(No Model.) 2 Sheets—Sheet 1.

M. D. CONNOLLY.

ELECTRIC SWITCH.

No. 262,646. Patented Aug. 15, 1882.

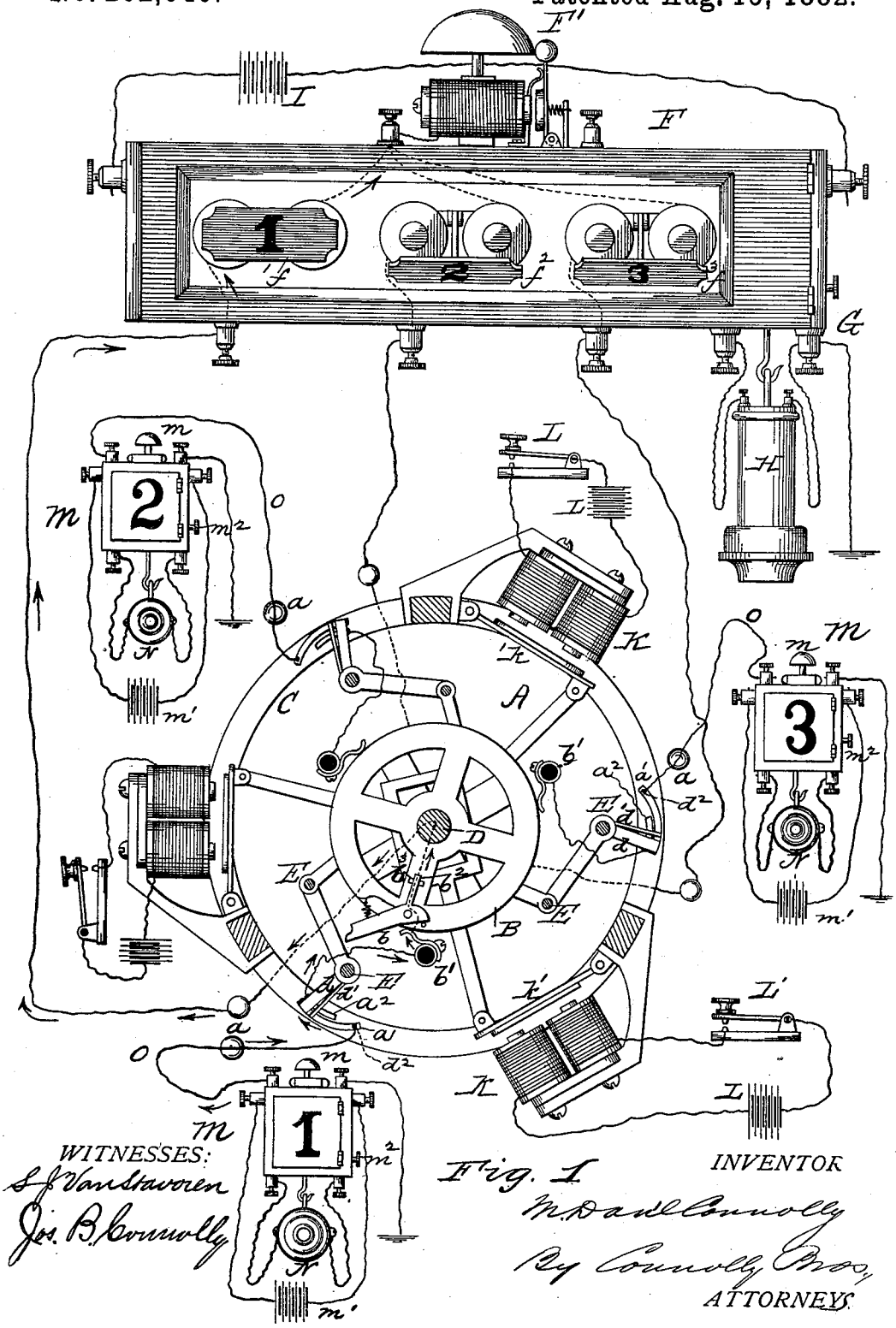

Fig. 1

WITNESSES:
S. F. Vanstavoren
Jos. B. Connolly

INVENTOR
M. D. Connolly
By Connolly Bros.
ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

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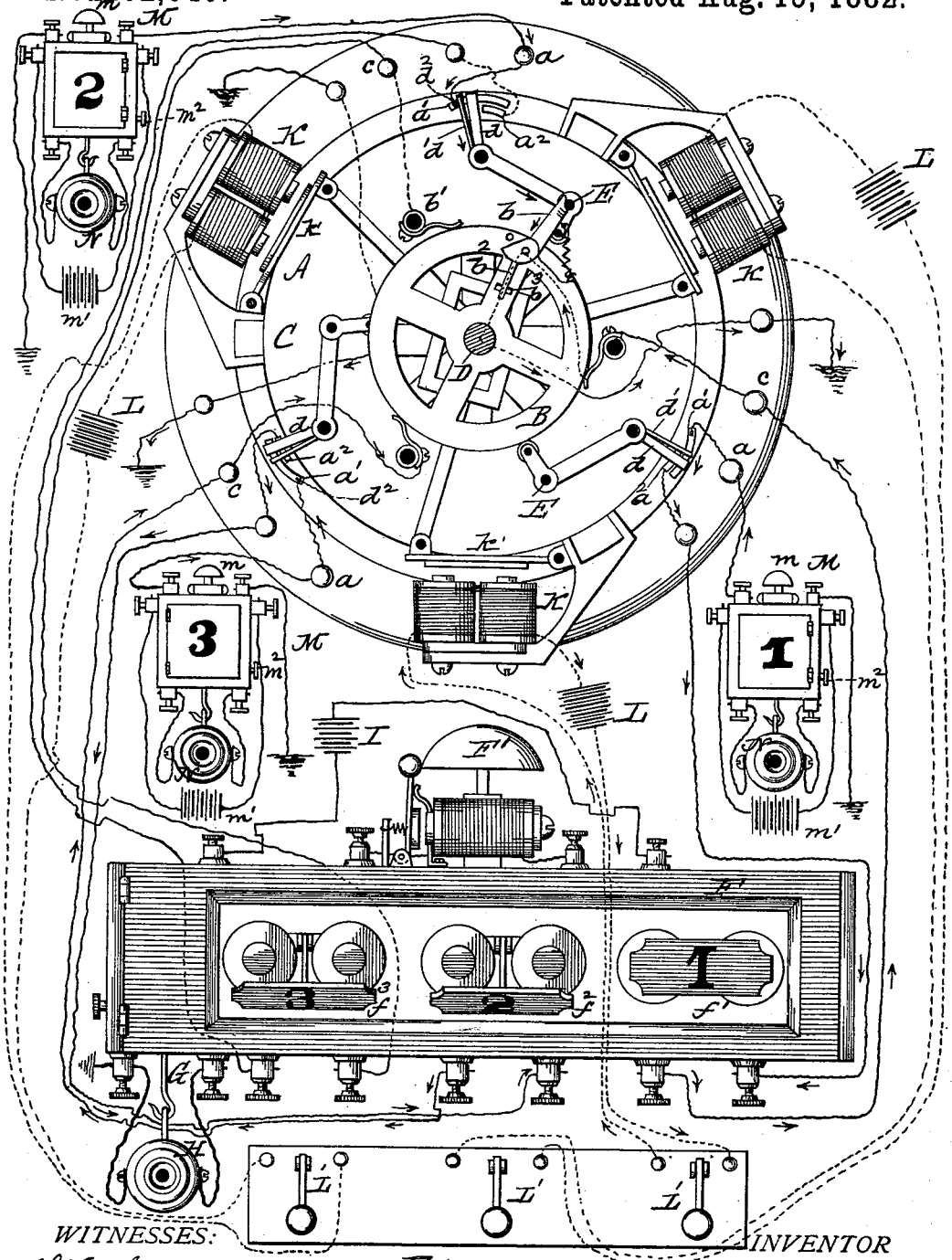

Fig. 2.

WITNESSES:

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INVENTOR

M. David Connolly

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UNITED STATES PATENT OFFICE.

M. DANIEL CONNOLLY, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO SPENCER D. SCHUYLER, OF NEW YORK, N. Y.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 262,646, dated August 15, 1882.

Application filed November 29, 1881. (No model.)

To all whom it may concern:

Be it known that I, M. DANL. CONNOLLY, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric Switches or Circuit-Changers; and I do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, which form part of this specification, in which—

Figures 1 and 2 are diagrams illustrating my invention.

My invention has relation to switches or circuit-changers for electric conductors, and particularly to those employed for telephonic transmission.

My improvements have for their object to provide a switch or circuit-changer operative by hand, and in which the connection of normally-independent lines is effected by a rotary movement of the switching devices.

I will now describe my invention as applicable to the connection of conductors which form the subscriber's lines of a telephone-exchange, such lines converging to a central office, where the switching devices are located. For the purpose of such illustration the apparatus shown is modeled closely upon the automatic telephone-exchange described and claimed in the joint application of myself, Thomas A. Connolly, and Thomas J. McTighe, filed August 29, 1881—that is to say, I employ the rings, contact-fingers, and bars of said joint application. I dispense, however, with the polarized relays shown in said application, whereby the battery is thrown onto the ring-actuating magnets, substituting therefor a manual key, and instead of leading the incoming lines directly from the exchange apparatus to ground I carry them to an annunciator provided with means for receiving an alarm, for returning an answering alarm, and for placing a telephone in circuit. Hence the resemblance between the invention herein described and that shown in the joint application aforesaid is that in both cases the connection of normally-independent lines is made by a rotary or traveling movement of the central-office mechanism. The difference between them consists essentially in the fact that in the automatic arrangement the connection of lines is effected, without manual intervention at the central office, by subscribers themselves sending electric impulses over their lines, causing relays at the central office to be actuated, and thus move the switch mechanism, while in the present case subscribers call up the central office, and the latter makes the desired connection by manual operation.

Referring to the accompanying drawings, A shows the central-office switch, comprising a series of rings or wheels, B B B, mounted in a suitable frame, C, so as to be capable of being rotated therein, by preference on a central shaft, D. Each of these rings or wheels carries a contact-finger, *b*, there being one such ring or wheel and finger for each subscriber's line. To each line is also assigned a contact-bar, E, said bars being so disposed that they may be swung outwardly, but when standing in their normal position are in the paths of the contact-fingers, so as to be engaged by the latter as they travel around. The circuit of each line is through the ring or wheel, finger, and contact-bar, as in the joint application above mentioned. When the finger of one line is in engagement with the bar of another the two lines so engaged are in the same circuit. When a finger is not so engaged the circuit of its line is to an annunciator, F, having a bell, F′, and shutters or drops $f' f^2 f^3$, one for each line. Such annunciator has or is connected with means (designated in the drawings at G) for putting a telephone, H, in each line at the central office, and a battery, I, or equivalent generator, for sending back answering signals. These parts, comprising the annunciator and its appurtenances, need not be particularly described, as they are or may be the same as those commonly employed in connection with plug switch-boards, used for like purpose.

To produce the rotation of the rings any suitable mechanical or electro-mechanical means may be employed. In the drawings I have illustrated pawl-and-ratchet mechanism, the pawls being connected with the armatures *k′* of the electro-magnets K, upon which local circuits of batteries L are closed by manual keys L′.

M represents subscribers' boxes, of the usual or any suitable construction, having electric bells *m* to receive signals, batteries *m′*, (or equivalent magneto-electric generators,) push-

buttons m^2 for throwing the batteries onto line to send signals over the latter, and telephones N, with suitable appliances and connections for placing the same in circuit with such lines and boxes. Lines O lead from the boxes to the central-office mechanism, each line entering the latter by binding-posts *a*, thence to segment *a'*, and by brush *d* (on contact-bar E, but insulated therefrom) to segment a^2, thence to insulated strip or plate *b'*, in electric contact with rings or wheels B, thence to finger *b*, thence by tail-piece b^2 to segment b^3 on lower section of ring B, from said lower section to annunciator, and from the latter to ground.

The operation is as follows: A subscriber calls central office by manipulating his push-button m^2. This sends a signal over the line, moving drop or shutter *f'* and ringing bell at central office. Central office responds by an answering signal, and then puts telephone into circuit. Subscriber states the connection he desires, which is then effected by central-office attendant working the key L' of calling line. This produces a rotation of calling subscriber's ring, his contact-finger traveling therewith and engaging with the contact-bar of the sought line. The movement of the finger on its pivot, resulting from the engagement of such finger with the bar it engages, cuts out the circuit of the calling line to the annunciator, as such movement involves the movement of the tail-piece b^2 off the segment b^3, through which circuit is had to annunciator. Reciprocally the outward movement of a contact-bar, resulting from engagement with such bar of a finger, cuts out the annunciator from an engaged or called line, as such movement of the bar moves the brush *d* on said bar off its segment, bringing its other brush, *d'*, which is in metallic contact with said bar, into contact with the metal post d^2 on the segment *a*. Hence when two lines are connected, as described, the circuit is direct between them, to the exclusion of the annunciator and its appliances. If, however, it be desired to allow the annunciator and its battery and telephone appurtenances to remain in circuit, so that after two lines are connected the central office can send a signal over said lines to notify the subscribers that connection has been established and can retain a telephone in the circuit, the circuits may be arranged as shown in Fig. 2. In this arrangement circuit is from a subscriber's box to binding-post *a*, thence to segment *a'*, thence across brush or bridge *d* to inner short segment, a^2, thence to annunciator, from annunciator back to switch A by binding-post *c*, thence to insulated strip *b'*, to ring B, to finger *b*, to ground. Now, when a subscriber has called central office and has had his ring rotated by central office until his contact-finger engages with a bar his brush *d* still maintains the connection between the two segments *a'* a^2 belonging to his own line, and his circuit therefore is through and includes the annunciator and its appurtenances. He has, however, been cut off from ground at the central office by reason of the movement of the tail-piece of his finger, and his circuit is therefore onward through the bar of the subscriber with which his contact-finger engages to and over the line pertaining to such bar; but this bar, which I call the "engaged bar," has been moved so far by the finger engaging with it that the insulated brush of said bar is off its own inner segment. Hence the engaged line has its own annunciator-connection cut off; but as the annunciator of the calling line and its battery and telephone appurtenances are in the normal circuit of the calling line the central office may by these latter signal over both connected lines after their connection has been effected and retain, if desired, its telephone in the circuit.

I have shown and described my improvements in connection with a particular form of switching mechanism; but I do not limit my claims to the combination therewith, as my invention includes any form of switching apparatus in which the connection of lines is effected by normally-operated devices which produce such connection by a rotary movement, such devices being uncontrolled in their movements by electric impulses sent over the lines.

I have shown electric keys and batteries for closing circuits on magnets whose armatures are connected with pawl-and-ratchet mechanism for producing a rotation of the wheels and rings; but I reserve the right to substitute any mechanical devices which will effect the same result.

I should here call attention to the fact that in Fig. 1 the annunciator is shown in what may be termed the "ground-circuit"—*i. e.*, between the switching device and ground. In this arrangement, as already stated, the annunciator is cut out as to any two lines when such lines are connected. In Fig. 2, however, the annunciator is actually in the internal circuit of the machine—*i. e.*, in the circuit between the short inner segment, a^2, and the insulated strip *b'*—such position corresponding to that of the polarized relays in the joint application already mentioned. In this position, as already explained, the annunciator remains in the normal circuit of a calling line, being cut out, however, from the normal circuit of an engaged line. In this position the central office can send alarms, &c., over connected lines. There is a third position in which the annunciator may be placed—namely, in the main line, or in circuit between the subscribers' boxes and the switch. In this position the annunciator would not at any time be cut out of circuit by the switch. My invention accordingly includes the combination, with a manual rotary switching device, of an annunciator and its suggested appurtenances, whether located in the ground, the internal, or the main-line circuit.

What I claim as my invention is as follows:

1. A rotary switching device or circuit-changer comprising a series of travelers pro-

vided with contact-makers and transverse conductors, which form parts of the circuits of independent lines, such travelers being adapted and designed to move so as to bring such circuit-makers successively into contact with said transverse conductors, in combination with means, substantially as stated, for producing by manual operation movement therein to effect the connection of normally-independent lines, such means being located at the switch out of line-circuit and uncontrolled by electric impulses sent over said lines, as set forth.

2. The combination of a switching device or circuit-changer in which the connection of any two normally-independent lines is effected by a rotary movement of a traveler pertaining to one of such lines with means, substantially as stated, for producing such movement by manual operation, and an annunciator with appurtenances for throwing a battery onto line and placing a telephone in circuit at the central office or point of connection, substantially as set forth.

3. The combination, with a rotary switching device or circuit-changer adapted and designed to effect connection of normally-independent lines, of means located at the switch for moving the same by manual operations and an annunciator and appurtenances for throwing a battery onto line and placing a telephone in circuit at the central office or point of connection, such annunciator being located in the internal circuit of the switch, whereby when two lines are connected an alarm may be sent over both from the central office and communications passing over such connected lines be received at such office, substantially as set forth.

4. The combination of a series of subscribers' or local boxes having means for receiving and sending electric alarms and telephonic communications, a switching device having line-connections with such boxes and designed and adapted to effect connection of any two such lines by rotary movement of one of the contacting devices of such lines, means, substantially as stated, for producing such rotary movement by manual operation at the central office or place of connection, and an annunciator with appliances for throwing a battery onto line and placing a telephone in circuit, substantially as and for the purpose set forth.

5. The combination of a rotary switching device comprising a series of travelers carrying contact-fingers and transverse conductors, forming parts of line-circuits, means, substantially as described, for moving said travelers by manual operation so as to bring said fingers successively in contact with said conductors, and an annunciator with appliances for throwing a battery onto line and placing a telephone in circuit, as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 26th day of November, 1881.

M. DANL. CONNOLLY.

Witnesses:
S. J. VAN STAVOREN,
CHAS. F. VAN HORN.