

(No Model.)

2 Sheets—Sheet 1.

E. C. WILLIAMS.
AUTOMATIC CIRCUIT CLOSER.

No. 572,923.

Patented Dec. 8, 1896.

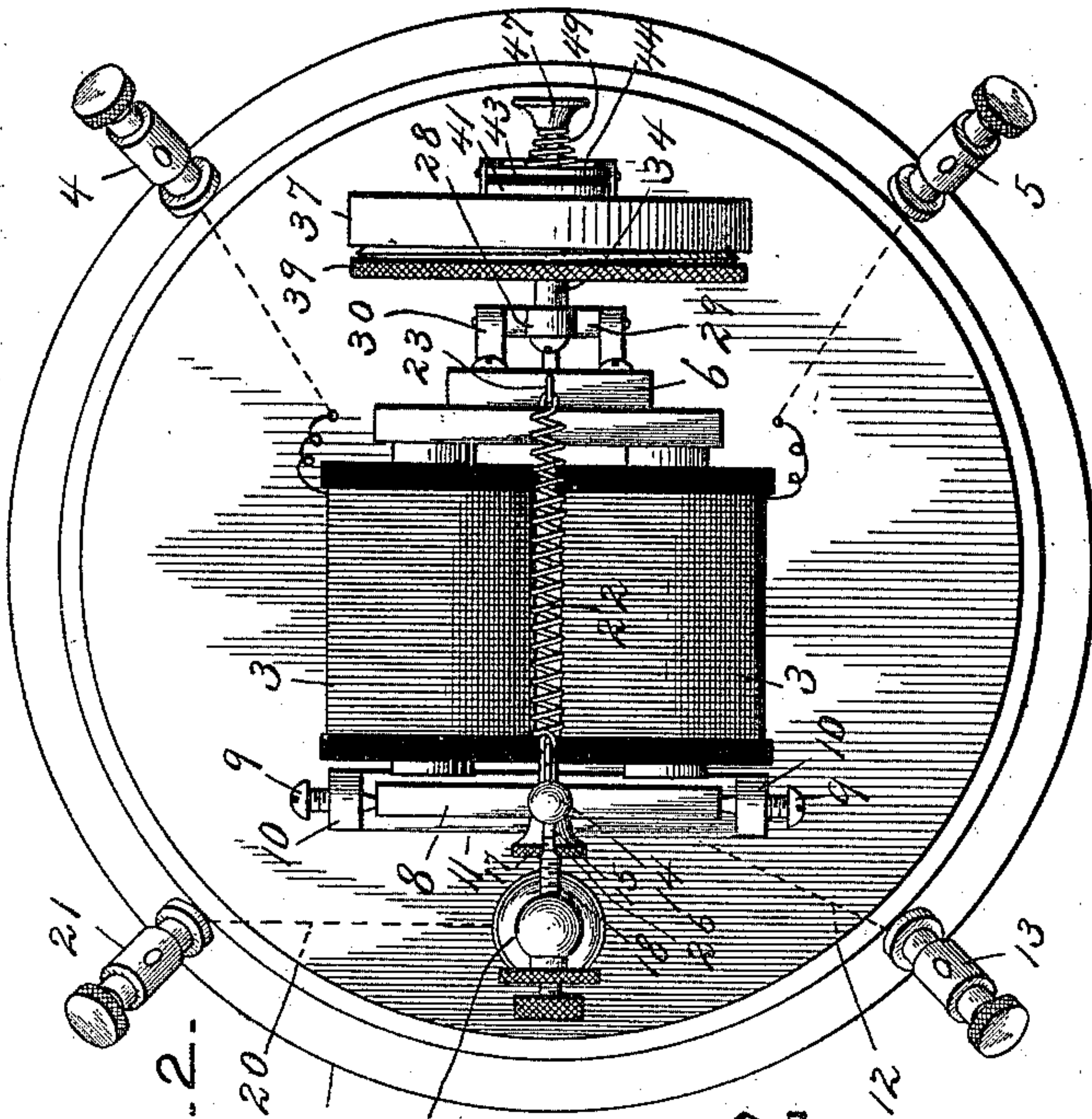


FIG. 1.

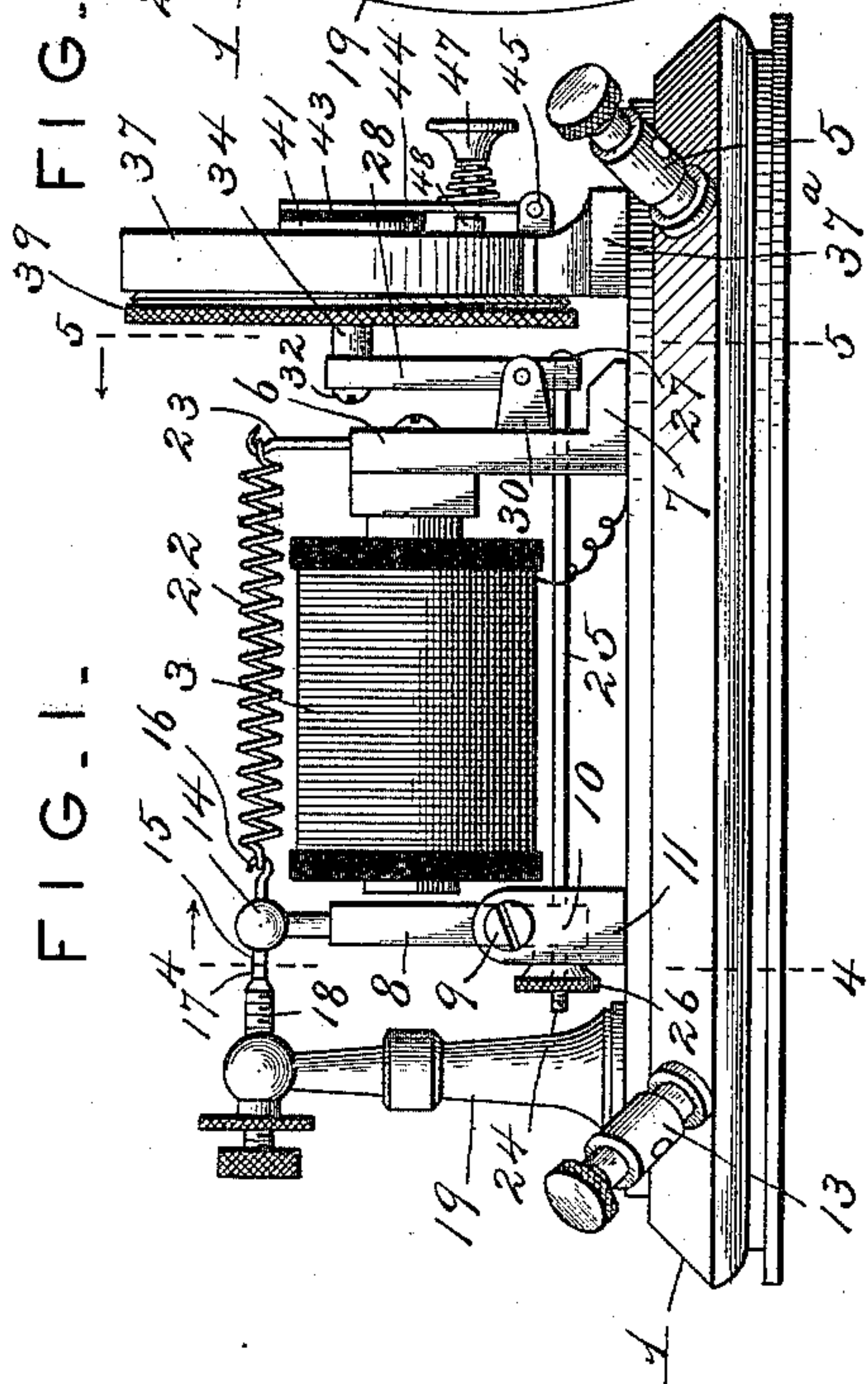


FIG. 2.

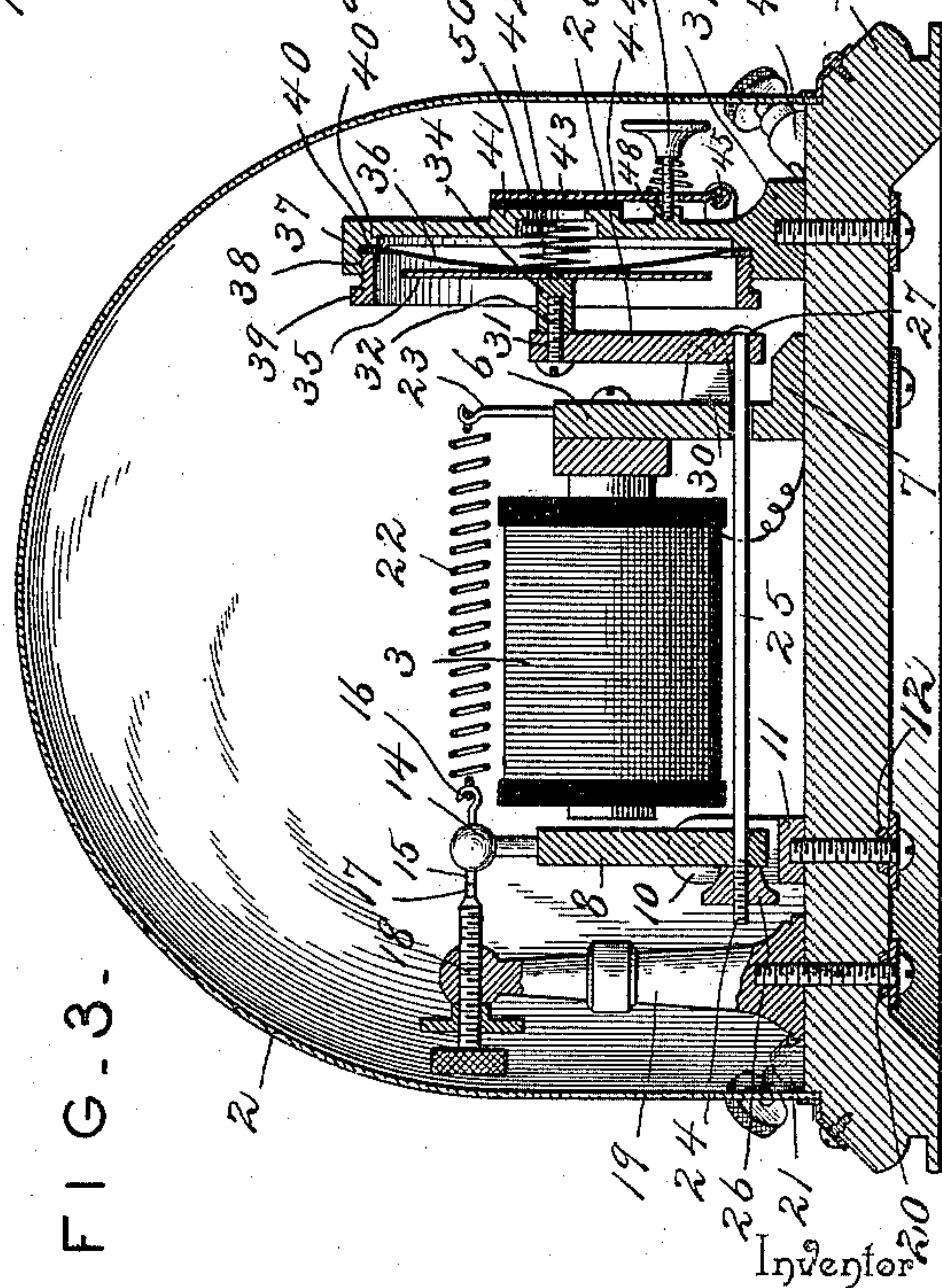


FIG. 3.

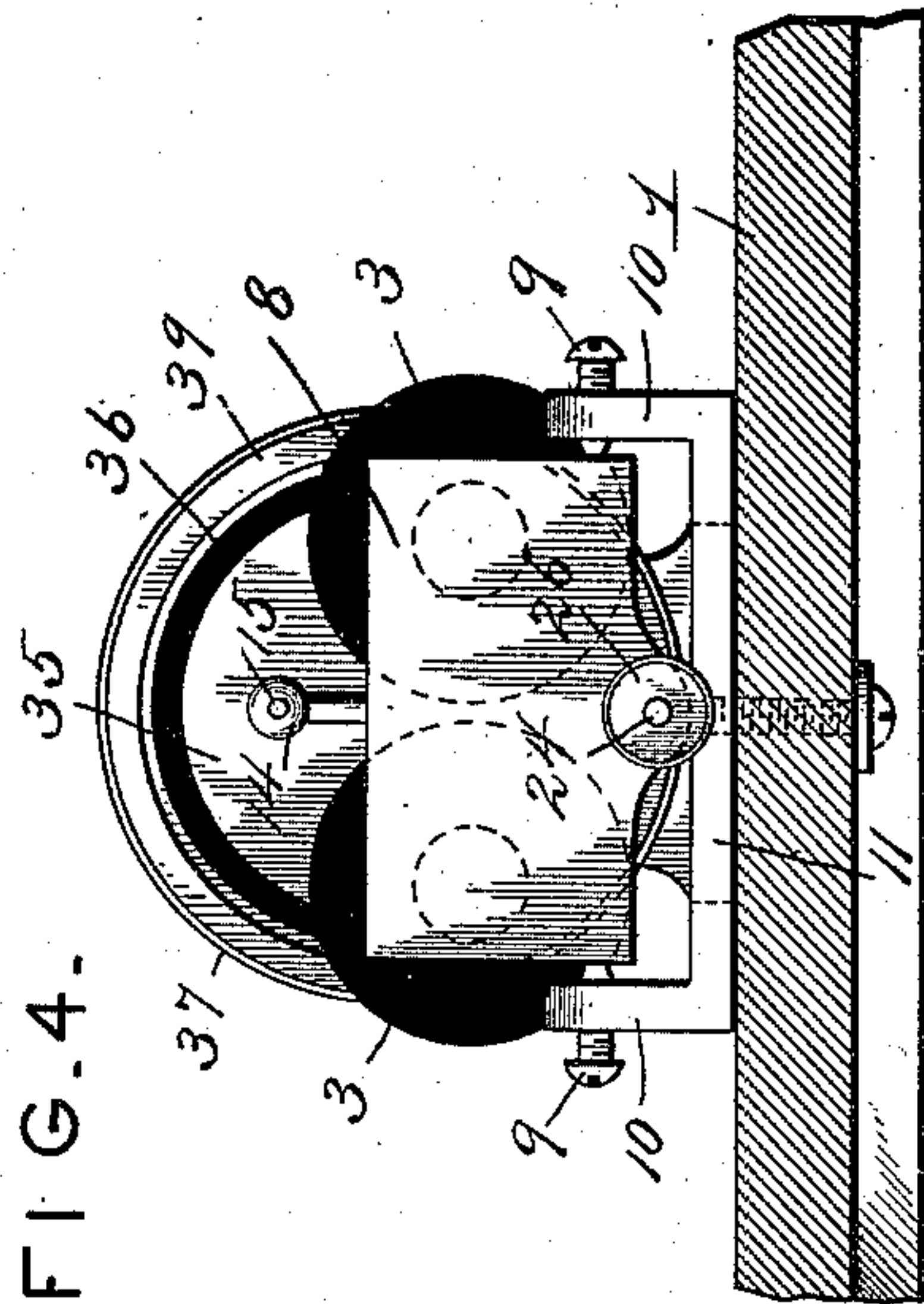


FIG. 4.

Witnesses.

Harry L. Amer.
S. P. McHaupter

By His Attorneys,

Edwin C. Williams.

C. A. Snow & Co.

(No Model.)

2 Sheets—Sheet 2.

E. C. WILLIAMS.
AUTOMATIC CIRCUIT CLOSER.

No. 572,923.

Patented Dec. 8, 1896.

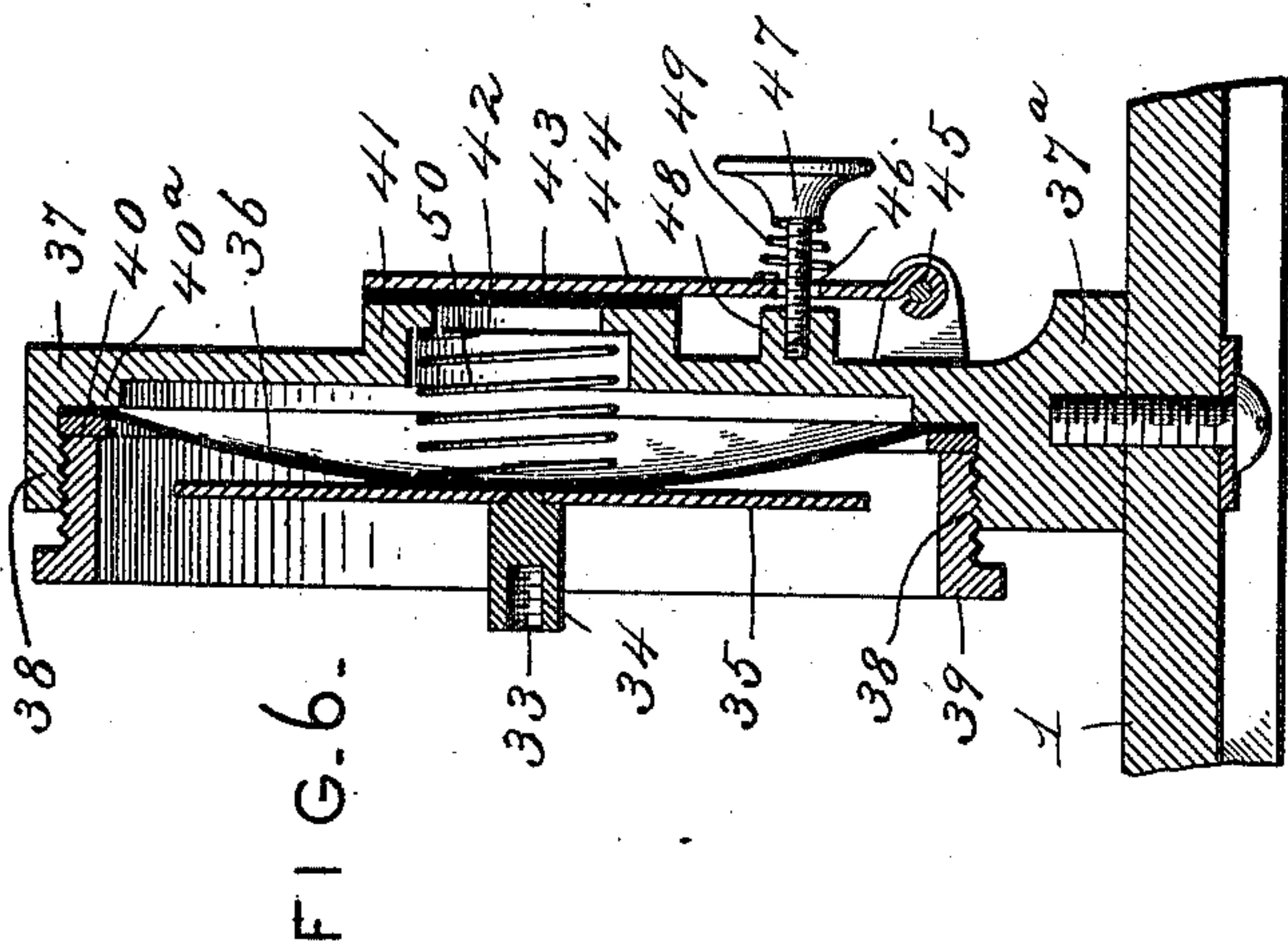


FIG. 6.

FIG. 5.

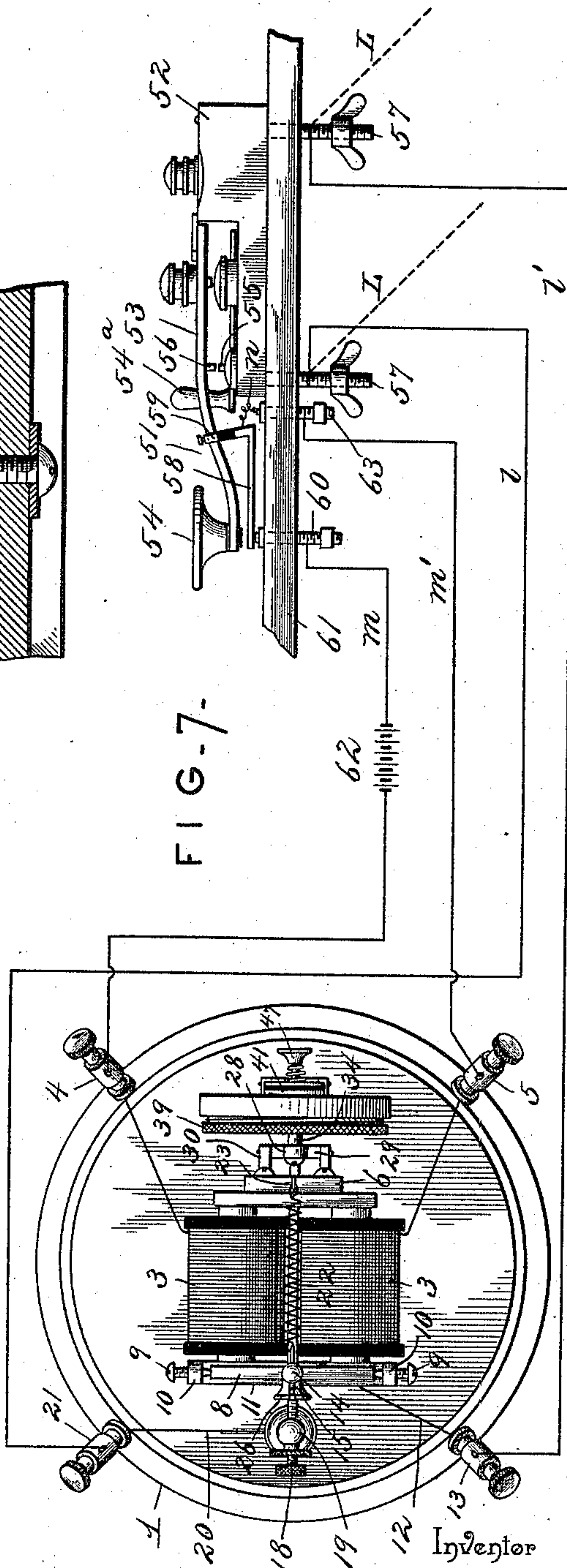
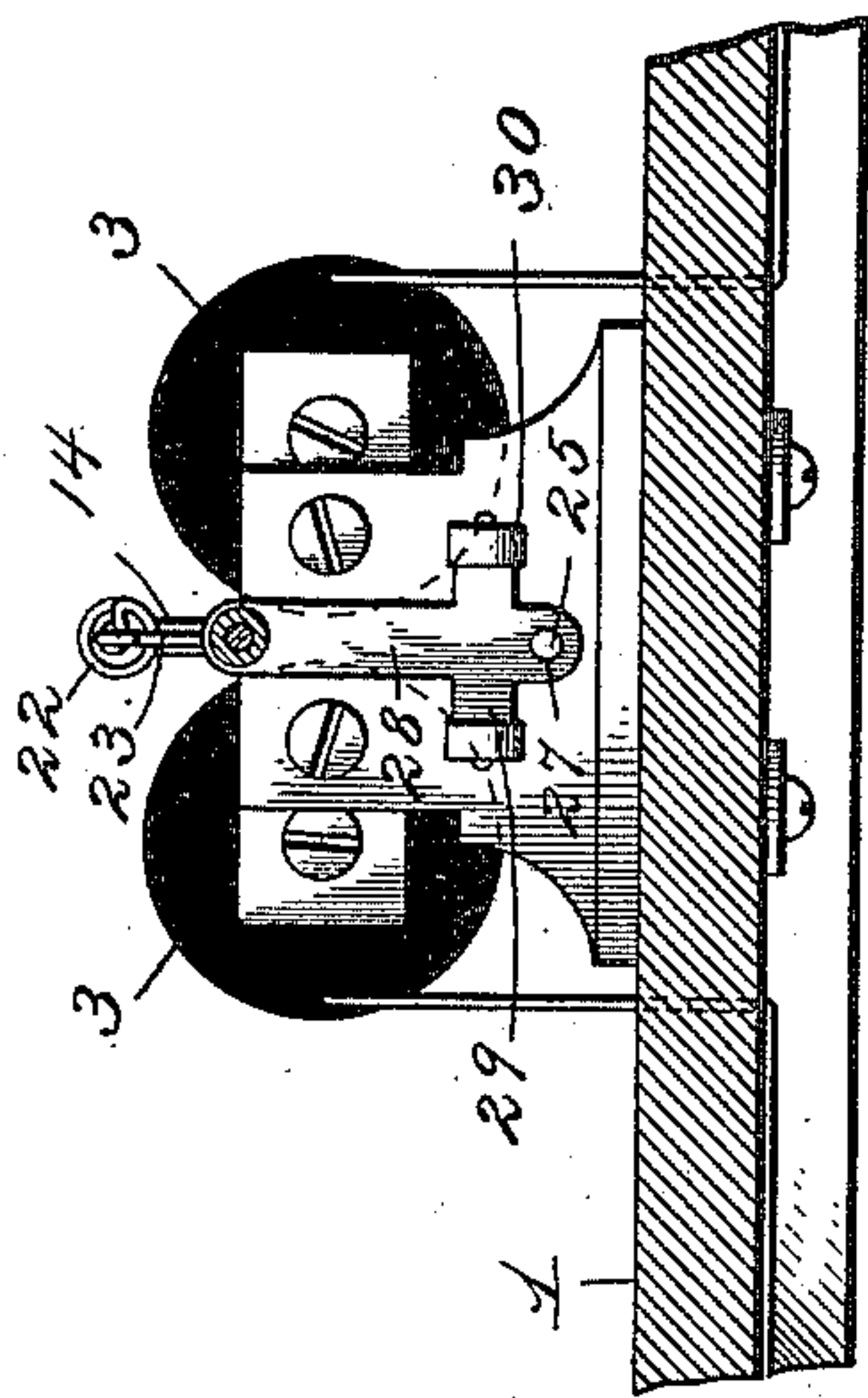


FIG. 7.

Witnesses

Harry L. Amer.
L. P. Hollander

By His Attorneys,

Edwin C. Williams

Cashmore & Co.

UNITED STATES PATENT OFFICE.

EDWIN C. WILLIAMS, OF CLARKSVILLE, TENNESSEE, ASSIGNOR OF ONE-FOURTH TO SEELY DUNN, OF SAME PLACE.

AUTOMATIC CIRCUIT-CLOSER.

SPECIFICATION forming part of Letters Patent No. 572,923, dated December 8, 1896.

Application filed May 9, 1896. Serial No. 590,896. (No model.)

To all whom it may concern:

Be it known that I, EDWIN C. WILLIAMS, a citizen of the United States, residing at Clarksville, in the county of Montgomery and State of Tennessee, have invented a new and useful Automatic Circuit-Closer, of which the following is a specification.

This invention relates to automatic circuit-closers; and it has for its object to provide an instrument of this character used in connection with telegraph and other closed circuits to provide positive and efficient means for automatically closing the circuit should it be left open by accident or carelessness.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a side elevation of an automatic circuit-closing instrument constructed in accordance with this invention. Fig. 2 is a top plan view thereof. Fig. 3 is a vertical longitudinal sectional view of the instrument. Fig. 4 is a transverse sectional view on the line 4 4 of Fig. 1. Fig. 5 is a similar view on the line 5 5 of Fig. 1. Fig. 6 is an enlarged detail sectional view of the air-cup device. Fig. 7 is a diagrammatic view of a telegraph-key and its connections with the circuit-closing instrument contemplated by this invention.

Referring to the accompanying drawings, the numeral 1 designates a suitable base on which is preferably fitted in an air-tight joint a glass or other suitable cover 2, which protects the different parts of the instrument from dust and moisture, so as to insure a constant and positive operation of the instrument at all times. The base 1 has arranged thereover a pair of electromagnets 3, having their wire terminals connected with the binding-posts 4 and 5, respectively, which binding-posts are fitted on the base 1 in any convenient position. The electromagnets 3 are rigidly fastened at one end to an upright supporting-plate 6, provided at its lower end with a flange 7, secured to the base 1, to provide for firmly supporting the magnets 3 in a proper relative position above the base.

Arranged to work at one end of the magnets 3 is a swinging armature-plate 8, pivotally supported in position by the pointed pivot or trunnion-screws 9, which are passed through the opposite upright arms 10 of a U-shaped bearing-bracket 11, fastened on the upper side of the base. The inner pointed ends of the pivot or trunnion screws 9 pivotally engage the swinging armature-plate 8 at its opposite ends and near its lower edge, in order that the same may be pivotally supported in a proper relative position with respect to the adjacent core ends of the electromagnets. The bearing-bracket 11 has a suitable wire connection 12, with a binding-post 13, fitted on the base 1 at a convenient point, and the swinging armature-plate 8 carries centrally at its upper edge a short upwardly-disposed contact arm or post 14, provided at one side with a platinum contact-point 15 and at the side opposite said point with a hook 16, the function of which hook will be more particularly referred to.

The contact-point 15 of the contact-arm 14 is adapted to normally contact with an adjacent oppositely-disposed platinum contact-point 17, formed at the inner end of a contact-screw 18, adjustably fitted in the upper end of an upright contact-post 19, secured on the base 1 and having a suitable wire connection 20 with a binding-post 21, fitted on the base at a convenient point.

The hook 16, at one side of the short contact-arm 14, has connected thereto one end of a retractile spring 22, the other end of which spring is connected to a fixed hook 23, fitted in the upper side of the supporting-plate 6 for the electromagnets, and the function of the spring 22 is to take up all lost motion between the different parts of the instrument during the operation thereof. At its lower edge below the point of pivot the swinging armature-plate 8 is perforated to receive the threaded end 24 of a pull or connecting rod 25, and at one side of the plate 8 the threaded end of said rod receives thereon a thumb-nut 26, which provides for properly adjusting the play of the parts connected with the swinging armature-plate, as may be required.

The connecting-rod 25 preferably extends from its point of connection with the arma-

ture-plate 8 below the electromagnets and is suitably connected at its end opposite said armature-plate, as at 27, to the lower end of a swinging lever 28. The swinging lever 28 is preferably arranged at one side of the supporting-plate 6, and is provided near its lower end with the oppositely-disposed pivot-arms 29, which are pivotally mounted in the perforated pivot lugs or ears 30, projected from one side of the said plate 6. The swinging lever 28 is provided in its upper end with an opening 31 to receive the connecting-screw 32, which engages the threaded socket 33 of the short connecting-post 34, projected from one side of the metallic compression plate or disk 35, which is suitably fastened at a central point to the outer side of a flexible rubber or similar diaphragm 36, forming one of the inclosing sides of the air-cup 37.

The air-cup 37 is preferably of a circular shape and is provided at its lower side with an attaching-foot 37^a, which provides means for securing the air-cup on the base 1 in an upright position. The said air-cup 37 is provided with an interiorly-threaded flange 38, forming an inner open side, which removably receives an exteriorly-threaded clamping-ring 39, engaging the threads of the flange 38 and working against a gasket-ring 40, fitted within the open side of the air-cup and against the peripheral edges of the flexible diaphragm 36, so as to clamp such diaphragm in an airtight joint against the interior shoulder 40^a, formed within the air-cup.

The outer closed side of the air-cup 37 is provided with a centrally-located offstanding hollow boss 41, having therein a valve-opening 42, adapted to be covered and uncovered by the valve-disk 43, formed of soft rubber or some similar material and working over the outer side of said hollow boss. The valve-disk 43 is fitted on the inner side of one end of a valve-lever 44, the other end of which lever is pivotally connected, as at 45, with the outer side of the air-cup. Adjacent to its point of pivot the valve-lever 44 is provided with an opening 46, which receives a thumb-screw 47, the shank of which adjustably engages a threaded socket 48, formed on the outer side of the cup 37, and the head of said screw bears against one end of a spring 49, the other end of which bears against the outer side of the valve-lever 44, to normally hold the valve-disk over said valve-opening 42, and by regulating the screw 47 the pressure of said valve-disk against the outer side of the hollow boss may be accurately regulated.

An adjusting-spring 50 is arranged within the air-chamber formed between the outer closed side of the air-cup and the diaphragm 36, and arranged with one end bearing against said diaphragm and the other end disposed within the hollow boss 41. The said spring 50 normally presses the diaphragm 36 outward, so as to overbalance the action of the

spring 22 and normally adjust the contact-point 15 against the contact-point 17.

While the instrument just described may be used in connection with any normally-closed electric circuit, the same is especially designed for use in connection with the telegraph-key used with the Morse or other closed-circuit system, and in Fig. 7 of the drawings an ordinary form of telegraph-key 51 is illustrated. The key 51 is an ordinary type of the well-known Morse telegraph-key, and essentially consists of the body portion 52, the key-lever 53, having the finger-piece 54, and the switch 54^a, designed to electrically connect the body portion 52 with the lower contact-point 55, arranged below the contact-point 56, projected from the under side of the key-lever. The lower contact-point 55 has electrically connected therewith one of the usual pair of key-posts 57, the other of which key-posts is electrically connected with the body portion 52 of the telegraph-key in the usual manner, and said key-posts have respectively connected therewith the separate terminals of the main-line circuit-wire L. In addition to the main-line terminal connections therewith, one of said posts 57 has connected therewith one terminal of a branch-line wire l', the other terminal of which is illustrated as being connected to the binding-post 21 for the contact-post 19, and the other of said key-posts 57 also has connected thereto one terminal of a branch-line wire l'', the other terminal of which branch-line wire is connected to the binding-post 13 for the bearing-bracket 11, which is in metallic connection with the short contact arm or post 14.

To provide for operating the circuit-closing instrument in connection with the telegraph-key, a metallic contact-spring 58 is employed. The contact-spring 58 is provided at one end with an insulated clamp 59, rigidly fastened to a key-lever 53 of the telegraph-key, and the other end of said contact-spring 58 lies directly below the finger-piece 54 and is disposed directly above and out of contact with the contact-screw 60, fitted in the table 61, on which the telegraph-key is arranged, and said contact-screw 60 has connected therewith one terminal of a local-circuit wire m, included in circuit with a local battery 62, and having its other terminal connected to one of the binding-posts 4 for the electromagnets 3, and the other binding-post 5 for said electromagnets has connected thereto one terminal of the other local-circuit wire, m'. The other terminal of the local-circuit wire m' is connected to the connecting-screw 63, fitted in the table 61 of the telegraph-key and having a short wire connection n with the contact-spring 58, so as to complete a circuit through said contact-spring and the contact-screw 60, cooperating therewith.

With the parts of the telegraph-key in their normal positions the space between the normally-separated contact-spring 58 and con-

tact-screw 60 is slightly less than the space between the ordinary contact-points 55 and 56 of the telegraph-key, in order to give a good connection between the spring 58 and the screw 60 and open the circuit through the circuit-closing instrument before the first part of the character is made by the contact of the points 55 and 56, and at this point it will be noted that the spring 58 is so flexible as to make no perceptible difference in the working of the key.

Normally the contact-points 15 and 17 of the circuit-closing instrument are in direct contact with each other, thereby maintaining a closed circuit over the wires *l l'* L L, and it will therefore be obvious that the circuit of the main line is kept closed whether the operator has left his switch 54^a open or not, it of course being understood that in telegraph-keys operated on a closed circuit when the key is not in use the switch 54 must be closed in order to close the circuit of the main line; but this is not always done by operators, either on account of carelessness or accident, and consequently the circuit is left open, which will prevent the sounding instruments from being operated from a distant point.

When the telegraph-key is brought into use, the operator opens the switch 54, providing, of course, that the same had been closed, and upon the first touch of the finger-piece of the key-lever the contact-spring 58 will be pressed in contact with the contact-screw 60, so as to close a circuit over the local-circuit wires and through the electromagnets, which will immediately energize said magnets before the contact-points 55 and 56 of the key touch. Immediately upon being energized the electromagnets attract the swinging armature-plate 8, which swings in a direction to carry the contact-point 15 away from the contact-points 17, and thereby open the circuit on the wires *l l'*, so that the main-line circuit L will be allowed to remain open during the operation of the telegraph-key.

When the armature is attracted to the adjacent core ends of the magnets, the connecting-rod 25 is moved in a direction so as to oscillate or swing the lever 28 in one direction, so as to move the compression plate or disk 35 inward. The inward movement of the plate or disk 35 presses the diaphragm 36 inward against the pressure of the spring 50, and thereby forces the air within the air-chamber of the air-cup out through the valve-opening 42 of said air-cup. The inward pressure of the flexible diaphragm causes the valve-disk 43 to move away from its seat sufficiently to allow the air within the air-cup to be expelled out through the valve-opening 42. The flexible diaphragm reaches its inward limit of movement when the armature-plate contacts with the adjacent core ends of the magnet, and the tendency of the flexible diaphragm to move outward and allow the contact-point 15 to swing against the contact-point 17 immediately closes the valve 43 suf-

ficiently tight, so as to prevent a sufficient quantity of air entering the air-cup to allow the diaphragm to reach its outward limit of movement, in which position the contact-point 15 will contact with the point 17. However, during the operation of the telegraph-key it will of course be understood that the battery-circuit being continually closed by the spring 58 and contact-screw 60 the electromagnets are always energized sufficiently quick to break the contact 15 17.

When the telegraph-key is not being manipulated, or at least after being used, the circuit through the electromagnets is broken, and the spring 50 within the air-chamber exerts its full pressure against the flexible diaphragm and gradually forces the same outward, thereby adjusting the parts 28 and 25 so as to swing the armature-plate 8 away from the magnets, and thereby carry the contact-point 15 toward the contact-point 17. However, this movement of the several parts referred to is very gradual and is dependent upon the amount of leakage around the edges of the valve 43, which amount of leakage is determined by the adjustment of the tension of the spring 49 by means of the thumb-screw 47.

With the magnets inactive the air gradually leaks around the valve 43 and refills the air-chamber confined within the air-cup, and when the said air-chamber has become entirely refilled with air the contact-point 15 will have reached the contact-point 17 and again closed the circuit over the main line through the medium of the branch-line connections *l* and *l'*, so that the closing of the main-line circuit is not at all dependent upon the closing of the telegraph-key switch 54^a, which may be left open by negligence or accident. The slowness with which the armature-plate is adjusted away from the magnets after being attracted thereby is of course important, irrespective of the circuit-closer 58 60, to prevent the contacts 15 and 17 retouching at any time during the use of the telegraph-key.

While the herein-described circuit-closing instrument has been described and illustrated in connection with a telegraph-key, it will of course be understood that the instrument may be used to automatically close any electric circuit of any closed-circuit system should it be left open by accident, and any changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In an automatic circuit-closer, a fixed contact-point, a movable contact-point normally contacting with the fixed point and magnetically controlled in a direction away from said fixed point, an air-cup provided at one side with a flexible movable diaphragm and

at its opposite side with a normally-closed leak-valve, and suitable connections between the flexible diaphragm and the movable contact, substantially as set forth.

5 2. In an automatic circuit-closer, a suitable base, a fixed contact-point supported above the base, an electromagnet supported above the base, a swinging armature supported at one end of the magnet and carrying a contact-
10 point opposite the fixed contact-point, an air-cup provided with a flexible diaphragm, and adjusting connections between said flexible diaphragm and the said armature to retard the movement of the latter away from the
15 magnet, substantially as set forth.

3. In an automatic circuit-closer, a suitable base, a fixed contact-point supported above the base, an electromagnet, a swinging armature supported at one end of the magnet and
20 carrying a contact-point working opposite the fixed point, an air-cup provided at one side with a flexible movable diaphragm and at its opposite side with a normally-closed leak-valve, and adjusting connections between said
25 diaphragm and said armature, substantially as set forth.

4. In an automatic circuit-closer, the base, a fixed contact-point supported above the base, an upright supporting-plate carrying a
30 pair of electromagnets arranged above the base, a bearing-bracket fitted on the base at one end of the electromagnets, a swinging armature-plate pivotally supported within said bracket and carrying a short upwardly-dis-
35 posed contact-arm having a contact-point working opposite the fixed contact-point, a retractile spring suitably connected at one end to the said contact-arm and at its other end to a fixed point of attachment, an air-cup
40 supported in an upright position on the base and provided at one side with an interiorly-threaded flange and in its outer closed side with a normally-closed leak-valve, a flexible diaphragm arranged within the air-cup, an
45 exteriorly-threaded clamping-ring engaging the threaded flange of the cup and binding the peripheral edges of the flexible diaphragm therein, a metallic compression plate or disk suitably fastened at a central point to the
50 outer side of said diaphragm and provided with an offstanding socketed connecting-post,

a swinging lever pivotally supported at one side of the supporting-plate for the magnets and suitably connected at one end to said connecting-post, a connecting-rod connected
55 at one end with the other end of said swinging lever and at its opposite end to said armature-plate, and an adjusting-spring arranged within the air-cup and pressing outward against the inner side of the flexible dia-
60 phragm, substantially as set forth.

5. In an automatic circuit-closer, a suitable base, a fixed contact-point supported above the base, an electromagnet, a swinging armature supported at one end of the magnet and
65 carrying a contact-point working opposite the fixed point, a suitably-arranged air-cup provided at one side with a flexible diaphragm and in its opposite side with a valve-opening, adjusting connections between said dia-
70 phragm and said armature, and a spring-adjusted valve-lever pivotally mounted at one end on the outer side of the air-cup and carrying at its opposite end a valve-disk normally covering said valve-opening, substan-
75 tially as set forth.

6. In an automatic circuit-closer, the combination with a telegraph-key; of an electro-
magnet, a swinging armature supported at one end of the magnet and carrying a con-
80 tact-point, a fixed contact-point arranged opposite the contact-point carried by the armature, branch-line wires respectively connected with said fixed and movable contact-
85 points and with the separate main-line terminal connections with the telegraph-key, a local-battery circuit including said electromagnets and having a circuit-closer operated by the movement of the key-lever of the tele-
90 graph-key, and a retarding device having suitable connections with said armature to retard the movement of the contact-point carried thereby toward the fixed point, substantially as set forth.

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

EDWIN C. WILLIAMS.

Witnesses:

G. G. PERKINS,
T. E. BROOKS.