

No. 652,104.

Patented June 19, 1900.

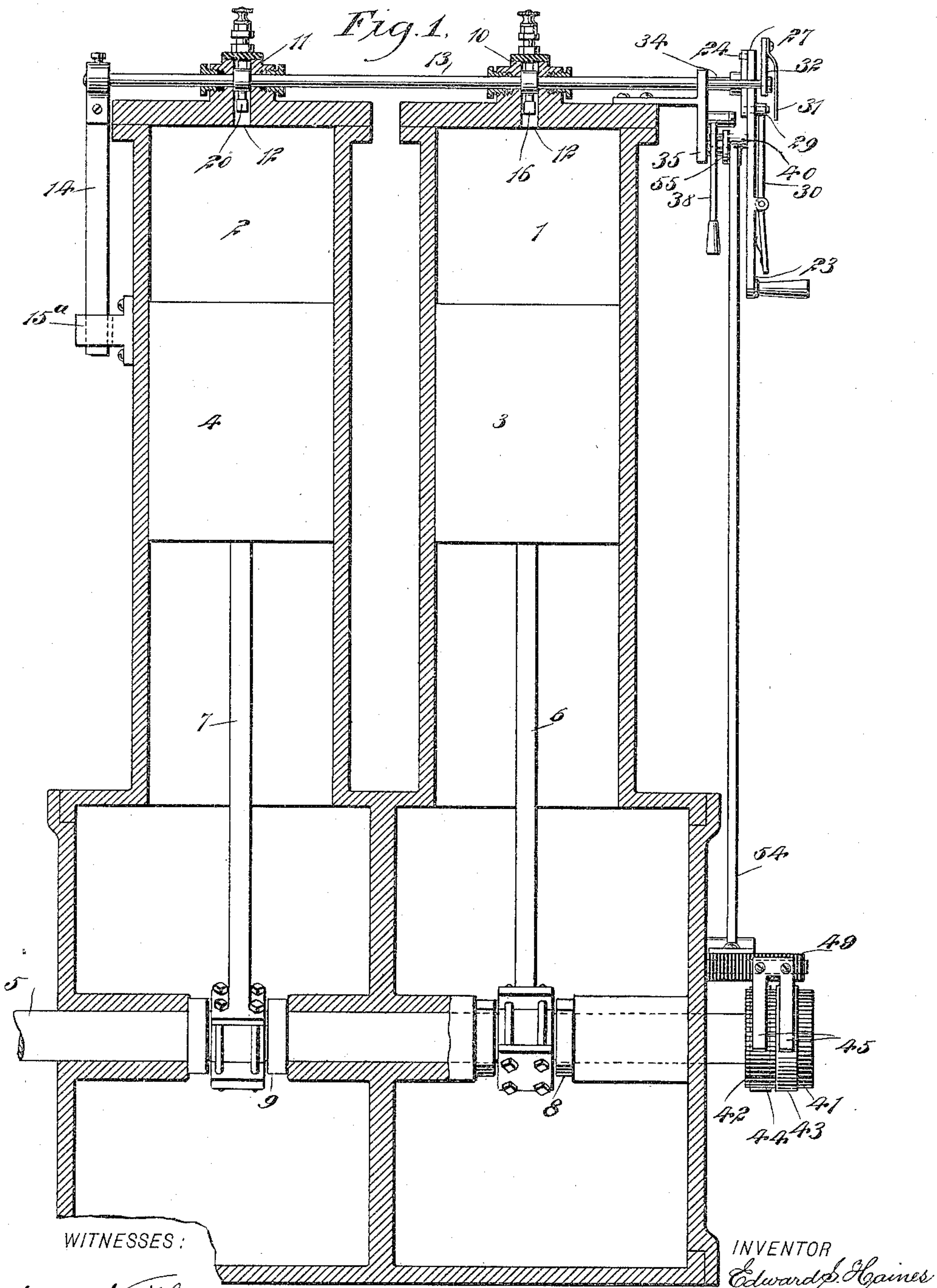
E. S. HAINES.

COMBUSTION ENGINE STARTING AND REVERSING DEVICE.

(Application filed Mar. 22, 1899.)

(No Model.)

3 Sheets—Sheet 1.



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Fig. 2.

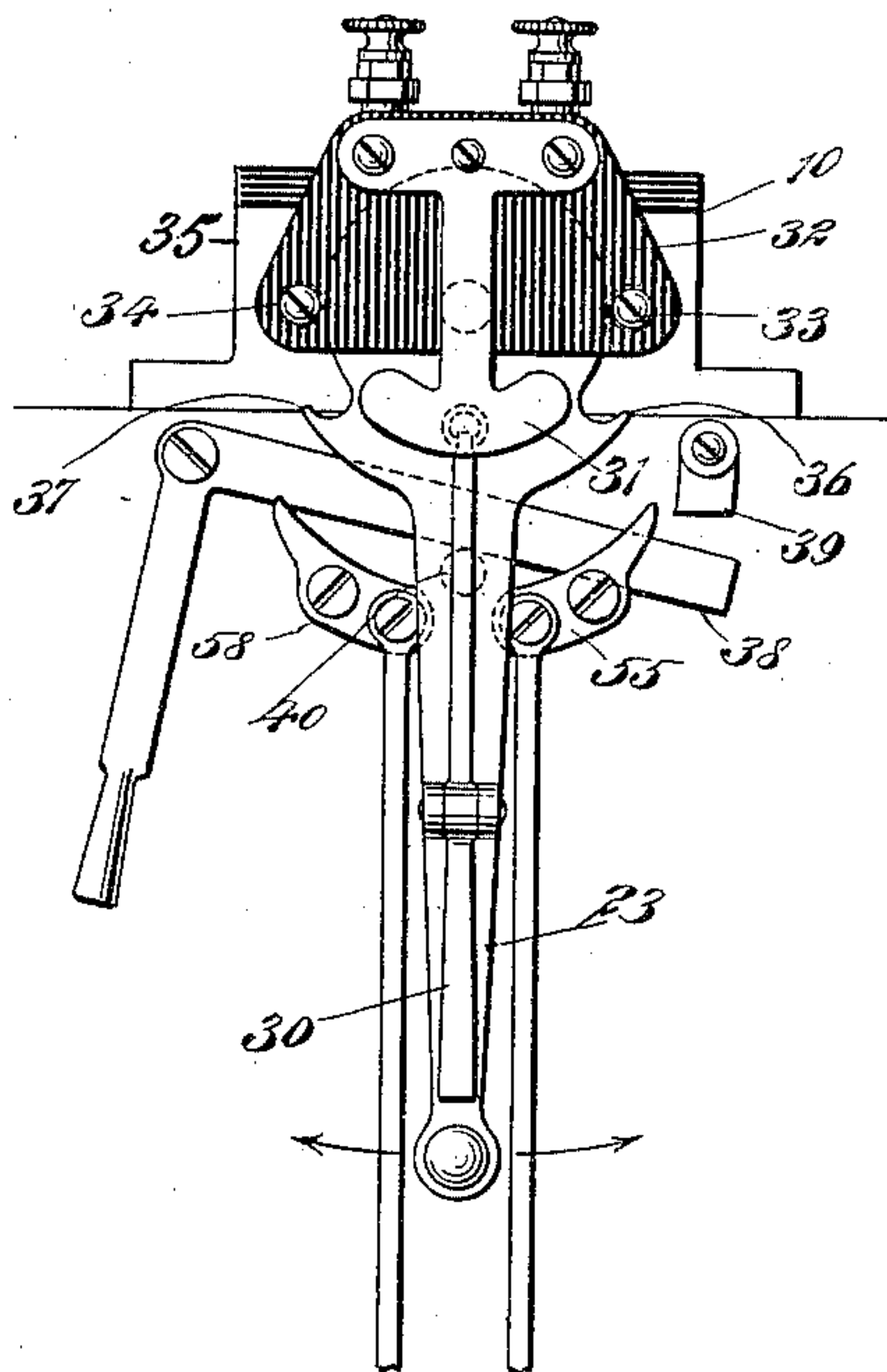


Fig. 3.

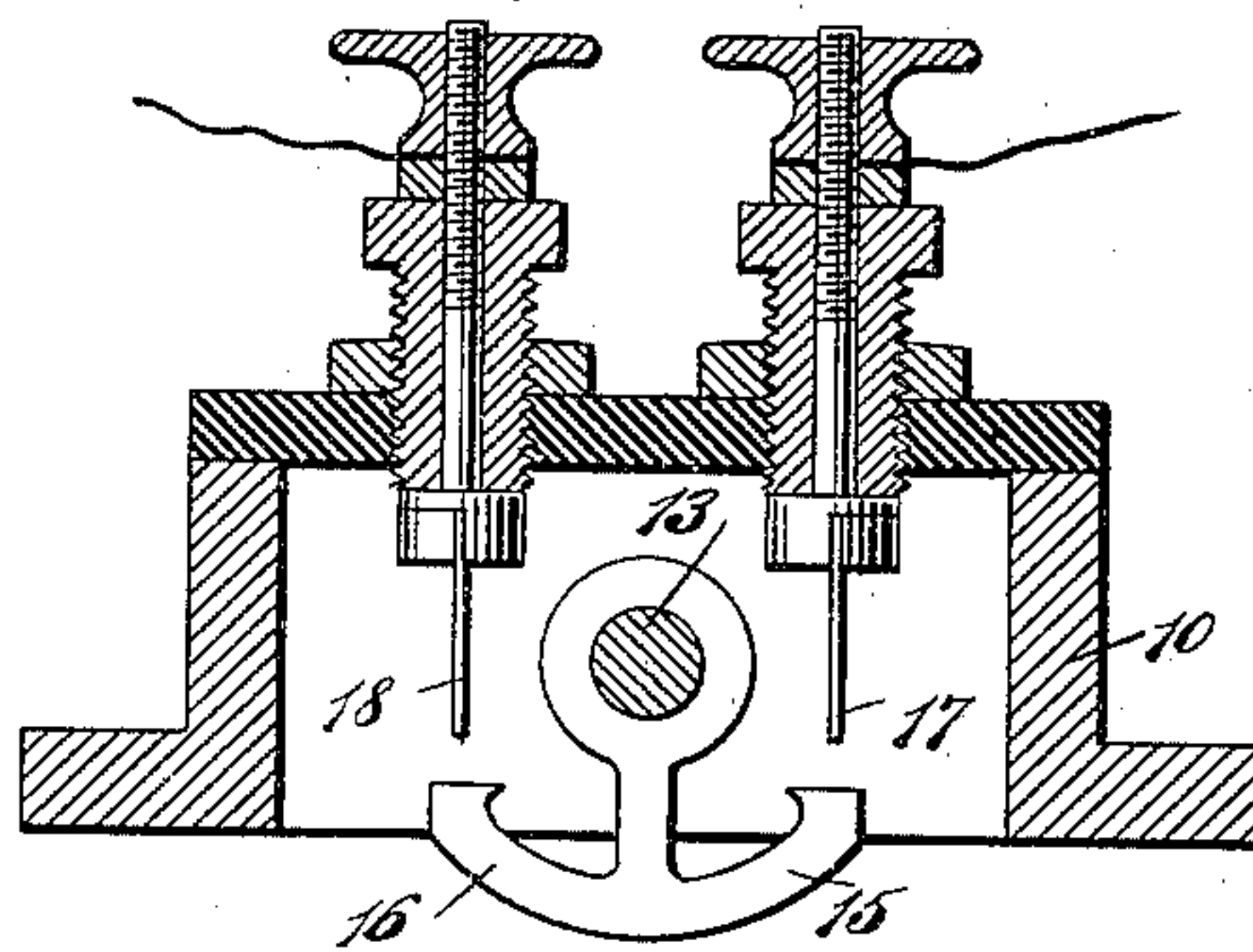


Fig. 4.

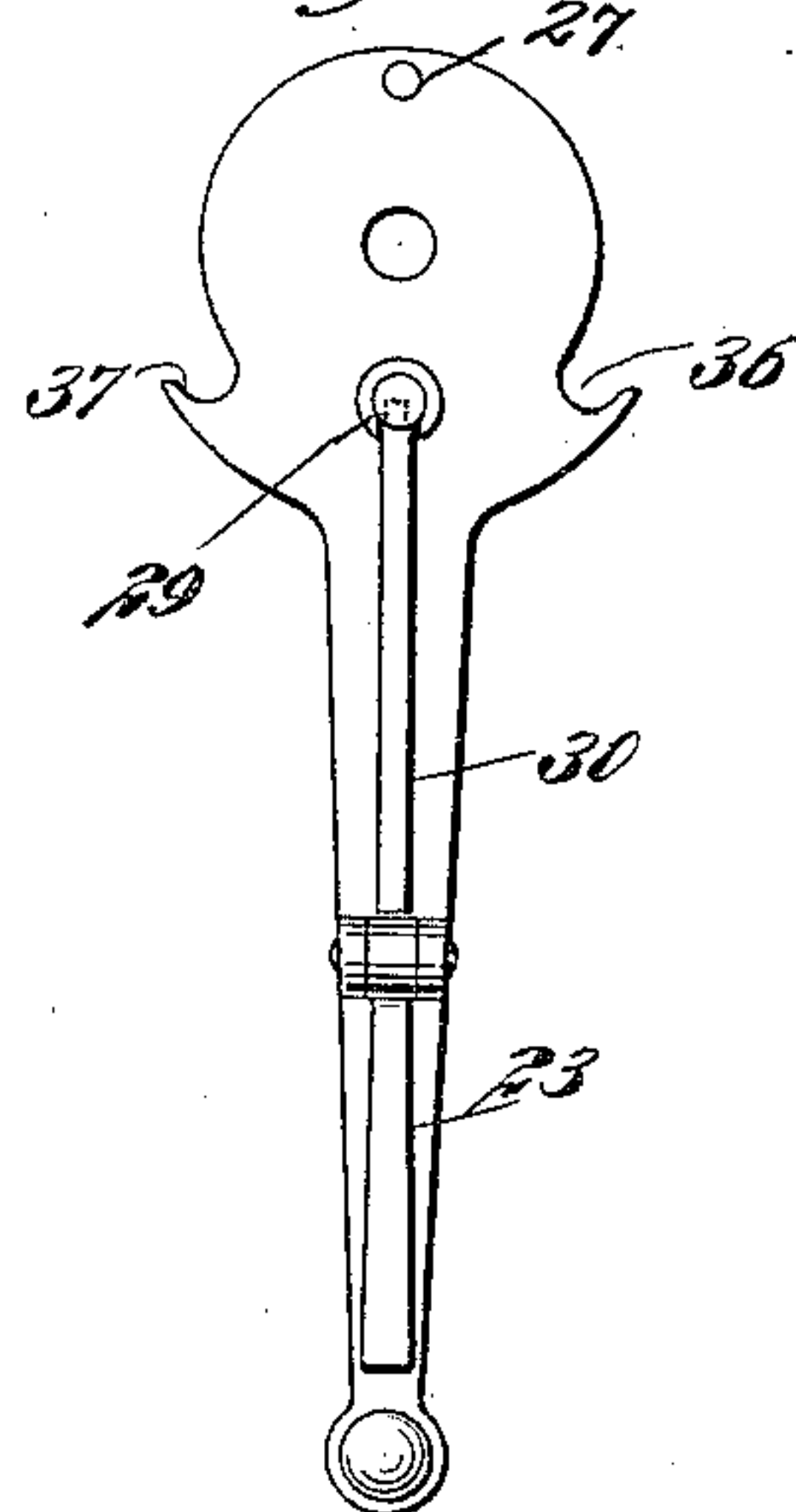


Fig. 5.

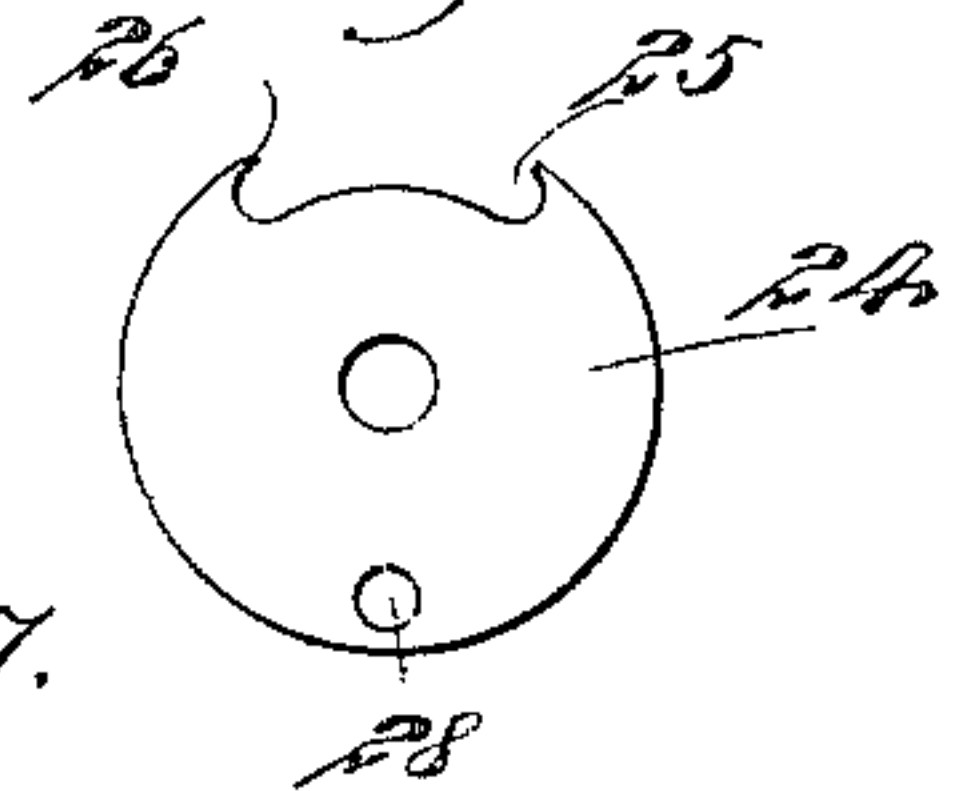
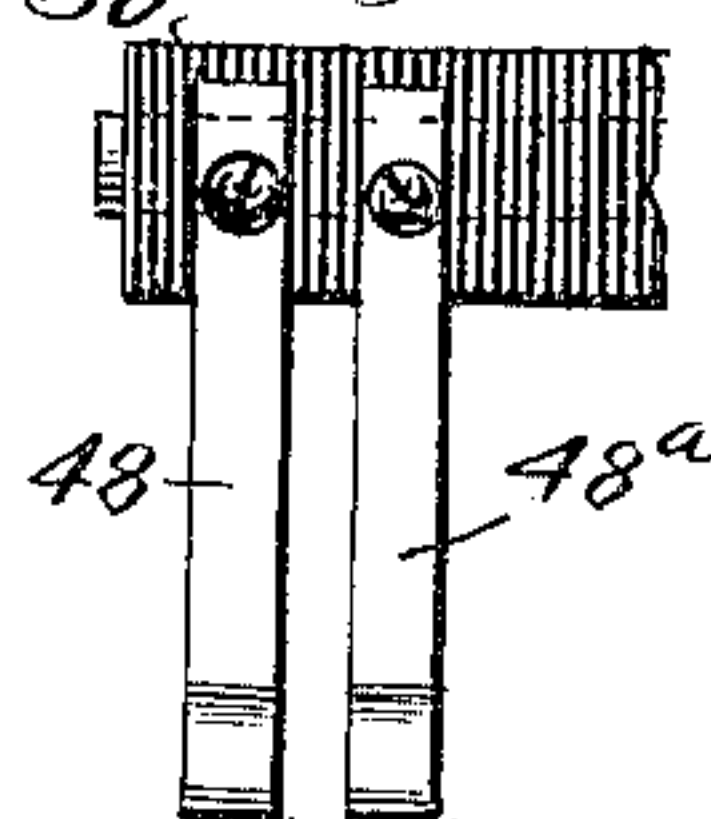


Fig. 7.



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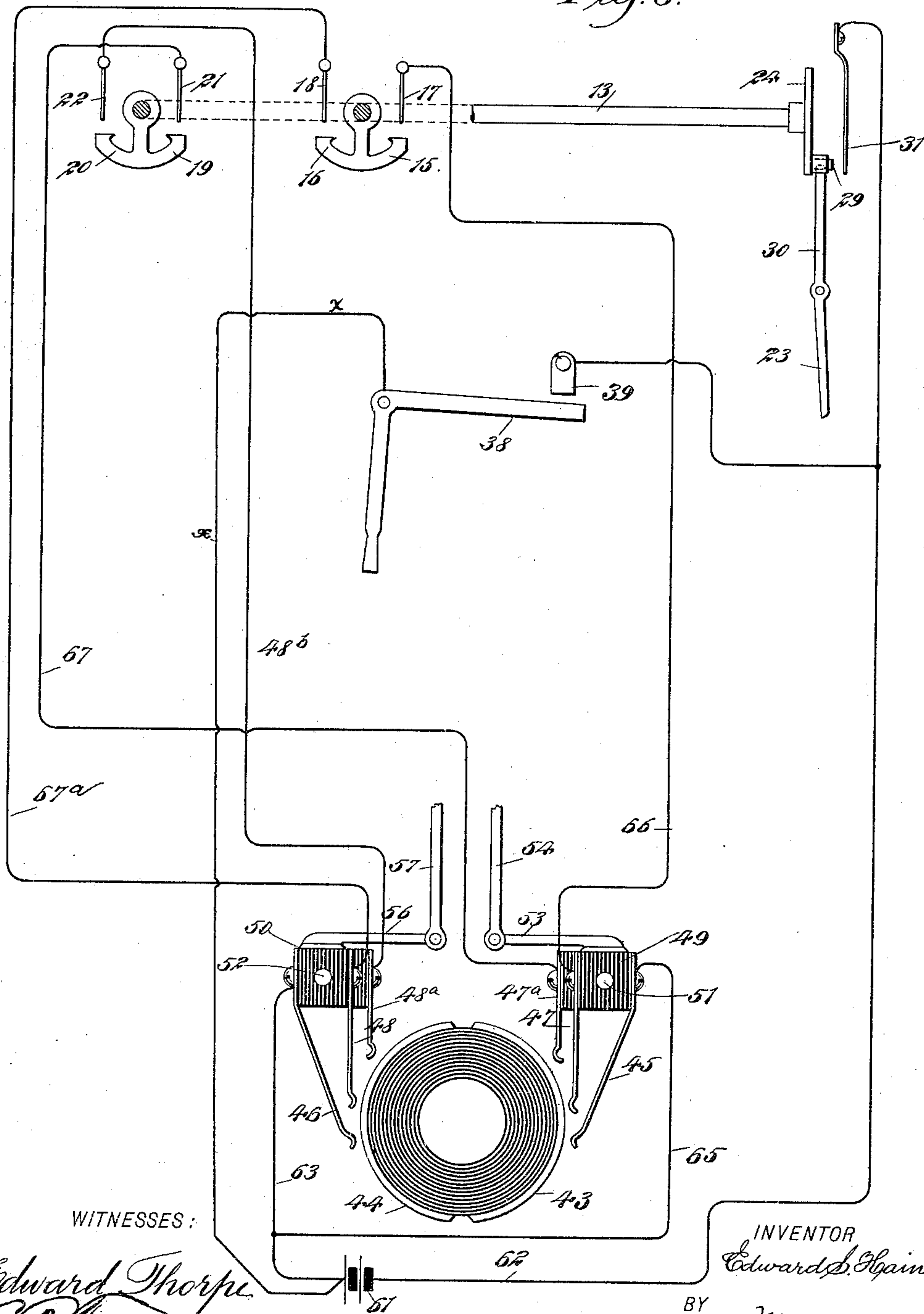
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Fig. 6.



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# UNITED STATES PATENT OFFICE.

EDWARD S. HAINES, OF JACKSONVILLE, FLORIDA.

## COMBUSTION-ENGINE STARTING AND REVERSING DEVICE.

SPECIFICATION forming part of Letters Patent No. 652,104, dated June 19, 1900.

Application filed March 22, 1899. Serial No. 710,126. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD S. HAINES, of Jacksonville, in the county of Duval and State of Florida, have invented a new and Improved Combustion-Engine Starting and Reversing Device, of which the following is a full, clear, and exact description.

This invention relates to improvements in starting and reversing devices for combustion-engines; and the object is to provide a device of this character comparatively simple in its construction and by means of which the engine may be started or reversed without manually turning the crank-shaft, as is the usual practice.

I will describe a combustion-engine starting and reversing device embodying my invention and then point out the novel features in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a vertical section of a combustion-engine, showing my invention as applied thereto. Fig. 2 is an elevation showing the circuit making and breaking devices. Fig. 3 is a section showing the sparking-electrodes. Fig. 4 is a face view of an actuating-lever employed. Fig. 5 is a face view of a rock-plate employed. Fig. 6 is a diagrammatic view illustrating the electric circuits, and Fig. 7 is a detail showing certain contact-fingers employed.

Referring to the drawings, 1 2 designate the two cylinders of a combustion-engine, and in which the pistons 3 4 are operated. These pistons have connection with the crank-shaft 5 by means of piston-rods 6 7 and cranks 8 9 and 9, and it will be noted that the cranks 8 9 extend in diametrically-opposite directions, so that when the engine is at a stand-still the two cranks will be substantially on a horizontal plane. Extending through casings 10 and 11 on the cylinder-heads, and in each one of which is a sparking-chamber 12, is a shaft 13, which at one end has attached to it a spring-plate 14, which engages with a lug 15<sup>a</sup> on one of the cylinders. This spring 14 is designed to return the shaft to its normal position upon being released, as will be hereinafter described.

Mounted on the shaft 13, within the chamber formed in the casing 10, is an electrode comprising oppositely-extended arms 15 16, adapted to engage, respectively, with fixed electrodes 17 18, extended through the top of the casing, and arranged within the chamber 12, formed in the casing 11, is a similar electrode consisting of the oppositely-extended arms 19 20, adapted to engage, respectively, with the fixed electrodes 21 22, extended through the top of the casing 11.

Mounted to swing on the shaft 13 is a shifting lever 23, and rigidly mounted on said shaft is a rock-plate 24, having stops 25 26, with either one of which a pin 27 on the lever 23 is designed to engage. This rock-plate 24 is also provided with an opening 28, designed to receive a lug 29 on a spring-pressed lever 30, fulcrumed on the lever 23. This lug 29 is designed to engage in said opening 28 for the purpose of rocking the shaft 13, or, in other words, to place the lever 23 in locked connection with said shaft, and it is also employed as a circuit-closer when placed in connection with a contact-plate 31, attached to a plate 32, of insulating material, and supported on pins 33 34, which are projected from a bracket 35, attached to the cylinder 1. The lever 23 is provided with a stop-lug 36, adapted to engage with the pin 33 to limit the movement of the lever in one direction, and it is also provided with a stop-lug 37, designed to engage with the pin 34 to limit the movement of the lever in the opposite direction. A circuit-closing lever 38 is mounted on the bracket 35 and is adapted to be placed in engagement with the contact-plate 39. This lever 38 normally rests on a pin 40, connected to the lever 23, but insulated therefrom.

Mounted on the crank-shaft 5 are two disks 41 42, of insulating material, and on the disk 41 is a segmental contact-plate 43, while on the disk 42 is a segmental contact-plate 44, these contact-plates being directly opposite each other. At opposite sides of the crank-shaft are spring-yielding contact-fingers 45 46, adapted to engage with the disks 41 42 or with the segments thereon to close a circuit through fingers 47 48, or through fingers 47<sup>a</sup> 48<sup>a</sup>, near the fingers 47 48, but insulated therefrom, the fingers 45, 47, and 47<sup>a</sup> being in the line of movement of segment



43 and the fingers 46 48 48<sup>a</sup> being in the line of movement of segment 44. The fingers 45, 47, and 47<sup>a</sup> are mounted on a block 49 of insulating material and the fingers 46, 48, and 48<sup>a</sup> are mounted on a block 50 of insulating material. These blocks 49 50 are mounted, respectively, to rock on studs 51 52. Extended upward from the arm 53, projected from the block 49, is a shifting rod 54, which at its upper end is connected to a rocking cam 55, pivoted to the bracket 35, and extended upward from the arm 56, connected to the block 50, is a shifting rod 57, which at its upper end connects with a rocking cam 58, also pivoted to said bracket. The upper edges of the rocking cams 55 and 58 are formed in the segment of a circle and are designed to be engaged by the pin 40 on the lever 23 when said lever is shifted. The circuit-closing fingers are held normally out of engagement with the segmental contact-plates when the engine is at rest by means of springs 59 60, which at one end connect with the rods 54 57 and at the other end with a fixed portion of the engine.

Having described the mechanical construction of the device, I will now describe the electrical connections.

From a battery 61 a wire 62 extends to a connection with the contact-plate 31, and from the other pole of the battery a wire 63 extends to electrical connection with the fingers 46. The finger 45 is connected to the wire 63 by means of the wire 65, and the finger 47 is connected to the electrode 17 by means of a wire 66, while the electrode 21 is connected to the finger 47<sup>a</sup> through a wire 67. The electrode 18 is connected to the finger 48 by the wire 67<sup>a</sup>, and the electrode 22 is connected to the finger 48<sup>a</sup> by the wire 48<sup>b</sup>.

In operation to start the engine the lever 23 is to be moved until the stop 37 comes in contact with the pin 34. In doing this the shaft 13 is partly revolved until the electrode 16 comes into engagement with the electrode 18. This movement of the lever 23 engages its pin 40 with the cam 58, rocking said cam to draw the rod 57 upward, and consequently rocking the block 50 to cause the fingers 46 and 48 to press against the segmental contact 44, thus closing the circuit at this point. Up to this time no spark has been made between 16 and 18 on account of the break in the circuit at 29 31, the object being to prevent premature or double spark. As the pin 40 engages with the lever 38, it is obvious that upon moving the lever 23 the said lever 38 will be moved into engagement with the contact-plate 39, thus closing the circuit at this point for the automatic sparking. The lever 30 is now to be operated to disengage the pin or lug 29 from the rock-plate 24, and in said movement of the lever 30 the said lug 29 is placed in electrical engagement with the contact-plate 31. As soon as the plate 24 is released from the lever 23, as described, the spring 14 will

rock the shaft 13 and cause a break between the electrode 16 and the electrode 18, thus making a spark to ignite the gas contained in the cylinder 1, and when the gas is ignited it is obvious that pressure will be immediately brought upon the piston 3 and start the engine. When the circuit is closed through the parts 29 31, the current will flow from the battery 61 through the wire 62, the contacts 31 29, the shaft 13, electrode 16, electrode 18, the wire 67<sup>a</sup>, the finger 48, thence to the segment 44, the finger 46, and back to the battery through the wire 63. After once having been started in the manner described the sparking is done by automatic sparkers in the ordinary manner, and which it is not deemed necessary to show here. It may be stated, however, that said automatic sparkers will be in connection with the lever 38 and with the contact-plate 39, which consequently serve as circuit-closers for said automatic sparkers. When it is desired to stop the engine, it is only necessary to move the lever 38 out of engagement with the plate 39, the lever and plate being the circuit-closers for the main sparking device, which may be in circuit with the battery 61 and have connection with the lever by means of the wire *x*. To start the engine in the opposite direction, the gas must be ignited first in the cylinder 2. Therefore the shaft 13 is to be turned, as before described, to engage the electrode 19 with the electrode 21, and then by connecting the parts 29 and 31 the current will flow from the battery 61 through the wire 62, parts 31 29, the shaft 13, electrode 19, the electrode 21, the wire 67, fingers 47<sup>a</sup> and 45, and the segment-plate 43, the wire 65, and back to the battery. The above operation is for starting the engine in either direction, depending upon the position of the crank-shaft and segments. To prevent overtravel of the lever 23 while operating the same, the pin 27 is provided to engage with either one of the stops 25 or 26, depending, of course, upon which direction the said lever is moved.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A starting device for a combustion-engine, comprising fixed electrodes in the engine, rocking electrodes for engagement with the first-named electrodes, a shaft on which the rocking electrodes are mounted, a source of electricity, a lever for rocking the electrode-carrying shaft, means carried by said lever for locking it to the shaft and also for closing the circuit, and rotary contact-carrying devices for completing the circuit, substantially as specified.

2. A starting device for a combustion-engine, comprising fixed electrodes in the cylinders of the engine, a rock-shaft, electrodes mounted on said rock-shaft and adapted for engagement with the first-named electrodes, a lever loosely connected to said shaft, means



for placing said lever in locked engagement with said shaft, a contact-point carried by the lever, a source of electricity adapted to be closed by said contact-point, disks of insulating material mounted on the crank-shaft of the engine, segmental contact-plates on said disks, contact-fingers arranged in the electric circuit, and means for moving said contact-fingers into connection with the segmental contact-plates, substantially as specified.

3. A starting and reversing device for a combustion-engine, comprising fixed electrodes in the engine-cylinders, a rock-shaft, electrodes carried by said rock-shaft and adapted for engagement with the fixed electrodes, a lever loosely mounted on said shaft, means for placing said lever in a locked engagement with said shaft, a source of electricity, segmental contact-plates carried by the crank-shaft of the engine but insulated therefrom, and one from the other, spring contact-fingers arranged in the electric circuit and adapted for engagement with the segmental contact-plates, means carried by the shifting lever for closing the electric circuit, and means carried by said lever for moving either one of the sets of spring-yielding fingers into contact with

the segmental plates, substantially as specified.

4. A starting and reversing device for combustion-engines, comprising fixed electrodes arranged in the cylinders of the engine, a rock-shaft, electrodes mounted on said rock-shaft and adapted for engagement with the fixed electrodes, a rock-plate secured to the shaft, a lever loosely mounted on the shaft, a spring-pressed pin for locking the lever to the rock-plate, the said spring-pressed pin also serving as a circuit-closer, an electric circuit adapted to be closed by said circuit-closer, segmental contact-plates carried by the crank-shaft of the engine, but insulated therefrom and one from the other, spring contact-fingers adapted for engagement with the segmental plates, rocking blocks on which the fingers are mounted, rods extended upward from arms extended from said blocks, and cam-blocks on the upper ends of said rods adapted to be engaged by a pin extended from the lever, substantially as specified.

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Witnesses:

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