No. 842,405. PATENTED JAN. 29, 1907.

S. A. LEONARD.

SWITCH FOR STORAGE BATTERIES.

APPLICATION FILED MAY 14, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

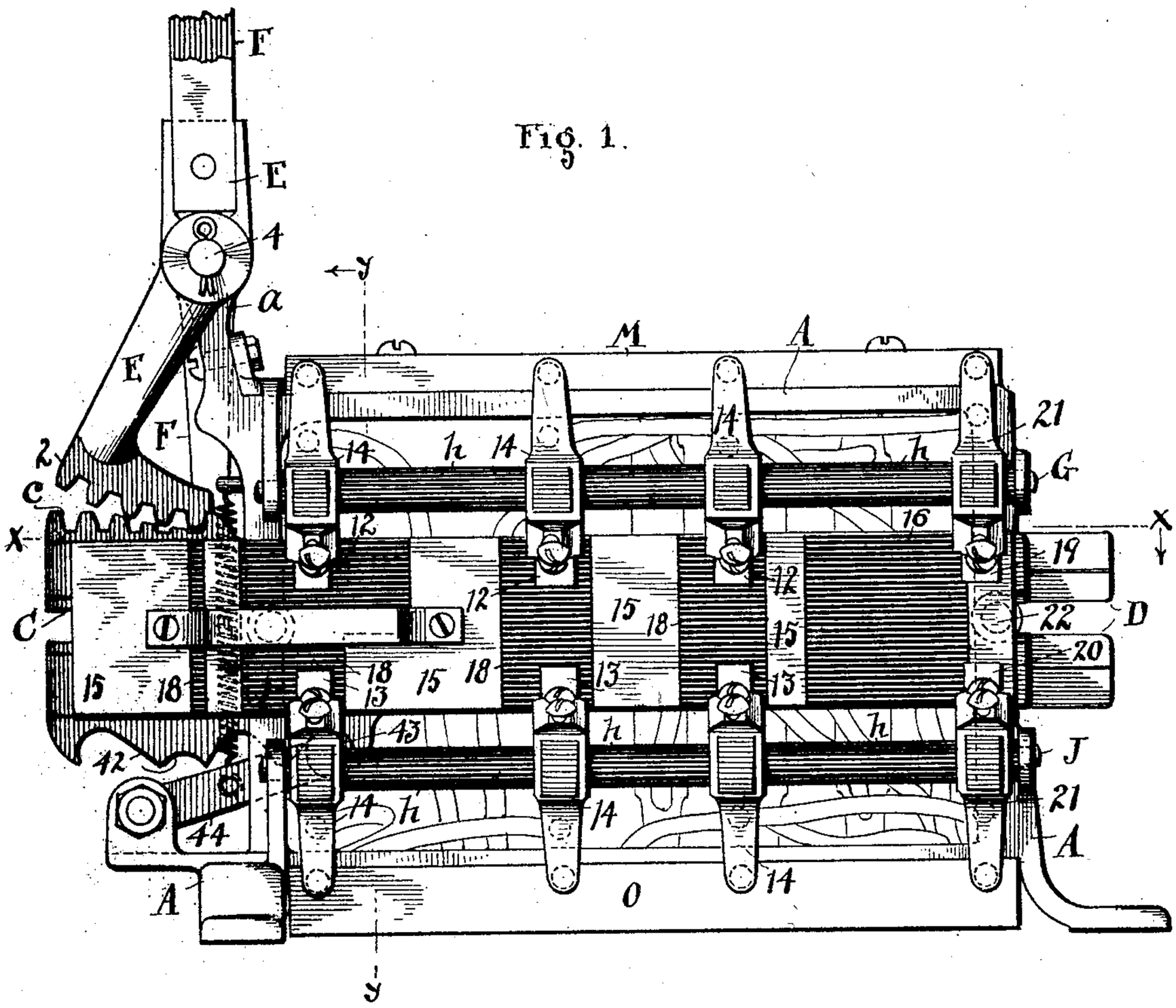

Fig. 2.

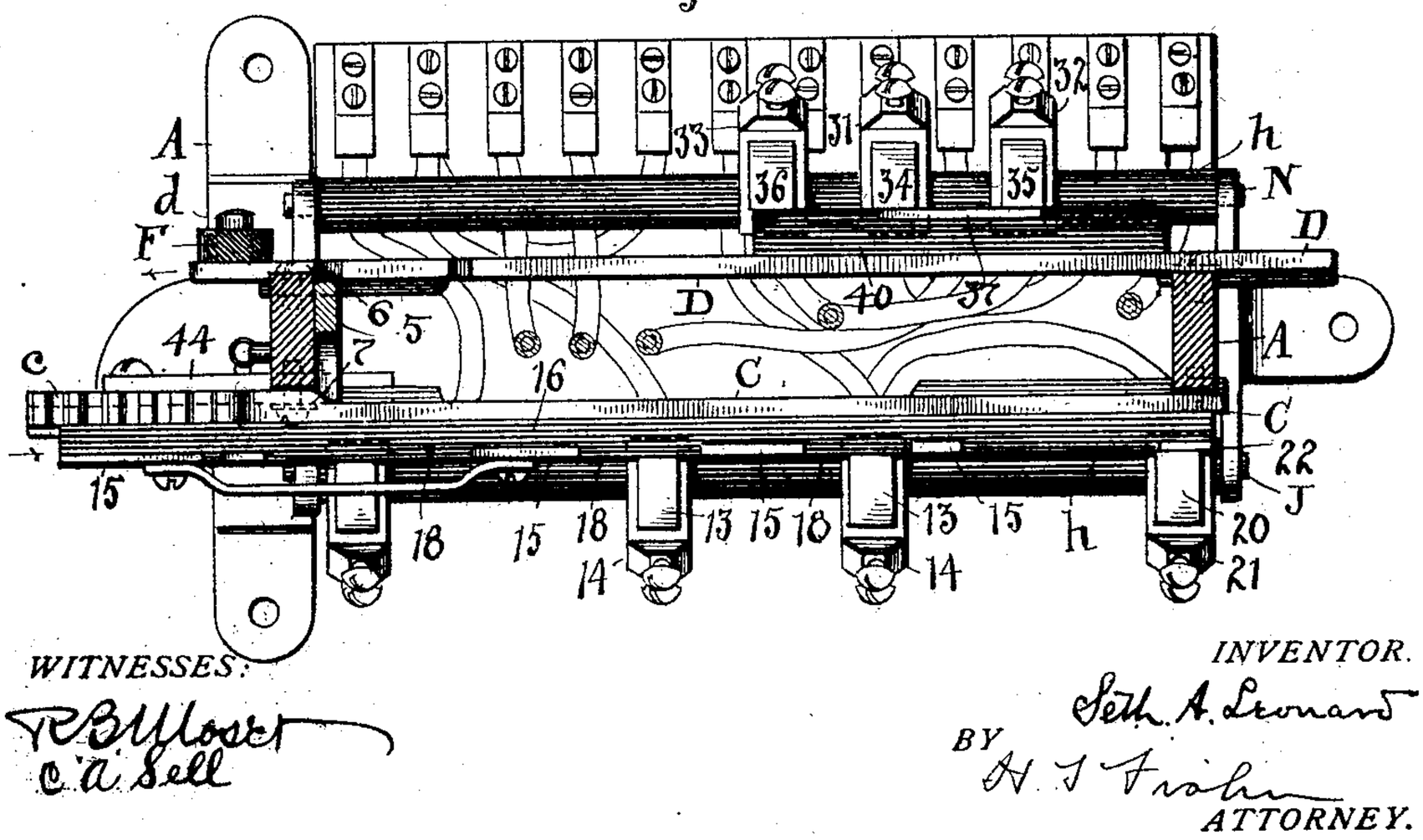

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Fig. 3.

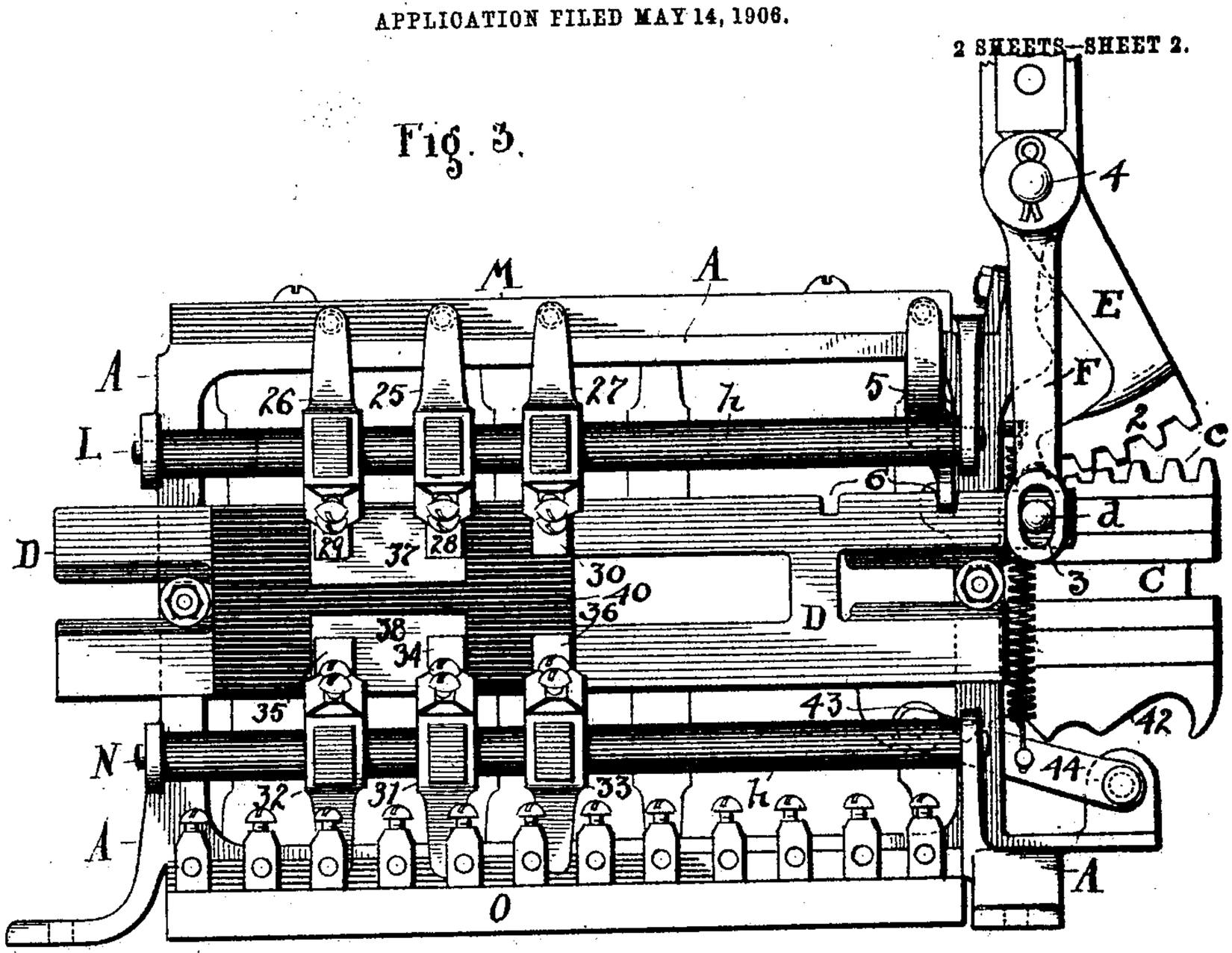


Fig. 4.

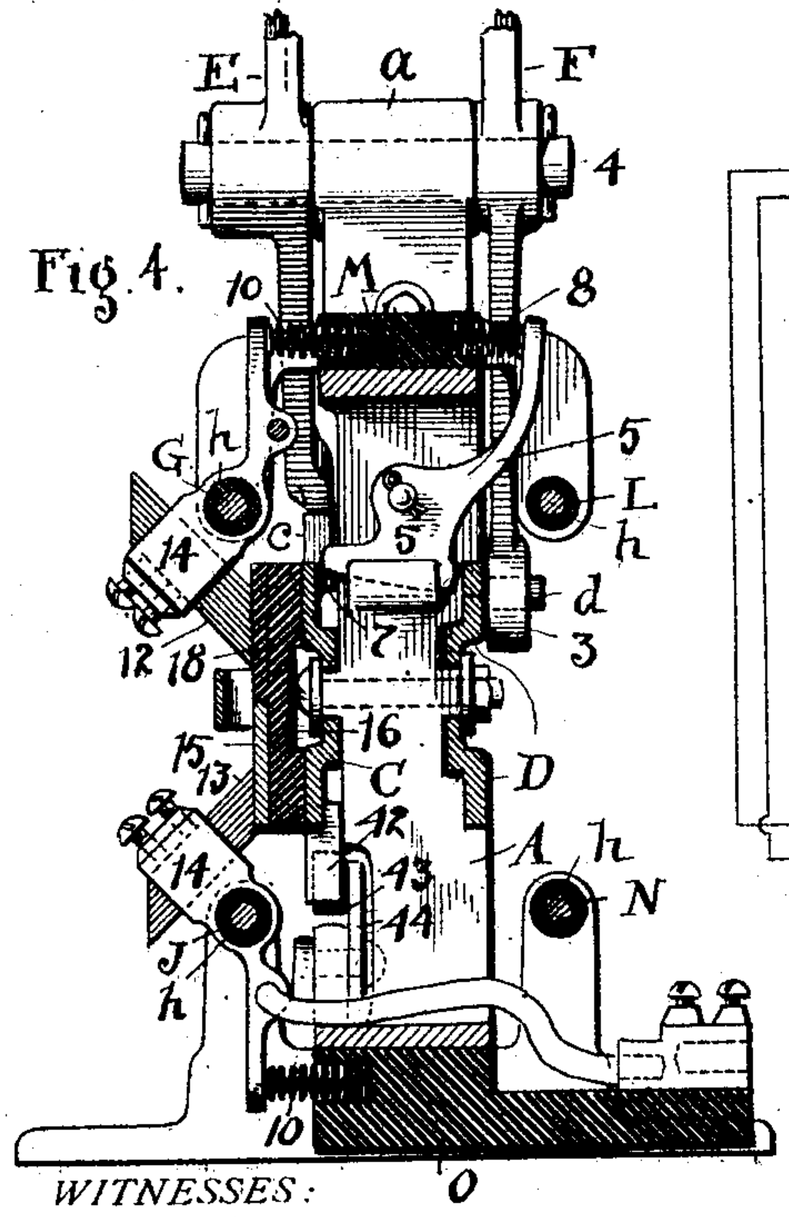
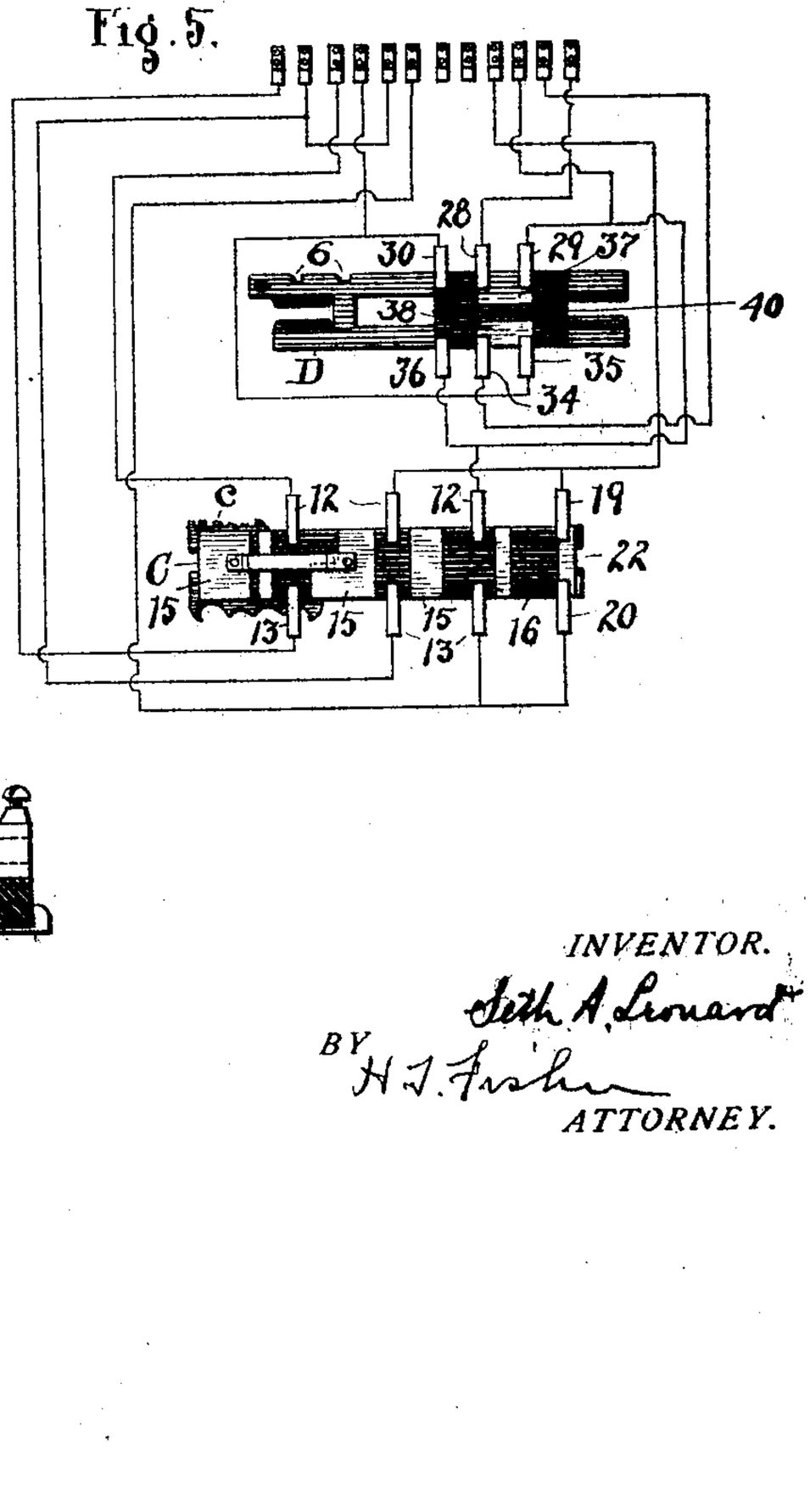


Fig. 5.



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SWITCH FOR STORAGE BATTERIES.

No. 842,405. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed May 14, 1906. Serial No. 316,705.

To all whom it may concern:

Be it known that I, SETH A. LEONARD, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Switches for Storage Batteries; and I do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in switches for storage batteries; and the invention consists in the construction and combination of parts, substantially as shown and described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of the switch; and Fig. 2 is a horizontal plan view thereof on line *x x*, Fig. 1, looking down. Fig. 3 is a side elevation of the switch opposite to that shown in Fig. 1; and Fig. 4 is a cross-section on line *y y*, Fig. 1, looking to the left. Fig. 5 is a diagrammatic view illustrating the two side plates of the switch separately and the electrical connections therewith, and to which they run, as hereinafter fully described.

As thus shown, the switch comprises a suitable supporting-frame A, which is provided with details of construction here and there, adapted to attach or guide or otherwise sustain and carry the working parts of the switch, and said frame may be an integral or an assembled structure rigidly erected and of any suitable material, but usually of cast metal. It will therefore be assumed that metal is used in this instance. Mounted upon opposite sides of this frame are the sliding plates C and D, running in grooves or on suitable ledges which hold said plates in sliding relation lengthwise of the frame. Plate C, which is the main current-controlling plate, has a rack *c* at its top and end, which is engaged by a toothed segment 2 on lever E, adapted to control the position of said plate, and plate D, which is the current-reversing plate, is controlled by lever F, which has an elongated slot 3 at its lower end engaging a lug or projection *d* on said plate. Both said levers are mounted on a post or part *a* of the main frame on a transverse pivot-pin 4 therein, and the two levers and the plates they control operate separately and independently and can only be operated one at a time—that is, when either plate is partly thrown from its initial positions of rest the other is locked for the time and prevented from being operated. To this end I employ a locking device or lever 5, Fig. 4, pivoted on an upright portion of main frame A and constructed below its pivot at its engaging point with such width that it will necessarily engage one plate or the other and that the release can only occur at a time when both plates are out of current connection. To this end reversing-plate D has notches 6 in its edge, and plate C has an inner shoulder 7 opposite said notches, which when engaged against the corresponding edge of the lock forces it across into the notch 6 opposite; but when the said plate C is carried back out of current connections (position Fig. 1) and shoulder 7 is withdrawn from opposite lock or lever 5 the spring 8, bearing against the upper end of said lock 5, throws the lock out of engagement in notch 6 and against plate C. This releases plate D, so that the current can be reversed, if desired, and the motor driven in the opposite direction; but, if not reversed, plate C is and remains free to be manipulated by its controlling-lever E as freely as if no such lock or stop were used. This gives the operator free and positive control over the current by two adjacent levers within easy reach and effectively prevents the current from being reversed except when plate C is in the one position of rest, as shown.

All the conducting-wires are arranged to make connections with the brushes or brush-holders between the sides of the switch and plates C and D, and each side of the switch has two sets of brushes, upper and lower, mounted, respectively, on rods G and J on the controlling side of the switch and L and N on the other or reversing side, and insulating-sleeves *h o* on these rods separate the brush-holders mounted thereon. These several rods are supported at their ends in brackets on the main frame, and springs 10 are interposed between one end of said holders and the respective insulating strips or pieces M and O, so as to hold the brushes severally in contact on the respective contact or connecting plates carried by plates C and D. All of said brushes and the holders therefor are alike in construction, and the brushes preferably consist of laminæ of copper strips adjustably fixed in the holders and are arranged to expose their inner ends to said contact-plates, the end of each strip being brought into contact relation, thereby dis-

tributing the contact and minimizing the resistances. Furthermore, the brush-holders are carried on their supporting-rod in such way that the brushes will wipe or engage edgewise with the contact-plates.

Now on the common or working side of the switch I show a series of three upper brushes 12 and corresponding lower brushes 13, supported by holders 14, and these switches are adapted to engage simultaneously on contact-plates 15, secured on insulating-backing 16 of any suitable kind fixed to plate C. Insulating-sections 18 of said backing are interposed between contact-plates 15 and flush therewith, and end brushes 19 and 20 on holders 21 are adapted to make contact with plate 22 beneath when the brushes 12 and 13 are thrown out of circuit and serve for making charging connections for the battery when desired.

On the opposite side for reversing the current the holders 25, 26, and 27, respectively, at the top carry brushes 28, 29, and 30, and holders 31, 32, and 33 below carry brushes 34, 35, and 36, and said series of brushes above and below contact with plates 37 and 38 above and below, respectively. These brushes are so arranged that only the middle brushes of each series and one set of the other brushes can rest on said plates at the same time, and the current connections with said plates are such that opposite directions of flow of current and travel of the motor are established according as said brushes are shifted in pairs. Thus in Fig. 3 brushes 30 and 36 are out of the circuit and the others are in. This, presumably, is the forward relation of the parts. To reverse and back the machine, 29 and 35 would be thrown out of circuit onto the insulation 40 and the machine would be reversed. The exact lines of connection between these parts are clearly traceable in diagram, Fig. 5.

The main operating-plate C is provided with a series of rounded scallops 42 at its bottom and outer end, which are adapted to be engaged by a small roller 43 on a spring-supported arm 44, and thus a distinct stop mechanism is provided for said plate adapted to accent each particular pull on lever E as the current is being thrown in variously for the purposes desired, and said mechanism is such as to distinctly announce each stop to the operator through the touch on the handle, while it is so constructed that he can overcome the stop by another push, and so on, the roller dropping into another notch as this is done, and so on to the end of the stroke.

When the parts are at rest, as shown in the several views, either of the plates may be thrown forward by their respective lever connections, and this position may be deemed the starting position, with all the circuits controlled by the brushes and contact-plates on main plate C as off, except a charging-circuit for the batteries, (represented by brushes 19 and 20 and contact-plate 22.)

The first step forward of plate C, as defined by the second of the series of notches 42 and by roller 43, breaks the contact between brushes 19 and 20 and contact-plate 22 and brings all the other sets of brushes into engagement with their respective contact-plates to close various circuits, whereby the batteries are placed in parallel through resistance to the motor. The next step forward of plate C cuts out the circuit for the resistance, but leaves the batteries in parallel, and the next step forward establishes a circuit placing the batteries in series. Obviously this arrangement of circuits may be modified or extra brushes and contact-plates may be added to cut in extra batteries, and I do not wish to limit myself to the specific number and arrangement of brushes and contact-plates or the manner in which they are electrically connected in circuits, as shown.

It will be noted that rack *c* of plate C and segment 2 of lever E have portions of their teeth removed to provide clearance between them, whereby disengagement between the parts may be effected and lever E independently operated without operating plate C. This arrangement makes it possible to operate suitable brake mechanism for the vehicle upon a continued movement of lever E without causing a further outward movement of plate C.

What I claim is—

1. In switches for storage batteries, a suitable supporting-frame, longitudinally-movable plates mounted oppositely on said frame, and brush and plate connections for the current operatively related to said plates.

2. In a switch for storage batteries, a supporting-frame, opposite slidable plates on the sides of the frame and means to operate said plates separately, contact and insulating surfaces on said plates respectively, and upper and lower series of brushes supported on pivots at right angles to said plates.

3. In electrical switches, opposite longitudinal slidable plates having contact and insulating surfaces upon their outer sides and means to operate said plates independently, a series of brushes at the top and another series at the bottom of each of said plates respectively, and said brushes formed of laminæ of copper strips adapted to engage edgewise with said contact-surfaces.

4. In an electrical switch, a suitable support, opposite slidable plates thereon and means to operate said plates separately, and separate brushes for said plates, one of said plates adapted to throw in more or less current progressively and the opposite plate adapted to reverse the current.

5. In a switch for storage batteries, a suitable support, opposite plates upon the sides

thereof independently operative, and a locking device between said plates adapted to hold one plate while the other is free to be operated.

6. In a switch for storage batteries, a suitable support, plates on opposite sides thereof adapted to be moved lengthwise and separate actuating-levers therefor, in combination with a device between said plates to lock one and leave the other free and operative, and said plates constructed to be engaged by said locking device when out of current connections.

7. The switch substantially as described having a main frame, opposite members slidably mounted thereon, a separate lever for each member and a single support wherein said levers are pivoted side by side, separate brushes and contact-plates for each member and means interposed between said members adapted to automatically lock one of said members while the other member is unlocked and the current is open thereto.

8. In a storage-battery switch, a suitable support, a contact-carrying part on the side thereof slidable lengthwise and provided with a series of curved notches at its lower edge, a lever to operate said plate and a pivoted spring-engaged arm and a roller thereon adapted to engage said notches and accent the steps in the movements of said plate.

9. In switches for storage batteries, a support and a plate slidably mounted thereon, contact-plates on said slidable plate, brushes on said support comprising a series of metal strips adapted to engage edgewise with said contact-plates, and a lever for said plate having a freeing connection therewith during a portion of its throw.

10. In switches for storage batteries, a support and a plate slidably mounted thereon, a series of contact-plates on said slidable plate, a series of brushes comprising metal contact-strips arranged to wipe sidewise over said contact-plates, means to fix predetermined stopping positions for said slidable plate and an operating-lever for said slidable plate.

In testimony whereof I sign this specification in the presence of two witnesses.

SETH A. LEONARD.

Witnesses:
R. B. MOSER,
C. A. SELL.