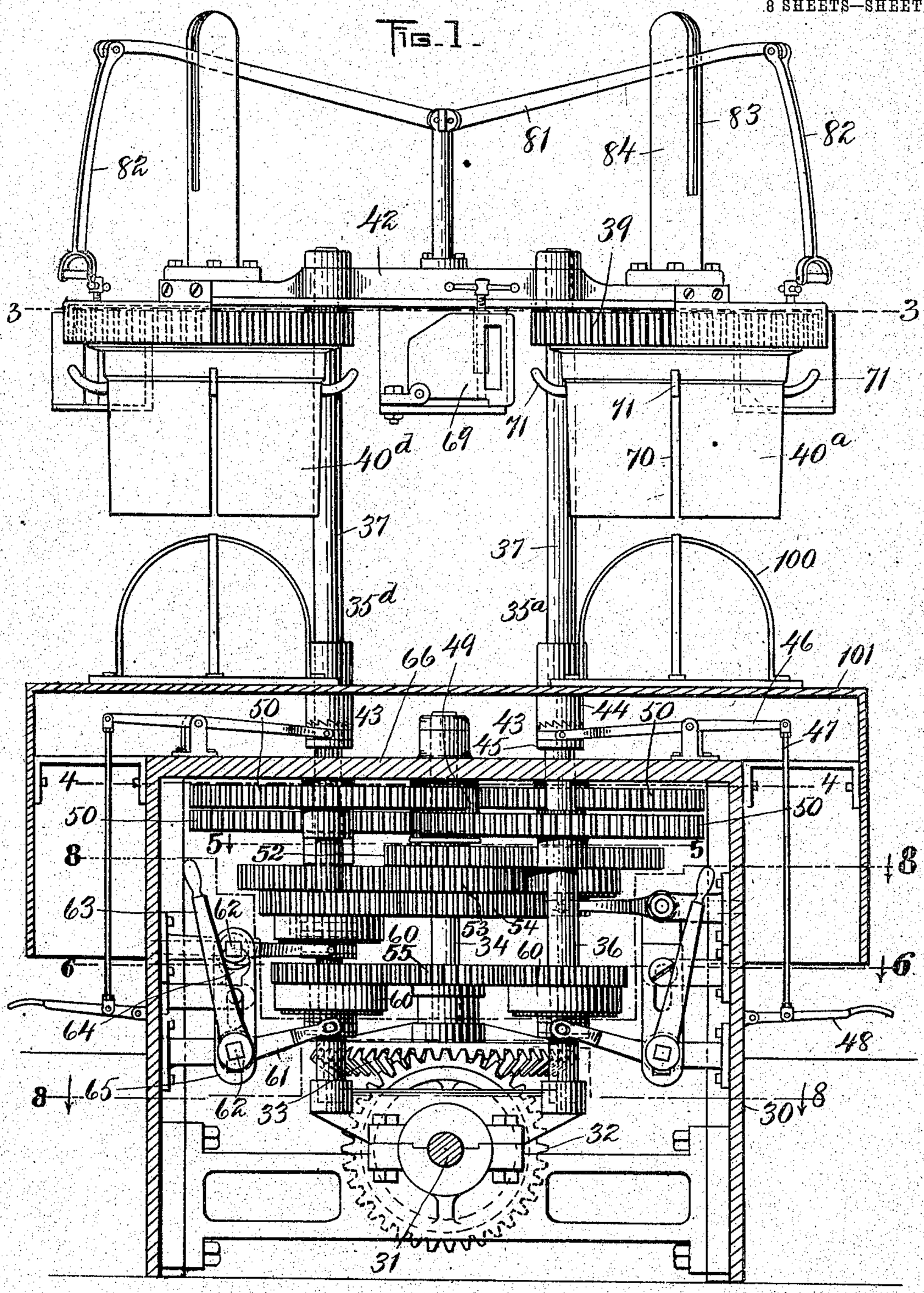
J. A. HORTON.

WIRE DRAWING MACHINE.

APPLICATION FILED JUNE 15, 1903.

8 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

A. C. Ralfegan

E. Batchelder

INVENTOR:

J. A. Horton.

by Wright, Brown & Quinby.

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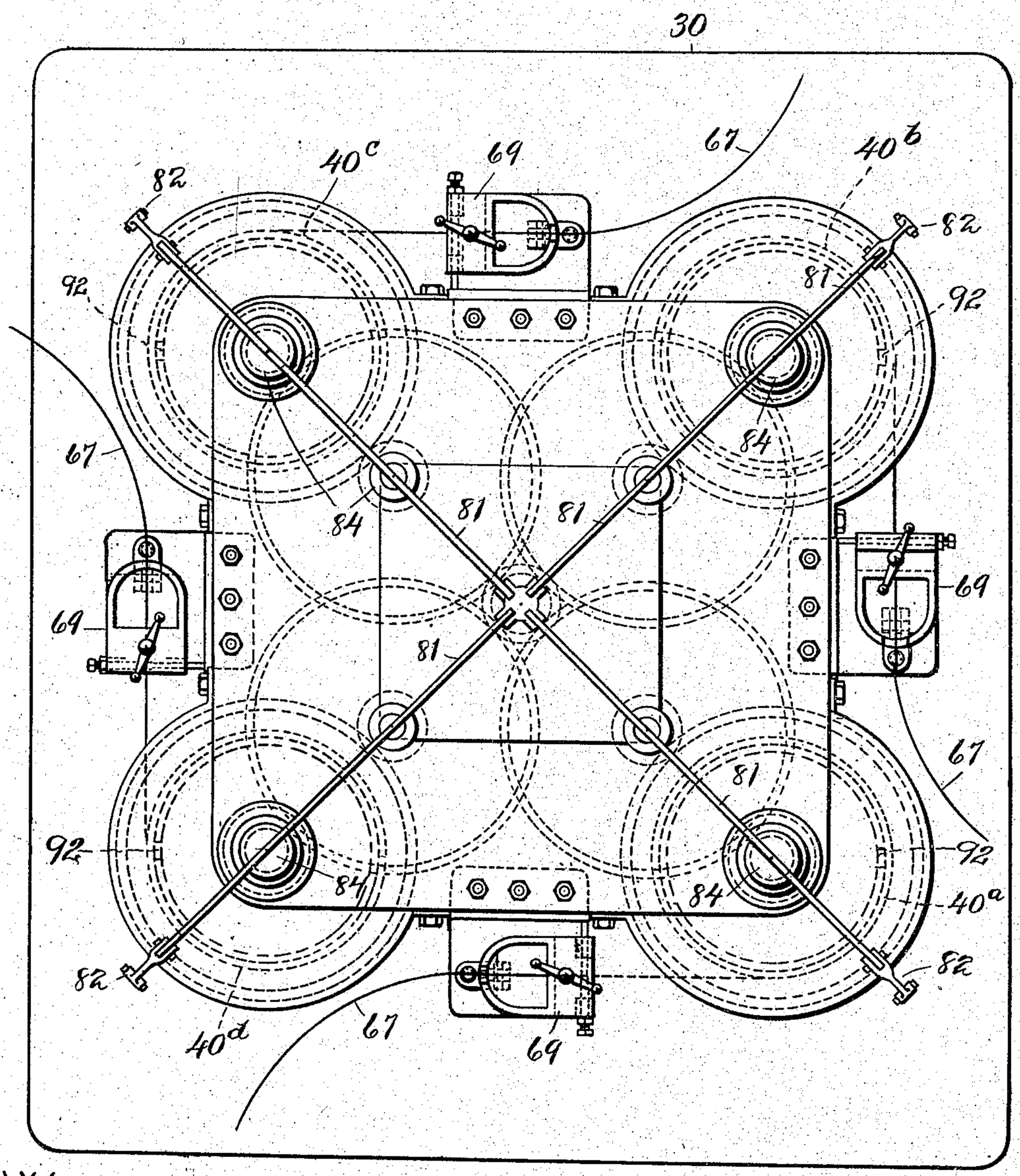
8 SHEETS—SHEET 2.

FIG. 2.



WITNESSES.

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No. 827,371. PATENTED JULY 31, 1906.

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8 SHEETS—SHEET 3.

FIG. 3.

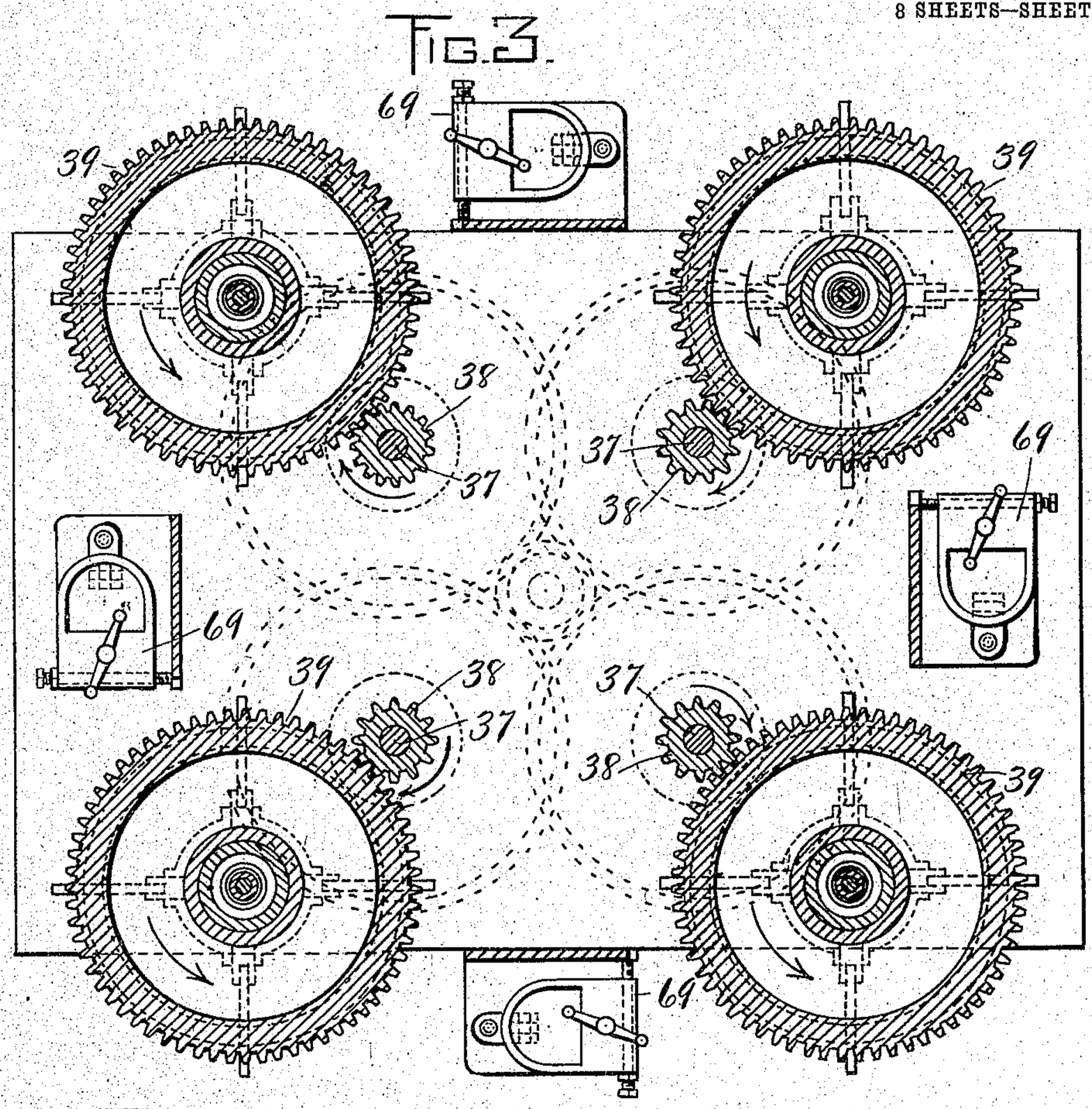
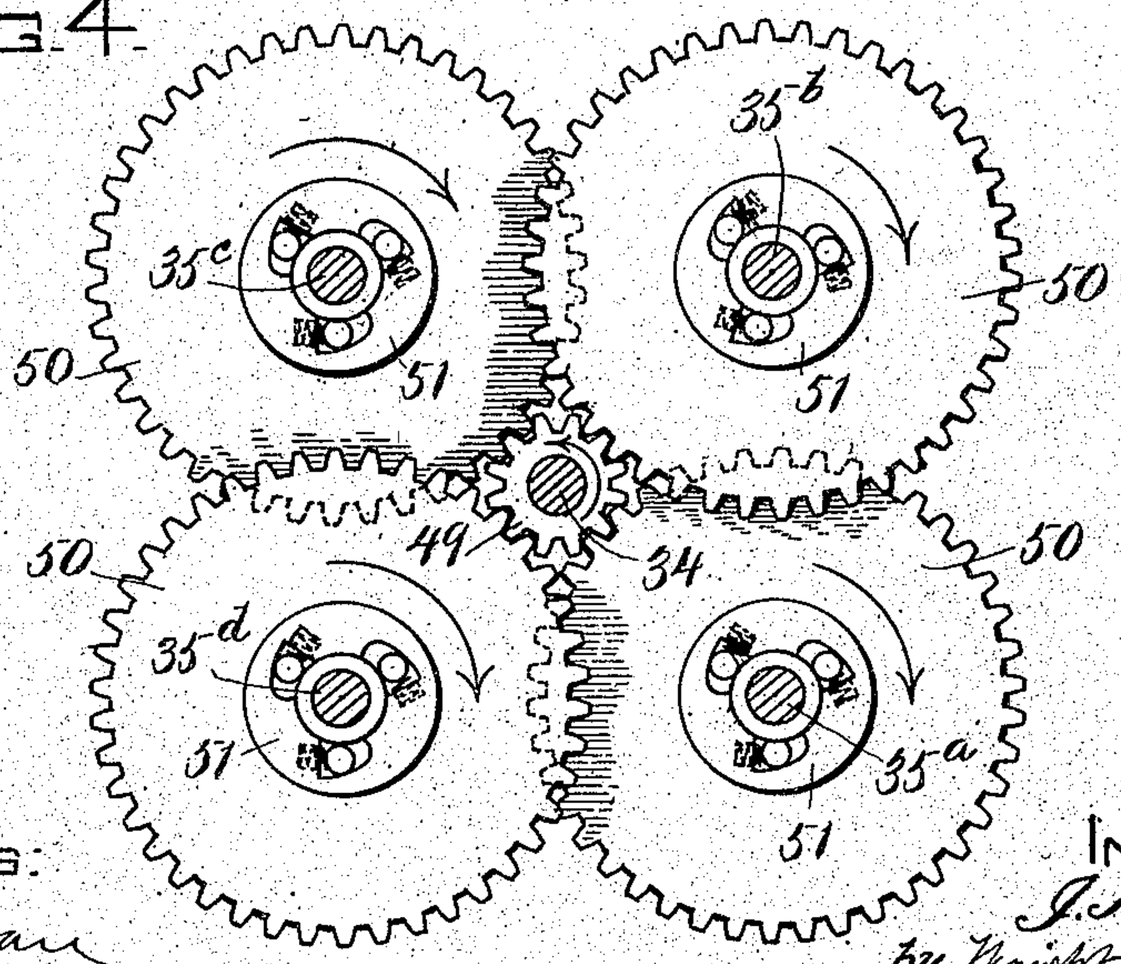


FIG. 4.



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8 SHEETS—SHEET 4.

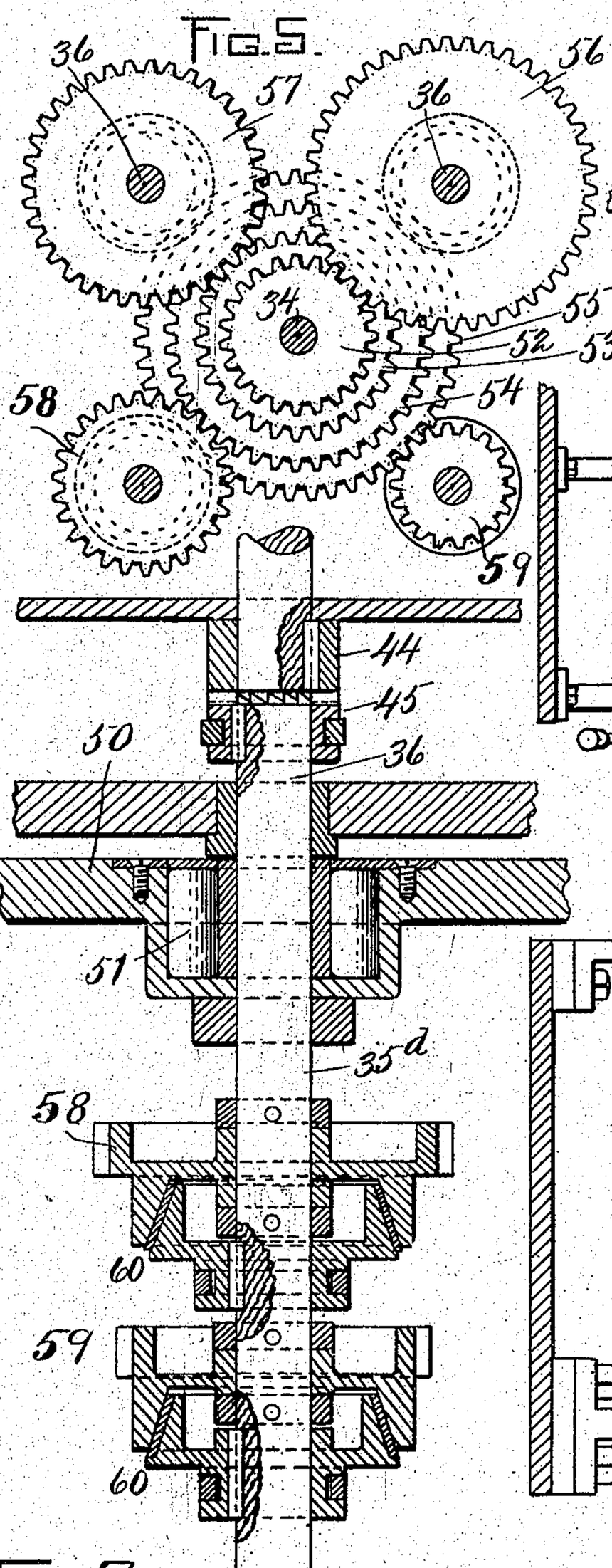

FIG. 5.

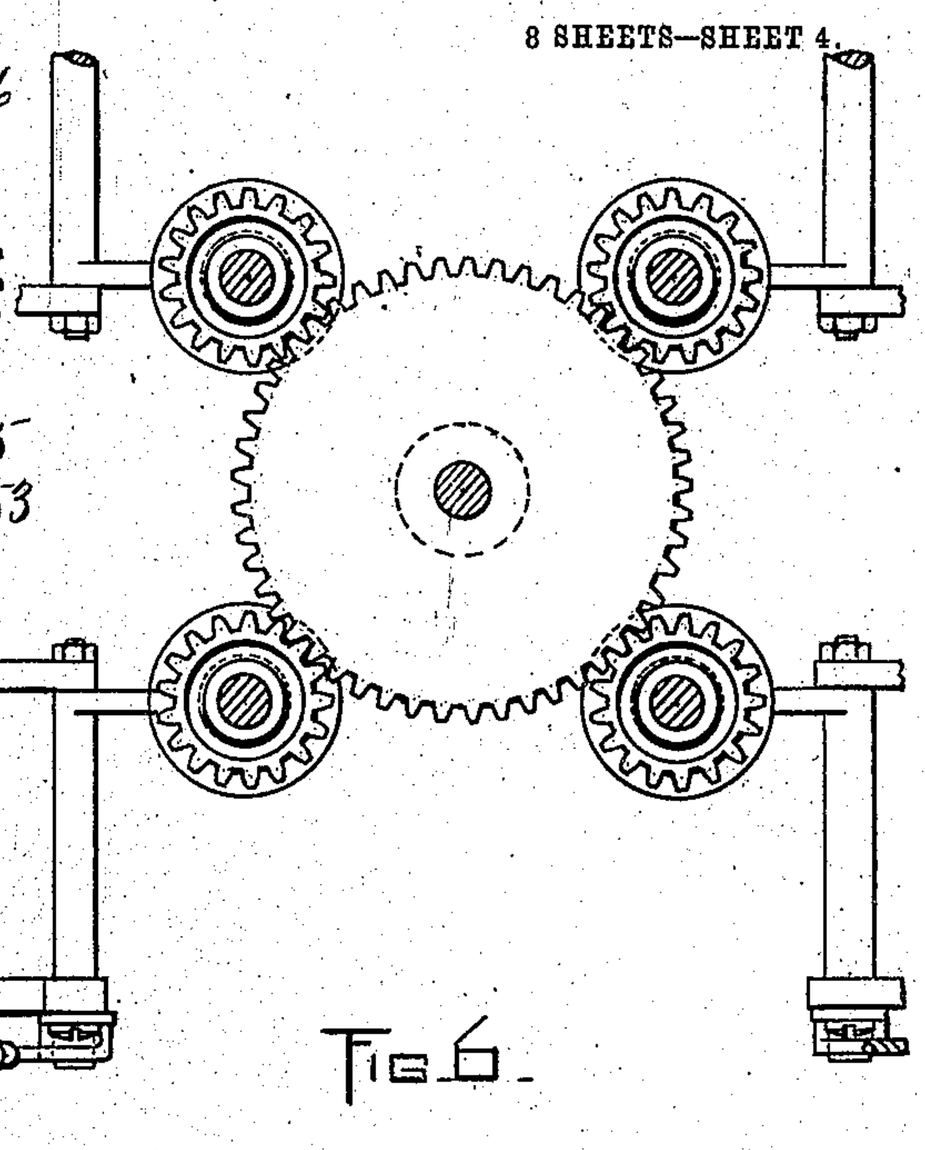

FIG. 6.

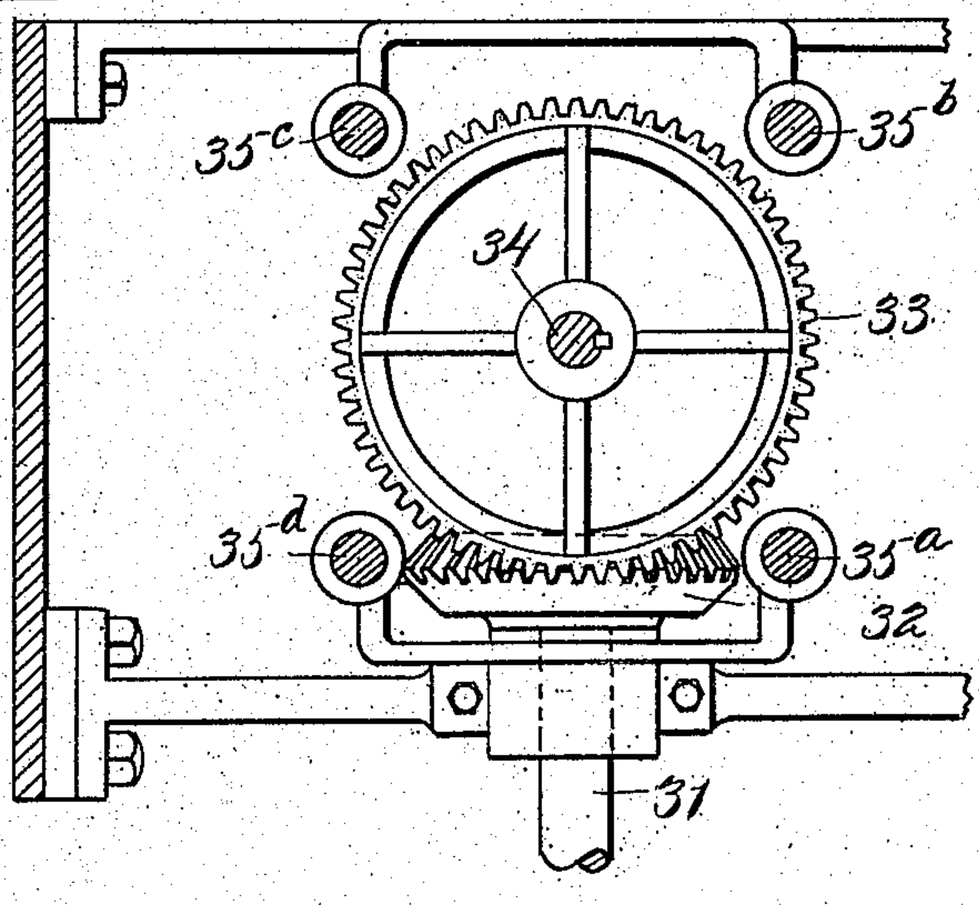

FIG. 8.

FIG. 7.

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No. 827,371. PATENTED JULY 31, 1906.

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8 SHEETS—SHEET 5.

FIG 10.

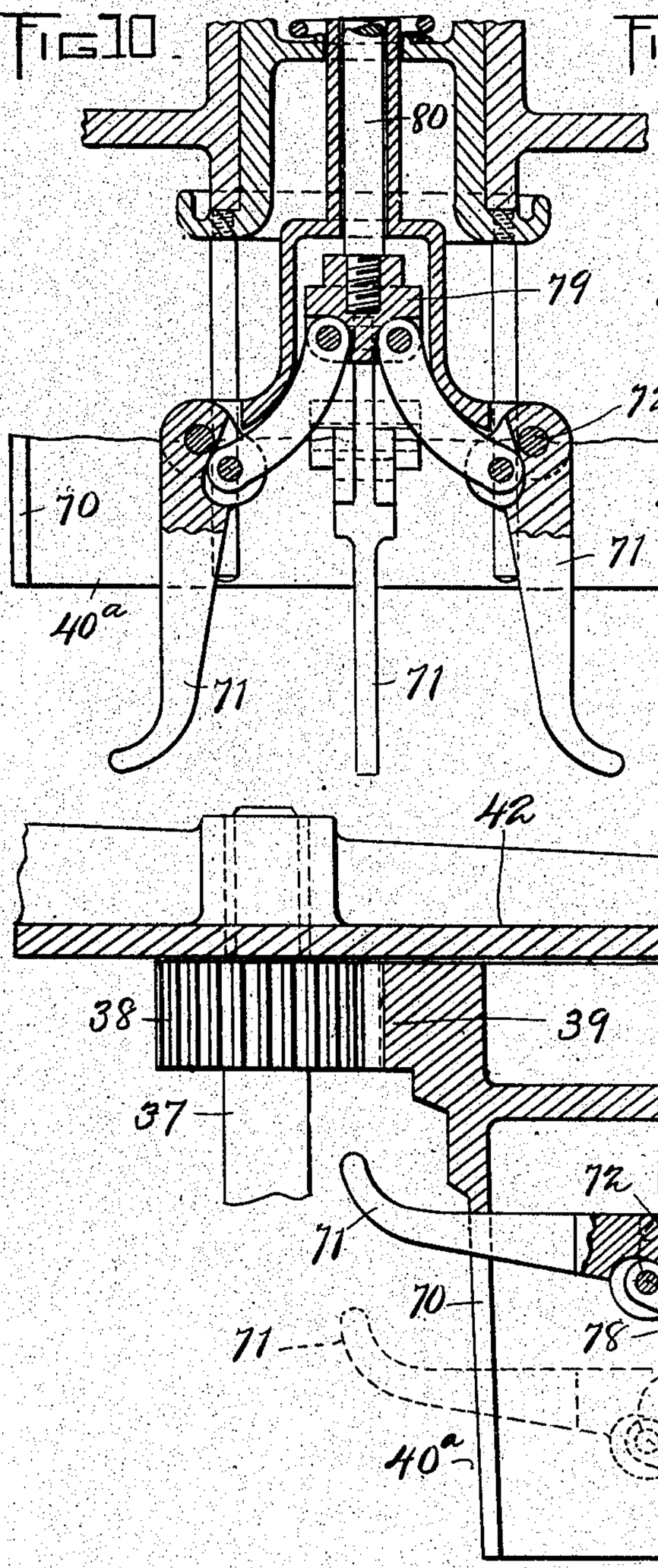


FIG 9.

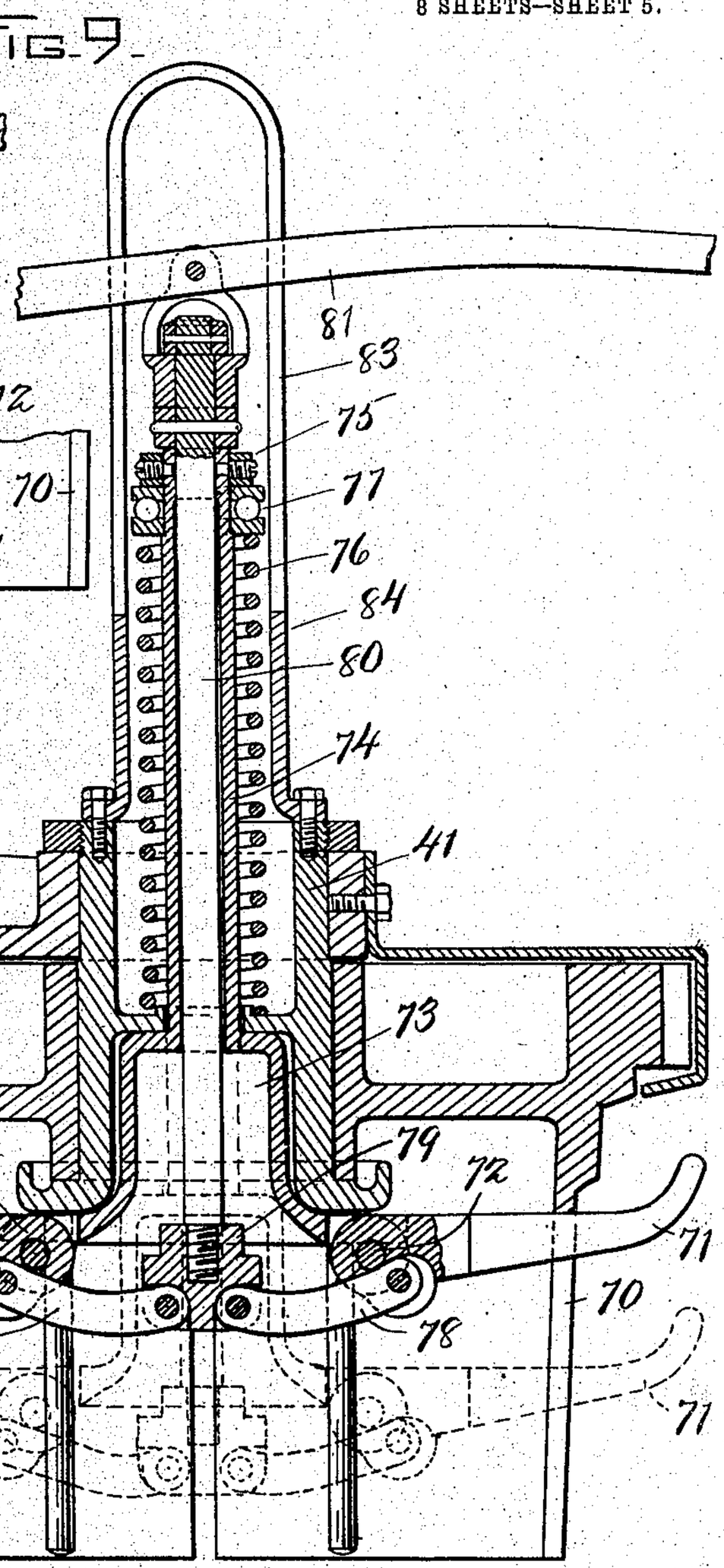
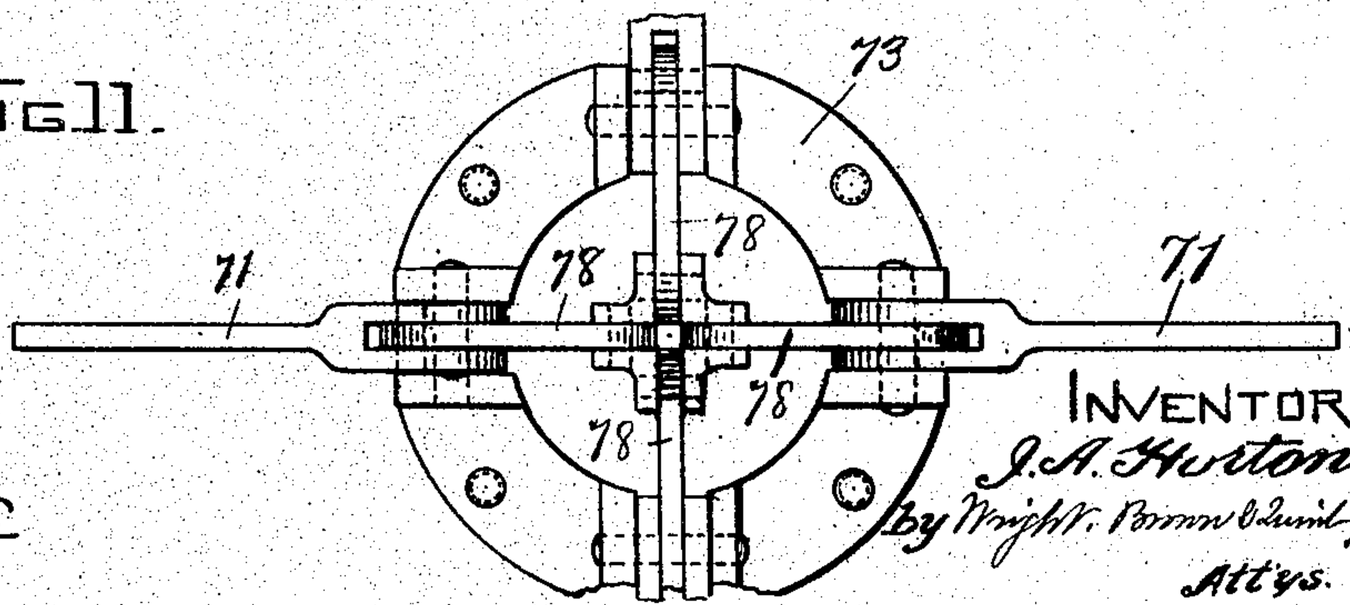


FIG 11.



WITNESSES:
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No. 827,371. PATENTED JULY 31, 1906.

J. A. HORTON.

WIRE DRAWING MACHINE.

APPLICATION FILED JUNE 15, 1903.

8 SHEETS—SHEET 6.

FIG. 12

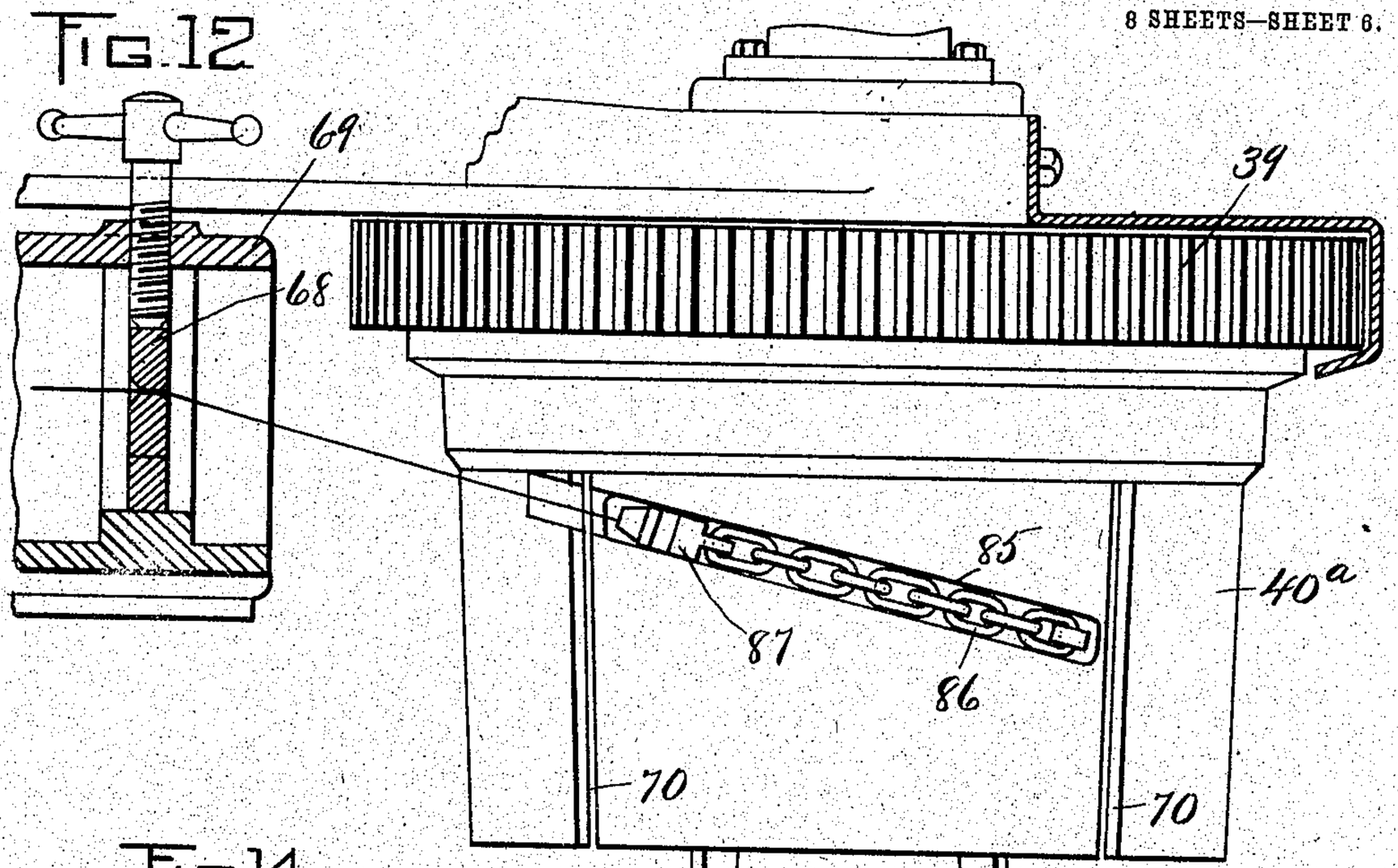


FIG. 14.

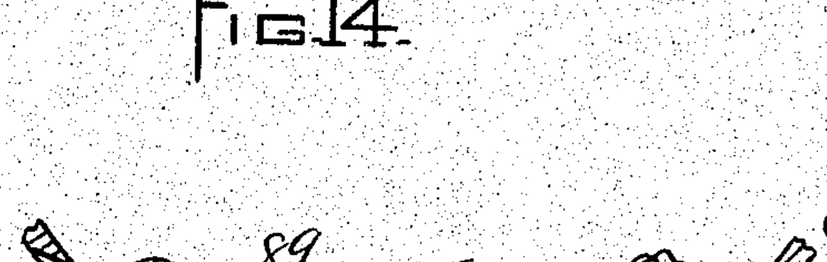


FIG. 14a.

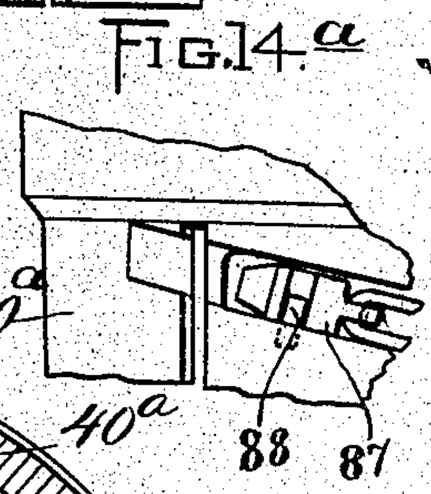


FIG. 13.

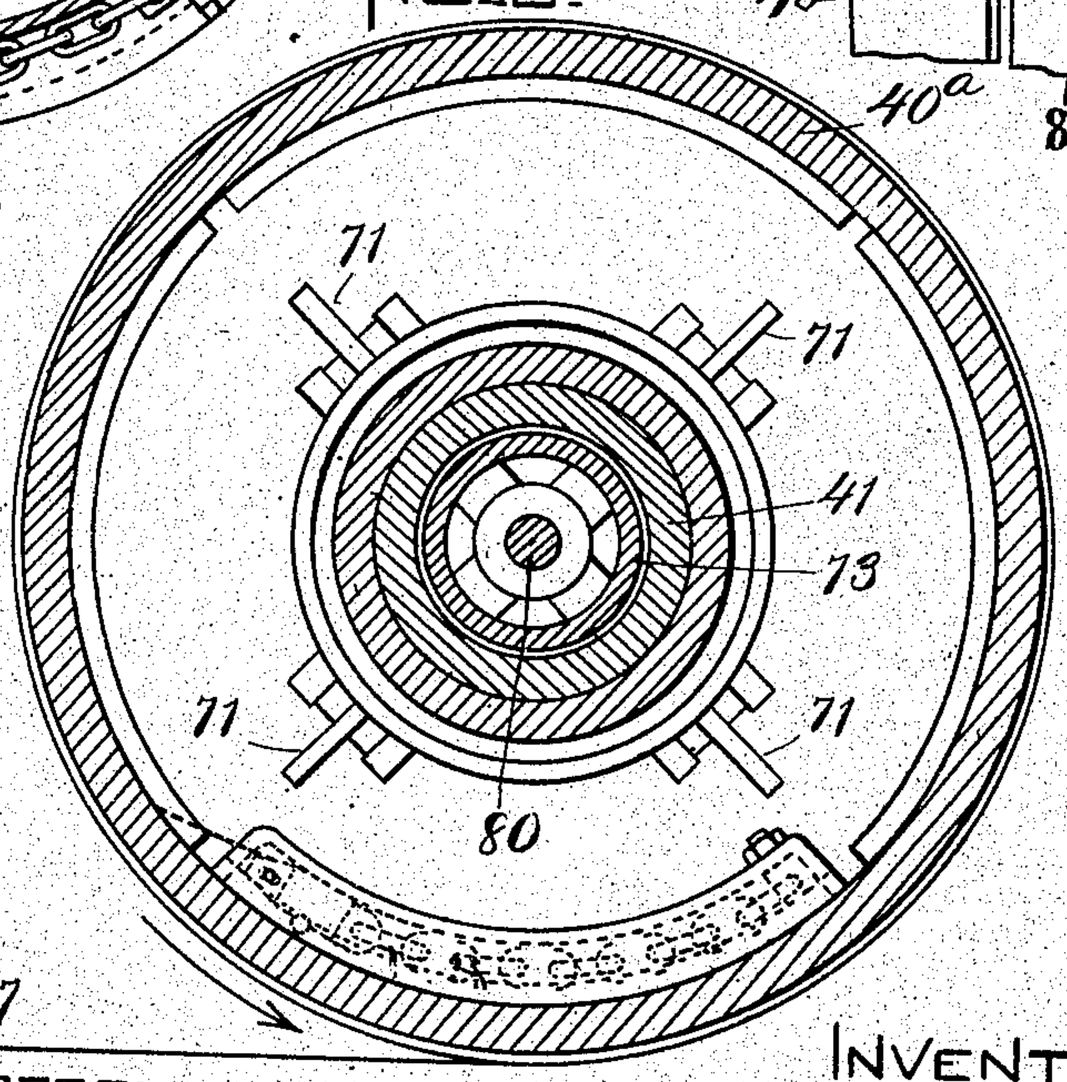
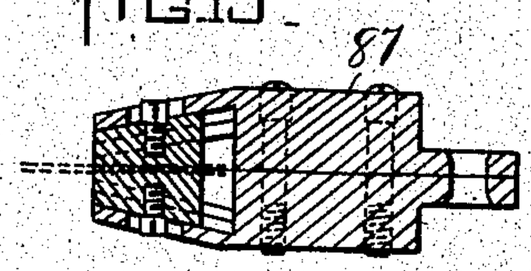
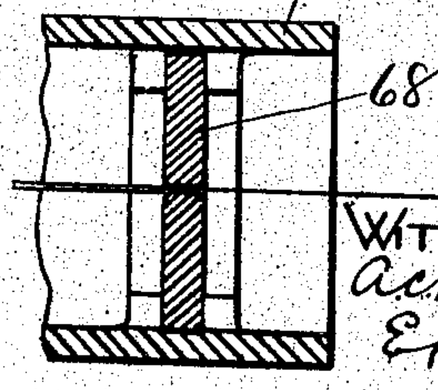


FIG. 15.





WITNESSES:
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8 SHEETS—SHEET 7.

Fig. 16.

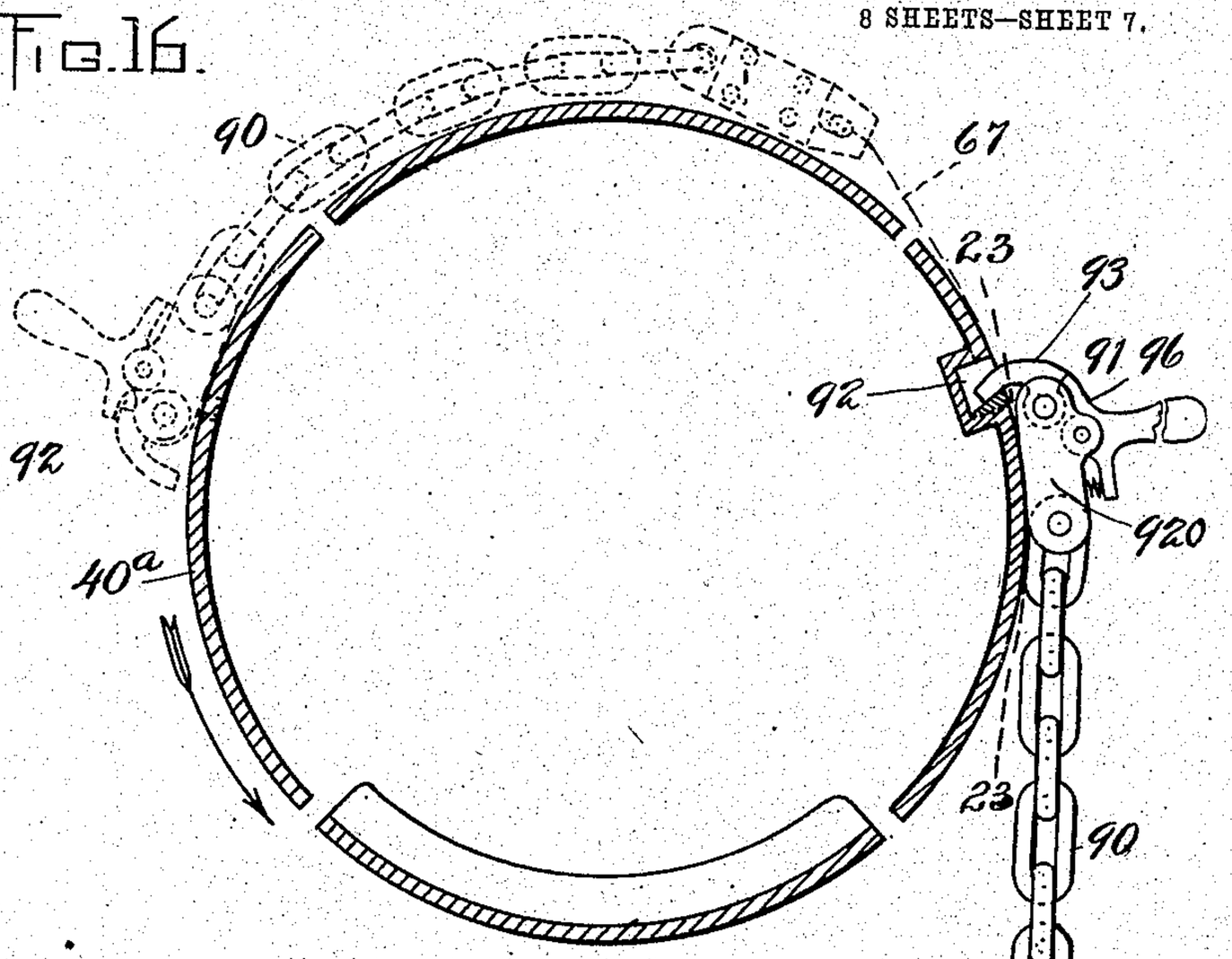


Fig. 23.

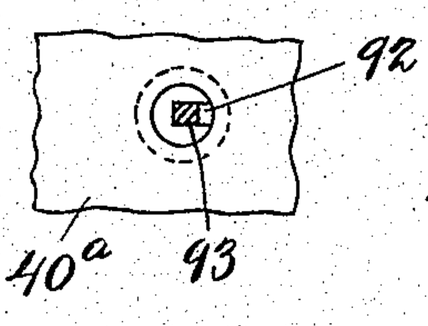


Fig. 17.

Fig. 21.

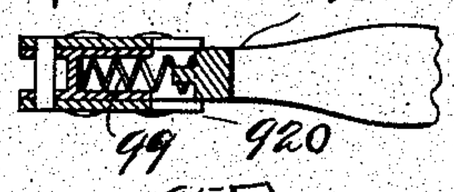


Fig. 18.

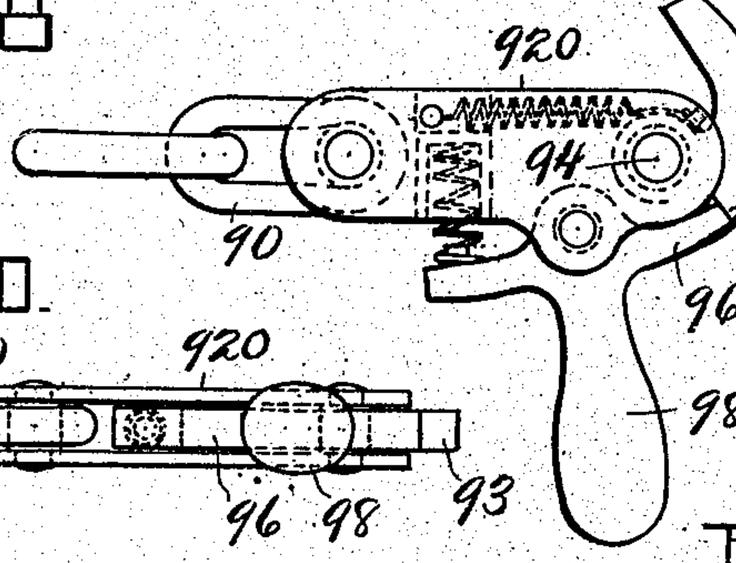


Fig. 19.

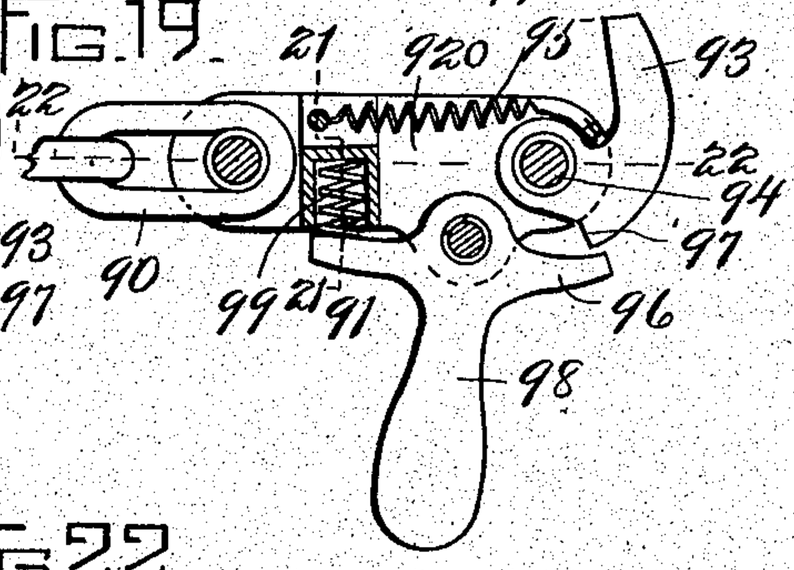
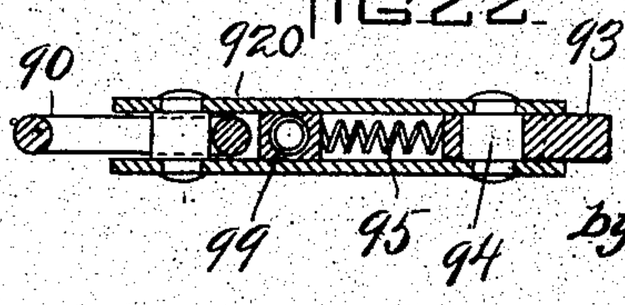


Fig. 20.

Fig. 22.



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No. 827,371. PATENTED JULY 31, 1906.

J. A. HORTON.

WIRE DRAWING MACHINE.

APPLICATION FILED JUNE 15, 1903.

8 SHEETS—SHEET 8.

FIG. 24.

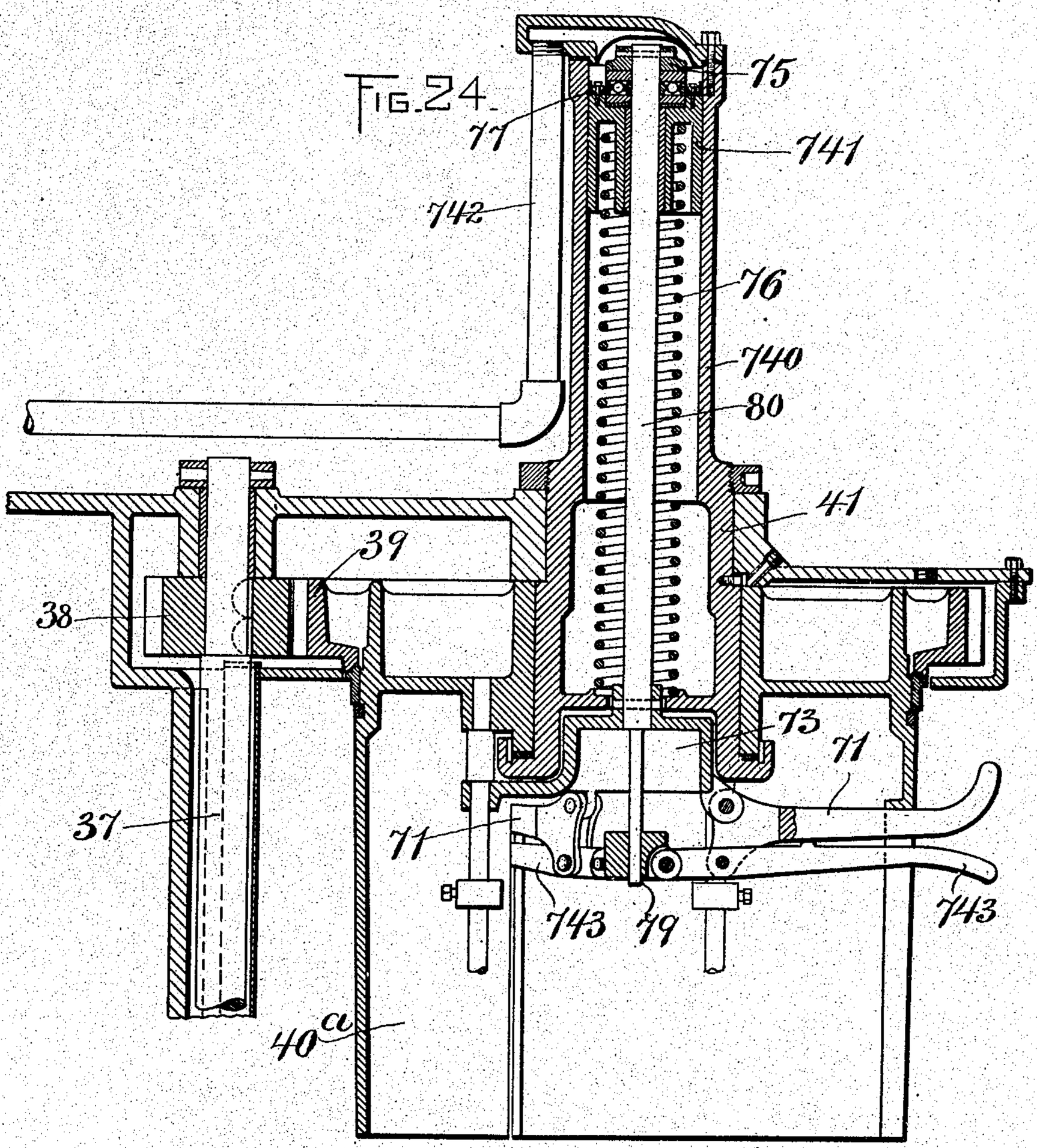
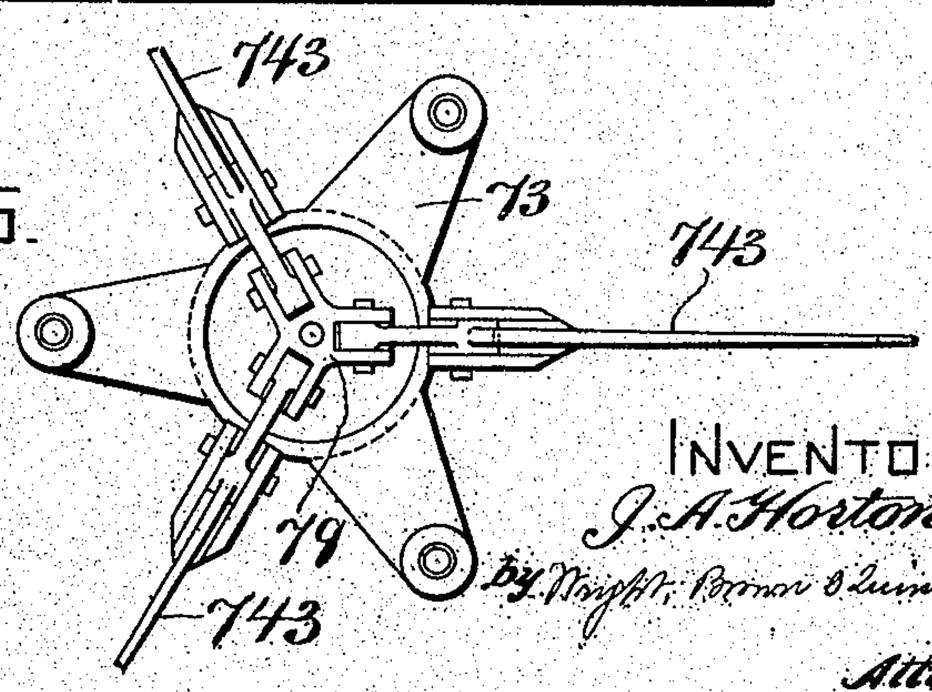


FIG. 25.



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UNITED STATES PATENT OFFICE.

JAMES A. HORTON, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO IROQUOIS MACHINE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

WIRE-DRAWING MACHINE.

No. 827,371. Specification of Letters Patent. Patented July 31, 1906.

Application filed June 15, 1903. Serial No. 161,566.

To all whom it may concern:

Be it known that I, JAMES A. HORTON, of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Wire-Drawing Machines, of which the following is a specification.

This invention relates to wire-drawing machines, and more particularly to those in which the wire or "rod" is handled in its initial stages while at a large diameter.

The principal objects of the invention are to increase the speed of performing the wire-drawing operation, to provide a machine which may be used either on the single-pass system or on the multiple-pass or series system, to provide for the ready removal of the coils of wire from the drum or drums, and to provide for stopping the machine when the wire runs out.

Other incidental objects and improvements in general construction are attained, as will be understood from the succeeding description and claims.

Of the accompanying drawings, Figure 1 represents a vertical section through the frame of a wire-drawing machine embodying my invention, the working parts being mainly shown in elevation. Fig. 2 represents a plan view. Figs. 3, 4, 5, and 6 represent sections on the correspondingly-numbered lines in Fig. 1. Fig. 7 represents a vertical section of one of the drum-driving shafts. Fig. 8 represents a section on line 8 8 of Fig. 1. Fig. 9 represents a vertical section through one of the drums. Fig. 10 represents a fragment of Fig. 9 with the coil-supporting means collapsed. Fig. 11 represents a reverse plan view of the coil-supporting arms. Fig. 12 represents a side elevation of one of the drums and a section of its die. Fig. 13 represents a horizontal section of said parts. Fig. 14 represents a detail horizontal section showing the wire-starting chain. Fig. 14^a represents a detail elevation showing the means for stowing the gripper end of the starting-chain. Fig. 15 represents a section of the wire-gripper on the end of the chain. Fig. 16 represents a horizontal section showing the means employed for starting the wire through the die when the machine is used continuously. Fig. 17 represents a side elevation of the drum, showing said means. Fig. 18 represents a plan view of the hook employed in said wire-starting means. Fig. 19 represents a horizontal section of said hook. Fig. 20 represents an edge view of said hook. Fig. 21 represents a section on line 21 21 of Fig. 19. Fig. 22 represents a section on line 22 22 of Fig. 19. Fig. 23 represents a section on line 23 23 of Fig. 16. Fig. 24 represents a vertical sectional view of a drawing-drum with modified coil-supporting means. Fig. 25 represents a reverse plan view of said means.

The same reference characters indicate the same parts in all the figures.

In the drawings, 30 is a frame journaling a horizontal main driving-shaft 31, which connects, through bevel-gears 32 33, with a central vertical shaft 34.

35^a 35^b 35^c 35^d are four vertical corner-shafts, each consisting of a lower section 36 and an upper section 37, having a pinion 38. The several pinions mesh with the teeth of gears 39 on the peripheries of four drawing-drums 40^a 40^b 40^c 40^d, which are hung on dead or non-rotating studs 41, Fig. 9, which depend from the four corners of the upper frame-plate 42. The lower shaft-sections 36 constantly rotate, and their motion is communicated to the alined upper sections 37 through four clutches 43, having upper sections 44, secured to the shaft-sections 37, and lower sections 45, splined to the shaft-sections 36, Fig. 7. The clutch members 45 are operated by levers 46, links 47, and hand-levers 48 and are weighted, so that gravity carries them out of engagement with the upper members 44 when there is no strain on the clutches. The clutch members are provided with saw-teeth, as shown, having vertical driving-faces and inclined backs. When the pull of the wire causes a resistance to the rotation of the drum, the lower members 45, having once been raised, will remain in engagement with the upper members 44, and the lower shaft-sections will drive the upper shaft-sections; but should the wire run out the lower clutch members will disengage by gravity.

A single small pinion 49, Figs. 1 and 4, on the central shaft 34 constantly drives four large gears 50 on the shafts 35^a 35^b 35^c 35^d, and these gears drive the last-said shafts through single-acting roller friction-clutches

51 when the said shafts are not rotated at a faster speed by the gearing placed lower down on the shaft and presently to be described.

In addition to the lowest speed imparted by the pinion 49 and gears 50 each of the shafts 35^b 35^c 35^d has two higher speeds, and the shaft 35^a has one higher speed. The central shaft 34 has a cone of four gears 52 53 54 55, Fig. 5, of graduated size fixed to it and engaging complemental gears 56 57 58 59 on the several lower shaft-sections 36, the last-said gears being connected to and disconnected from the said shaft-sections by friction-clutches 60, (shown in detail in Fig. 7,) the movable members of which are operated by arms 61, Fig. 1, and rock-shafts 62, which are oscillated by handles 63. Each of the shafts has a gear 59, meshing with the largest central gear 55, so that all of the corner-shafts have the same highest and lowest speeds. The handles 63 are removably mounted on the squared ends of the rock-shafts 62, and their hubs are passed through holes 64 in movable locking-plates 65, Fig. 1. Each locking-plate, except the one corresponding to shaft 35^a, has two of said holes and is recessed above and below the holes to permit the plate to slide and bring one or the other of the two holes into central relation with the upper and lower shafts 62. The holes are nearer together in the plate than the distance between the upper and lower shafts, so that the handles 63 can only be placed on one shaft of the pair at a time. This prevents the upper and lower friction-clutches 60 on the same shaft from both being engaged at the same time, to the damage of the machine.

It is evident that should any of the shafts 35^a, &c., be rotated at its slowest speed through pinion 49 and gear 50 it can be raised to a higher speed by throwing in one of the clutches 60. The gear 50 will continue to rotate, but will be released from the shaft-section 36 by the automatic action of the clutch 51, Fig. 4, which permits said shaft-section to rotate at a higher speed than the gear.

As indicated, the drums 40^a 40^b 40^c 40^d are inverted and tapered downwardly and unobstructed underneath. The coils of wire when finished are therefore removed from the drum by a downward movement. The gears 39 project beyond the largest diameter of the wire-receiving portion of each drum, so as to permit a small pinion 38, Fig. 9, to be employed and the size of the gearing underneath the frame-plate or table 66 to be reduced. The wire 67 passes to each drum through a die 68, Figs. 12 and 13, mounted in a holder 69, secured to the frame-plate 42.

Each drum 40^a, &c., has vertical slots 70 formed in it, through which normally project a series of coil-supporting hooked arms 71 71, pivoted at 72 72 to a hub or spider 73, Figs. 9 and 10, located partly within the hollow stud 41. Said spider is formed with a hollow stem or sleeve 74, having a collar 75 at its upper end, between which and a partition in the stud 41 is interposed a spring 76. Between the upper end of said spring and the collar 75 is an antifriction-bearing 77, which permits the spider 73 to rotate freely without rotating the spring. When the arms 71 are radially extended, as indicated in Fig. 9, they are so held by links 78, pivoted to said arms and to a central block 79 upon the lower end of a rod 80. In other words, said block 79 when in the position shown in Fig. 9 constitutes positive arm-locking means, which will hold the arms 71 radially extended through the medium of the links 78, and said block 79 is movable, as indicated by comparing Figs. 9 and 10, in a direction transverse of the direction of thrust of the links from the arms toward the block, so that when said block is moved from the position shown in Fig. 10 to the position shown by full lines in Fig. 9 the arms will be held in projected position. The several rods 80 receive movement from levers 81, having depending handles 82, said levers projecting through slots 83 in casings 84, which inclose the springs and adjacent parts. The stress of the springs 76 is such as to increase proportionately with the weight of the coils, so that the descent of each coil is proportional to the accretion at its upper end. Normally the arms are yieldingly supported adjacent to the initial drawing-surface of the drum, so that the base of the coil moves downwardly as its height and weight increase. A raising of the rod 80 through the sleeve 74 by manipulation of the handle 82 allows the arms 71 to collapse, as shown in Fig. 10, and permits the coil of wire to be removed from the drum.

Each drum is formed with an inclined groove 85, Fig. 12, in one end of which is secured a chain 86. To the free end of said chain is secured a gripper 87, adapted to engage the end of the wire projecting through the die. As the drum rotates the chain 86 wraps itself within the groove 85 and draws the end of the wire toward the base of the drum. The end of the wire reaches the periphery of the drum as the chain becomes completely sunk within its groove, and the wire then winds upon the drum, the operation of drawing out or starting the wire being therefore continuous with the operation of winding the wire upon the drum. The inclination of the groove 85 prevents the wire from dropping into the groove as it winds upon the drum. When the chain 86 is not in use, it may be held within its groove by a pin 88, Fig. 14^a, removably mounted in a hole 89, Fig. 14, and engaging the gripper 87.

The chains 86 on the drums are for use

when the drums are employed singly. The machine, however, is also adapted for drawing with the drums in series or by the continuous-pass method, in which the wire is led through a die, passed around the first drum, led through a second die, passed around a second drum, and so on. In this method it is evident that the wire after being drawn through the first die and taking one or more turns around the first drum must then be released from the first drum and threaded through the second die. The permanently-attached chain 86 is unsuitable for this operation, and in its stead I employ a detachable chain 90, Fig. 16, having a wire-gripper 87 at one end and a hook 91, whose end is inserted within a recess 92 in the surface of the drum. The hook is composed of a frame or body 920, having a head 93 pivoted thereto at 94. This head is normally held in projected or hooking position by a spring 95 and is so supported by a prop 96, residing behind a shoulder 97 on the head. Said prop has a handle 98 and is yieldingly projected into operative position by a spring 99. When it is time to release the hook 91 from the drawing-drum, the attendant may engage the handle 98 as the hook is carried past by the rotation of the drum, which allows the hook to collapse and unhook from the drum, thereby disconnecting the chain from the drum.

When any drum 40ª, &c., is to be employed singly, the attendant disconnects its clutch 43 by means of the lever 48 and connections, unwinds the chain 86 from its inclined groove, and attaches the gripper 87 on the end of said chain to the pointed end of the rod inserted through the opening in the die. He then starts the drum in rotation at its slowest speed by connecting the clutch 43. The chain 86 wraps itself in the groove 85 and draws the wire toward the periphery of the drum, as before described, and when the wire reaches the drum it begins to wind on the largest part of the drum, each convolution displacing the previously-wound convolution downwardly. The operation of starting the wire, as before mentioned, is continuous with the operation of winding the wire. After the wire has been started the speed of the drum may be raised by throwing in one of the clutches 60 on the driving-shaft of that drum, there being only one clutch 60 in operation at one time on said shaft. By providing a single-pass wire-block with speed-changing means I am enabled to attain a higher final speed of the wire than is possible when only a single speed is employed, for such single speed must in practice be so low as not to break the wire when the drum is started. As the coil on the drum increases in size and weight its lower end descends and carries with it the arms 71, compressing the spring 76. When the drum is full, the attendant lifts the handle 82, which, working through lever 81 and rod 80, collapses the wire-support formed by the arms 72, and the coil falls off of the drum onto a carrying reel or rack 100, placed below it on a table 101. By depression of the handle 82 the arms 71 are restored to their radial coil-supporting position, and the drum is ready for the next operation.

When the machine is used on the continuous-pass or series system, no changes are made in its construction, except that the dies are properly graded in size, and the chains 86 on the drums are confined in their grooves by the pins 88. It will be understood that wire of the size on which this machine is intended to operate cannot conveniently be grasped in the hands of the operator or manually passed by him around a drum, because of the stiffness of the wire and the heat caused therein by passing it through the die. I therefore employ the loose or detachable chain 90, with a hook on one end and gripper on the other, and employ the same to start the wire through one die and wrap it around the corresponding drum, then start it through the next die and wrap it around the corresponding drum, and so on, the drums for this purpose being preferably rotated at their lowest speed. The chain is left on each drum until the wire has been wrapped one or more turns around the drum and drawn out an additional length sufficient to reach through the next die. After the wire is all strung on the machine the successive drums are increased in speed by the described speed-changing mechanism and are given speeds which correspond as nearly as possible to the successive elongations which the wire experiences in the dies. To prevent abrasion between the wire and the surfaces of the intermediate drums when the machine is used continuously, I may equip said drums with circumferential slipping shoes, as described in my copending application, Serial No. 132,072, filed November 20, 1902.

In Figs. 24 and 25 I have represented a modified form of coil-supporting means including in its construction a tubular extension 740 of the drum-supporting stud 41, the upper part of which constitutes a dash-pot, in which operates a piston 741, attached to the upper end of the rod 80, the interior of said dash-pot being filled with a suitable fluid, which enters and leaves by a pipe 742. This device retards the rise of the coil-supporting means connected with rod 80 when the arms 71 have collapsed and released the coil. In this instance the links connecting block 79 with the arms 71 are continued underneath said arms in the form of projecting levers or handles 743, the depression of whose outer ends when a coil is on the arms 71 raises the rod 80 with respect to the spider 73 and allows the arms to collapse.

By the employment of a series of drums—

two gearings for driving one drum of the series either at a low speed and at a higher speed, three gearings for driving the next drum of the series at a low speed and at two higher speeds, and one-way-acting clutches to connect the low-speed gearings to the drums—I am enabled to operate either drum independently of the others or to operate any two or more as units or members of a series, which may include all the drums of the series or any lesser number.

It will be understood that this invention is not limited to the precise construction herein shown.

The part hereinbefore termed a "wire-drawing drum" is also known as a "wire-block" and is so denominated in some of the following claims.

I claim—

1. In a wire-machine, a die, a drawing-drum having an unobstructed periphery, its discharge end being lowermost, a coil-supporting withdrawable arm projecting beyond the periphery of said drum, and positive arm-locking means movable transversely of the direction of thrust from said arm for holding the latter in projected position.

2. In a wire-machine, a die, a drawing-drum having an unobstructed periphery, its discharge end being lowermost, pivotal arms projecting beyond the periphery of said drum for supporting the coil, and toggle-links connected with said arms and movable into and out of positive arm-locking position.

3. In a wire-machine, a wire-drawing drum rotated on an upright axis and having vertically-movable coil-supporting means projecting from the periphery of the drum, and provisions for automatically increasing the sustaining power of said means with its descent under the increasing weight of the coil, said supporting means being yieldingly supported adjacent to the initial drawing-surface, so that the base of the coil gradually moves downward as its height increases.

4. In a wire-machine, a drum having its discharge end lowermost, coil-supporting means yieldingly supported within the drum adjacent to its initial drawing-surface and depressible by the weight of the coil, a spring exerting an increasing sustaining power on said means, and mechanism for simultaneously moving said means to and from their coil-supporting position.

5. In a wire-machine, a drum having its discharge end lowermost, collapsible coil-supporting means depressible axially of the drum in parallelism with itself to accommodate a growing coil, and mechanism to simultaneously project and retract said means.

6. In a wire-machine, a drum, a one-way-acting clutch to rotate the same, having driving and driven parts automatically engaging by the rotation of said driving part, means to rotate said driving part, and disengageable driving means arranged to drive said drum faster than the speed imparted by said driving part and in the same direction.

7. In a wire-drawing machine, a drum, two gearings for driving said drum respectively at a low speed and at a higher speed, a second drum, three gearings for driving the latter at a low speed and at two higher speeds, and one-way-acting clutches to connect the low-speed gearings to the drums.

8. In a wire-drawing machine, a wire-winding drum, mechanisms for rotating said drum at a plurality of different speeds, clutches to connect said mechanisms to the drum, operating devices therefor, and a locking device having provisions for unlocking any one and locking the others of said operating devices.

9. In a wire-drawing machine, a wire-winding drum, clutches for alternately driving the same, a plurality of rock-shafts for operating said clutches, a handle to rock said shafts, and a movable locking-plate embracing the shafts and having apertures arranged to permit the coupling of said handle with one of the shafts and prevent coupling of said handle with the other shaft.

10. In a wire-machine, a drum, having a diagonal peripheral recess and a wire-gripper movable without and within said recess.

11. In a wire-machine, a drum having a diagonal recess in that portion of its periphery overlaid by the wire coil, and a flexible tractor in said recess withdrawable entirely within the recess and within the line of the periphery of the drum and having one end fixed to the drum.

12. In a wire-drawing machine, a wire-winding drum formed with a peripheral recess, a flexible tractor fixed by one end in said groove, and an automatic latch-pin for retaining the free end of the tractor in the groove.

13. In a wire-drawing machine, a plurality of wire-winding drums having coupling members, means for rotating said drums at different relative speeds, and a flexible tractor interchangeable on the several drums, and having a coupling member to engage those on the drums.

14. In a wire-drawing machine, a wire-winding drum having a coupling member, and a flexible tractor having a collapsible hook for engaging said member and thereby attaching the tractor to said drum.

15. In a wire-drawing machine, a wire-winding drum having a coupling member, and a flexible tractor therefor having a pivoted hook-head, and a pivoted prop for holding said head in hooking position and having a projection whereby is may be swung to release said hook-head.

16. In a wire-drawing machine, a wire-winding drum, coil-supporting means for said drum vertically movable with respect

thereto, yieldable means for returning said coil-supporting means to its upper position, and a buffer device for retarding the return of said means to said upper position after the release of the coil.

17. In a wire-drawing machine, a wire-winding drum rotatable on an upright axis, collapsible coil-supporting means therefor, resilient means resisting the depression of said coil-supporting means, and a dash-pot retarding the ascent of said coil-supporting means.

In testimony whereof, I have affixed my signature in presence of two witnesses.

JAMES A. HORTON.

Witnesses:
R. M. PIERSON,
A. C. RATIGAN.