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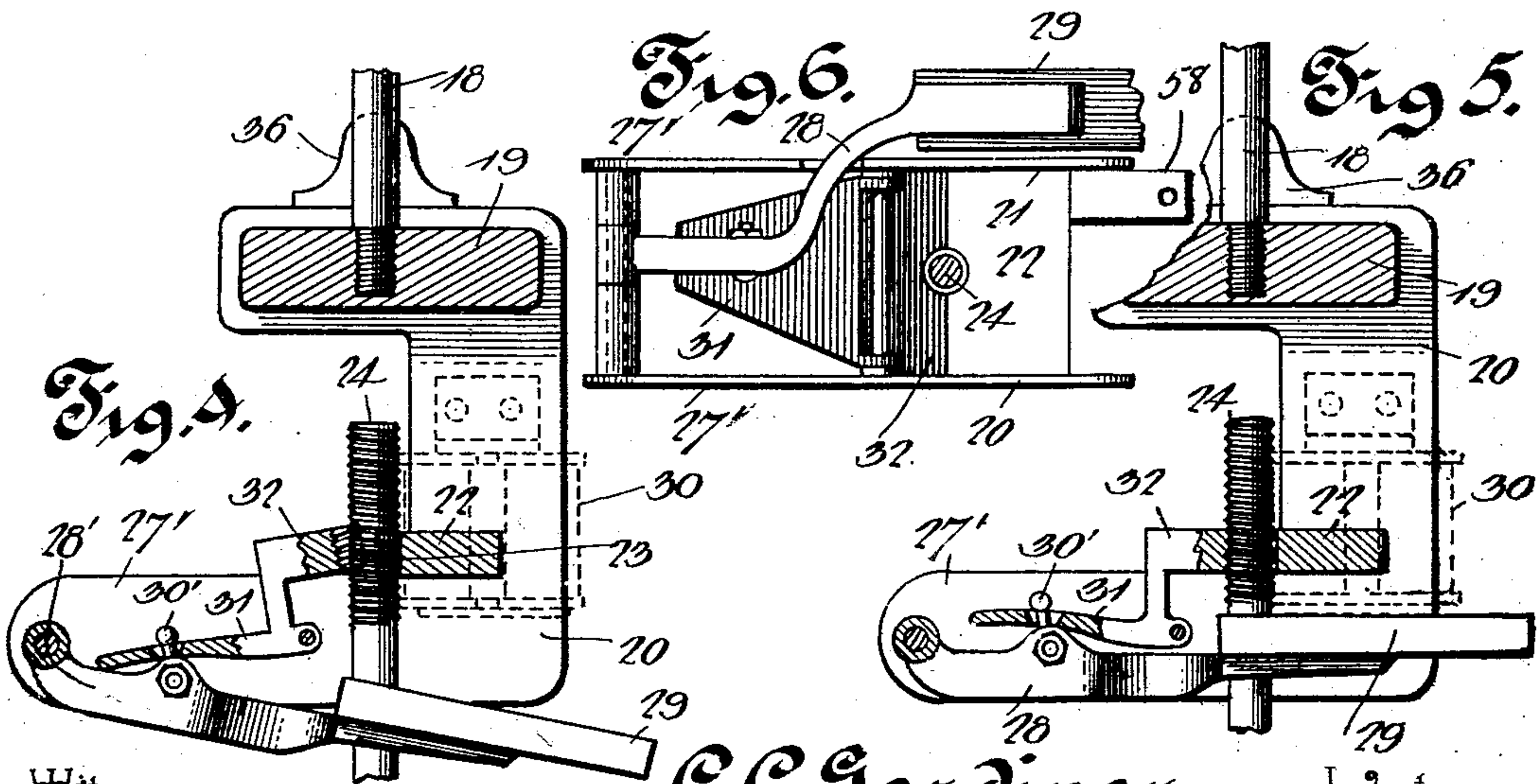
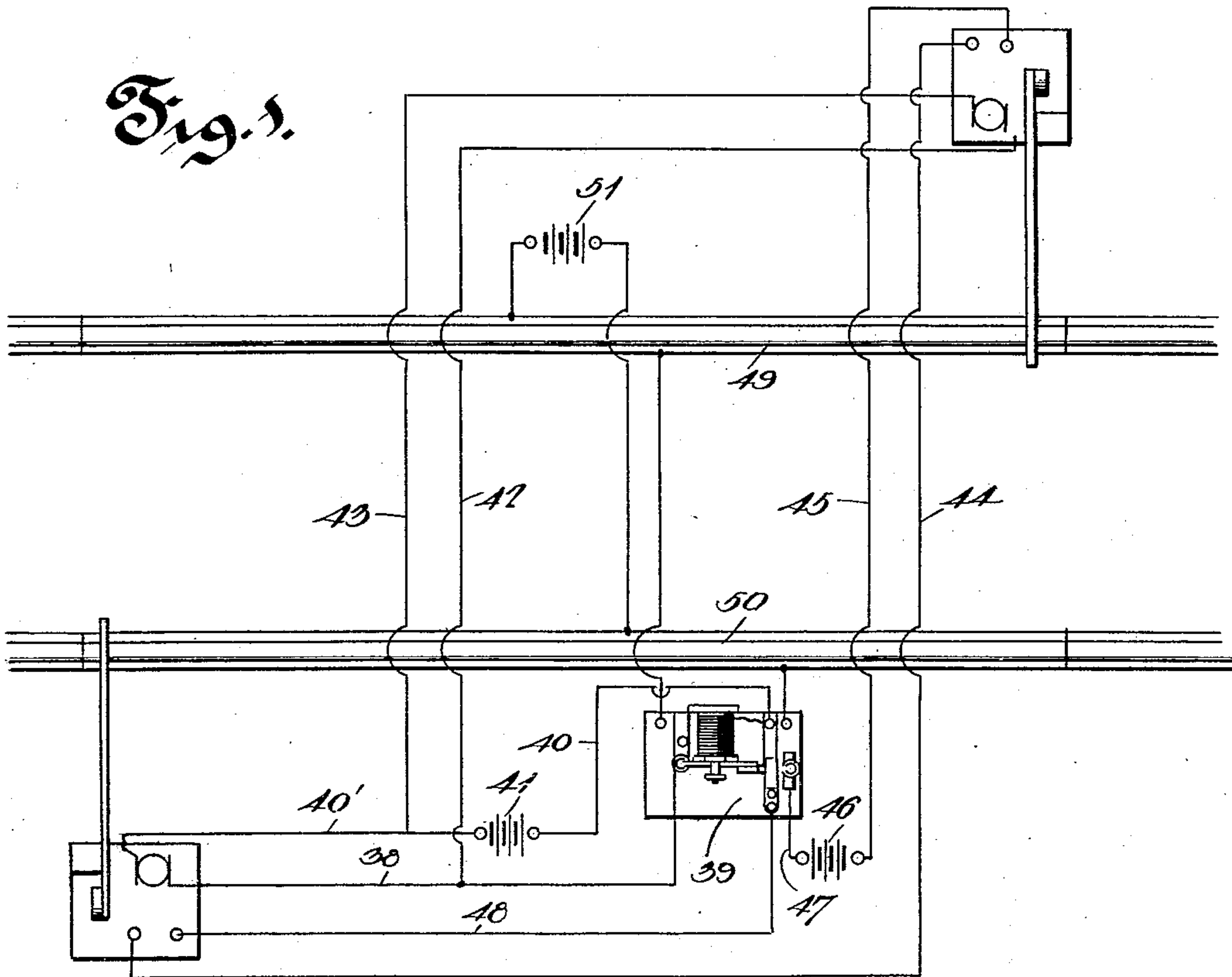
Patented Nov. 5, 1901.

C. C. GARDINER.  
SEMAPHORE OPERATING MECHANISM.

(Application filed Apr. 13, 1901.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses

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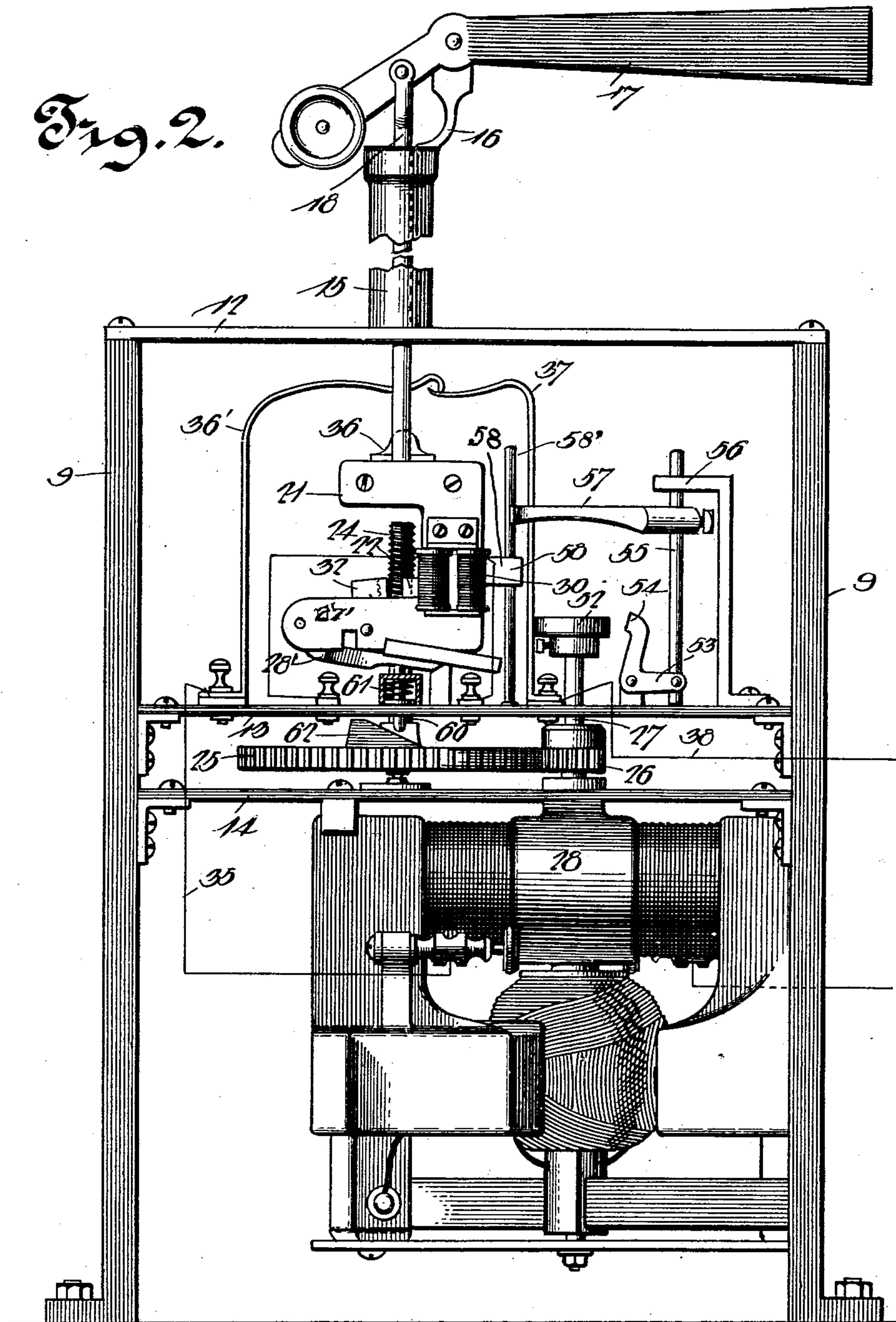
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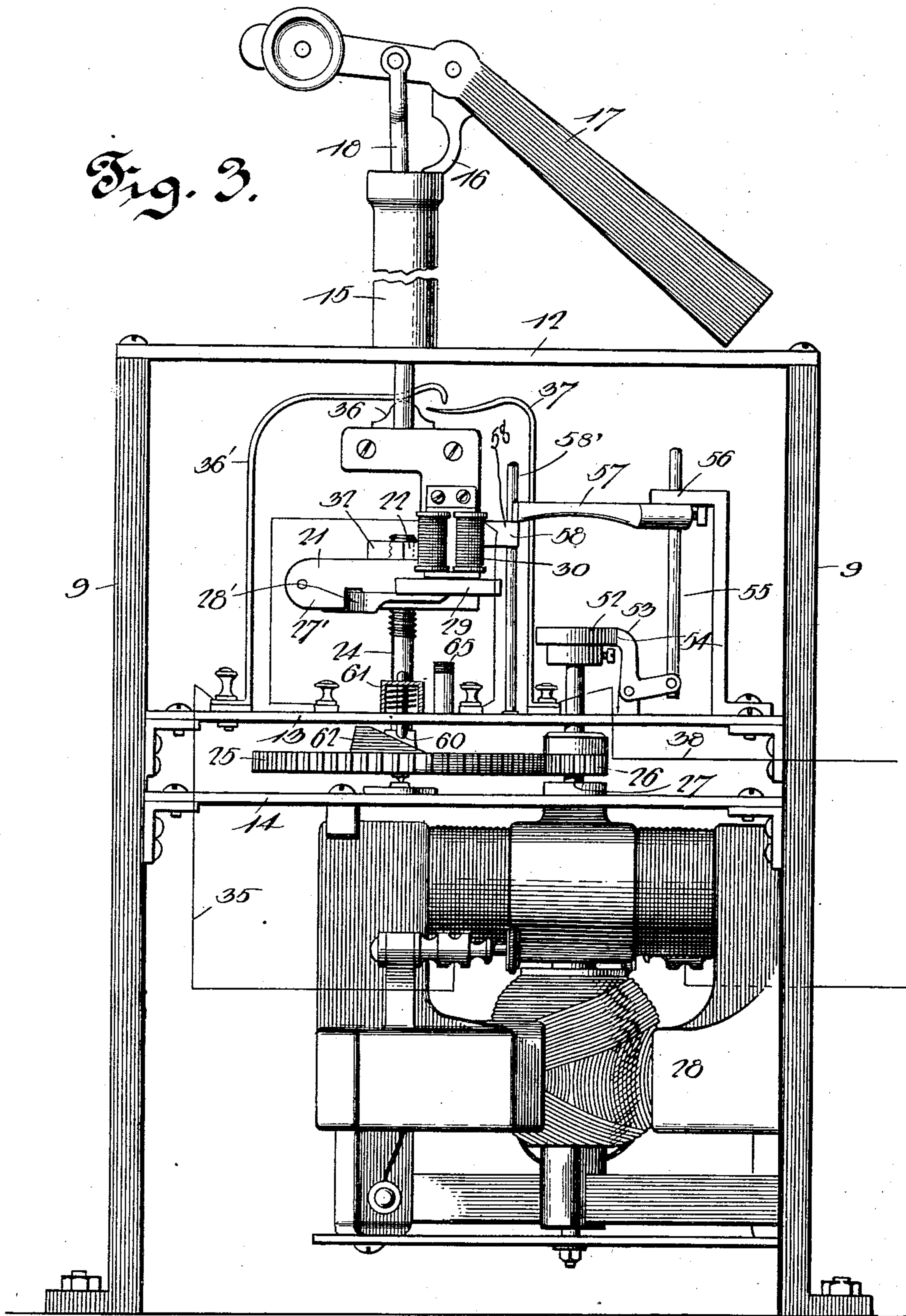
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Fig. 3.



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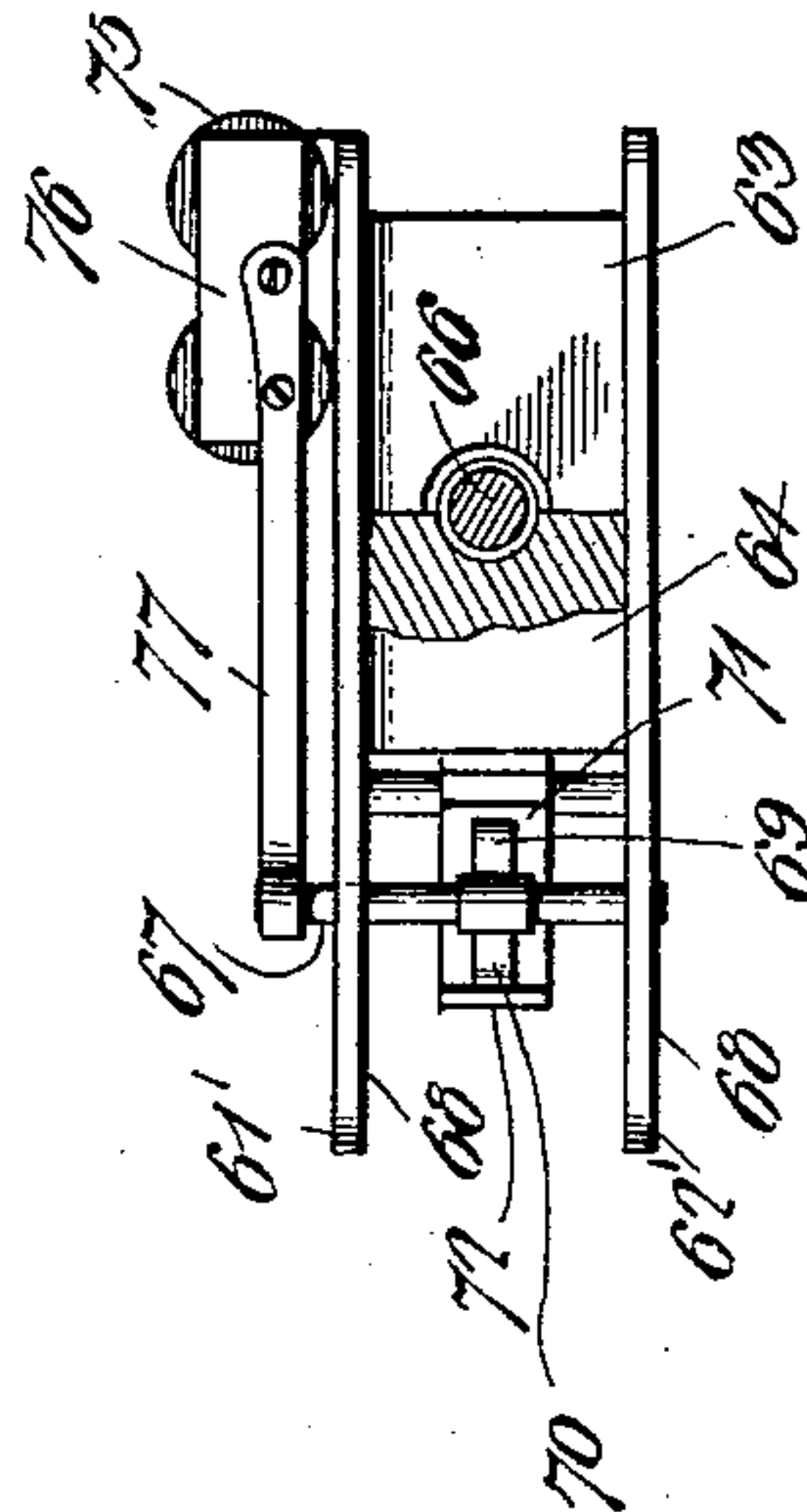
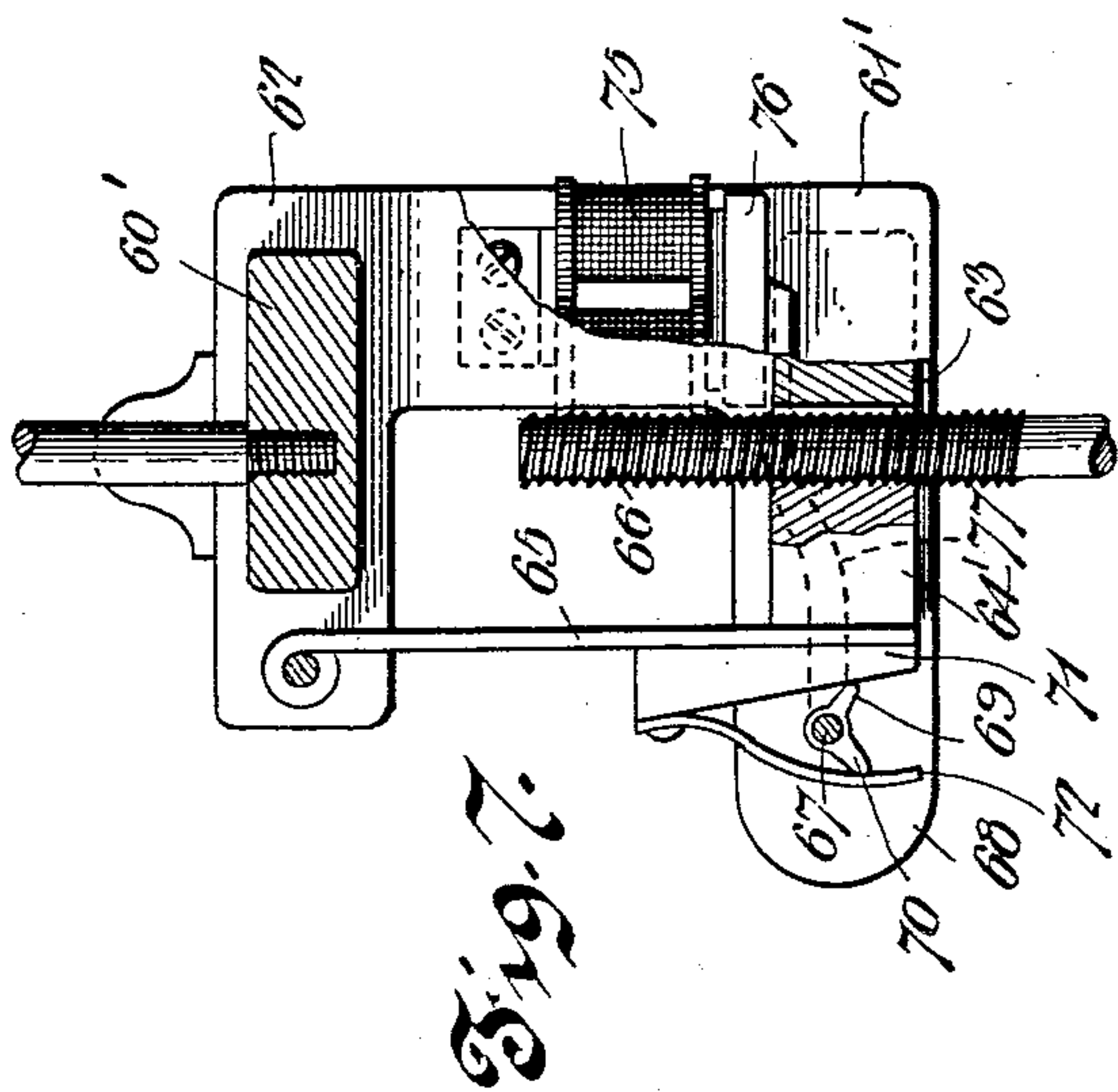
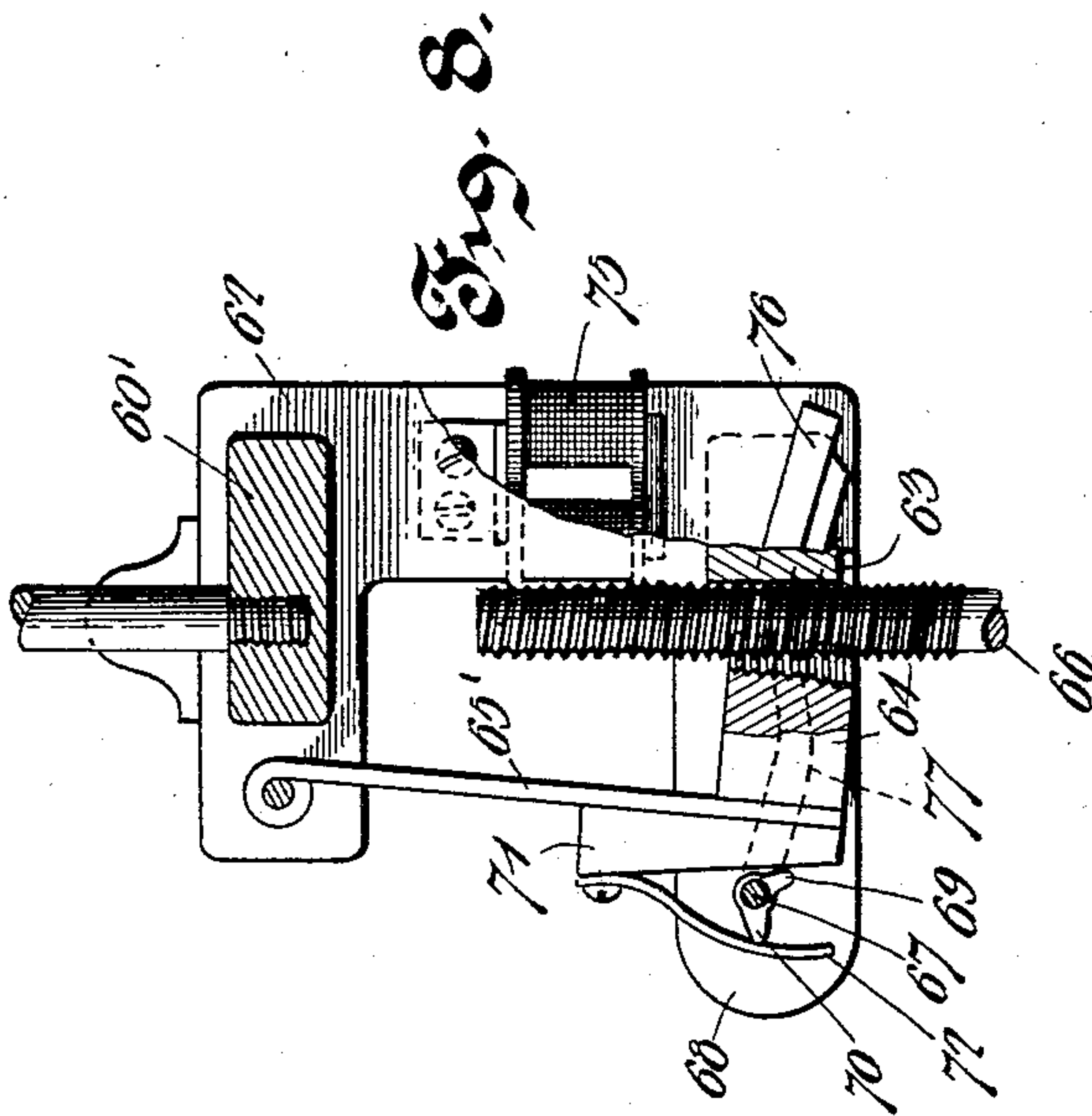
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4 Sheets—Sheet 4.



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# UNITED STATES PATENT OFFICE.

CHARLES C. GARDINER, OF TOPEKA, KANSAS.

## SEMAPHORE-OPERATING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 685,754, dated November 5, 1901.

Application filed April 13, 1901. Serial No. 55,726. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES C. GARDINER, a citizen of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented a new and useful Semaphore-Operating Mechanism, of which the following is a specification.

This invention relates to semaphore-operating mechanisms; and it has for its object to provide a construction for use in connection with a block-signal system, and which construction will be operated to set the signal at "danger" when the track is obstructed or should the mechanism become out of order at any stage of its operation or while in the safe position. In mechanisms of this nature it is highly important that the signal indicate the condition of the apparatus as well as the state of the track, and in the present construction if the circuit that operates and holds the locking mechanism active be broken, or if the relay-circuit be broken, or either battery runs down, then the semaphore will swing to the danger position.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a diagrammatic view showing a block system in which the apparatus is designed to be used. Fig. 2 is a side elevation of the mechanism for lowering the semaphore to the safe position and for releasing it to permit it to rise to the danger position. Fig. 3 is a view similar to Fig. 2 and showing the semaphore in an opposite or safe position. Fig. 4 is a sectional elevation taken vertically through the follower and showing the movable nut-section in disengaged position. Fig. 5 is a view similar to Fig. 4 and showing the movable nut-section in engaged position. Fig. 6 is a bottom plan view of a portion of the follower. Fig. 7 is a view similar to Fig. 5 and showing a modification. Fig. 8 is a view similar to Fig. 7 and showing the parts released. Fig. 9 is a section on line 9 9 of Fig. 7.

Referring now to the drawings, the mechanism is inclosed in a casing and is directly supported in a frame including uprights 9, connected at their tops by a top plate 12, and below this plate are additional transverse plates 13 and 14. Upon the top plate 12 is

disposed a tubular semaphore-post 15, having a laterally-extending bracket 16 at its upper end, and to this bracket is pivoted the semaphore 17, with which is connected the rod 18, extending down through the post and connected at its lower end with the follower, which is actuated to lower the semaphore to safe position. The follower consists of a block 19, to which are secured side plates 20 and 21, and between these side plates and at the lower ends thereof is fixed a metal block 22, having an arcuate recess 23 in one edge, in which lies a shaft 24, journaled at its lower end in bearings in the plates 13 and 14, the upper portion lying in the recess, being threaded, as shown, and on the shaft and between the plates 13 and 14 is fixed a gear-heel 25, meshing with a pinion 26 on the shaft 27 of a motor 28, which is supported below the plate 14 in any suitable manner.

The plates 20 and 21 have laterally-projecting feet 27' at their lower ends, which project beyond the recessed edge of the block 19, and between the ends of these feet is pivoted a lever 28', which extends in the direction of the block and is then bent to lie beyond the plate 21, where it is provided with an armature 29 in the field of an electromagnet 30, which is mounted upon the side of the plate 21. The lever 28' carries a post 30', which is engaged with a perforation in one end of an angular rock-lever 31, which is pivoted between the plates 20 and 21, so that when the lever 28' is raised and lowered the rock-lever will be operated, and at the upper end of this rock-lever is fixed a nut-section 32, which when the rock-shaft is rocked is moved into and out of position to engage the threads of its recess 33 with the threads of the shaft 24, the engaging movement of the nut-section being secured by attraction of the armature 29 to the electromagnet 30 when the latter is energized, and thus the energization of the magnet accomplishes the engagement of the nut-section and the threaded shaft. If the shaft be then rotated by energization of the motor, the nut-section, and therewith the follower, will be raised to lower the semaphore-arm, the arrangement of the rock-lever and the nut-section thereon being such that if after the follower is raised the circuit of the magnet 30 be broken the lever 28' in dropping will move the



rock-lever to draw the nut-section from the shaft, so that the follower, being no longer supported, will drop and the semaphore-arm will be raised. To limit the downward movement of the lever 28', the rock-lever is continued beyond the point of connection of the post 30' thereto, so that as lever 28' drops this rear end of the rock-lever also drops until it rests upon the top of lever 28' and prevents further downward movement thereof, the post having a head, as shown, to prevent slipping through the perforation in the lever 28', and it is from this head that the lever 28' is supported and stopped. When the nut-section has been engaged with the shaft and the motor has been energized to raise the follower to the proper height to lower the semaphore-arm to safe position, it is of course necessary to then break the circuit of the motor, but in such manner that when the follower is dropped the circuit will be again closed at this point. For this purpose the circuit-wire 35 from one terminal of the motor is connected with the binding-post at the base of a contact-finger 36', which extends upwardly and over the insulating-block 36 on the follower, and its free end is above the end of a second contact-finger 37, from the base of which leads a line-wire 38, which leads to one point of a relay 39, a cooperating point of said relay being connected by wire 40 with a motor-battery 41, and the opposite terminal of this motor-battery is connected by wire 40' with the second terminal of the motor. The contact-fingers 36' and 37 lie normally in engagement, and when the follower rises to engage the finger 36' with the block 36 finger 36' is raised from finger 37 and the motor-circuit is broken and is held open so long as the follower is in raised position. When the follower is dropped by disengagement of the feeding nut-section from engagement with the screw-shaft, the finger 36' is lowered to resume contact with the finger 37.

In Fig. 1 there are shown two signal mechanisms, located at opposite ends of a block, and the circuits of their motors and electromagnets are controlled by a track-relay 39, above referred to. The motors of the two mechanisms are connected in multiple with the motor-battery through two points of the relay, this multiple connection being made by connecting the line-wires 42 and 43 with wires 38 and 40'. The two electromagnets of the mechanisms are connected in series by a line-wire 44, connecting corresponding terminals of both magnets direct, a wire 45 leading from the second terminal of one magnet direct to the battery 46, a wire 47 leading from said battery to a point of the relay 39, and a wire 48 leading from a different point of the relay, the second terminal of the other magnet. The winding of the relay is connected direct to the track-rails 49 and 50 of the block to be protected, and with these rails are also connected the terminals of a

relay-battery 51, so that when a train comes onto the block the relay-battery is short-circuited and the relay is deenergized to permit its arms to move and break the circuits of the motors and electromagnets of the semaphore-operating mechanisms.

In order to stop the motor quickly after the circuit thereof has been broken by separation of arms 36' and 37, the upper end of the motor-shaft, which extends through and above plate 13, is provided with a brake-drum 52, and in operative relation thereto is a rocker 53, having a brake-shoe 54 for engagement with the brake-drum. A rod 55 is pivoted to the end of the rocker 53, and its upper end is slidably disposed in a guide-arm 56, mounted upon plate 13, and on this rod is fixed a finger 57, which lies in the path of movement of a finger 58 on the follower, so that when the follower has reached a point near to the upper limit of its movement the finger 58 strikes the finger 57 and by raising it operates the rocker to engage the brake-shoe with the brake-drum to stop the motor, the engagement of the shoe being after the motor-circuit has been broken by separation of the fingers 36' and 37.

The operation of the mechanism is as follows: Normally the follower is in raised position, the semaphore-arm being lowered, the fingers 36' and 37 being out of contact and the movable nut-section in engagement with the screw-shaft. The track-relay is closed, and both the motor and magnet circuit are closed at the relay. A train then entering the block short-circuits the relay-battery through the wheels and axles of the cars, and the relay is deenergized to break the circuits of both the motors and magnets at the relay. The magnets being deenergized their armatures are released, and in dropping they move the movable nut-sections from the feed-shafts, and the followers are permitted to drop and raise the semaphores. When the train passes from the block the short-circuit of the relay-battery is removed, and the relay being then energized the circuits of the motors and magnets are closed at the relay and the armatures of the magnets are raised to engage the feed nut-sections with the feed or screw shafts, as hereinafter described. The feed-shaft being then in motion from the motor the follower is raised to lower the semaphore, and its upward motion is continued until the finger 36' is moved from finger 37 to break the motor-circuit, the brake being operated at the same time, as above described.

In order that the electromagnet of the mechanism may not be compelled to lift the dead weight of its armature, a pin 60 is mounted in a boxing 61, upon the plate 13, directly beneath the armature and with its lower end in the path of a lug or cam 62 upon the gear on the feed-shaft, and when the motor and magnet are both energized this gear-wheel is ro-



tated and its cam engages the pin and moves it upwardly to raise the armature against the magnet, and thus the magnet is called upon only to hold the armature raised, this requiring little energy and insuring positive upward movement of the armature and engagement of the feed-nut with the feed-shaft.

To absorb the jar when the follower drops, a rubber stop 65 is mounted upon the plate 13 to be struck by and to support the follower. While the lug or cam 62 acts to raise the armature into the field of force of the electromagnet, it also acts to move the nut-section so that it engages the screw-shaft just at the proper time to mesh its threads with those of the shaft. Also it will be noted that the finger 58 of the follower is slidably engaged with a guide-rod 58' upon the plate 13, and which latter, through the medium of the finger, holds the follower against vibration such as would displace it from operative position.

In Figs. 7, 8, and 9 of the drawings there is shown a modification wherein the follower consists of the block 60', having the plates 61' and 62' attached to the ends thereof and arranged parallel, and between the lower ends of these plates is the fixed nut-section 63, having the threads stripped therefrom. The movable nut-section 64 is attached to the end of a hanger 65', which is pivoted at its upper end between the plates 61' and 62', so that the nut-section may be swung into and out of engagement with the screw-shaft 66. To move the nut-section 64 into and out of engagement with the screw-shaft, a rock-shaft 67 is mounted in the forwardly-projecting feet 68 of the plates and carries a cam including the two fingers 69 and 70, of which the former is adapted to bear against the wedge 71 on the outer face of the hanger, while the finger 70 is adapted to bear against the inner face of the spring finger or plate 72, attached to the upper portion of the wedge. Thus as the shaft is rocked in one direction finger 69 moves up the wedge and forces the movable nut-section into engagement with the screw-shaft, and when the shaft is rocked in an opposite direction the finger 70 bears against the spring-plate and moves it to move the hanger and carry the movable nut-section from engagement with the screw-shaft. To operate the rock-shaft and to hold it with the movable nut-section in engagement with the screw-shaft, the electromagnet 75 is provided and is mounted upon the side of the hanger, said magnet having an armature 76, carried by a lever 77, attached to the shaft, so that when the magnet is energized the armature will be attracted and held with the nut-section engaged. In practice this form of follower may be substituted for that above described, and the armature will be raised to rock the shaft and engage the nut with the screw-shaft by action of the pin moved upwardly by the lug.

In practice modifications of the specific

construction shown may be made, and any suitable material and proportions may be used for the various parts without departing from the spirit of the invention.

What is claimed is—

1. In a semaphore-operating mechanism, the combination with a semaphore and a feed-screw having means for rotating it, of a follower connected with the semaphore for raising and lowering it, a pivoted feed-nut upon the follower for movement into and out of engagement with the feed-screw, a lever disposed for movement of the feed-nut into and out of engagement with the feed-screw, an armature carried by the lever, and an electromagnet carried by the follower and movable therewith in the field of which electromagnet the armature is disposed for movement by the magnet to engage the feed-nut with the screw.

2. The combination with a semaphore, of a feed-screw having means for rotating it, a follower connected with the semaphore, a rock-lever pivoted upon the follower, a feed-nut carried by the rock-lever for movement thereby into and out of engagement with the feed-screw, a lever pivoted to the follower and connected with the rock-lever to rock it, an armature upon the lever, and an electromagnet in operative relation to the lever to move it and engage the feed-nut with the screw.

3. The combination with a semaphore, of a feed-screw having means for rotating it, a follower connected with the semaphore, a rock-lever pivoted to the follower and carrying a feed-nut for movement into and out of engagement with the screw when the rock-lever is rocked, a lever pivoted to the follower and connected with the rock-lever at a point beyond its pivot from the feed-nut, to move the nut from the screw when said lever is moved in one direction, and the end of the rock-lever extending beyond its point of connection with the second lever to rest thereagainst to limit such movement of the second lever, an armature carried by the second lever, and an electromagnet in the field of which the armature is disposed for movement thereby and to hold it with the nut in engagement with the feed-screw.

4. The combination with a semaphore, of a screw-shaft, a follower connected with the semaphore, a block carried by the follower and having a smooth recess in which the screw is received, a rocker pivoted to the follower, a feed-nut carried by the rocker for movement into engagement with the screw at the opposite side from the block, said rocker extending rearwardly from the nut beyond its pivot, a lever pivoted to the follower and having an armature, connections between the lever and the arm of the rocker, said arm extending beyond its point of connection with the lever to rest thereon and limit the movement of the rocker and lever, and an electromagnet disposed upon the follower and in co-



operative relation to the armature for moving and holding it with the nut in engagement with the screw.

5 The combination with a semaphore, of a follower connected therewith, a motor, means for operatively connecting the follower with the motor to move the follower, an energizing-circuit for the motor, and contact-arms included in said circuit, said arms lying one  
10 above the other and the upper arm lying in the path of movement of the follower for movement thereby from the lower arm to break the motor-circuit.

6. The combination with a semaphore, of a  
15 follower having a feed-nut, a screw feed-shaft, a motor operatively connected with the feed-shaft to rotate it, electromechanical means carried by the follower for engaging the nut with the shaft, contact-fingers in circuit with the motor and disposed for movement of one from the other when engaged by  
20 the follower, to break the motor-circuit, a

brake-drum carried by the motor-shaft, a rocker having a shoe for engagement with the drum, an arm connected with the rocker for  
25 operating it, and an arm upon the follower for engagement with the first-named arm to operate the rocker to apply the brake.

7. The combination with a semaphore, of a feed-screw having means for rotating it, a fol-  
30 lower connected with the semaphore, a clutch for engaging the follower with the feed-screw for movement thereby, means operably connected with the feed-screw for initially engaging the clutch, and electromechanical  
35 means for holding the clutch engaged.

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

CHARLES C. GARDINER.

Witnesses:

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