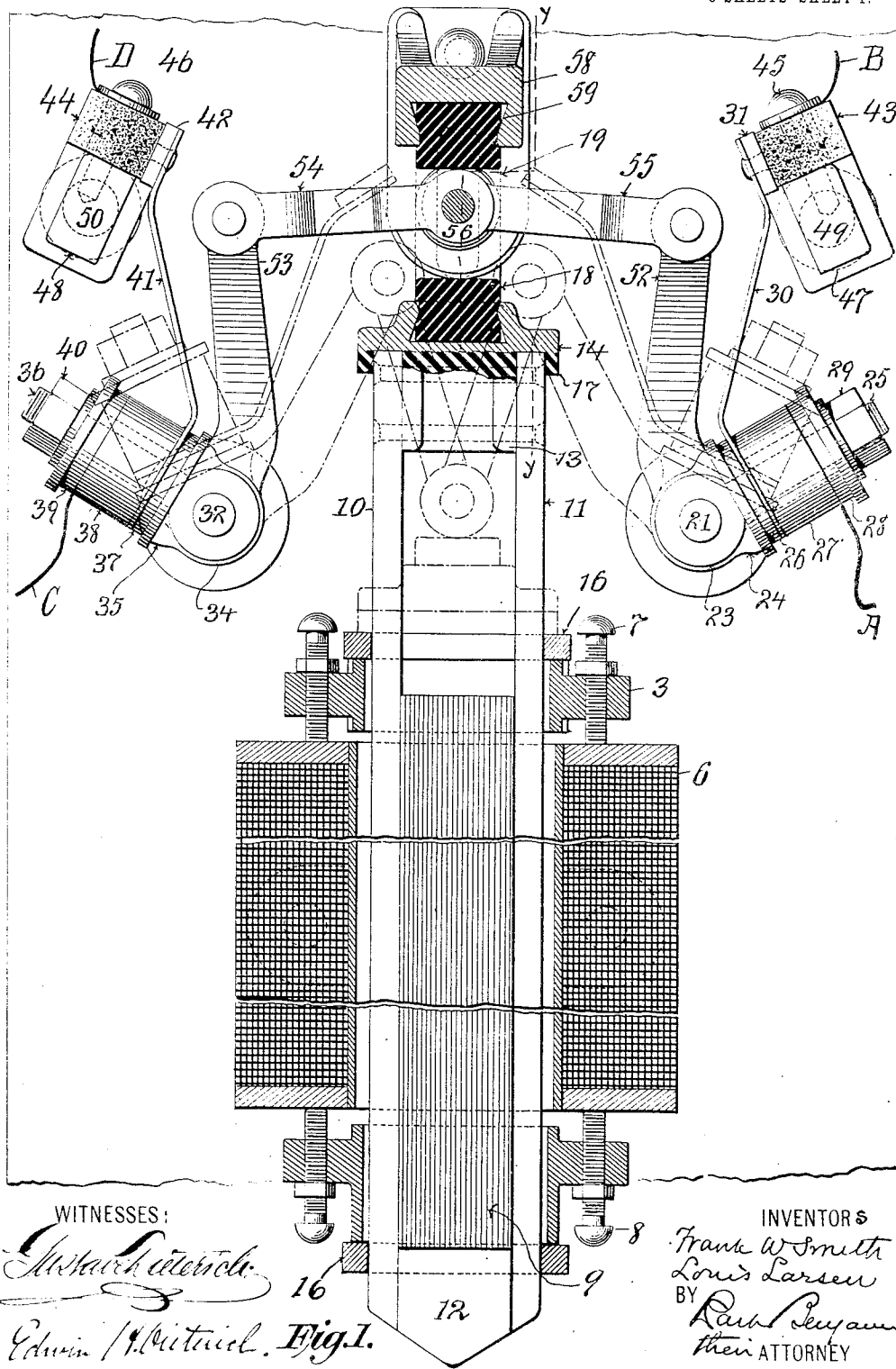


F. W. SMITH & L. LARSEN.
 ALTERNATING CURRENT SWITCH.
 APPLICATION FILED MAY 25, 1907.

1,031,387.

Patented July 2, 1912.

3 SHEETS-SHEET 1.

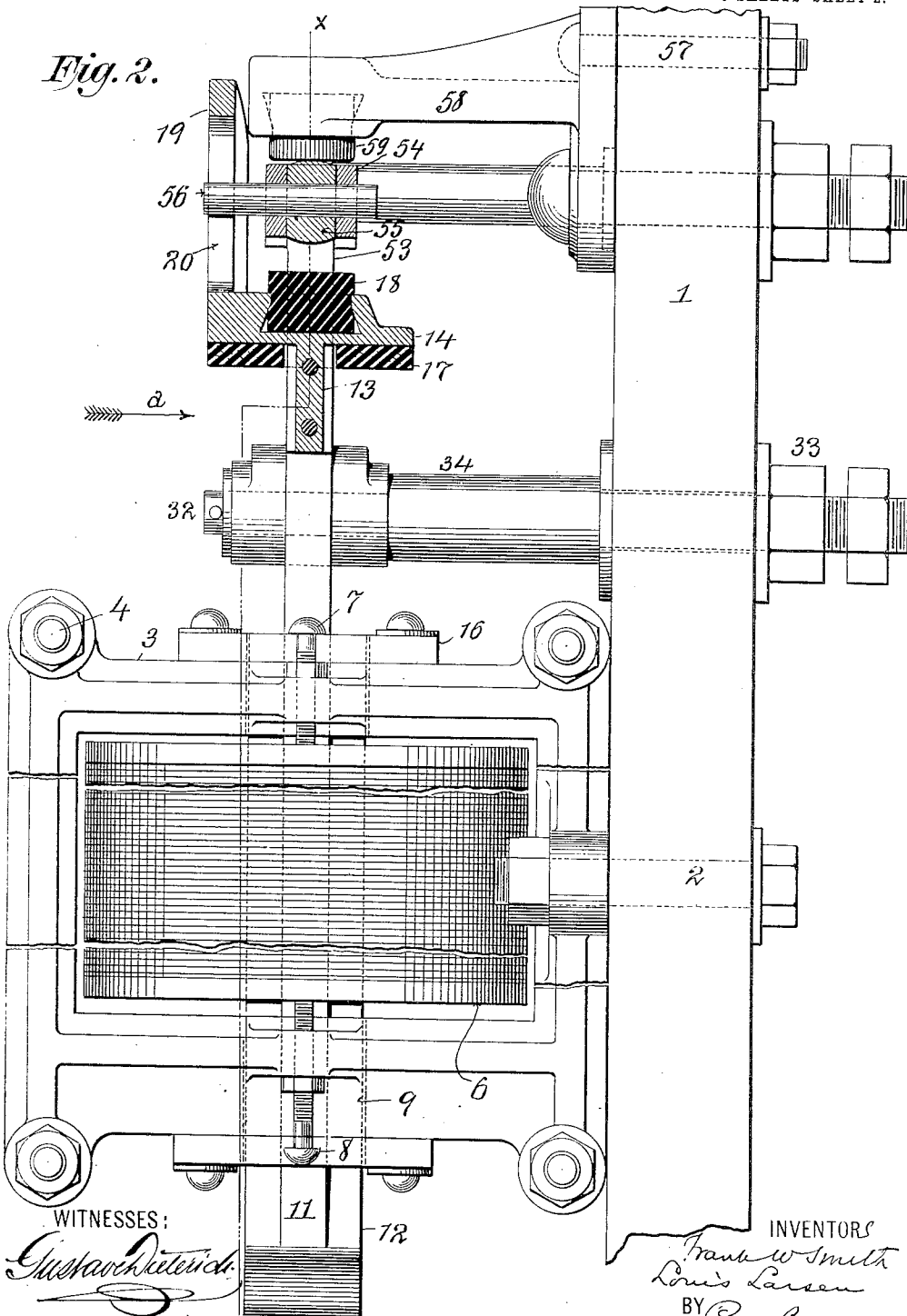


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3 SHEETS—SHEET 2.

Fig. 2.



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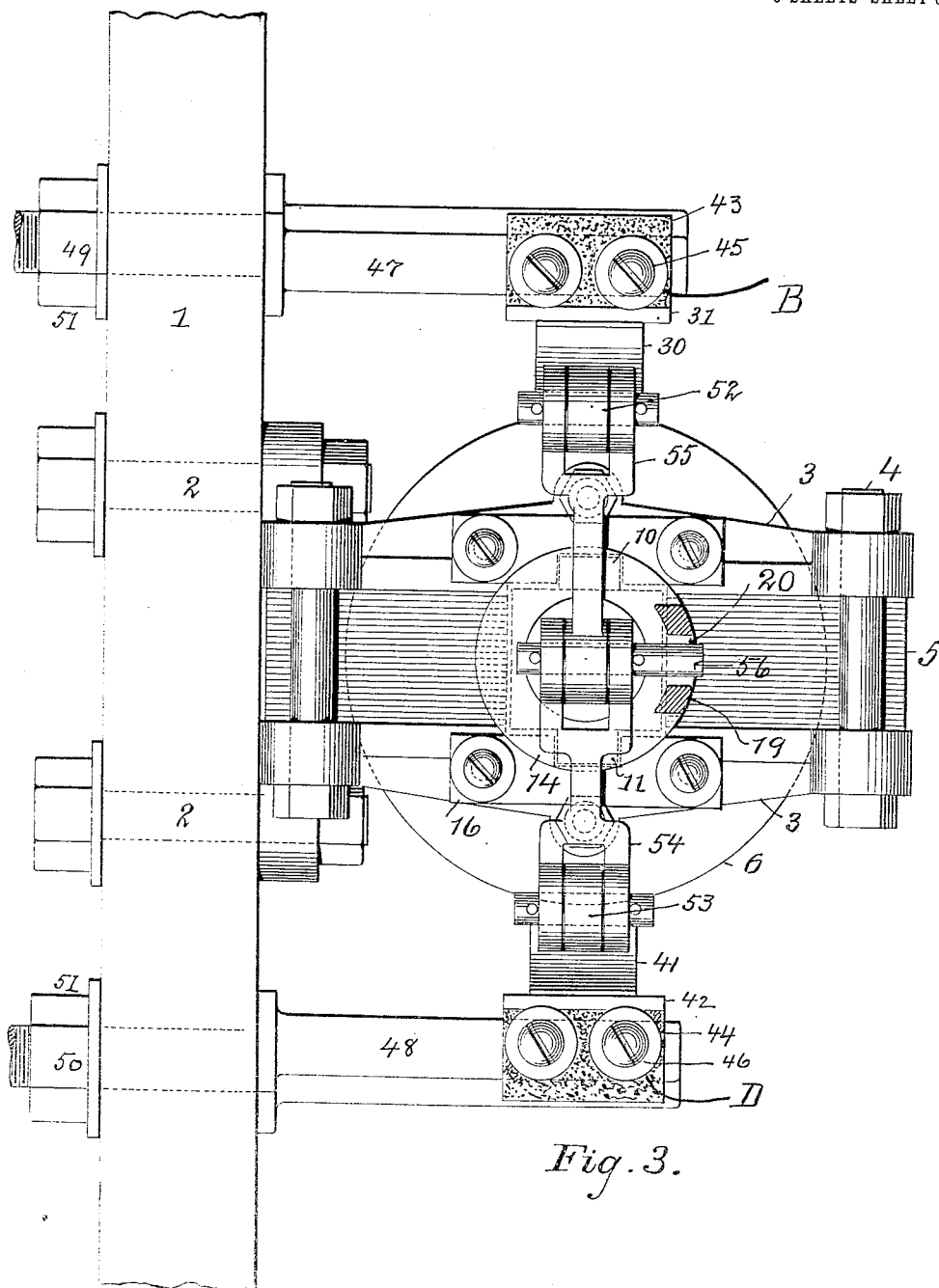


Fig. 3.

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UNITED STATES PATENT OFFICE

FRANK W. SMITH AND LOUIS LARSEN, OF NEW YORK, N. Y.

ALTERNATING-CURRENT SWITCH.

1,031,387.

Specification of Letters Patent.

Patented July 2, 1912.

Application filed May 25, 1907. Serial No. 375,591.

To all whom it may concern:

Be it known that we, FRANK W. SMITH and LOUIS LARSEN, citizens of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Alternating-Current Switches, of which the following is a specification.

The invention relates to an electromagnet operated by an alternating current to control circuit closing switches, or other mechanism.

The invention consists in apparatus wherein the movable core of the electromagnet after actuating the said mechanism through a movable abutment in its path assumes a position of equilibrium at a point distant from said abutment and does not transmit thereto vibrations due to current alternations in the magnet coil; also wherein a loose joint is interposed in the transmitting mechanism between movable core and device actuated thereby, whereby said core is permitted to vibrate under current alternations without imparting motion to said device; also in the construction of the circuit closing switch and alternating current magnet hereinafter particularly described, wherein my said invention is specifically embodied.

In the accompanying drawings—Figure 1 is a front view of the apparatus taken in the direction of the arrow *a*, and in section on the line *x x* of Fig. 2. Fig. 2 is a side elevation and partial section on the line *y y* of Fig. 1. Fig. 3 is a top view with the bracket 58 removed and the slotted bar 19 in horizontal section. In this figure also, for the sake of clearness, the pins 21, 32, and the sleeves and clamping devices carried thereby are omitted.

Similar numbers of reference indicate like parts.

1 is the supporting plate, usually of slate. Secured thereto by bolts 2 passing through suitable lugs are two parallel cast iron frames 3, connected by the transverse bolts 4 and receiving between them the rectangular frame 5 of laminated iron. Disposed between the frames 3, 5, is the electromagnet 6 which is held firmly in position by means of the upper set screws 7 and lower set

screws 8 passing through lugs in frames 3. The magnet core 9 is made of laminations and is rectangular in cross section. It is clamped between two brass guide bars 10 and 11, which at their lower ends are secured to the block 12, against which the lower extremity of said core bears. The upper ends of the guide bars receive between them, and are respectively secured to, lugs 13, which are formed integral with and depend downwardly from the circular cap plate 14.

In the upper and lower members of frames 3 and 5 are openings in which the core 9 with its guide bars 10, 11, freely slides, and bolted to the upper side of the upper members and to the lower side of the lower members of frames 3 are fixed guide plates 16, having recesses to receive the said sliding guide bars 10 and 11. The object of the fixed guide plates 16 and the guide bars 10, 11, is to ensure the placing of the core symmetrically with respect to its inclosing frame and its movement in a right line. To the under side of the plate 14 is secured a washer 17 of leather or other elastic material. On the upper side of said plate is a dovetail recess in which is a block 18 of rubber or other elastic material. Extending upwardly from the front side of said plate is a bar 19, (Fig. 2) in which is a vertical slot 20.

Supported on a pin 21 passing through the back plate and secured by nuts, is a sleeve 23, having an offset 24. From said offset extends a pin 25, which carries three cylindrical spacing disks 26, 27, 28. A nut 29 on the threaded end of pin 25 clamps disks 26, 27, 28, together. Between disks 26, 27, is held the end of a leaf spring 30, which at its extremity carries a contact piece 31. On the opposite side of the electromagnet is a pin 32 passing through the back plate and secured by nuts 33 on which is a sleeve 34 having an offset 35. From said offset extends a pin 36, which carries three cylindrical spacing disks 37, 38, 39. A nut 40 on the threaded end of pin 36 clamps disks 37, 38, 39, together. Between disks 37, 38, is held the end of a leaf spring 41, which at its extremity carries a contact piece 42. The contact pieces 31 and 42 make contact

with carbon blocks 43 and 44, secured by screws 45, 46, to standards 47 and 48, which standards are secured to the back plate 1 by pins 49 and 50, and nuts 51. Fast on the sleeves 23 and 34 are arms 52 and 53. To the arm 53 is pivoted an arm 54, which is forked at its end to receive the extremity of the arm 55 pivoted to arm 52. A pin 56 passes through the extremity of arm 55, the forked ends of arm 54 and extends through the slot 20 in bar 19. A toggle joint is thus formed between arms 52 and 53. Secured to the back plate 1, by pin 57 and nut, is a bracket 58, on the under side of the end of which is a dovetail recess which receives a block 59 of rubber or other elastic material. The rubber block 59 is directly above the toggle joint, and the rubber block 18 is directly below said joint.

When the electromagnet 6 is deenergized the core 9 descends to its lowest position, the washer 17 then resting on the guide plates 16 and the levers and contact springs taking the position shown in dotted lines, Fig. 1. When alternating current is established in the electromagnet the core rises. The lower edge of the slot 20 in bar 19 then strikes a movable abutment, namely the toggle joint, carrying said joint upward and to the position shown in full lines Fig. 1; that is with the center of the toggle pin 56 a little above a horizontal line joining the centers of the pivot pins connecting arms 52, 55, and 53, 54. The upper surface of the fork at the end of arm 54 then meets the rubber stop 59, which yields, and so prevents shock. The core 9 then falls back to a position of equilibrium, which it retains as long as current is maintained in the magnet coil.

By reason of the described parts having been brought to the position stated the springs 30 and 41 are moved into contact with the carbon blocks 43 and 44, thus establishing circuit from terminal A secured in any suitable way between spacing disks 26, 27, on pin 25, through spring 30 to block 43 and so to terminal B connected to screw 45, and also from terminal C secured in any suitable way between spacing disks 38, 39, on pin 36, through spring 41 to block 44 and so to terminal D, connected to screw 46.

It will be obvious that by this construction all vibrating movement of the core due to current alternations in the magnet coil is prevented from reaching the contacts closed between springs 30 and 41, and carbon blocks 43, 44: since such movement merely causes an up and down travel of the bar 19 upon the pin 56 which is permitted by the slot 20 receiving said pin, and hence through the loose joint thus afforded no motion is transmitted to the pin itself.

When current is interrupted in the magnet coil, core 9 drops. The upper edge of

slot 20 in bar 19, then strikes toggle pin 56, forcing said pin downward and so bringing the parts back to the position shown in dotted lines, Fig. 1. The lower side of the toggle joint strikes the rubber block 18 in descending, which block yields and prevents shock.

We claim:

1. An electromagnet, a free movable core, a device actuated by said core, transmitting mechanism between said core and said device, and constructed to be operated by said core on said core reaching a movable abutment in its path, and means for magnetically equilibrating said core at a point distant from said abutment after said device shall have been operated.

2. An electromagnet, a free movable core, a device actuated by said core, transmitting mechanism between said core and said device and constructed to be operated by said core on said core reaching a movable abutment in its path, means for retaining said device in operated position and means for magnetically equilibrating said core at a point distant from said abutment after said device shall have been operated.

3. An electromagnet, a free movable core, a device actuated by said core, transmitting mechanism between said core and said device and constructed to be operated by said core, on said core reaching a movable abutment in its path, means controlled by said core for retaining said device in operated position and means for magnetically equilibrating said core at a point distant from said abutment after said device shall have been operated.

4. An electromagnet, a free movable core, a circuit closer actuated by said core, transmitting mechanism between said core and said circuit closer and constructed to be operated by said core, on said core reaching a movable abutment in its path, means controlled by said core for retaining said circuit closer in closed position and means for magnetically equilibrating said core at a point distant from said movable abutment after said circuit closer shall have been operated.

5. The combination of an electromagnet, a longitudinally movable core therein, pivoted sleeves on opposite sides of the path of movement of said core, a toggle joint connection between said sleeves, a plate having an elongated vertical slot supported on said core, the slot in said plate receiving the pin of said toggle joint, contact arms supported on said sleeves and fixed contacts disposed in the path of movement of said arms: the aforesaid parts being constructed so that upon alternating current being established in said electromagnet, said toggle connection shall be raised to vibrate said sleeves and

thereby bring said arms into contact with
said fixed contacts, and thereafter upon said
core assuming an equilibrated position in
said magnet, said plate shall be moved up
5 and down upon said pin without imparting
motion thereto by the vibration of the core
due to current alternations in the electro-
magnet coil.

In testimony whereof we have affixed our
signatures in presence of two witnesses.

FRANK W. SMITH.
LOUIS LARSEN.

Witnesses:

GERTRUDE T. PORTER,
H. I. SHIRE.