

No. 713,712.

Patented Nov. 18, 1902.

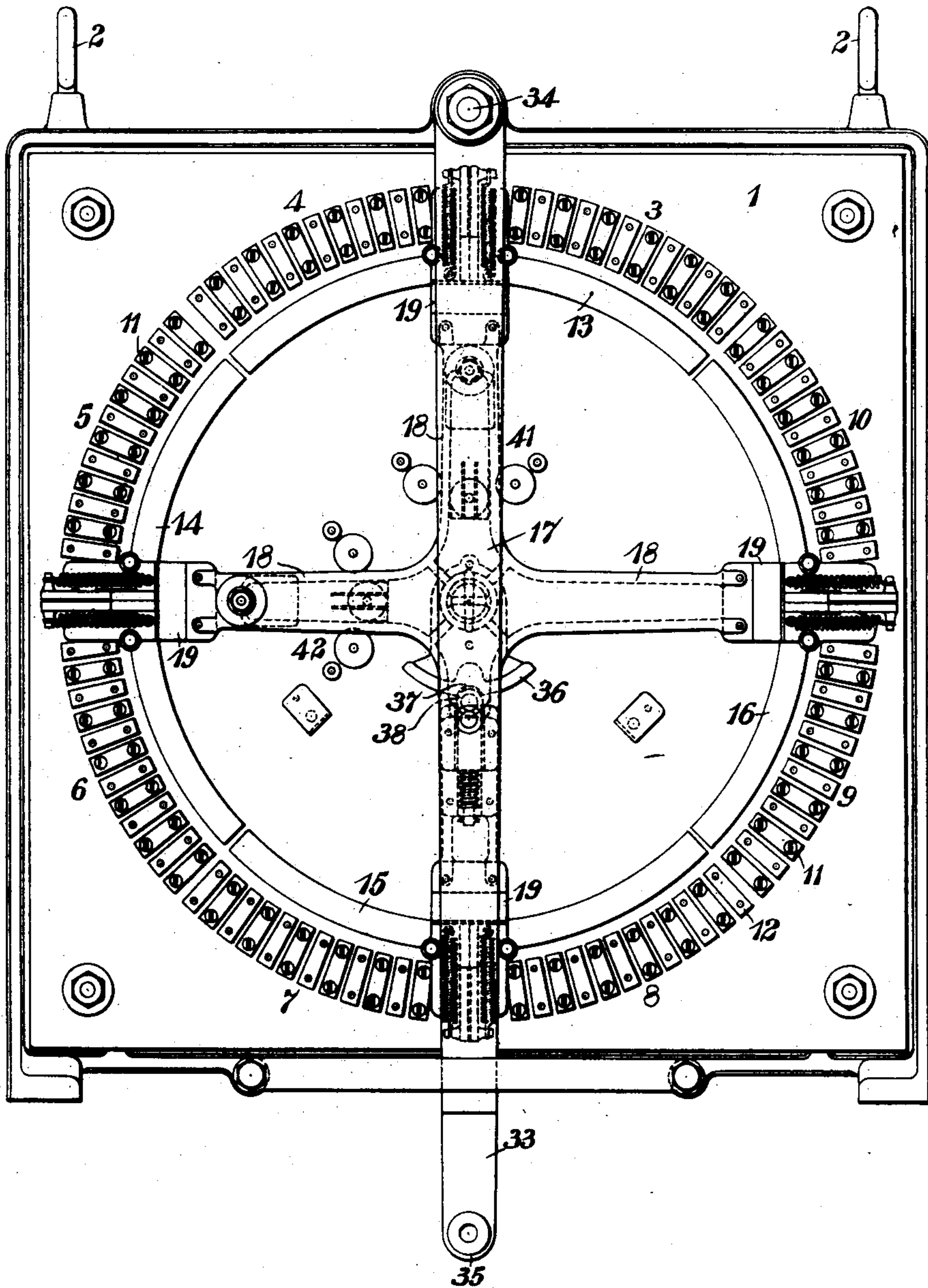
H. R. STUART.
SWITCH FOR ELECTRIC CIRCUITS.

(Application filed Jan. 6, 1902.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.



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Fig. 2.

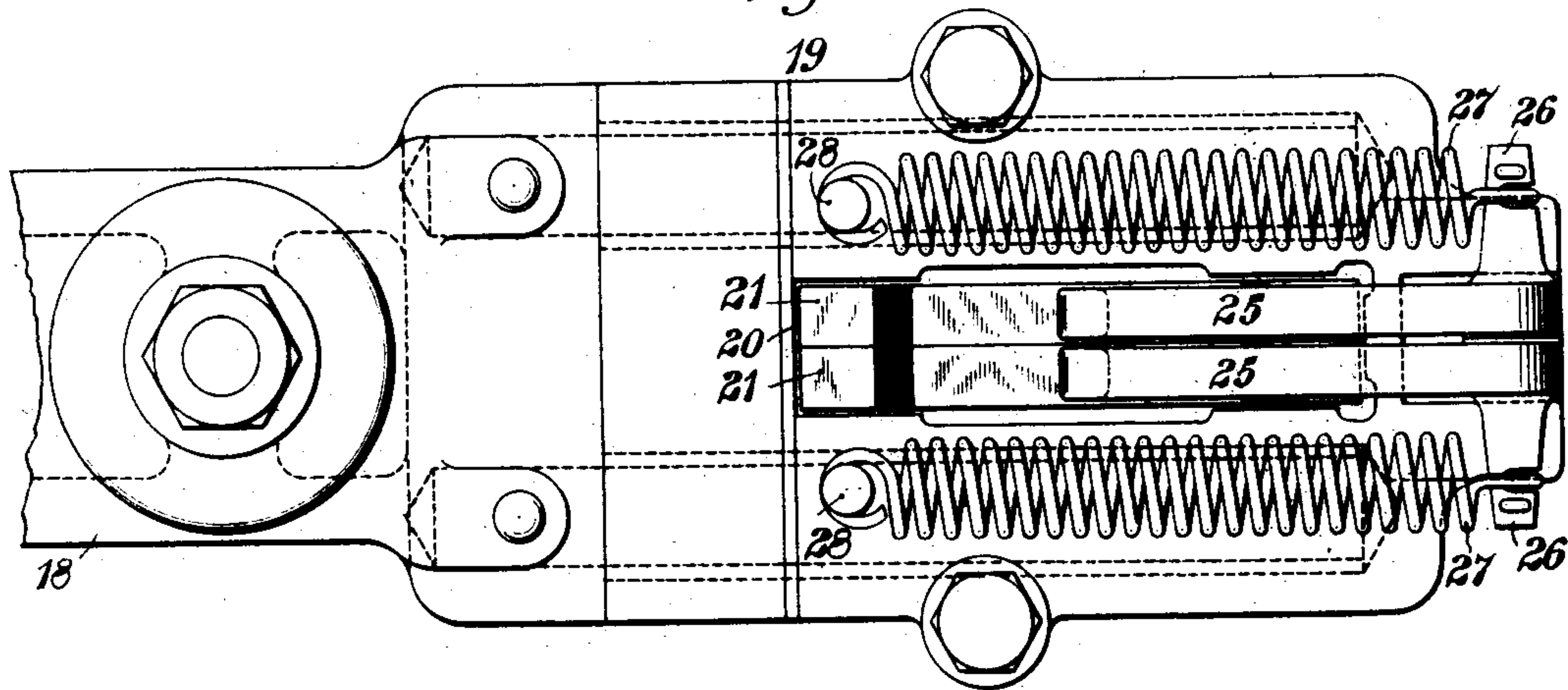


Fig. 3.

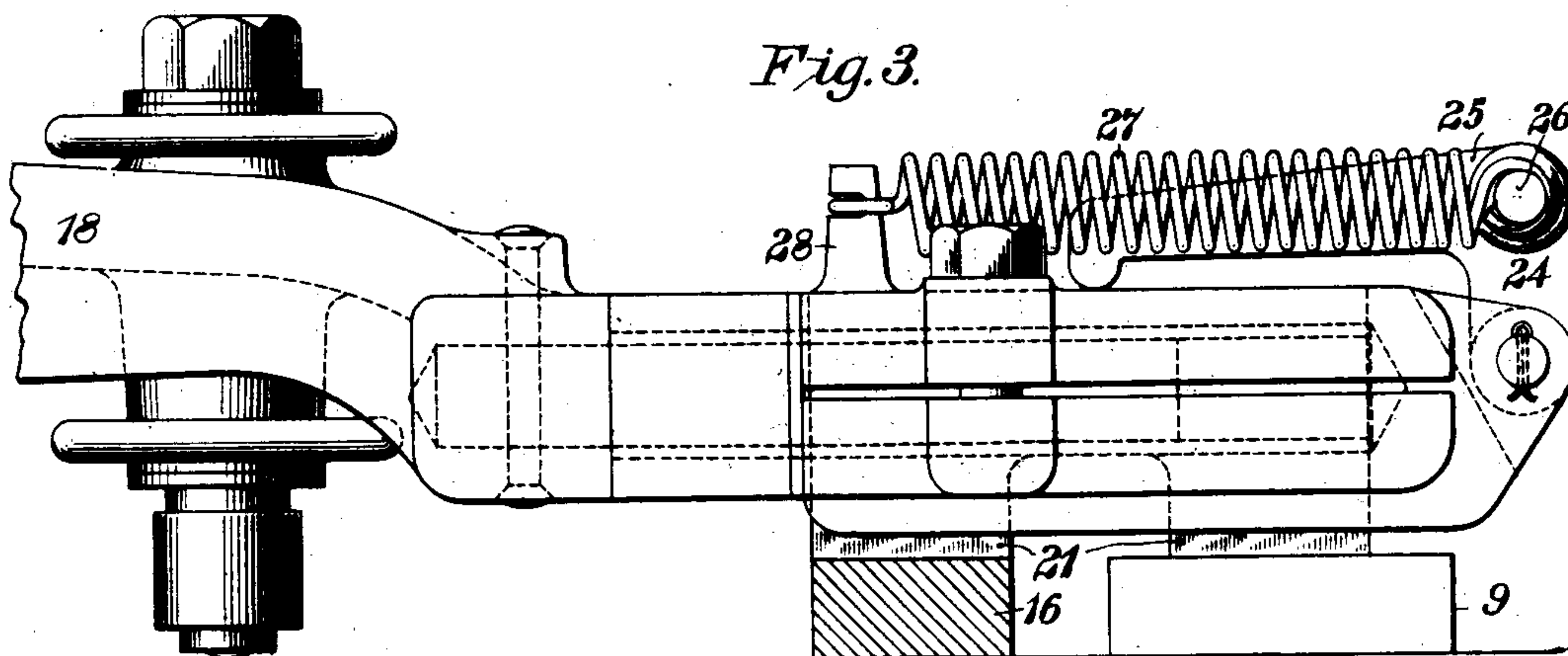
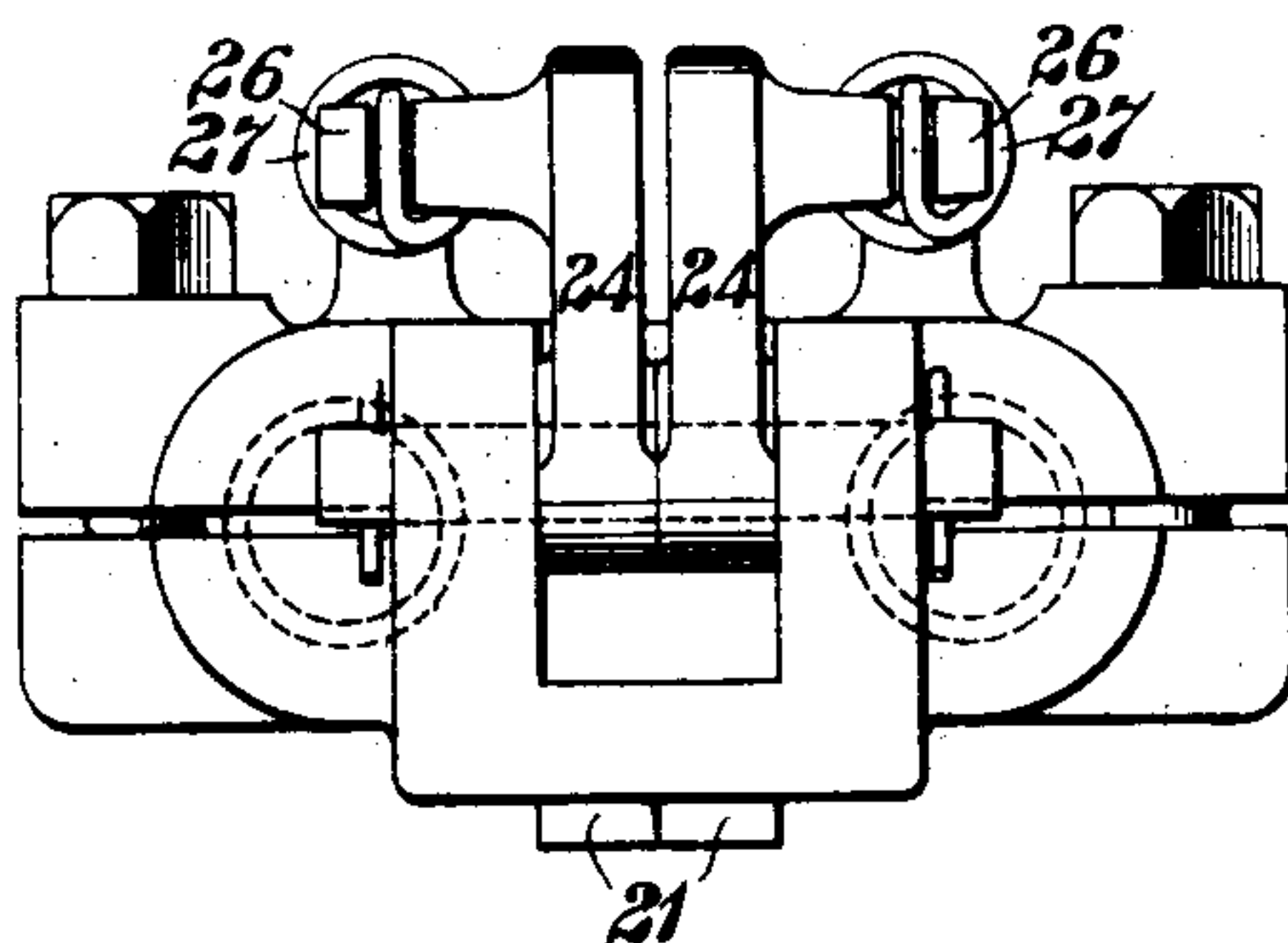


Fig. 4.



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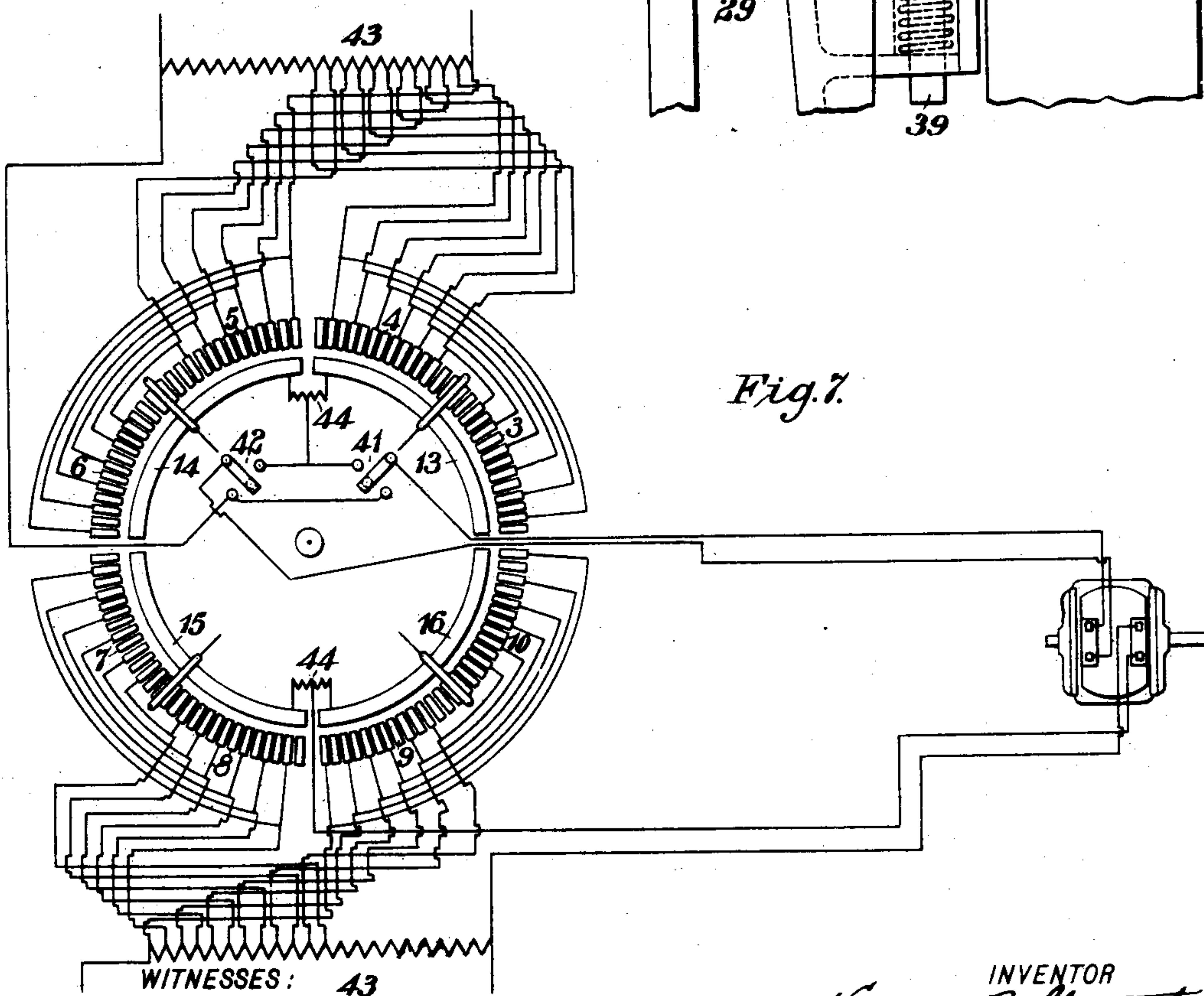
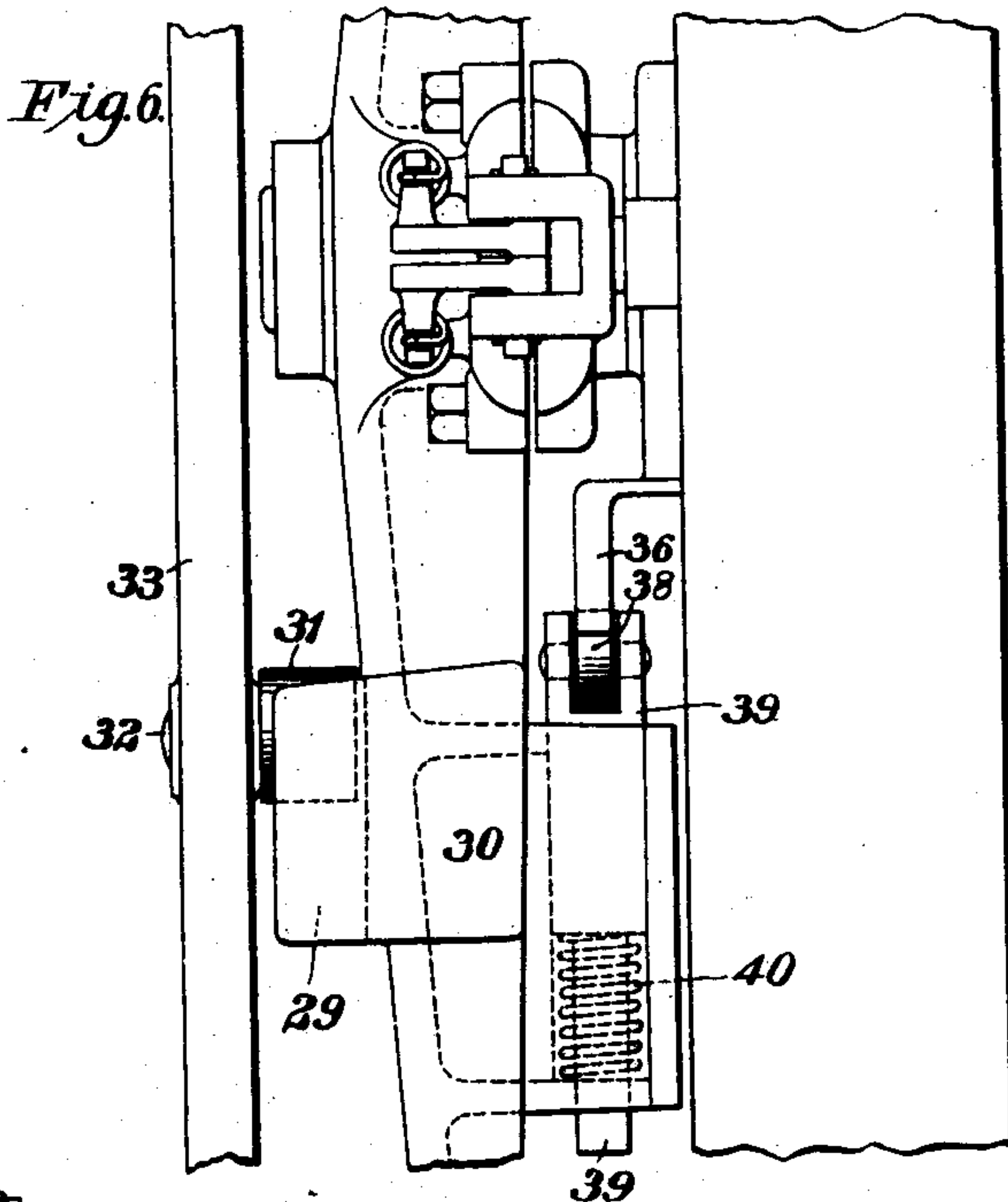
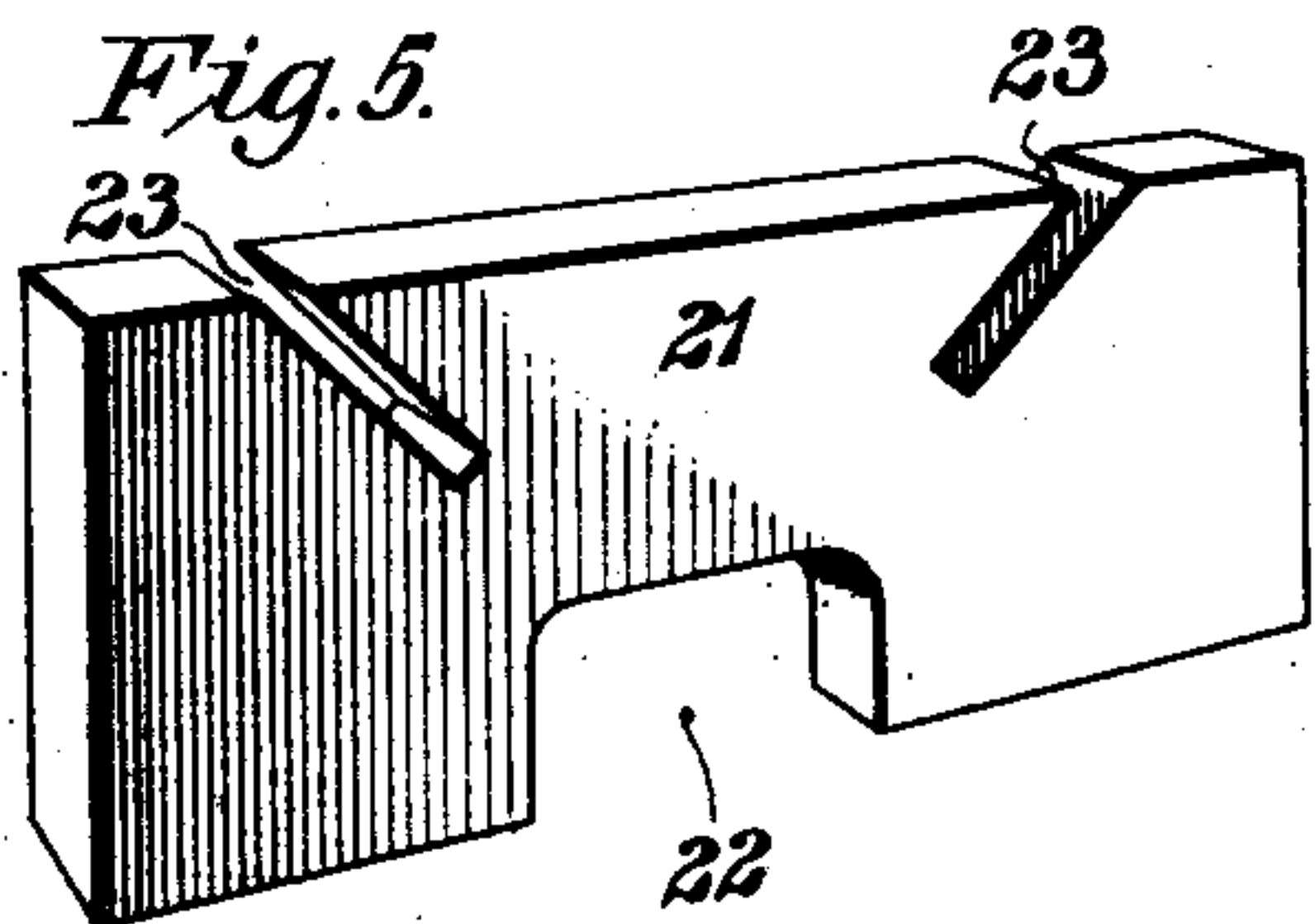
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

HARVE R. STUART, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO
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SWITCH FOR ELECTRIC CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 713,712, dated November 18, 1902.

Application filed January 6, 1902. Serial No. 88,612. (No model.)

To all whom it may concern:

Be it known that I, HARVE R. STUART, a citizen of the United States, residing in Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Switches for Electric Circuits, of which the following is a specification.

My invention relates to adjustable switches for electric circuits; and it has for its object to provide a device of this character which shall be simple and comparatively inexpensive in construction and effective and durable in operation.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of the circuit-changing parts of a controller for electric motors. Fig. 2 is a front elevation of one pair or set of contact devices or brushes and the holder therefor. Fig. 3 is an inverted plan view of the part shown in Fig. 2. Fig. 4 is an end elevation of the parts shown in Figs. 2 and 3. Fig. 5 is a perspective view of one of the contact blocks or brushes. Fig. 6 is an end or edge elevation of a portion of the apparatus shown in Fig. 1, and Fig. 7 is a diagram of a two-phase alternating-current induction-motor and a controller for use in connection therewith.

As illustrated in the drawings and hereinafter described, my invention is embodied in a controller for varying the active lengths of either the primary or the secondary portions of the windings of autotransformers interposed between a polyphase source of electrical energy and a motor to be operated thereby, this being the particular service for which the invention has been developed and it being therefore convenient to describe it in this connection. It is to be understood, however, that in so far as the invention is adapted for use in other relations it is not to be construed as limited to use in connection with the specific controlling apparatus here set forth.

The supporting-base 1, upon which the operative portions of the controller are mounted, is provided with suitable rings or handles 2, by means of which it may be moved. Mounted upon the face of the plate 1 are a plurality of sets of stationary contact-plates, which are

suitably electrically connected to each other and to autotransformers, as indicated in Fig. 7 and as will be more fully hereinafter described. As shown, there are eight sets 3, 4, 5, 6, 7, 8, 9, and 10 of these plates arranged circumferentially, the active plates 11 of these sets being alternated with dead or inactive plates 12 in order to facilitate the movement of the contact blocks or brushes from each contact-plate to the next in the series. Centrally arranged inside of the sets of plates 4 to 10, inclusive, are four contact-rings 13, 14, 15, and 16, the ring 13 corresponding in position and dimensions to the sets of contact-plates 3 and 4, the ring 14 to the plates 5 and 6, the ring 15 to the plates 7 and 8, and the ring 16 to the plates 9 and 10.

Mounted in front of the sets of plates 3 to 10, inclusive, and the rings 13 to 16, inclusive, is a spider 17, having four arms 18, which project at right angles to each other and each of which has at its outer end a brush-holder 19, provided with an oblong slot 20, the length of which is approximately equal to the distance between the inner edge of the rings 13 to 16, inclusive, and the outer extremities of the contact-plates. In each of the slots is mounted a plurality of contact-blocks 21 of good conducting material—such, for example, as copper—the number of blocks in the present instance being two, though a greater number might be employed, if desired. These blocks fit freely in the slot, and therefore bridge and make contact with the stationary rings and the surrounding contact-plates.

As indicated in Fig. 5, the middle portion adjacent to the lower edge of the block or brush is cut away to form a recess 22, which corresponds to the space between the adjacent edges of the rings and contact-plates. The upper edge is also shown as provided with inclined saw-cuts 23 in order to provide means whereby the block or brush may be grasped to remove it from its slot when desired.

At the outer end of each brush-holder is pivotally mounted a pair of bell-crank levers 24, the long arms 25 of which project over substantially to the middle of the corresponding slot, so as to rest upon the tops of the blocks 21

at substantially their middle points. Each of the bell-crank levers 24 is provided at its elbow with a laterally-projecting stud 26, to which is connected one end of a coil-spring 27, the other end of the spring being fastened to a stud 28, that projects upward from the brush-holder adjacent to the inner ends of the blocks 21. It will be seen that with this arrangement of apparatus the inner ends of the bell-crank levers are held with a yielding pressure against the upper edges of the blocks 21, and thus hold them in contact with the stationary contact rings and plates.

The spider, with its brush-holders and brushes, is designed to move through an angle of forty-five degrees in each direction from its zero position, the movement in one direction serving to operate the controlled motor in one direction and the movement in the opposite direction from zero position serving to control the movement of the motor in the other direction.

One arm of the spider, as shown, is provided with a slot 29, formed in a block 30, which may constitute an integral portion of the corresponding arm of the spider. In this slot 29 operates a roller 31, mounted on a pin 32, which projects inward from an operating-lever 33. One end of the lever 33 is pivoted to the upper edge of the base-plate 1 at 34, and its other end 35 projects through the slot in the opposite edge of the plate and somewhat beyond the edge of the plate. This may be moved directly by hand; but in ordinary service it is connected by a suitable system of levers to an operating-handle, which is located at a convenient point to be manipulated by the motorman or attendant.

The base-plate 1 is provided adjacent to its center with a curved plate 36, having at its middle point a recess 37. A roller 38, which is mounted in the inner end of a rod 39, that is pressed inward by means of a coiled spring 40, engages with the curved plate 36 in order to indicate to the operator when zero or off position is reached.

The reversal of one of the phases of current for the purpose of reversing the motor is effected by means of two switches 41 and 42, (indicated in Fig. 1 and diagrammatically in Fig. 7,) the movable member of each of these switches being thrown to the one side or the other by suitable devices on the corresponding arms of the spider, which engage therewith as the spider is rotated in a well-known manner.

It will be seen by inspection of Fig. 7 that as the spider is rotated the active length of the secondary portion of the winding of each autotransformer 42 is varied for the purpose of varying the speed, the circuit connections being made through the various contact-plates and the corresponding rings, with which the brushes or contact-blocks make engagement. It will also be seen that a preventive resistance 44 is cut into the circuit as each change

is made, there being two of these resistances shown in Fig. 7. These circuits and circuit connections are shown in this connection merely for the purpose of indicating a practical application of my invention and not as embodying in themselves any novel features. Consequently a more specific description of them is deemed unnecessary.

It will be seen that by reason of the operative connections between the operating-lever 33 and the spider 17 a comparatively small movement of the end 35 of the operating-lever will effect a much greater range of movement of the spider and its attached parts.

As has already been indicated, I desire it to be understood that my invention is not limited to specific details of construction, since these may be varied within considerable limits without departing from the invention.

I claim as my invention—

1. In a controller for electric motors, the combination with a frame, circumferentially-arranged contact-pieces on said frame and comprising eight sets and a centrally-pivoted, four-armed spider having one or more brushes in each arm adapted to engage two sets of said contact-pieces, of an operating-lever having one end pivoted to the frame outside the spider and the contact-pieces and a slot-and-pin connection between the operating-lever and the spider, whereby a limited movement of the lever in either direction serves to move the spider in the same direction through one-eighth of a revolution.

2. In a controller for electric motors, the combination with a frame and circumferentially-arranged contact-plates comprising eight sets, of a concentrically-pivoted, four-armed spider having one or more brushes in each arm to make contact with two sets of said plates, and having a radial slot or groove in one of its arms of an eccentrically-pivoted operating-lever having a roller and a supporting-pin therefor located in said slot or groove, whereby a limited movement of the lever in either direction serves to move the spider in the same direction through one-eighth of a revolution.

3. In a controller for electric motors, the combination with a frame having a plurality of contact-ring segments and corresponding, concentric sets of contact-plates, of a centrally-pivoted spider having brushes in the ends of its respective arms to make engagement with said ring-segments and plates, an eccentrically-pivoted operating-lever having a slot-and-pin connection with one of the spider-arms and means for latching the spider in zero or off position.

4. In a controller for electric motors, the combination with a ring-segment and an adjacent, concentric set of contact-plates, of a brush-holder arm having a slot therein in front of said ring-segment and set of contact-plates, a bridging-block fitting freely in said slot, a bell-crank lever pivoted to the brush-

holder arm and means for yieldingly pressing the free end of said lever against the outer edge of said bridging-block.

5 In a controller for electric motors, the combination with a ring-segment and an adjacent, concentric set of contact-plates, of a brush-holder arm having a slot therein in front of said segment and set of contact-plates, a pair of bridging-blocks fitting freely, side
10 by side in said slot, two bell-crank levers pivoted to the brush-holder arm and means for yieldingly pressing the free end of each of said levers against the outer edge of the corresponding bridging-block.

15 6. In a controller for electric motors, the combination with a ring-segment and an adjacent, concentric set of contact-plates, of a brush-holder having a slot, a pair of bridging contact-blocks fitting freely in said slot in
20 side-by-side relation, a pair of bell-crank levers pivoted to said holder and a pair of springs for holding the free ends of the levers in engagement with the outer edges of the bridging-blocks.

25 7. In a controller for electric motors, a brush-holder having an elongated slot extending laterally through it and provided with a pair of pivoted bell-crank levers projecting over said slots and actuating-springs therefor, in combination with a pair of side-by-side conducting-blocks fitting freely in said slot and en-
30

gaged at substantially the middle points of their outer edges by the free ends of said levers.

8. In a controller for electric motors, a brush- 35 holder having an elongated slot extending through it at right angles to its plane of movement and having a plurality of bell-crank levers pivoted to it and actuating-springs therefor, in combination with a plurality of cop- 40 per blocks located side by side in said slot and having the middle points of their outer edges engaged by the free ends of said bell-crank levers.

9. In a controller for electric motors, the 45 combination with concentric contact-pieces, of a pivoted brush-holder having a slot in front of said contact-pieces and provided with spring-actuated, pivoted, bell-crank levers the free ends of which project over said slot 50 and conducting-blocks fitting freely in said slot the middle points of the outer edges of which are engaged by the free ends of said levers.

In testimony whereof I have hereunto sub- 55 scribed my name this 16th day of December, 1901.

HARVE R. STUART.

Witnesses:

JAMES B. YOUNG,
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