(Model.)

4 Sheets—Sheet 1.

J. O. JEFFRIES.

TELEPHONE STATION APPARATUS.

No. 251,234. Patented Dec. 20, 1881.

Fig. 1.

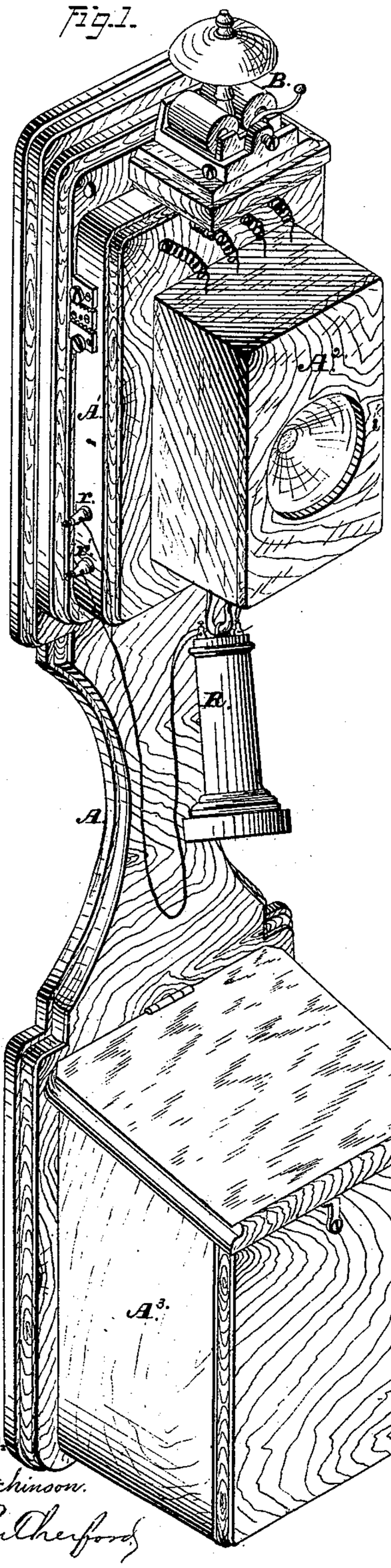
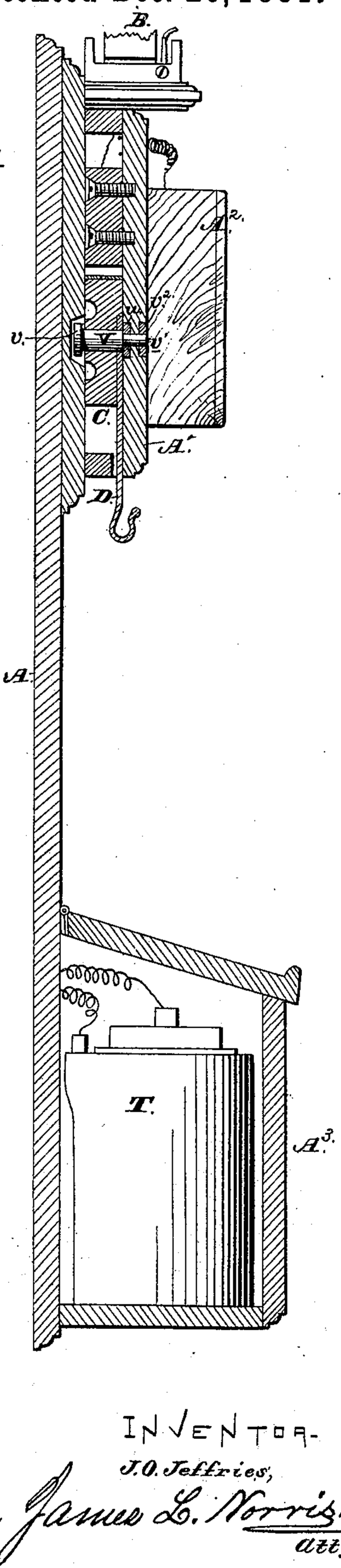


Fig. 2.



WITNESSES:

Jas. E. Hutchinson.

J. A. Rutherford.

INVENTOR.

J. O. Jeffries,

by James L. Norris.

Att'y.

(Model.) 4 Sheets—Sheet 2.

J. O. JEFFRIES.

TELEPHONE STATION APPARATUS.

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Fig. 3.

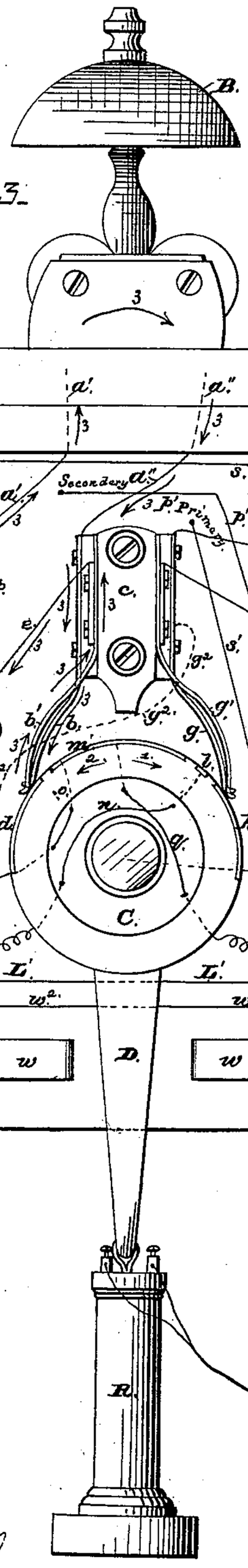


Fig. 4.

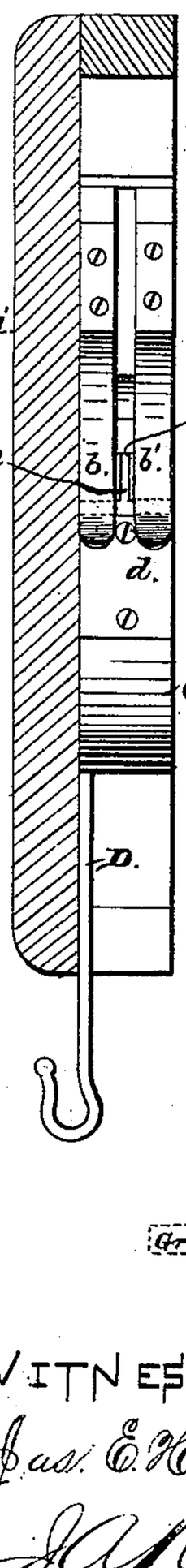
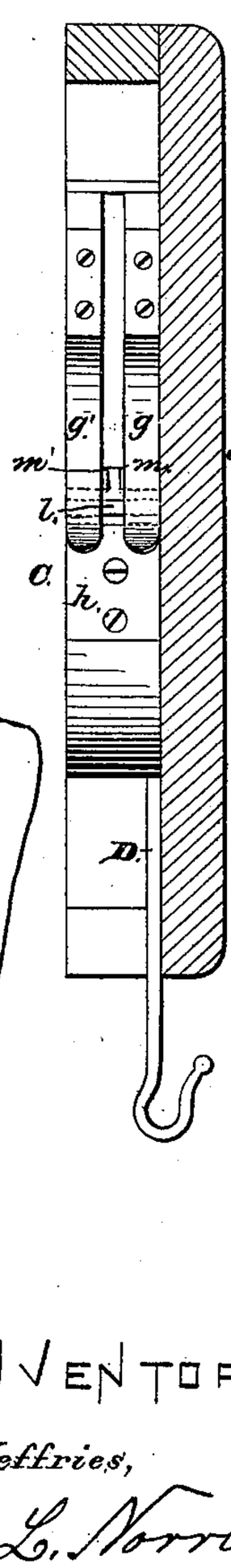


Fig. 5.



WITNESSES=

Jas. E. Hutchinson.

J. A. Rutherford.

INVENTOR-

J. O. Jeffries,

by James L. Norris.

Atty.

(Model.) 4 Sheets—Sheet 3.

J. O. JEFFRIES.

TELEPHONE STATION APPARATUS.

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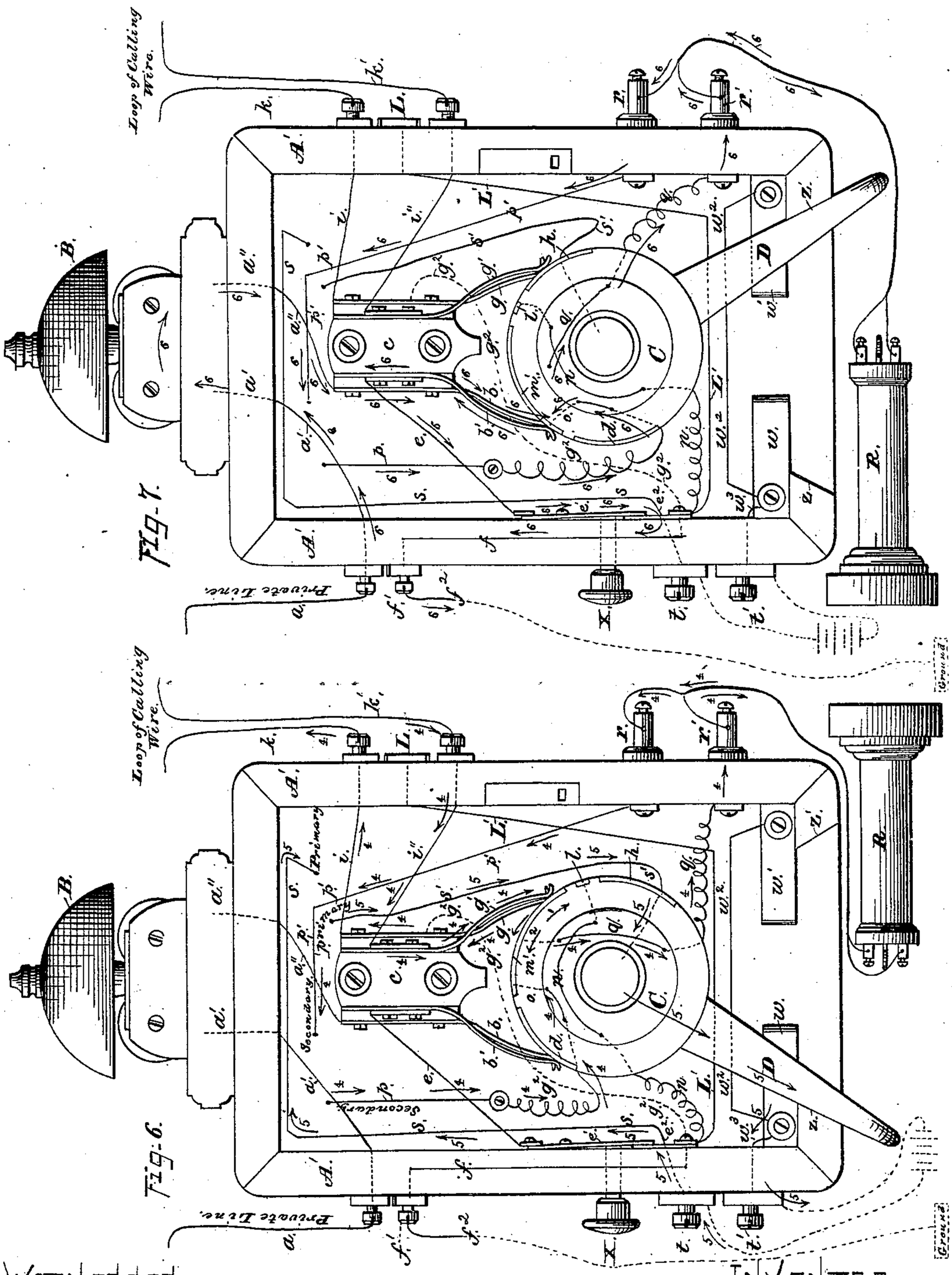

FIG. 7.

FIG. 6.

WITNESSES:

Jas. E. Hutchinson.

J. A. Rutherford

INVENTOR.

J. O. Jeffries,

By James L. Norris.

Atty

(Model.) 4 Sheets—Sheet 4.

J. O. JEFFRIES.

TELEPHONE STATION APPARATUS.

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Fig. 8.

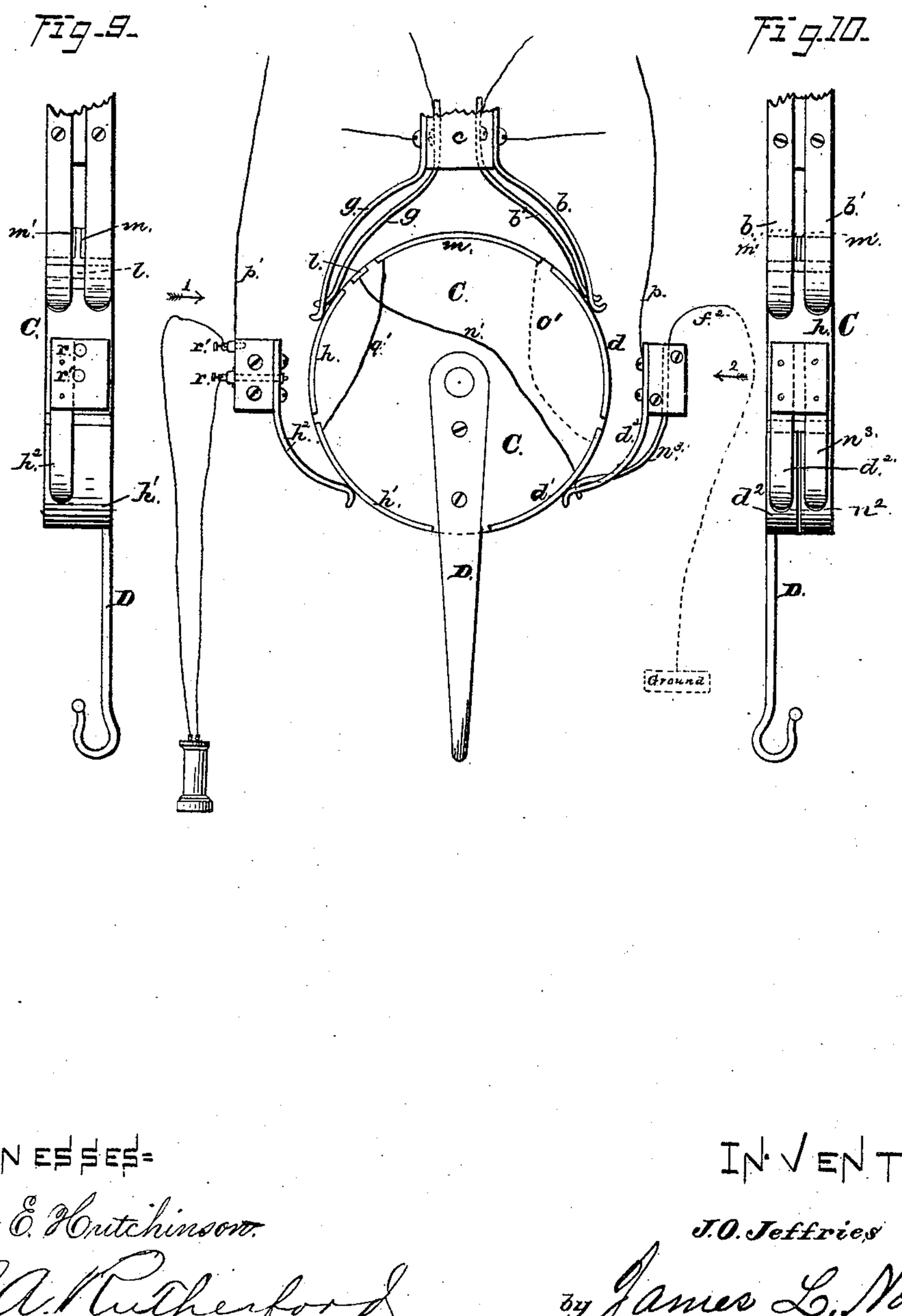

Fig. 9.

Fig. 10.

WITNESSES:

Jas. E. Hutchinson.

J. A. Rutherford

INVENTOR.

J. O. Jeffries

by James L. Norris.

atty.

UNITED STATES PATENT OFFICE.

JOSEPH O. JEFFRIES, OF MONTGOMERY, ALABAMA.

TELEPHONE-STATION APPARATUS.

SPECIFICATION forming part of Letters Patent No. 251,234, dated December 20, 1881.

Application filed September 25, 1880. Renewed November 8, 1881. (Model.)

To all whom it may concern:

Be it known that I, JOSEPH O. JEFFRIES, a citizen of the United States, residing at Montgomery, in the county of Montgomery and State of Alabama, have invented new and useful Improvements in Telephone-Station Apparatus, of which the following is a specification.

This invention relates to an improvement in telephone-station apparatus especially adapted for use in the "two-wire" system. In this system each subscriber's station is connected with the central office by two wires, one of which is a private wire, used exclusively for communicating with other subscribers, and the other a calling-wire, used exclusively for notifying the central office to connect and disconnect private wires, all of which connect at the central office with a switch-board so arranged that any two may be readily connected together or disconnected. The calling-wire is either a metallic circuit looped into each subscriber's station, or a single main line with branch wires running from it to each subscriber, the distant end of the main line and the end of the branch in each subscriber's office being left open. Each subscriber's office, as heretofore arranged, is provided with a transmitting and a receiving telephone and an electro-magnetic bell or call-box provided with two switches, one for changing from the bell to the telephones and the other for changing the telephones from the private wire (in which they normally are connected) to the calling-wire. The imperfect connections made by the two switches, their liability to get out of order, owing to weakening of their springs, and the manipulation necessary from their separate action render desirable an apparatus more reliable, durable, and simple of construction. To ring the bell or speak to the central office, as heretofore connected, the subscriber is required to press a push-button or pull and hold down a connecting-switch. Experience has shown that it is impracticable to have the subscribers understand and remember the operation of these devices in relation to the telephones and other connections.

To simplify and render reliable the switching devices and to insure the making of calls and required connections are the main object of my invention, in which one movement in one direction of the hooked lever which carries the receiving-telephone causes the ringing of the call-bell at the central office and cuts in the subscribers' telephones on the calling-wire, ready to speak to the operator answering the call, and one movement in the opposite direction connects the telephones with the private wire, ready to communicate with the other subscriber with whom he has been connected. When the communication has been finished one movement of the lever to its normal position causes the ringing of the bell at the central station to notify the operator to disconnect the two private wires, cuts the telephones out of both wires, and places the subscriber's bell in proper connection to receive calls.

My invention has the further object to combine in one complete compact apparatus capable of convenient mounting in position for use and packing for transportation all the essential requisites of a telephone-exchange subscriber's station. This I accomplish by attaching to a single base-board a box or casing inclosing the switching devices and connections, and a box or casing for containing the transmitter-battery, said box or casing being provided with an inclined hinged lid which serves as a desk. Suitable wires are led from the battery-box to the switching devices, for the purpose of connecting the battery with said devices.

In the accompanying drawings, illustrating my invention, Figure is a front perspective view of my improved apparatus and casing ready for use. Fig. 2 is a side view partly in section. Fig. 3 is a rear view of the box opened, showing the arrangement of the switching devices and connections. Fig. 4 is a section on line *x x* of Fig. 3. Fig. 5 is a section on line *y y* of Fig. 3. Figs. 6 and 7 are views similar to Fig. 3, with the switching devices in different positions. Fig. 8 is a view of a modification of the switching devices and connections. Fig. 9 is a view of same, looking in direction of arrow No. 1; and Fig. 10 a similar view, looking in the direction of arrow No. 2.

The letter A, Figs. 1 and 2, designates the base-board, which supplies the entire station apparatus. A′ is the casing inclosing the switching devices and connections. A^2 is the transmitter, secured to the front of said cas-

ing; and A^3 is the battery-box, secured to the lower end of the base-board, and having the slanting lid, which serves as a desk. The casing A′ is hinged to the base-board to swing outward therefrom, and has mounted upon it the electric bell B.

Referring to Fig. 3, which is a rear view of the casing A′ detached from the base-board, the letter *a* indicates the private-line wire, which leads direct from the subscriber's station to the central office. This wire connects with one terminal, *a′*, (shown by dotted line) of the bell-magnet, the other terminal, *a″*, of which connects with a leaf-spring, *b*, one end of which is secured to a block, *c*, of wood or other insulating material, fixed to the wall of the casing, the free end of said spring bearing upon a curved metallic plate, *d*, (see also Fig. 4,) let into the periphery of a disk, C, of wood or other insulating material, pivoted to the wall of the casing. A spring, *b′*, similar to spring *b*, is also secured to the block *c* on an offset thereof, and separated from spring *b*, and has its free end resting also upon metallic plate *d*. From the spring *b′* a wire, *e*, leads to a flat spring, *e′*, secured to the side wall of the casing, and having its free end resting upon a metallic plate, e^2, likewise secured to said wall, and from the plate e^2 a wire, *f*, let into the wall, leads to a binding-post, *f′*, from which leads a wire, f^2, which is to be connected with the ground when the apparatus is located for use. In its normal condition the disk C stands, as shown in Fig. 3, with its attached telephone hook-arm D in a vertical position, and the springs *b* and *b′* both resting upon plate *d*, and a call for the station may then be sounded upon the bell B by means of an electric current sent from the central office over the private-line wire *a* in the direction indicated by arrows No. 3 in Fig. 3, through the bell-magnet coils, over spring *b*, plate *d*, spring *b′*, wire *e*, flat spring *e′*, plate e^2, wires *f* and f^2, to the ground.

To the opposite edge of the block *c* from springs *b* and *b′* are secured two similar springs, *g* and *g′*, the free ends of both of which rest upon a curved metallic plate, *h*, let into the periphery of the disk C. From the springs *g* and *g′* respectively lead the wires *i* and *i′*, which connect with the loop-wires *k k′* of the calling-wire, leading from the station to the central office, and it may be to other stations. The calling-circuit, as will be seen, is closed normally through springs *g* and *g′* and plate *h*.

Into the periphery of the disk C, just above the plate *h*, and separated therefrom, is let a narrow metallic plate, *l*, extending entirely across said periphery, and between this narrow plate *l* and the plate *d*, and separated from both, are arranged two parallel curved plates, *m* and *m′*, (see Figs. 4, 5, 6,) let into the opposite margins of the periphery and separated from each other. From the narrow transverse plate *l* a wire, *n*, leads to the plate e^2. From the narrow curved plate *m* a wire, *o*, leads and connects with one terminal, *p*, of the secondary coils of the transmitter, which, it will be understood, is a battery-transmitter having an induction-coil, not necessary to be shown in the drawings, and the other terminal, *p′*, of said secondary coil leads to the binding-post *r*, to which is connected one of the wires leading from the receiving-telephone R. From the post *r′*, to which the other receiver-wire is connected, a wire, *q*, leads to the narrow curved plate *m′* on the periphery of disk C. From one of the terminals of the primary coil of the transmitter a wire, *s*, leads to a binding-post, *t*, which is connected to one pole of a local battery, T, which is located in the box A^3, as shown in Fig. 2, and from the other terminal of said primary coil a wire, *s′*, leads to a metallic washer, *u*, (see Fig. 2,) let into the wall of the casing, and forming a bearing against which plays the surface of the inner end of the metallic telephone hook-arm D, which arm is secured to the face of the disk C, which is next to the wall of the casing, and extends toward and somewhat beyond the center of said disk, an aperture being formed near its inner end, through which passes the pin V, upon which the disk C turns. Said pin is provided with a head, *v*, and its other end is shouldered and provided with a screw-threaded extension, *v′*, which passes through the front wall of the casing and receives a nut, v^2, which secures it in place.

The letters *w* and *w′* indicate metallic spring-plates, fixed near the lower end of the casing, at opposite sides thereof, and in the path of the arm D, which extends downward through a slot in the bottom wall of the casing. These plates are bowed outward slightly, so as to be struck by the said arm D, which slides upon them, and they are connected by a wire, w^2, while a wire, w^3, leads from plate *w* to pole of the local battery opposite that to which the wire *s* is connected.

From the plate e^2 a wire, L′, leads to a lightning arrester plate, L, located between the binding posts of the loop-wires *k k′* in the usual manner.

The hook-arm D being in its normal position, as is shown in Figs. 1 and 3, when the subscriber desires to communicate with another he moves the arm D to the right, as shown in Fig. 6, (which, it will be borne in mind, is a rear view, and therefore the left of the drawing is the right of the box,) until it strikes the stop *z* and is brought into contact with the plate *w*. This movement of the arm causes the disk C to turn in the direction of the arrow No. 1, carrying the plate *h* out of contact with the springs *g* and *g′*, and as the springs leave said plate the loop circuit is broken, but closed again as the further movement of the disk brings the narrow transverse plate *l* under the ends of the springs. It is again broken as the said narrow plate *l* is carried from under the springs by the still further movement of the disk, which also brings the parallel plates *m* and *m′* respectively under the springs, the former being in contact with spring *g* and the latter with spring *g′*. The breaking and closing of the loop-circuit

cause a call to be sounded over the calling-wire at the central office, and as the springs come in contact with plates *m* and *m'* a circuit is established from, say, loop wire *k'* in the direction of wires No. 4, Fig. 6, through spring *g'*, plate *m'*, wire *q*, through the receiver, and thence over wire *p* to the secondary coil of the transmitter, and thence through terminal wire *p'*, wire *o*, plate *m*, spring *g*, and wire *i* to wire *k*, thus placing the telephones, receiver, and transmitter in the calling-wire circuit ready to receive from the central office an answer to the call, and to instruct said office as to with what subscriber communication is desired. The same movement of the arm D, by bringing it in contact with plate *w*, establishes a circuit from one pole of the local battery over wire *s*, in the direction indicated by arrow No. 5, through the primary coil of the transmitter, over wire *s'* to washer *u*, over arm D to plate *w*, and thence over wire w^3 back to the battery, thus placing the transmitter in condition for operation. All these changes and connections, it should be borne in mind, are made by one movement of the lever D from its vertical position to the stop *z* to the right. The necessary instructions having been given to the operator at the central office and notice received that connection with another subscriber has been made, as desired, the arm D is to be moved to the left until it comes in contact with stop *z'* and plate *w'*. By this movement the local-battery circuit is broken, but immediately re-established through the primary coil of the transmitter over plate *w'*, wire w^2, and the other conductors, as before described. When the arm D strikes stop *z'* the disk C has been turned in the direction indicated by arrow No. 2 until plate *m'* is brought under spring *b'* and plate *m* under spring *b*. The same movement changes the springs *g* and *g'* from plates *m* and *m'* first to the narrow transverse plate *l* and then to plate *h*, thus making and breaking the calling-circuit, as before explained, and sounding a bell at the central office to notify it that no further attention is required. In this position of the parts a circuit is established from the private-line wire *a* in the direction indicated by arrows No. 6, Fig. 7, to bell-coil terminal *a'*, through the bell-coils, from terminal *a''* to and over spring *b*, over plate *m* and wire *q* to post *r'*, through the receiving-telephone R, thence to post *r* and over wire *p'*, through the secondary coil of the transmitter, thence over wire *p*, wire *o*, plate *m'*, spring *b'*, wire *e*, flat spring *e'*, plate e^2, wires *f* and *f'*, to ground. The receiver and transmitter are thus both connected with the private-line wire and the circuit closed through the loop from the calling-wire, so that while the two connected subscribers are communicating calls may be sent to the central office from other stations. The changes and connections now described are all made by a single movement of the arm D from right to left.

The letter X indicates a push-button, of the usual construction, by which the flat spring *e'* may be forced out of contact with plate e^2 and circuit-breaker for calling another subscriber on the same private wire when there are two or more stations on the same line.

Referring now to Fig. 8, which illustrates a modification of my invention, and in which the parts are seen from a directly-opposite point of view from that of Fig. 3, the parts having like letters are identical in function and relative arrangement with those of Fig. 3.

The face of the disk C, which is next to the front wall of the casing, it is to be remembered, is shown in Fig. 6. In this modification the wire *o* of Fig. 3 is replaced by a wire, *o'*, which, instead of leading direct from plate *m'* to the terminal of the secondary coil of the transmitter, leads to a narrow curved plate, *d'*, let into the margin of the periphery of disk C, below and separated from plate *d*, and upon this plate bears a spring, d^2, which is connected with the wire *p*, leading to the secondary coil of the transmitter. The wire *n* of Fig. 3 is replaced by a wire, *n'*, which connects the narrow transverse plate *l* with a narrow curved plate, n^2, parallel with and separated from plate *d'* on the periphery of the disk C, and upon the plate n^2 bears a spring, n^3, with which is connected the ground-wire f^2. The plate *m* is connected by a wire, *q'*, with a single plate, *h'*, arranged upon the periphery of the disk C, below and separated from plate *h* and upon said single plate *h'* bears a spring, h^2, in metallic connection with the post *r*, to which is connected one of the receiver-wires, while from the post *r'*, with which the other receiver-wire is connected, the wire *p'* leads to the secondary coil of the transmitter. In the movements of the disk C the plates *d'*, m^2, and *h'* are never carried out of contact with the respective springs which bear upon them, and the circuits will be readily understood when it is remembered that spring d^2, plate *d'*, and wire *o'* simply replace wire *o* of Fig. 3, spring n^3, plate n^2, and wire *n'* replace wire *n*, and spring h^2, plate *h'*, and wire *q'* replace wire *q*. The battery-connections for the primary coil of the transmitter are precisely the same in this modification as shown in Fig. 2, and need not be shown in the figure.

If a simple branch from the calling-wire is used instead of a loop, the plates *h* and *l* are omitted from the disk C, and the branch wire is connected with either one of the springs *g* or *g'*, both of which should then bear normally upon the non-metallic portion of the periphery of the wheel, the branch being thus left open. One of the springs should be connected with the ground, as shown, for instance, by the dotted line g^2, Fig. 3, leading from spring *g* to plate e^2; or it might lead to any other ground-connection. Then when the disk is turned to bring them in contact with plates *m* and *m'* a circuit would be established, (see Fig. 3,) say, from wire *k'*, over wire *i'*, spring *g'*, plate *m'*, wire *o*, wire *p*, secondary coil of transmitter, wire *p'*, through the receiver, over wire *q*, plate *m*, spring *g*, and thence to ground, as described. This grounding of the branch wire closes cir-

cuit between the station and the central office and causes a signal to be sounded at said office.

In the branch system it will be remembered that the distant end of the main calling-wire and the end of the branch wires are normally left open.

I do not confine myself to the precise arrangement of the plates, as shown and described, upon the disk C; nor to the precise construction and arrangement of either the disk or the several circuit-changing devices.

Having fully explained the principle and object of my invention, I claim—

1. In a telephone-station apparatus, the combination, with the line-wire terminal, ground-wire terminal, and calling-wire terminals, of a circuit-changing device consisting of the disk C, having upon its periphery the separated metal plates *d*, *m*, *m'*, *l*, and *h*, arranged to be brought in contact with said terminals, respectively, by the rocking of said disk and the telephone-connections, substantially as described.

2. The combination, with the contact-springs *b b'*, arranged for connection respectively with the line-wire and ground-wire, and springs *g g'*, arranged for connection with a loop, of the calling-wire of the rocking circuit-changer, consisting of the disk C, having upon its periphery the metal plates *d m m' l h*, the conductors connecting plates *m* and *m'* with the secondary circuit of the transmitter and the receiver respectively, and the conductor connecting the receiver with said secondary circuit, substantially as described.

3. The combination, with the transmitter secondary and primary conductors, of the rocking disk C, provided with contact-plates for switching said secondary conductors into circuit with the line-wire, and the metallic hook-arm D, attached to said disk, and arranged to simultaneously switch the said primary conductors into the circuit of a local battery, substantially as described.

4. In a telephone-station apparatus, the combination of the springs *b b'*, connected respectively with the private-line wire and a ground-wire, and a spring or springs connected with the calling-wire, with the rocking disk C, having the separated metallic plates arranged upon its periphery for changing the circuits of said private-line and calling wires alternately to and from a transmitter secondary coil and receiver, and provided with a metallic lever connected with one terminal of a transmitter primary coil, and arranged to, by a movement in either direction, make electric connection with one pole of a battery having its opposite pole connected with the other terminal of said primary coil, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOSEPH O. JEFFRIES.

Witnesses:
GAYLORD B. CLARK,
FRANCIS B. CLARK.