936,578.

H. R. STUART.

ELECTRIC CIRCUIT INTERRUPTER.

APPLICATION FILED JAN. 24, 1906.

Patented Oct. 12, 1909.

3 SHEETS—SHEET 1.

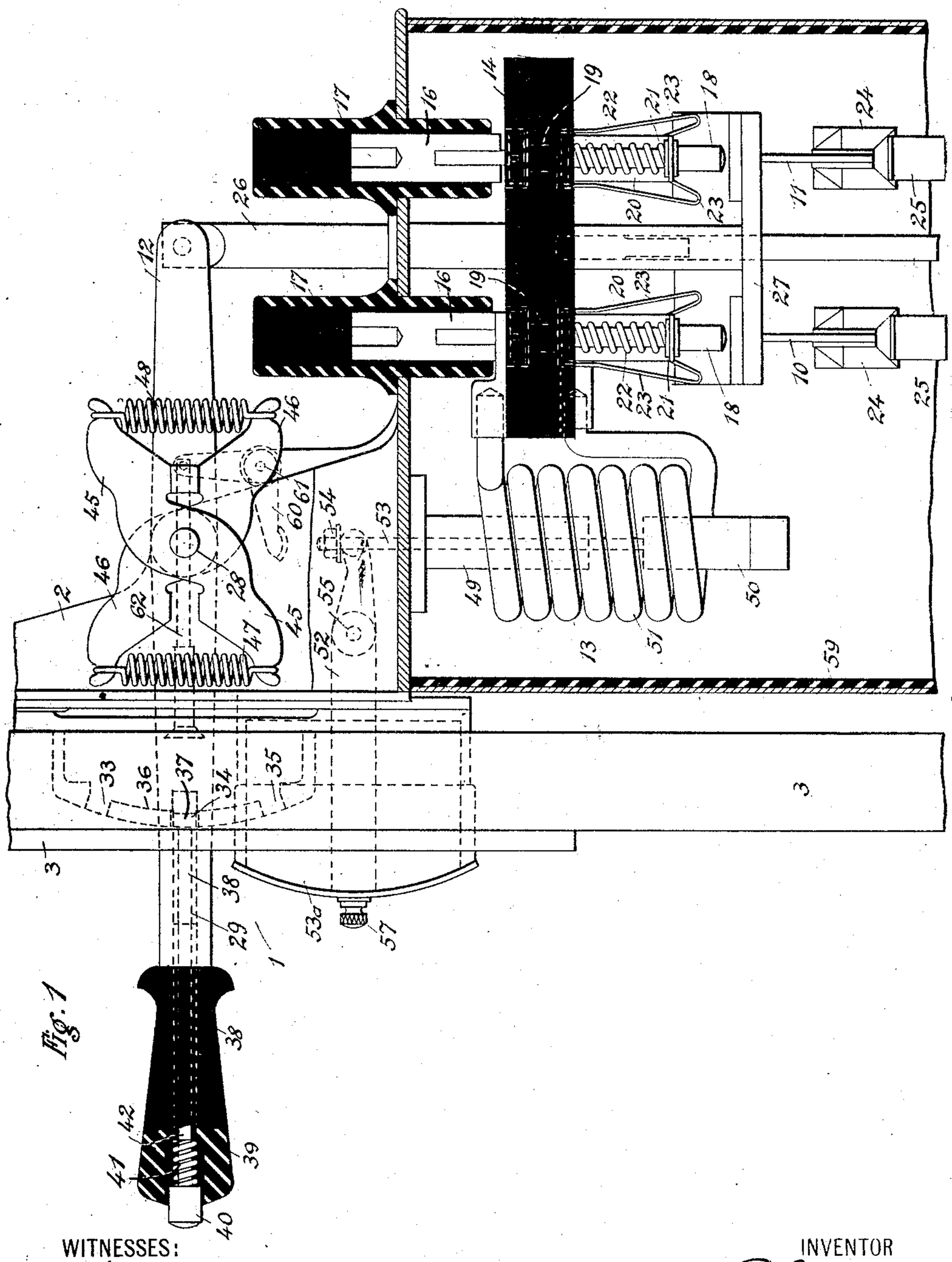

Fig. 1

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3 SHEETS—SHEET 2

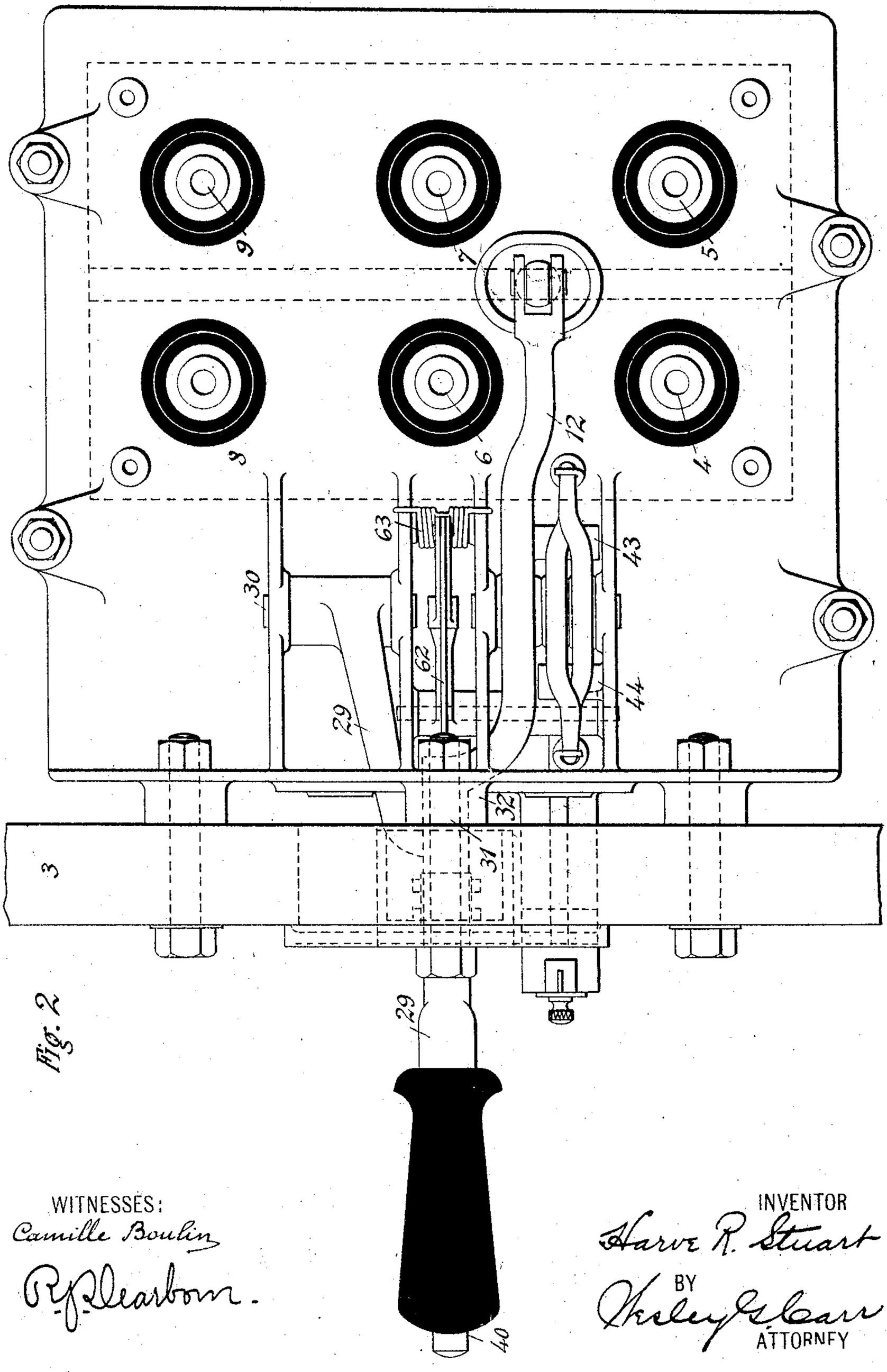

Fig. 2

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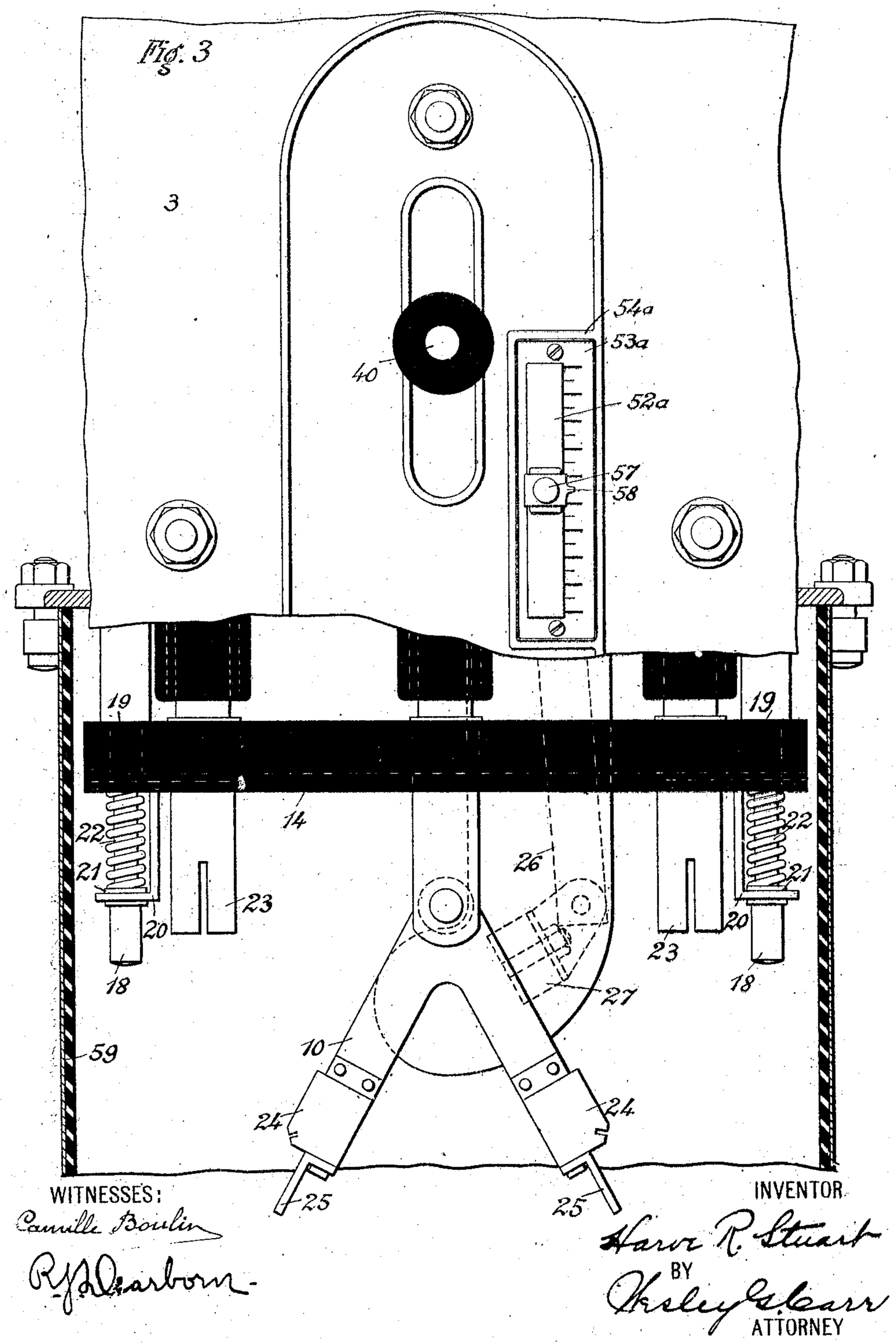
3 SHEETS—SHEET 3.

Fig. 3



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ELECTRIC-CIRCUIT INTERRUPTER.

936,578. Specification of Letters Patent. Patented Oct. 12, 1909.

Application filed January 24, 1906. Serial No. 297,688.

To all whom it may concern:

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

My invention relates to electric circuit interrupters which are arranged to automatically open circuits under predetermined conditions and it has for its object to provide a device of this character that shall be specially adapted for high voltage service and satisfactory switchboard mounting; that shall be simple and durable in construction and that shall embody an improved, adjustable, release-magnet mechanism.

A circuit interrupter which is automatically released under overload conditions is usually provided with a tripping-magnet mechanism which comprises a magnetizing coil connected in series with the interrupter and a core member having relatively stationary and movable portions of magnetizable material. By reason of their circuit connections the magnet coils are necessarily insulated for the maximum voltage for which the interrupter is designed and, in the prior art, when high voltage interrupters were mounted on the back of a switchboard, the tripping coils were usually located on the front of the board to permit the adjustment of the parts to effect variations in the current value at which the circuit should be automatically interrupted. With relatively high-voltage interrupters, this arrangement involved considerable expense and difficulty, either to provide adequate insulation for the coil or to reduce its voltage by means of a transformer for the safety and protection of the attendant.

In order that suitable adjustment may be effected from one face of a switchboard without locating any current-carrying parts on that face or involving the use of transformers, I provide a pivotally mounted lever, the inner end of which is connected by a lost motion connection to a movable portion of the tripping-magnet core member, which is grounded and the outer end of which extends through a slot in the switchboard. In this way, the magnetizing coil may be insulated by any convenient means or it may be constructed of bare wire or strap conductor and be oil immersed if the switch parts operate in oil.

The controller of my invention, exclusive of the aforesaid tripping mechanism, comprises contact terminals of a special design which insure a good contact and offer no resistance to the opening of the circuit, as well as extinguish arcs which may be formed upon the interruption of the circuit.

In the accompanying drawings, Figure 1 is a side elevation partially in section, Fig. 2 is a plan view and Fig. 3 a front elevation of a circuit interrupter which is constructed in accordance with my invention.

Referring to the drawings, a circuit interrupter 1 comprises a frame 2 which is mounted upon an insulating slab or switchboard panel 3 and supports a plurality of stationary contact members 4, 5, 6, 7, 8 and 9, movable contact members 10 and 11, an operating lever 12 and an overload release magnet 13. The stationary contact members 4, 5, 8 and 9 are supported from an insulating plate 14 and comprise arcing contact members and current-carrying switch members which extend below the plate 14 and connectors 16 that are surrounded by insulating bushings 17 and extend above the plate. The arcing contact members comprise pin terminals 18 which are movably fitted into holes 19 in the plate 14 and are connected to the current-carrying switch members by angular plates or strips 20, their longitudinal movement being limited and controlled by the collars 21 and by springs 22 which surround them between the plate 14 and the collars. The stationary current-carrying switch members have contact terminals formed of flexible strips 23 the lower ends of which are bent inwardly and upwardly to form substantially V-shaped recesses. The stationary contact members 6 and 7 are similarly provided with connectors and bushings above the plate 14 but below the plate they serve as supports for the movable contact members 10 and 11 which are pivotally mounted thereon. The movable contact members are similar to each other and consist of flat V-shaped plates which are pivotally mounted near their vertices upon the stationary contact members 6 and 7 and rotate in parallel planes. Hollow wedge terminal blocks 24 are so attached to the arms of the plates that they may engage the stationary terminal strips 23, and contact

strips 25 extend outwardly from the wedge blocks to engage the arcing terminal pins 18, the arrangement of parts being such that the circuit is always broken at the extremities of these pins. The simultaneous action of the movable members 10 and 11 is accomplished by a link 26 one end of which is pivoted to a block 27 with which the V-shaped plates are provided and the other end of which is pivoted to one end of the operating lever 12. The length of the connecting link 26 is such that the operating lever 12 is in a substantially horizontal position when the movable contact member 10 and 11 occupy a position midway between the stationary terminals 4 and 5, and 8 and 9, consequently, as the lever is moved through a slight angle in one direction in a vertical plane the movable contact members will move into engagement with one set of stationary members and, as it is moved through a similar angle in the opposite direction from the central position the movable members engage the opposite pair of stationary contact members.

The operating lever 12 is supported upon a fulcrum shaft 28 and may be manually operated, under normal conditions, by a handle lever 29 which is fulcrumed, near its inner extremity, upon a shaft 30 that is in alinement with the fulcrum shaft 28, the two levers being so constructed that a single forked lever is formed when a connecting pin 31 is inserted through a bushing or hub 32 at one extremity of the operating lever 12 into a hollow bored handle member of the other lever. It follows that the handle lever may also occupy any one of the three positions hereinbefore described which are accentuated by three notches 33, 34 and 35, that are located at equal intervals in a concave cylindrically curved surface 36 and are engaged by a latch 37. The latch 37 is attached to a rod 38 which is located in a tubular bore 39 in the handle lever and is provided with a push button 40 which projects beyond the end of the handle. The latch is forced into one or another of the notches by a spring 41 which is interposed between the push button 40 and a shoulder 42 in the handle bore and the pressure of which must be overcome in order to release the handle.

The operating lever 12 is provided with a projection 43 and the frame 2 is provided with a corresponding projection 44 both of which are engaged by two similar spring dogs 45 and 46 that are rotatably mounted upon the fulcrum shaft 28 of the operating lever. The spring dogs are so interconnected by springs 47 and 48 that the operating lever and the handle lever will return to the mid position, which is accentuated by the notch 34, when released from the other positions, since a motion in either direction from the mid position puts the springs under tension. The levers may be released from positions corresponding to notches 33 and 35 by the push button 40, or only the operating lever 12 may be released and returned to the mid position by the action of the release magnet 13 which comprises a stationary core member 49, a movable core member 50, a magnetizing coil 51, which may be included in the circuit when the switch occupies either of its closed positions and an adjusting lever 52. The movable core member 50 is attached to the lower extremity of a hammer rod 53 which passes through a hole in the stationary core member 49 and serves as a guide for the movable member. The motion of this member is limited by a nut 54 which is screw threaded upon the upper extremity of the hammer rod 53 after the rod has been thrust through the hole in the stationary member. Adjusting lever 52 is pivotally mounted upon a stationary shaft 55 and is forked at one end to so engage the nut 54 on the rod 53 that, by rotating the lever through a small angle, it is possible to determine the limit to which the core member 50 may be moved. The lever 52 extends through a slot 52^a in a projection 53^a which may be integral with the frame 2 of the interrupter and extends through a suitable opening 54^a in the switchboard. The face of this projection 53^a is of cylindrical contour and is concentric with the shaft 55 and may be calibrated in amperes to indicate the position at which the lever should be set in order that the circuit may be automatically interrupted by the action of the tripping mechanism. The lever may be set at any position along the slot 52^a, by means of a thumb screw 57, and be provided with an indicating finger 58 which moves across the scale on the dial. By making the projection and dial integral with the frame of the interrupter they may be independent of the thickness of the slab or panel and therefore be adapted for use on any switchboard.

When the interrupter is closed and the current flowing through the coil 51 reaches a value such that the movable core member 50 is moved into engagement with the stationary member 49, the upper end of the hammer rod 53 strikes one arm of a bell crank lever 60 which is fulcrumed on a shaft 61, the other arm of the bell crank lever being so connected with the pin 31 by a link 62 that the motion of the lever transmitted by the hammer rod 53 pulls the pin 31 out of the handle lever bore and releases the operating lever 12, which is immediately returned to the mid position. In order to again close the switch, the latch 37 must be released from its notch and the handle lever returned to its mid position, when the pin 31 reëngages the hub 32, by reason of a spring 63 which tends to hold the bell crank

lever in its normal position. This arrangement removes the possibility of holding the interrupter closed by the handle lever when excessive currents traverse the circuit in which it is located, since the automatic release mechanism effects the return of the movable contact members to the open circuit position, irrespective of the handle lever.

It will be observed that no current-carrying parts are located on the face of the switchboard and that the switch parts and the tripping coil may be immersed in oil for which purpose a detachable tank 59 is provided.

Variations in size, form and details of construction may, of course, be made within the scope of my invention.

I claim as my invention:

1. The combination with a magnetizable core, comprising a stationary portion and a movable portion having a projection at its upper end, and a magnetizing coil for said core, of means for adjusting the air gap which exists between the core members when the coil is deënergized, said means comprising a pivoted lever on one end of which said projection rests and the other end of which is provided with a clamping device.

2. The combination with a magnetizable core comprising a stationary portion and a movable portion, and a magnetizing coil for said core, of means for adjusting the air gap which exists between the core members when the coil is deënergized, said means comprising a pivoted lever one end of which supports the movable portion and the other end of which is provided with a clamping device.

3. The combination with a magnetizable core comprising a stationary member and a movable member, and a magnetizing coil for said core, of means for adjusting the air gap which exists when the coil is deënergized, said means comprising a pivotally mounted lever which supports the movable member, and means for clamping the lever in any position to which it may be moved upon its pivot.

4. A tripping device for circuit interrupters comprising a stationary core member, a movable core member, a hammer rod attached to said movable member and having an enlargement near one end, a pivotally mounted lever one end of which engages said enlargement, a calibrated dial having a slot through which said lever projects.

5. In a circuit interrupter, a tripping device comprising a stationary core member, a movable core member, a hammer rod attached to said movable member and screw-threaded near its free end, a nut on the screw-threaded portion, a lever one end of which engages said nut, and a calibrated dial having a slot through which said lever extends.

6. In a circuit interrupter, the combination with a tripping device comprising a stationary core member, a movable core member, a hammer rod attached to said movable member and screw-threaded near its free end, a nut on said screw-threaded portion, a pivotally mounted lever one end of which engages said nut, and a calibrated dial having a slot through which said lever projects, of means for clamping the lever at any point within the limits of the slot.

7. The combination with a switchboard panel, a circuit controller and release mechanism therefor comprising a coil and a movable core member mounted upon one side of said panel, of an adjustable lever which normally supports the movable core member and projects through the panel, and the outer end of which is provided with means for clamping it in any position to which it may be adjusted.

8. The combination with a switchboard panel, an oil-immersed circuit controller, a releasing mechanism comprising a stationary core member, and a magnetizing winding therefor, a movable core member and a hammer rod attached thereto having a nut located near its extremity, said parts being mounted on one side of the panel, of means for adjusting the release mechanism from the other side of the panel.

9. The combination with a switchboard panel, an oil-immersed circuit controller, a releasing mechanism comprising a stationary core member, and a magnetizing winding therefor, a movable core member and a hammer rod attached thereto having a nut located near its extremity, said parts being mounted upon one side of the panel, of means for adjusting the release mechanism from the other side of the panel, said means comprising a pivotally mounted lever one end of which is forked and engages said nut and the other end of which projects through a slot in the panel.

10. The combination with a switchboard panel, an oil-immersed circuit controller mounted upon one side of the panel and comprising a plurality of stationary contact members, movable contact members, and a release mechanism, comprising a stationary core member, a magnetizing winding therefor, a movable core member and a hammer rod attached thereto having a nut located near its extremity, of means for adjusting the air gap between the stationary and movable core members from the opposite side of the panel.

11. The combination with a switchboard panel, an oil-immersed circuit controller mounted upon one side of the switchboard and comprising a plurality of stationary contact members, movable contact members, and a release mechanism comprising a stationary core member, a magnetizing winding therefor, a movable core member and a

hammer rod attached thereto having a nut located near its extremity, of means for adjusting the air gap between the stationary and movable core members from the other side of the panel, said means comprising a pivotally mounted lever one end of which is forked and engages said nut, a slotted projection having an outer cylindrically curved dial surface to which the other end of the lever may be clamped.

12. The combination with a switchboard panel, an oil-immersed circuit controller mounted on the back of the panel and comprising a plurality of stationary contact members, movable contact members, and a release mechanism comprising a stationary core member, a magnetizing winding therefor, a movable core member and a hammer rod attached thereto having a nut located near its extremity, of means for adjusting the air gap between the stationary and movable core members from the face of the switchboard, said means comprising a pivotally mounted lever, one end of which is forked and engages said nut, a calibrated dial plate having a slot through which one extremity of said lever projects, and means for fastening the outer extremity of the lever at any point within the limits of the slot.

13. The combination with a switchboard panel, an oil-immersed circuit controller located on one side of the panel and comprising a plurality of stationary contact members, movable contact members, and a release mechanism comprising a stationary core member, a magnetizing winding therefor, a movable core member and a hammer rod attached thereto having a nut located near its extremity, of means for adjusting the air gap between the stationary and movable core members from the opposite side of the panel, said means comprising a pivotally mounted lever one end of which is forked and engages said nut, and a calibrated dial having a slot through which one extremity of said lever projects.

14. The combination with a switchboard panel, and a circuit-interrupting device, of means for automatically tripping said device, said means comprising a stationary core member, and a hammer rod attached thereto having a nut located near its extremity, a projection which is integral with the frame of the circuit-interrupting device and projects through a suitable opening in the switchboard panel and the outer extremity of which has a calibrated, cylindrically curved surface, of means for adjusting the release mechanism from the other side of the panel, said means comprising a pivotally mounted lever one end of which is forked and engages said nut and the other end of which projects through a slot in the projection having the calibrated, cylindrically curved surface.

In testimony whereof, I have hereunto subscribed my name this 8th day of January, 1906.

HARVE R. STUART.

Witnesses:
R. J. DEARBORN,
BIRNEY HINES.