E. G. TREMAINE.

RELAY MECHANISM.

APPLICATION FILED DEC. 13, 1905.

966,624.

Patented Aug. 9, 1910.

5 SHEETS—SHEET 1.

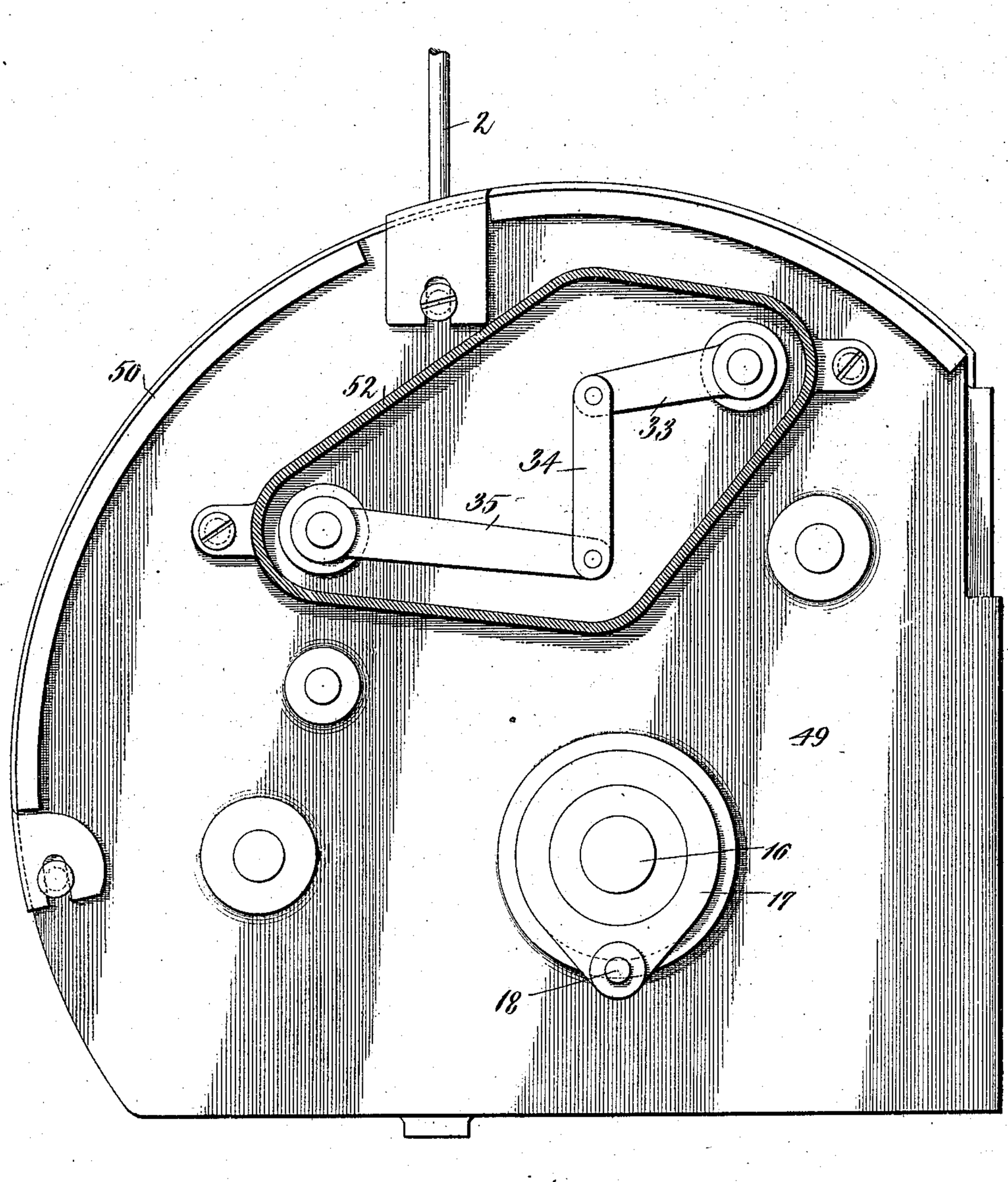

Fig. 1.

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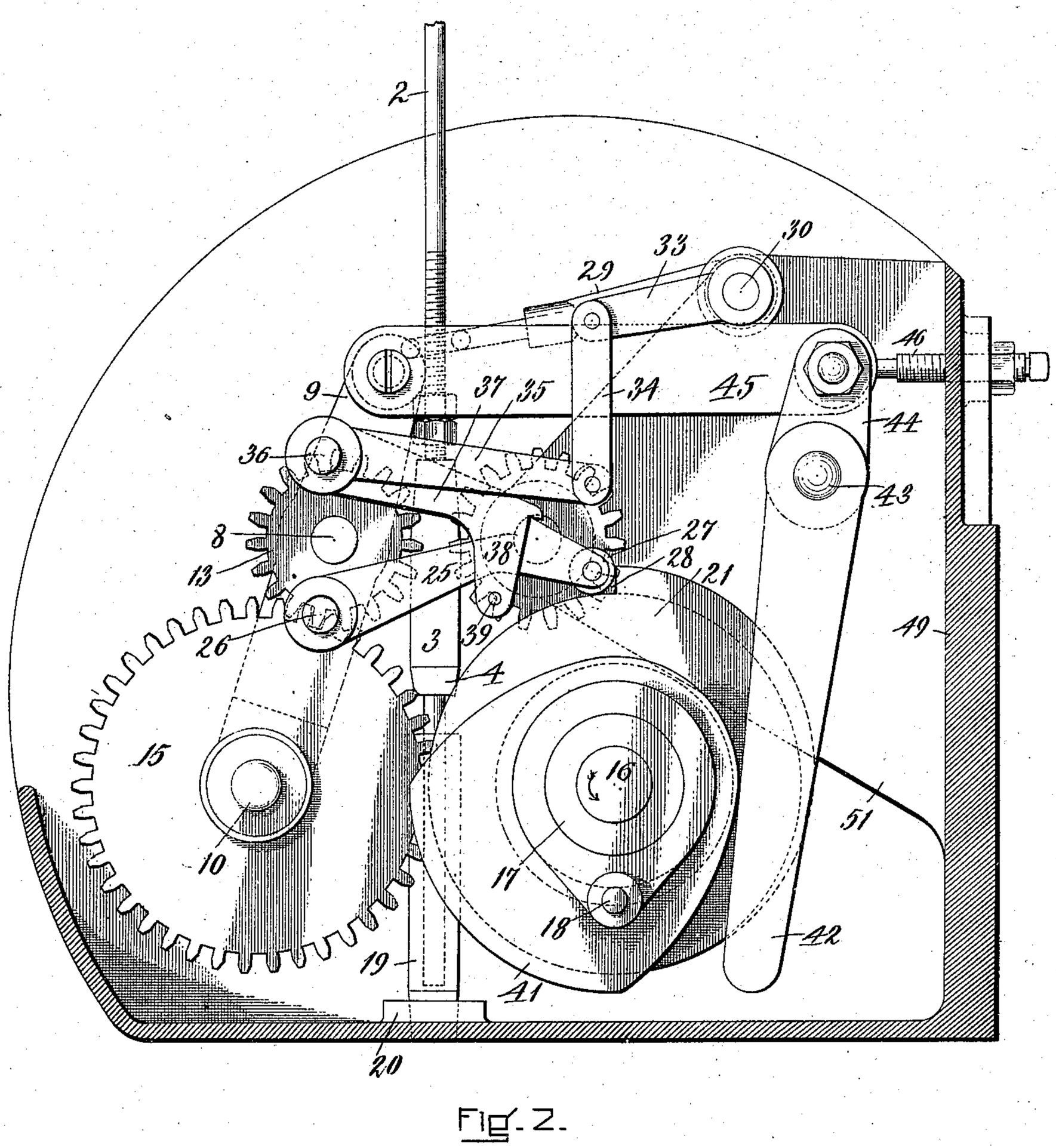

Fig. 2.

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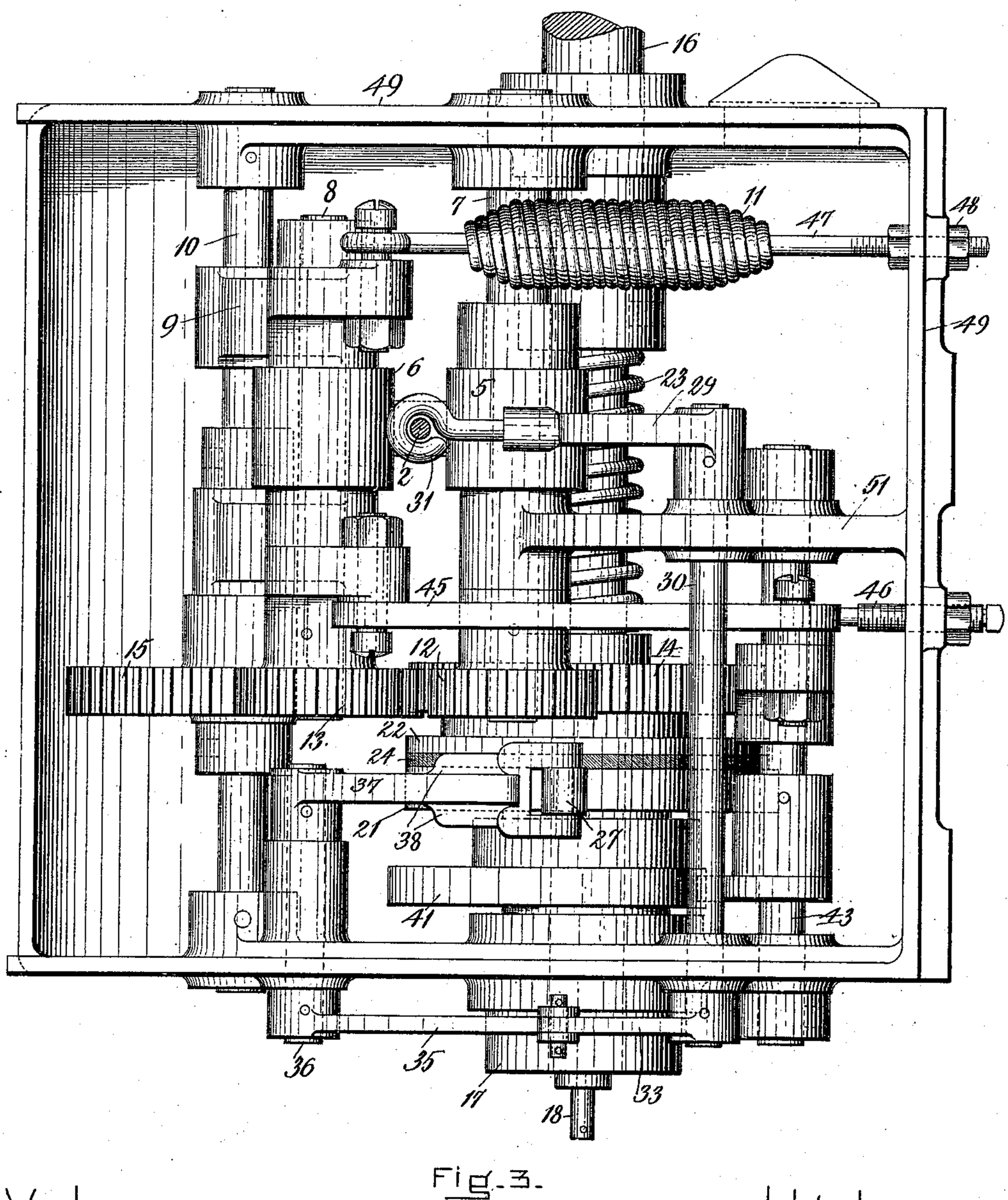

Fig. 3.

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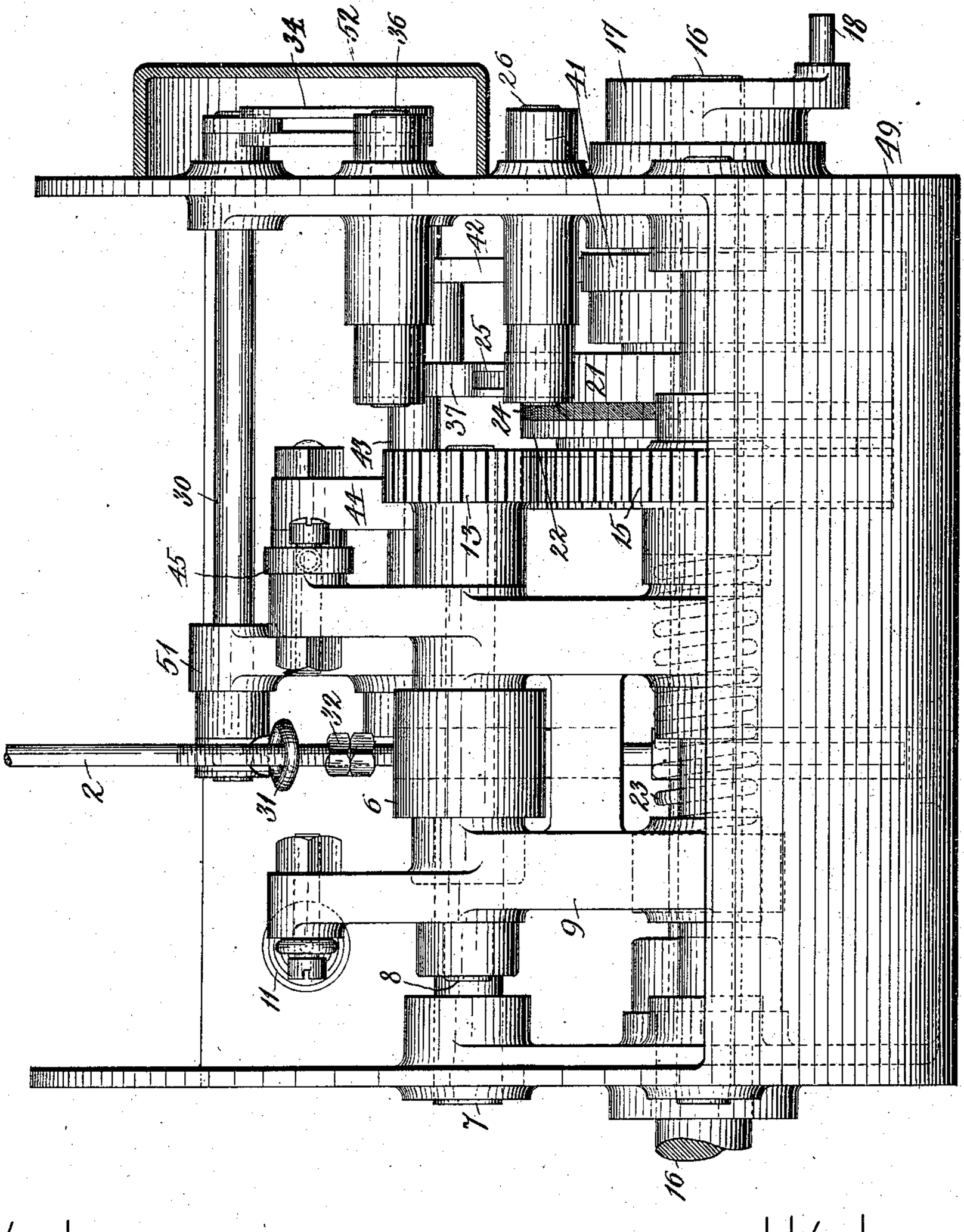

Fig. 4.

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5 SHEETS—SHEET 5.

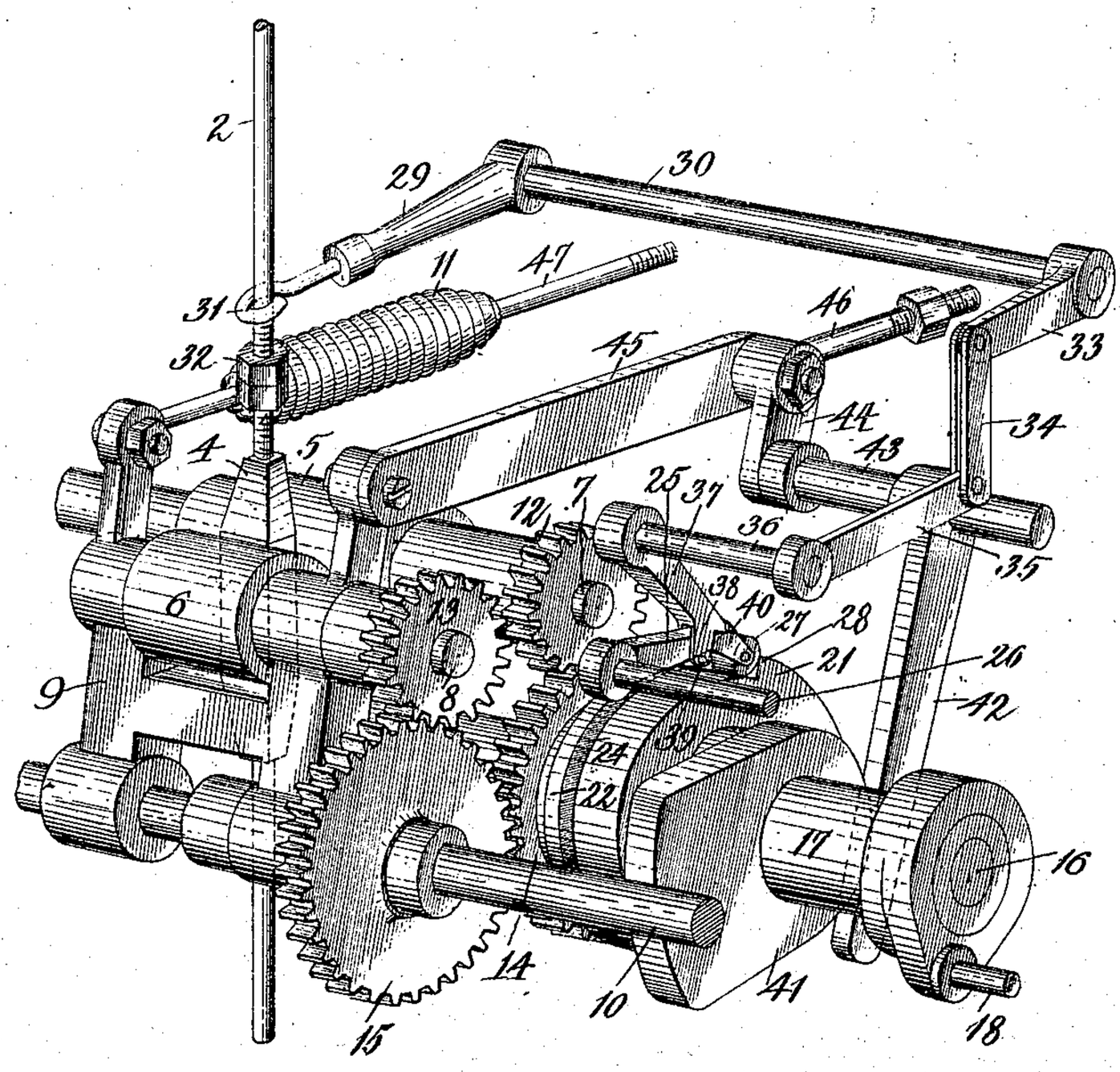

Fig. 5.

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UNITED STATES PATENT OFFICE.

EDWARD G. TREMAINE, OF HACKENSACK, NEW JERSEY, ASSIGNOR TO AUTOMATIC WEIGHING MACHINE COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW YORK.

RELAY MECHANISM.

966,624. Specification of Letters Patent. **Patented Aug. 9, 1910.**

Application filed December 13, 1905. Serial No. 291,533.

To all whom it may concern:

Be it known that I, EDWARD G. TREMAINE, a citizen of the United States, and resident of Hackensack, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Relay Mechanisms, of which the following is a specification.

My invention is intended to provide an improved device by means of which the operation of a mechanism or mechanical part, hereinafter referred to as the secondary member or movement, may be indirectly brought about by the operation of a primary member or movement which in itself has not sufficient force or power behind it to cause the operation of the secondary movement directly. Such relay mechanisms are useful in a variety of situations, as, for example, in case it is desired to cause the tilting of a scale beam in an automatic weighing machine to effect the operation of some other portion of the apparatus without interfering with the usual movements of the scale beam or impairing its delicacy of operation.

The embodiment of my invention herein represented is also adapted to reset itself and stop automatically at the end of each complete cycle of operations, such a mode of operation being desirable in many cases.

A relay mechanism containing my improvements in their preferred form is illustrated in the accompanying drawings, in which—

Figure 1 is an end elevation, partly in section, of the complete device; Fig. 2 is a transverse sectional view through the main casing showing the contained parts in end elevation; Figs. 3 and 4 are respectively a top plan view and a front elevation of the device, with the cover of the casing removed; and Fig. 5 is a perspective view showing the moving parts of the device.

The primary member of my device, as represented in the drawings, comprises a vertical rod 2 adapted to be connected to and lifted slightly by the part or mechanism by the operation of which it is desired to cause the operation of the secondary member hereinafter described. This rod 2 carries a block 3 having its opposite sides flat and parallel with each other and with the direction of movement of the rod 2, and also having its ends tapered somewhat, as shown at 4.

5 and 6 represent two rolls located on opposite sides of the rod 2 and carried respectively by countershafts 7 and 8, of which the former is journaled in fixed bearings, while the other is journaled in a frame 9 mounted to oscillate on another countershaft 10 also journaled in fixed bearings. The rolls 5 and 6 are given a tendency to approach each other by means of a spring 11 secured at one end to the frame 9, and means are provided for rotating said rolls continuously in opposite directions, such as pinions 12 and 13 mounted on ends of the countershafts 7 and 8 and meshing respectively with intermeshing gears 14 and 15, of which the latter is carried by the countershaft 10 and the former is carried by a main driving shaft 16 journaled in the framework of the device, which shaft is adapted to be continuously rotated in the direction indicated by the arrow, Fig. 2, by suitable connections (not shown) with any convenient source of power.

The construction above described permits the rolls 5 and 6 to move toward and away from each other without interfering with their continuous rotation, and they are normally maintained at such a distance apart that when the rod 2 is lifted slightly from its lowermost or normal position the tapering upper end of the block 3 will wedge itself into the space between the rolls until it comes into contact therewith, whereupon the rotation of the rolls will force said block and the rod 2 upward by frictionally engaging the opposite sides of said block until its tapering lower end passes out of operative engagement with the rolls. This upward movement thus forcibly imparted to the rod 2 is caused by suitable means such as hereinafter described to operatively connect the driving shaft 16 with the secondary member of the device, which secondary member is herein represented as consisting of a sleeve 17 mounted to turn freely on one end of said shaft 16 and carrying a crank pin 18 which may be connected to whatever part or mechanism it is desired to operate or set in motion by the actuation of said secondary member. The rod 2 is preferably provided at its lower end with a guide 19, Fig. 2, the lower end of which is squared and tapered to fit a correspondingly-shaped fixed socket 20 in which said guide seats itself when the rod 2 moves downward into its normal or inoperative position, thereby automatically centering said rod and maintaining the sides

of the block 3 in parallelism with the rolls 5 and 6.

For operatively connecting the driving shaft 16 with the sleeve 17 I prefer to employ a friction clutch, one member of which consists of a disk 21 rigidly secured to said sleeve while the other member consists of another disk 22 splined to the driving shaft and pressed toward the disk 21 by means of a spring 23 coiled around said shaft, as shown in Fig. 3. A disk 24 of leather or similar material may be placed between the adjacent faces of the disks 21 and 22, as is customary in such clutches. With this arrangement the secondary member 17 will evidently be driven continuously by the rotation of the driving shaft 16 except when the movement of the former is forcibly arrested, and for so arresting the rotation of the secondary member and causing its release by the operation of the primary member I provide a stop arm 25 pivoted at one end on a fixed stud 26 and carrying at its free end a roller 27 adapted to drop in front of a radial stop face 28 formed on the disk 21. The outer edge of this disk forms a guiding surface which supports and is followed by the roller 27 as said disk rotates, the arrangement being such that whenever the roller is lifted out of engagement with the stop face 28 the sleeve or secondary member 17 will be rotated until said stop face again engages said roller. The forcible upward movement of the rod 2 is caused to effect the disengagement of the roller 27 from the stop face 28 by suitable means preferably comprising an arm 29 carried by a rock shaft 30 and provided at its free end with an eye 31 which surrounds the rod 2 loosely and is adapted to be engaged and lifted by an abutment carried thereby, such as a nut 32 adjustably mounted on a threaded portion of said rod. The rock shaft 30 also has secured to it an arm 33 connected by a pivoted link 34 with another arm 35 secured to a supplementary rock shaft 36, the latter rock shaft being also connected with the stop arm 25 in such manner that when the eye 31 is lifted the roller 27 will be raised out of engagement with the stop face 28 on the disk 21. As preferably constructed, the connections between the rock shaft 36 and the arm 25 consist of an arm 37 rigidly secured at one end to said rock shaft and provided at its other end with downwardly-extending lugs 38 embracing the stop arm 25 and connected at their lower ends by a pin 39 extending transversely beneath said arm 25. The free end of the arm 37 is also formed to drop behind a shoulder 40 formed on the stop arm 25 when said arms are in their lowermost positions, the arrangement being such that when the free end of the arm 37 is lifted by the rocking of the shaft 36 it is first disengaged from the shoulder 40 on the stop arm, and the latter is then engaged and lifted by the pin 39. The result of this construction is that when the stop arm is in position to resist the rotation of the disk 21 it is positively locked therein by the engagement of the arm 37 with the shoulder 40 and cannot be accidentally raised to release said disk.

In operation, when the rod 2 is lifted the block 3 is engaged by the rolls 5 and 6 and forced upward, and during this upward movement the nut 32 engages and lifts the arm 29 and thus causes the release of the disk 21 as above described, the nut 32 being so adjusted on the rod 2 that it has a sufficient amount of free upward movement, before engaging the arm 29, to permit the block 3 to be drawn in between the rolls 5 and 6. As soon as the disk 21 is released the sleeve 17 is caused to rotate with the driving shaft 16, and at the same time the block 3 continues to move upward until its tapered lower end passes out of operative engagement with the rolls 5 and 6, the result being that the secondary member of the device is continuously operated until the block 3 is permitted to pass downward again between said rolls, whereupon the stop arm 25 drops and arrests the disk 21 as soon as the stop face 28 reaches the roller 27. This stopping of the secondary member may be automatically effected at the end of each complete rotation of the driving shaft 16 by providing the sleeve 17 with a cam 41 adapted to operate an arm 42 carried by a rock shaft 43, this rock shaft being in turn connected by an arm 44 and pivoted link 45 with the free end of the swinging frame 9 and the arrangement of these parts being such that immediately after the disk 21 has been released and set in rotation the operation of the cam 41 on the arm 42 will force the roll 6 away from its companion roll and thus permit the block 3 and rod 2 to move downward into their normal position, whereupon the operation of the secondary member will be stopped as above described at the end of one rotation thereof.

It will be evident that with the arrangement above described any force which is sufficient to lift the weight of the primary member will suffice to set in motion the secondary member, which will then be operated by sufficient power to do whatever work may be required of it.

The rolls 5 and 6 are normally held at the proper distance apart by a suitable stop herein represented as a rod 46 carried by the framework of the device in position to engage and limit the movement of the free end of the arm 44 under the influence of the spring 11. This rod 46 is preferably threaded into its support so that it may be conveniently adjusted toward or from said arm 44. It is also desirable to provide for the ad-

justment of the tension of the spring 11, as by connecting its stationary end to a rod 47 which has a threaded portion passing through a fixed support and provided with an adjusting nut 48.

The moving parts above described are preferably inclosed by a casing 49, whereby they are protected from accidental derangement as well as from dust, and the casing should include a removable cover 50, in order that the contained parts may be readily accessible. In the arrangement illustrated the pin 18 is conveniently located on the outside of one end of the casing, while the driving shaft 16 projects through the other end thereof, the rod 2 being passed through a suitable opening formed in the cover 50. The various shafts are journaled in bearings carried by the ends of the casing or by a bracket 51 located in the interior of the casing, and the arms 33 and 35 and link 34, in the arrangement shown, are located on the outside of one end of the casing 49 and inclosed by a supplementary casing 52 detachably secured to said casing 49. The casing also serves as the fixed support for the rods 46 and 47, which pass through the casing as shown in Fig. 3 and are thus made capable of adjustment from the outside of the same.

It will be observed that the function of the rolls is to render the operation of the primary member positive and give it sufficient force to operate the clutch-releasing mechanism, assuming that the initial force which lifts this primary member from its normal position is insufficient for this purpose. In case this initial force is in itself sufficient to release the secondary member, however, it will be evident that the rolls may be dispensed with. It will also be evident that my device may be widely modified in other particulars, especially with respect to the details of the connecting mechanisms, without departing from my invention.

I claim as my invention:

1. In a relay mechanism, the combination of a primary member adapted to move freely under the influence of a slight force, positively driven means for engaging said primary member at the end of its free movement and imparting a subsequent forcible movement thereto, a secondary member and a continuously driven shaft constantly tending to operate the same, a stop normally restraining the secondary member from movement, and means operated by the forcible movement of the primary member for releasing said stop.

2. In a relay mechanism, the combination of independently-actuated primary and secondary members, driving means for the secondary member, means operative with an initial movement of the primary member for imparting a subsequent forcible movement thereto, means arranged to be operated by said subsequent movement for causing said driving means to actuate the secondary member, and means operated by the secondary member for restoring the primary member to its initial position.

3. In a relay mechanism, the combination of primary and secondary members, driving means for the secondary member, means operative with an initial movement of the primary member for imparting a subsequent forcible movement thereto, means arranged to be operated by said subsequent movement for causing said driving means to actuate the secondary member, means for stopping the secondary member after one operation thereof, and means operated by the movement of the secondary member for restoring the primary member to its initial position.

4. In a relay mechanism, the combination of a driving shaft, a pair of opposed rolls geared thereto and arranged to be rotated thereby in opposite directions, a primary member adapted to be moved under the influence of a slight force into position to be gripped between and forcibly operated by said rolls, a secondary member and connections between the same and the driving shaft constantly tending to drive said secondary member, a stop normally restraining the secondary member from movement, and means operated by the forcible movement of the primary member for releasing said stop.

5. In a relay mechanism, the combination of a driving shaft, opposed rolls geared thereto and arranged to be rotated in opposite directions, a primary member adapted to be moved between and frictionally engaged and operated by said rolls, a secondary member, means operated by the movement of the primary member under the influence of said rolls for operatively connecting the driving shaft to the secondary member, and means operated by the movement of the secondary member for spreading said rolls and permitting the primary member to return to its initial position.

6. In a relay mechanism, the combination of a driving shaft, a countershaft geared thereto, a frame mounted to swing on the countershaft, a pair of opposed rolls geared to said driving shaft and countershaft respectively, one of said rolls being journaled in the frame, means tending to move the latter roll toward its companion roll, a primary member arranged to be moved between and forcibly operated by said rolls, a secondary member, and means operated by the forcible movement of the primary member for operatively connecting the secondary member with said driving shaft.

7. In a relay mechanism, the combination of a driving shaft, a countershaft geared thereto, a frame mounted to swing on the countershaft, a pair of opposed rolls geared to the driving shaft and countershaft re-

spectively, one of said rolls being journaled in the frame, means tending to move the latter roll toward its companion roll, a secondary member loosely mounted on said shaft, a friction clutch the engaging members of which are secured to said shaft and secondary member respectively, the latter clutch member being provided with a stop face, a stop arm arranged to engage said stop face, a primary member arranged to be moved between and forcibly operated by said rolls, and connections arranged to be operated by the forcible movement of the primary member for lifting said stop arm out of engagement with the stop face on said clutch.

8. In a relay mechanism, the combination of a driving shaft, a countershaft geared thereto, a frame mounted to swing on the countershaft, a pair of opposed rolls geared to the driving shaft and countershaft respectively, one of said rolls being journaled in the frame, means tending to move the latter roll toward its companion roll, a secondary member loosely mounted on said shaft, a friction clutch the engaging members of which are secured to said shaft and secondary member respectively, the latter clutch member being provided with a stop face, a stop arm arranged to engage said stop face, a primary member arranged to be moved between and forcibly operated by said rolls, connections arranged to be operated by the forcible movement of the primary member for lifting said stop arm out of engagement with the stop face on said clutch, and means operated by the rotation of the secondary member for spreading said rolls and thereby permitting the primary member to return to its initial position.

9. In a relay mechanism, the combination of a driving shaft, a secondary member loosely mounted thereon, a friction clutch the engaging members of which are secured to said shaft and secondary member respectively, the latter clutch member being provided with a stop face, a stop arm arranged to engage said stop face and having a locking shoulder, a supplementary arm loosely embracing the free end of the stop arm and formed to engage said locking shoulder, a primary member, and means operated by a movement thereof for actuating said supplementary arm to release the stop arm from the stop face on said clutch.

In testimony whereof, I have hereunto subscribed my name this fifth day of December, 1905.

EDWARD G. TREMAINE.

Witnesses:

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GEORGE L. GARDNER.