

(No Model.)

3 Sheets—Sheet 1.

D. F. SWEET.
ELECTRICAL CUT-OUT.

No. 529,213.

Patented Nov. 13, 1894.

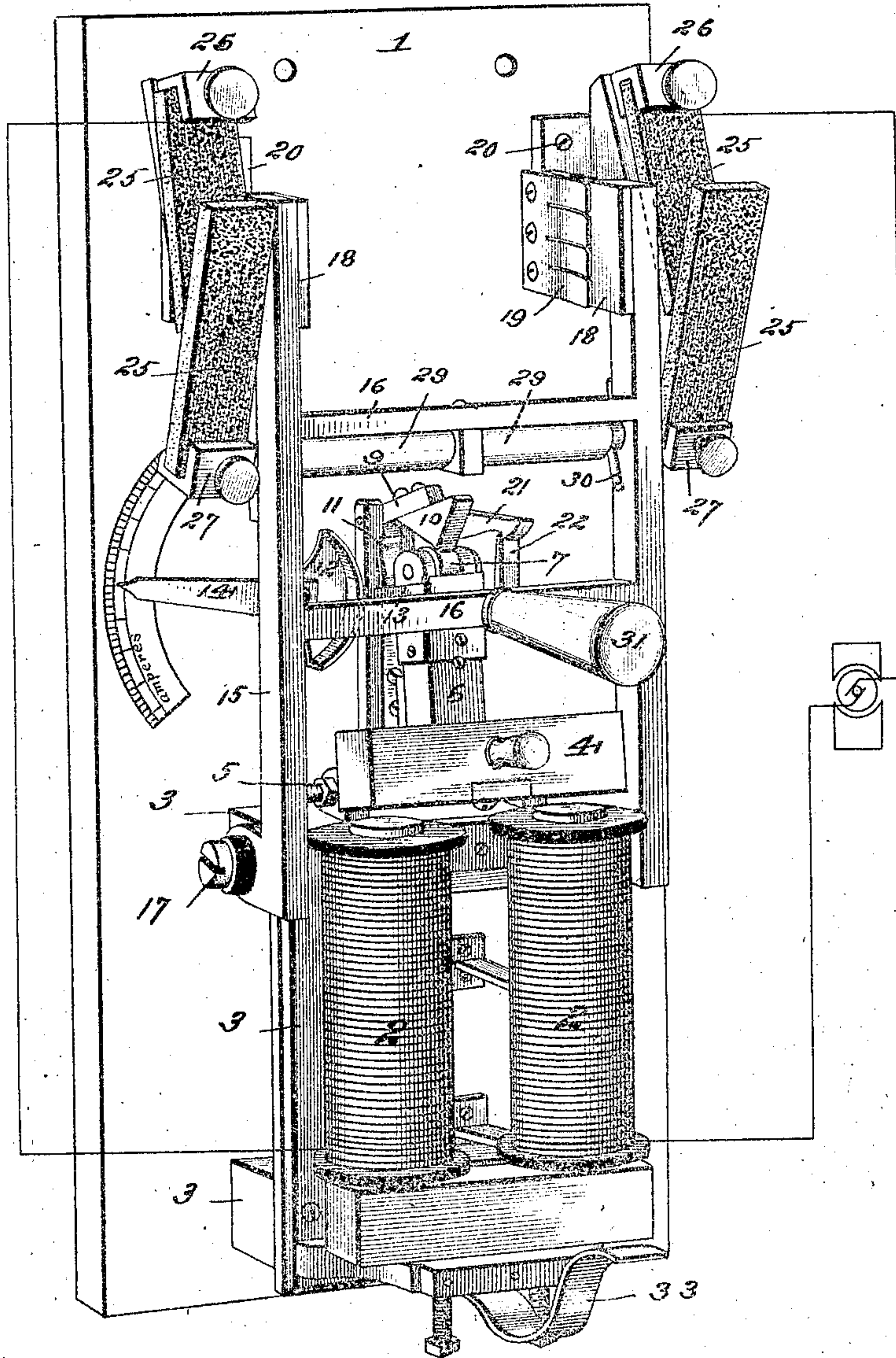


Fig. 1.

Witnesses.

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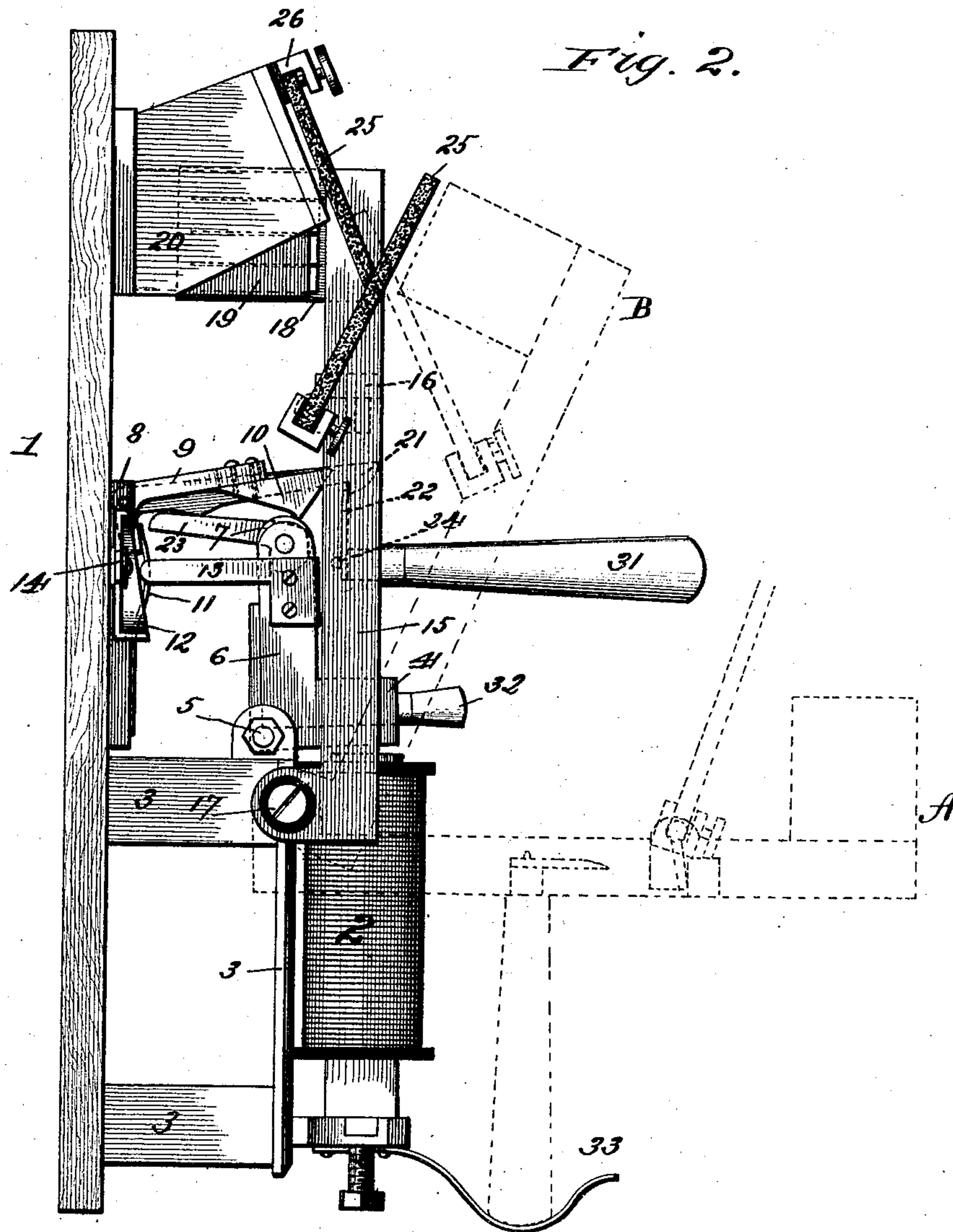
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3 Sheets—Sheet 2.

D. F. SWEET.
ELECTRICAL CUT-OUT.

No. 529,213.

Patented Nov. 13, 1894.



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3 Sheets—Sheet 3.

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Fig. 3.

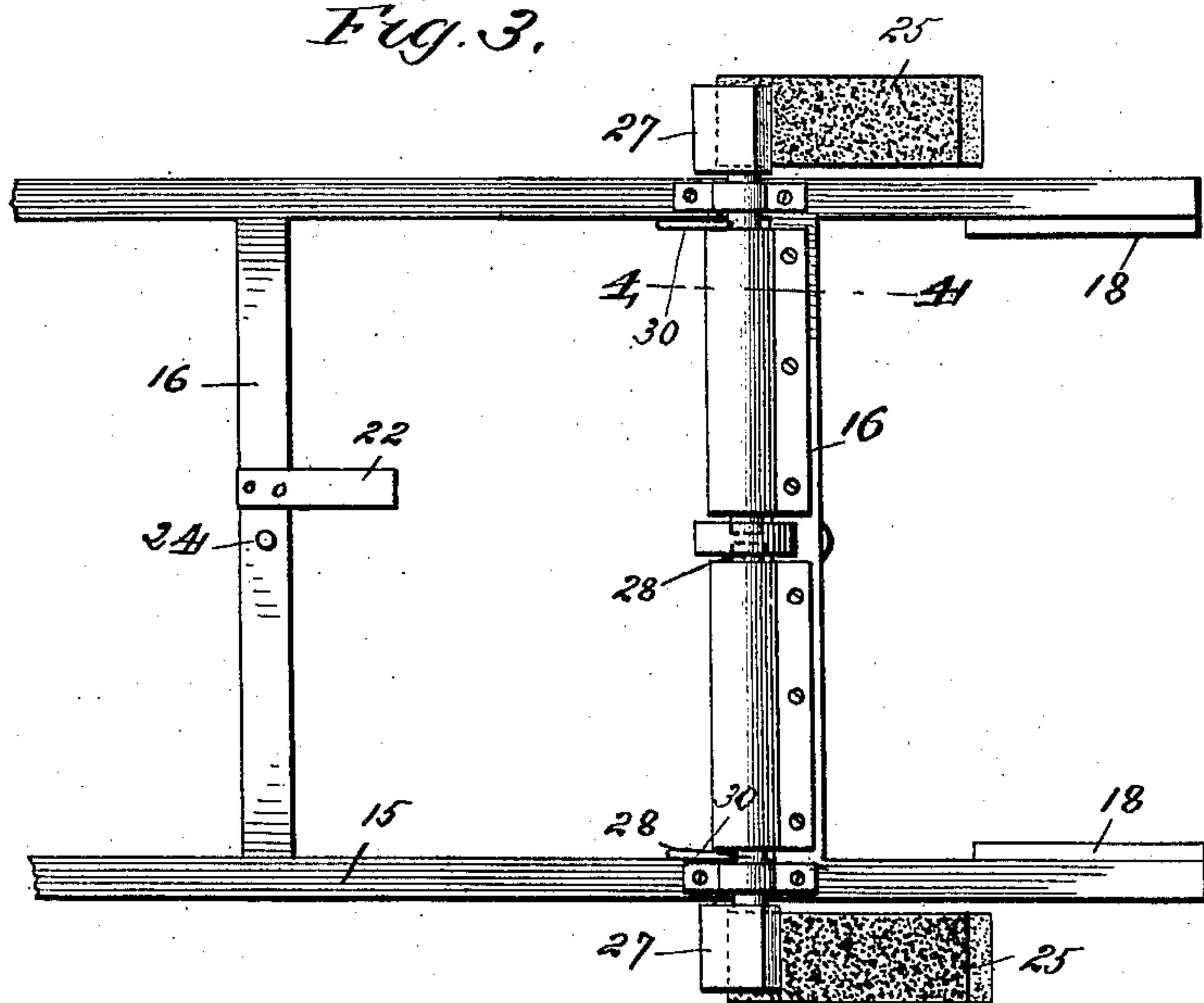


Fig. 4.

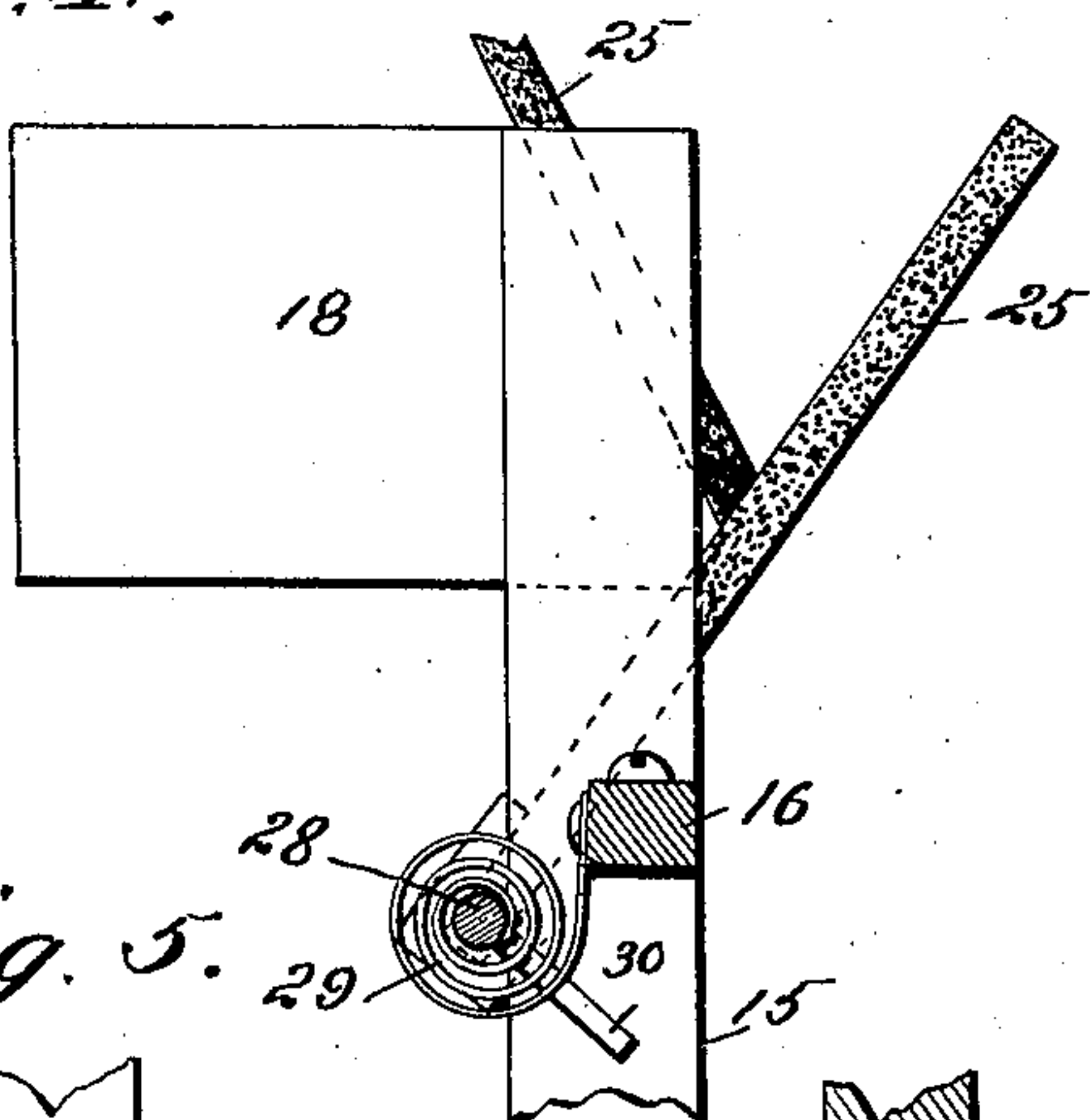
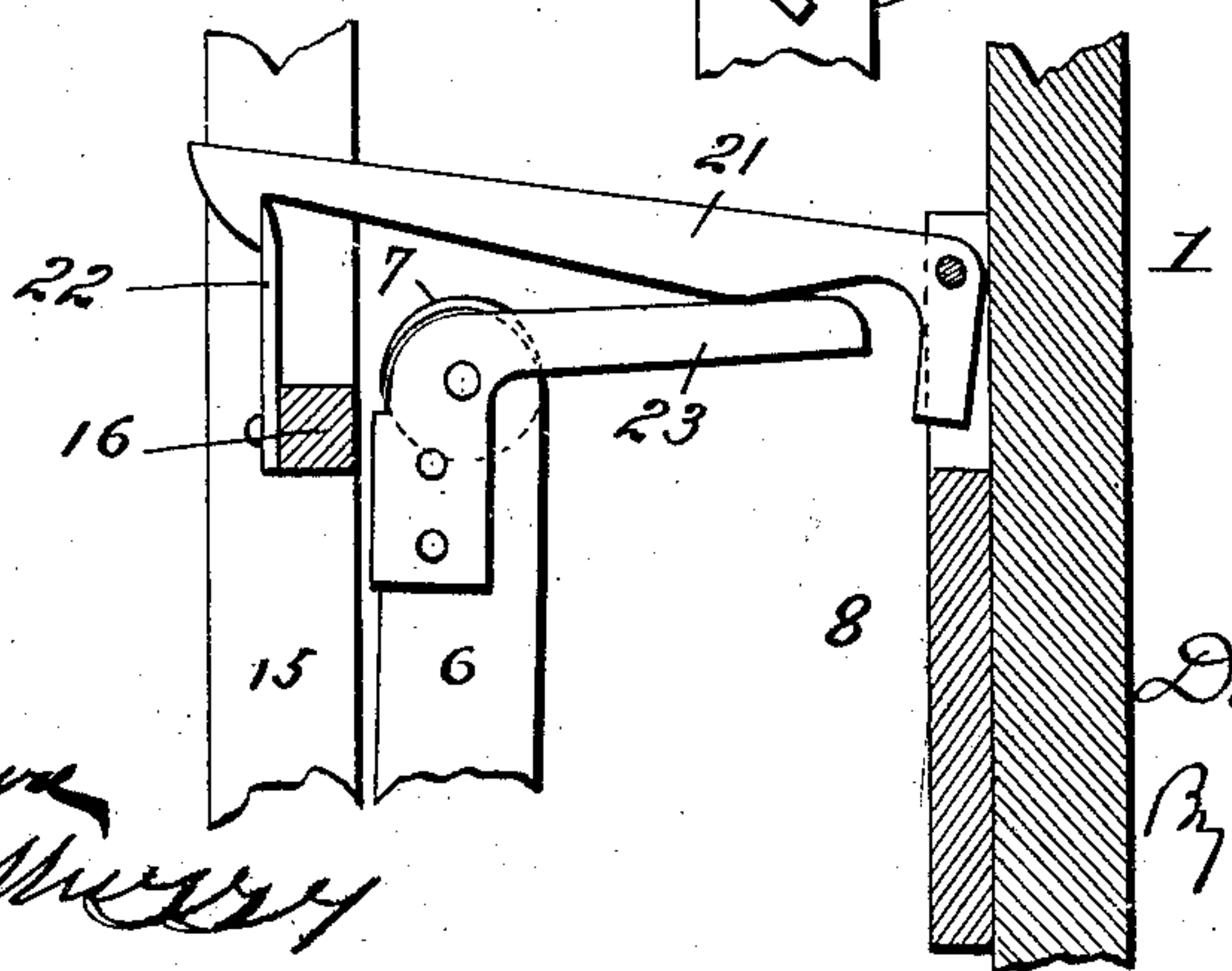


Fig. 5.



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UNITED STATES PATENT OFFICE.

DANIEL F. SWEET, OF GRAND RAPIDS, MICHIGAN.

ELECTRICAL CUT-OUT.

SPECIFICATION forming part of Letters Patent No. 529,213, dated November 13, 1894.

Application filed June 9, 1894. Serial No. 514,080. (No model.)

To all whom it may concern:

Be it known that I, DANIEL FRED SWEET, a citizen of the United States, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Electric Cut-Outs, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to an automatic cut-out for electric circuits, said cut-out being adapted to instantaneously break the circuit upon the passage therethrough of an abnormal current.

15 The essential objects of the present invention are to prevent destructive discharges at the contact plates when the circuit is broken and also to render the instrument more delicate in its adjustment so that it may be set to quickly respond to any desired predetermined strength of current, as more fully hereinafter set forth.

25 In the drawings, Figure 1 is a perspective view showing the instrument closed and connected up in a circuit; Fig. 2, a side elevation of the same, showing in dotted lines the movement of the swinging frame upon the passage of a destructive current; Fig. 3, a detail plan of the upper portion of the swinging frame, carrying the movable contact plates; 30 Fig. 4, a vertical sectional view of the same, and Fig. 5 a detail vertical sectional view showing the latch and the arm for releasing the same.

35 Referring to the drawings by numerals, 1 designates the board upon which the instrument is mounted; 2, an electro magnet mounted stationarily upon a small frame 3 secured to the lower end of the board; and 4, a rocking armature pivotally mounted on frame 3 by means 40 of screws 5 and provided with a vertical arm 6, in the upper end of which is nicely journaled a roller 7.

45 Pivoted in a plate 8 secured to the board 1 directly to the rear of the armature is an arm 9 carrying at its forward end a block 10, whose lower edge is sharpened and adapted to normally bear upon the periphery of roller 7 above the journal of the same. This knife- 50 edge carried by arm 9 is kept strongly pressed against the roller by a spring 11, which bears upon the front edge of a downward extension

of arm 9, said extension resting in a vertical slot in plate 8.

The armature is adjusted on its pivotal 55 bearing by means of a flanged cam 12 pivoted on the board alongside the plate 8 and bearing against an arm 13 extending inwardly from the armature-arm 6 to which it is attached. The cam 12 carries a laterally-pro- 60 jecting pointer 14 which works over a graduated scale on the board and serves to indicate the strength of current at which the instrument is set to operate.

A vertical frame 15, composed of two up- 65 right bars and two cross-bars 16, is pivoted at its lower end upon frame 3, said frame being insulated from its pivots 17. The upright bars of this frame carry the metallic contact plates 18 which are adapted to enter between 70 the fingers of the stationary contacts 19, carried by metallic holders or plates 20 secured to the board. This frame is held in its vertical position by means of the latch 21 piv- 75 oted in a slot in plate 8 and adapted to engage over the upper end of a catch 22 carried by the lower one of the cross-bars 16. This latch 21 is lifted off the catch to release the frame by means of an inwardly-projecting 80 arm 23 secured rigidly to the upper end of arm 6. The arm 23 is so adjusted that it strikes latch 21 and lifts it from its catch the instant the knife edge carried by arm 9 passes 85 over the vertical center of the roller, so that the instant the armature is released from said arm 9 the vertical frame will also be released from the latch.

It will be observed that by swinging the pointer or arm 14 along the scale, the cam 12, through the medium of arms 13 and 6, will 90 bring the armature nearer to or farther from the poles of the magnet, according as said pointer is moved down or up, said arm 13 being normally held against the inclined edge of the cam by the action of spring 11 and arm 95 which causes the knife edge to bear down forcibly upon the roller at a point in front of or beyond its journal and thereby tend to force said arm 6 normally inward toward the board. Before the poles of the magnet can draw the 100 armature down the attractive force must overcome the resistance caused by the knife-edge of block 10 pressing upon the roller in front of the center of its journal as is evident. It

is therefore obvious that the point at which the instrument is set to operate may be varied by simply adjusting the arm 6 (carrying the roller) so as to bring the knife-edge nearer to or farther from a vertical line drawn centrally through the pivots of the armature and the journals of the roller, it being evident that the farther the knife edge be adjusted from the line the greater will be the resistance offered and the stronger the current required to draw down the armature. In this manner an exceedingly delicate adjustment is obtained, so that the instrument may be set to accurately and quickly respond to any predetermined abnormal current, from the weakest to the strongest. The instant the knife edge passes over the center of the roller the arm 23 strikes the latch 21 and detaches it from part 22, and then as the arm 6 is swung forward by the downward movement of the armature said arm strikes forcibly against a stop 24 carried by the lower cross-bar 16 and quickly and forcibly throws down the swinging-frame to the position shown in dotted lines at A in Fig. 2. It will also be observed that after the knife-edge passes over the center of the roller the pressure of the spring 11 will tend to press said roller 7 outward and thereby assist the armature in throwing down the frame.

Alongside each pair of contact-plates 18 and 19 is arranged a pair of supplemental carbon contact plates 25. The upper ends of the stationary plates are clamped in sockets 26 formed on the same plates with the contact-plates 19, and said plates are inclined downwardly and forwardly and are without support except at their upper ends. The lower, movable plates or carbons 25 bear about midway their length against the lower ends of the upper plates and are secured at their lower ends in sockets 27 carried by independent shafts 28 journaled in the swinging frame. These lower carbons are kept normally pressed against the lower ends of the upper plates by means of convolute springs 29 secured on said shafts 28 and connected to the adjacent cross-bar 16.

The normal current passes through the metallic contact-plates, as they present the least resistance, and through the upper part of the swinging frame, the frame thereby forming a part of the circuit, but when a sufficiently abnormal current passes through the instrument and the swinging-frame is released and thrown down in the manner hereinbefore described, the current ceases to pass through the metallic contact-plates the instant they are separated and passes wholly through the carbon or supplemental contact-plates. It will be observed that by the time the metallic contact plates have become disconnected, the spring-actuated carbon plates have swung forward far enough to lie flat against the upper carbons, as shown in dotted lines at B in Fig. 2, and as the frame falls downward the movable carbons are drawn or slid down upon

the faces of the stationary carbon until they drop off the lower ends of the same. The object and advantages of this peculiar action of the supplemental plates are obvious. Thus throwing the current into the carbon contact plates relieves the metallic contact plates from destructive sparking and materially retards the abnormal current, as the carbon presents a higher resistance; and by bringing the carbons up flat against each other at the instant the metallic contacts separate and then sliding the contacting carbons apart endwise, the resistance is gradually increased until the carbons separate, by which time the strength of the current has been so reduced by the increase in the length of resistance-medium that the discharge, if there be any at all, is reduced to a harmless minimum. In this manner the heaviest currents may be sent through the instrument without causing noisy or destructive discharges at the contact plates, and herein lies one of the essential advantages of the instrument.

The numeral 30 designates a pin secured in each of the shafts 28 and adapted to strike against the upper cross-bar 16 as soon as the movable carbons slip off the upper carbons and thereby prevent the springs rotating said shafts farther than is necessary.

It will be observed that the action of the convolute springs not only tends to keep the carbons in contact but also assists in throwing down the swinging frame.

A handle 31 is secured to the lower cross-bar of the swinging frame in order to lift it after it is thrown down, and a similar handle on knob 32 is secured to the armature. When the swinging frame drops down the handle 31 strikes against and rests in a curved spring 33 secured to the lower part of frame 3.

It is understood that a solenoid is the equivalent of a magnet in this construction and I do not therefore confine myself to the use of a magnet.

Having thus fully described my invention, what I claim is—

1. A circuit interrupting device consisting of an electrical magnet responding to the action of an abnormal current, main contact plates and an armature adapted to separate said main contact plates, and a pair of high-resistance supplemental contact plates adapted to overlap at their free ends and slide upon each other endwise and thereby increase the resistance gradually until they separate and break the contact, which is after the separation of the main contact plates, substantially as and for the purpose described.

2. The combination in an automatic electric cut-out, and an electrical magnet in the circuit, an armature therefor adapted to be actuated by the presence of an abnormal current, main contact plates adapted to be separated by the action of the armature, and a pair of supplemental carbon contact plates adapted to receive and retard the current after the separation of the main contact-plates,

said carbon plates overlapping each other at their free ends and being normally pressed against each other and adapted to slide apart endwise to gradually increase the length of the resistance medium before separation, substantially as described.

3. The combination, in an electric cut-out, of the main contact-plates, a movable part carrying one of the contact plates, a pair of supplemental high-resistance contact-plates, one of said supplemental plates being carried by said movable part and having its free end overlapping the free end of the other supplemental contact, and means for normally pressing the overlapped ends of said supplemental contact plates together and holding them together as they are slid apart endwise, as and for the purposes set forth.

4. In an automatic cut-out, the combination of an electrical magnet in the main circuit, an armature adapted to respond to any pre-determined abnormal current, main contact plates in the circuit and adapted to be separated by the action of the armature, and supplemental carbon contact-plates adapted to be separated subsequently to the main contact-plates, one of said carbon plates being stationarily supported and the other being movably supported at an angle to the stationary plate and normally pressed against the free end of the same, substantially as described.

5. The combination of an electrical magnet in the main circuit, an armature adapted to be actuated by the presence of an abnormal current, a swinging frame adapted to be actuated by said armature, main contact-plates carried by said swinging-frame, supplemental carbon contact-plates, one of the carbon plates being supported stationarily and having one end free and the other carbon plate being carried by a shaft journaled in the frame, a spring for actuating said shaft and keeping the movable carbon normally pressed

against the stationary carbon, substantially as described.

6. In an electric cut-out, the combination of an electro magnet, an armature carrying an arm and pivotally supported, a roller journaled in said arm, a spring pressed arm carrying a knife-edge bearing on the periphery of said roller, a cam for adjusting said armature, an indicating-finger carried by said cam, a swinging frame carrying the contact-plates, a latch engaging said frame and means for disengaging said latch by the action of the armature, substantially as described.

7. In an electric cut-out, the combination of an electro magnet, an armature carrying a roller and pivotally supported, a spring pressed arm normally bearing on said roller, means for adjusting said armature and roller, a vertical frame pivoted at its lower end and carrying contact-plates at its upper end and adapted to be thrown down and released, a latch engaging said frame and holding it up, an arm carried by the armature and adapted to disengage said latch upon the passage of an abnormal current, substantially as herein shown and described.

8. In an automatic electric cut-out, the combination of an electro-magnet in the main circuit, an armature adapted to be influenced by the magnet, a movable frame or part carrying a high-resistance contact-plate, and adapted to be operated by the magnet, another high-resistance contact-plate adapted to lie on the movable contact-plate, and means for holding these plates in contact and sliding them apart as the contact is broken, whereby the resistance medium is lengthened while the contact is being broken, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

DANIEL F. SWEET,

Witnesses:

MAMIE S. TOOKER,

JOHN W. CHAMPLIN.