(No Model.) 2 Sheets—Sheet 1.

G. F. DURANT.

TELEPHONE STATION APPARATUS.

No. 307,106. Patented Oct. 28, 1884.

Fig. 1.

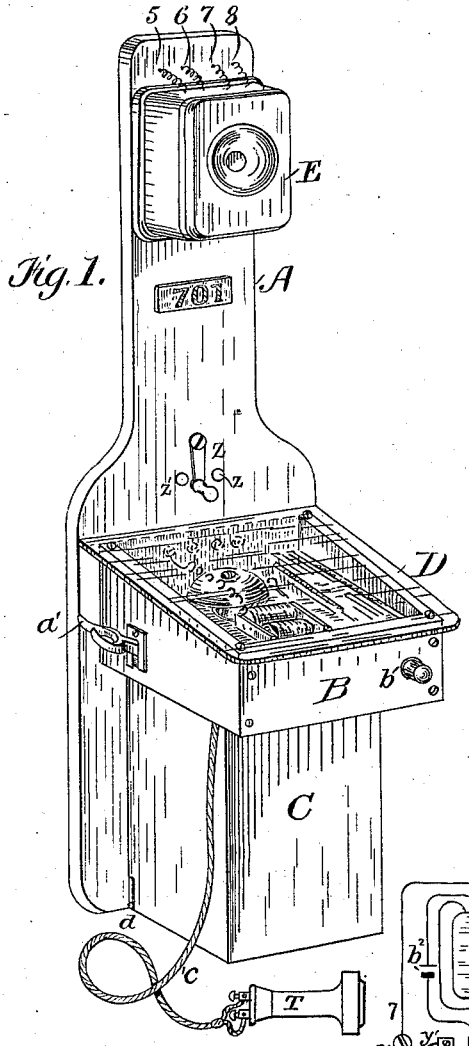


Fig. 2.

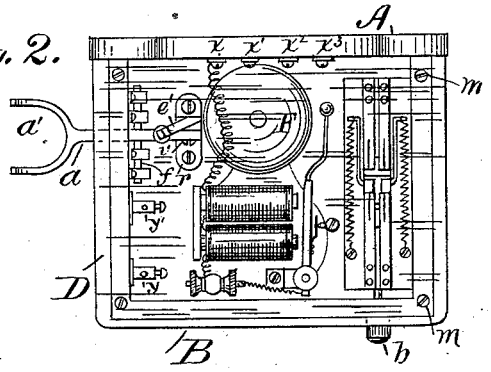


Fig. 3.

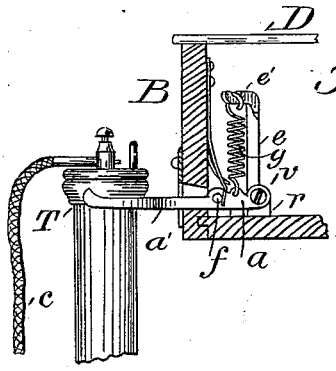
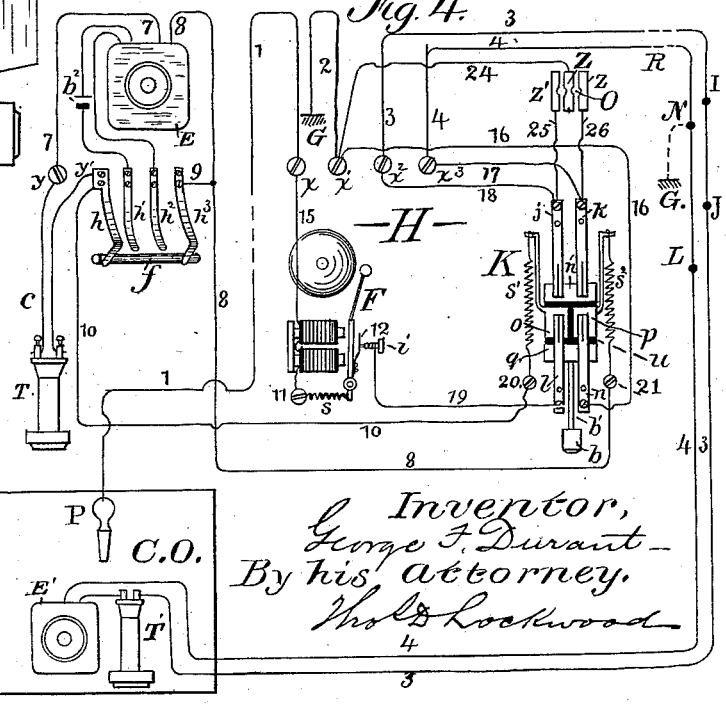


Fig. 4.



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Inventor,
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By his attorney.
Thos. D. Lockwood

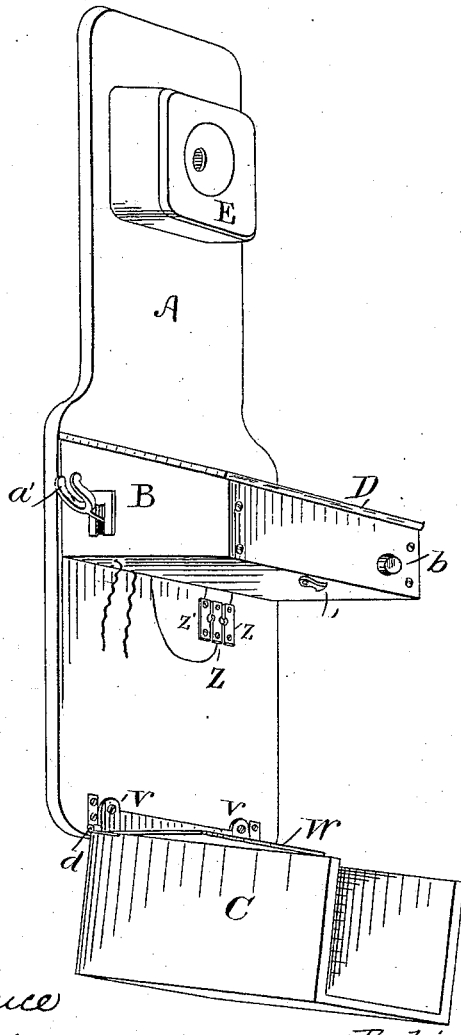
(No Model.) 2 Sheets—Sheet 2.

G. F. DURANT.

TELEPHONE STATION APPARATUS.

No. 307,106. Patented Oct. 28, 1884.

Fig. 5.



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D. E. Richards

Inventor,
George F Durant
By his Attorney.
Thos D Lockwood

UNITED STATES PATENT OFFICE.

GEORGE F. DURANT, OF ST. LOUIS, MISSOURI.

TELEPHONE-STATION APPARATUS.

SPECIFICATION forming part of Letters Patent No. 307,106, dated October 28, 1884.

Application filed May 21, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. DURANT, of St. Louis, and State of Missouri, have invented certain Improvements in Telephone-Station Apparatus, of which the following is a specification.

My invention relates to telephone-station apparatus, and particularly appertains to that class of signal-boxes which comprise a signal-bell to receive signals from distant stations, together with suitable arrangements of automatic switches, telephones, and a battery.

The signal-box which I am about to describe constitutes an improvement in apparatus to be worked in conjunction with the system of telephonic communication for which Letters Patent No. 220,874 were issued October 21, 1879, to Frank Shaw, and which is generally known as the "Law system." It consequently contains a portion of two distinct circuits—*i. e.*, a direct line from the central station to the sub-station, adapted to be used for conversation, and capable of being united at the central station to any other line for the same purpose, and a separate line known as the "call" or "signal" wire, which is a circuit running from the central station to and through any desired number of sub-stations and then back to the central station, constituting what is technically known as a "metallic circuit." The call-wire is provided at the central station with transmitting and receiving telephones, but at the several sub-stations is not normally connected with any instrument whatsoever. By operating a switch the telephones at the sub-station may be temporarily united with the call-wire for the purpose of notifying the operator at the central station, who is always listening at the call-wire telephones there, to place the direct line in communication with some other line for through conversation.

The object of my invention is to produce a signal-box whose connections and mechanism are always open to inspection without taking the instrument or any portion thereof apart, and which, in case any defect should occur, may be readily taken apart and put together again by persons having but an ordinary skill in the art. Other objects aimed at in this invention are to provide means whereby, in case of a break in the continuity of the call-wire, either side of the broken wire may be utilized to convey the telephonic impulses to the central station. Prior to my invention this could only be done by disturbing the normal arrangement of the connections, while my invention provides means whereby the desired result may be attained merely by inserting a plug. Finally, I aim at producing an apparatus which may be set up and connected with the several circuits by any one not having a special knowledge of its functions or of applied electricity. By the construction which I have devised and which I shall hereinafter show I accomplish these purposes.

My invention consists in inclosing the signal-bell, telephone-switch, and circuit-changing switch in a suitable desk-shaped case with a transparent glass cover screwed onto the frame-work of said case, and adapted to serve as a desk. The inclosed mechanism can all be seen through the glass cover. The telephone-support which operates the telephone-switch, and a push-button or other means to work the circuit-changing switch, project through the desk-formed casing. I attach the said case, as also a battery-box, to a base-board, as shown in the drawings, the lower portion of the former serving as a cover for the latter. The battery-box I hang by its lower-corners on hinges attached to the lowest end of the base-board, while the floor of said battery-box is formed by a metal plate, which by a suitable flange is screwed likewise to the base. The transmitting-telephone may be affixed to the upper part of the base-board, while the intermediate portion of said board may be used to accommodate a small plate designating the number of its sub-station, and if desired, afford room also for a card containing other numbers which are most frequently called for by that station. I may also use the same intermediate space, as shown in Fig. 1, for the reception of a grounding device whereby, should the call-wire be open, the subscriber may connect himself temporarily with the central station. I prefer, however, to attach the said device to the base-board inside the battery-box, where it is thus protected, and is furthermore not so likely to be interfered with by malicious or meddlesome persons.

In the accompanying drawings, Figure 1 is a perspective view of the entire apparatus; Fig. 2, a plan view of the inclosed mechanism

as seen through the desk-cover; Fig. 3, a detail showing an elevation of the telephone-switch. Fig. 4 is a diagram exhibiting the circuit arrangements included in the apparatus, and their operation with respect to the central station; and Fig. 5 is a perspective view of the apparatus, with the battery-box open to show its construction.

In the figures, A is the base-board to which the other parts, as clearly shown in Fig. 1, are attached. B is the desk-shaped case covered by the glass plate D. The transmitter E is shown at the upper part of the base-board, and is, as usual, connected with the primary and secondary wires belonging thereto, 5, 6, 7, and 8. The battery-inclosing box C is hinged to the base at *d*, and is ordinarily fastened in any convenient way in an upright position. The receiving-telephone T, connected with the circuit at the binding-screws *y* and *y'* by conducting-cord *c* is, when unused, hung on the yoke or hook *a'*, which is thus depressed into a position which enables it to shunt the telephones out of the main circuit and open the local circuit of the battery-transmitter. A switch, Z, the purpose whereof, will hereinafter appear, is shown on the base-board immediately over the desk, while above the said switch is the station-distinguishing number.

For a full description of the system of communication on which this invention is an improvement, reference may be made to the patent of Frank Shaw, which I have hereinbefore cited.

Within the desk-shaped case B, the mechanism is arranged in the manner shown in Fig. 2, and consists of an automatic switch, *a*, operated by the removal or replacement of the telephone, a vibrating signal-bell, F, the electro-magnetic helices whereof are included in the circuit of the direct telephone-line, and a circuit-changing switch adapted to be manually operated, and serving to transfer the telephones from the direct line to the call-wire, and vice versa. These instrumentalities are in any preferable way attached to the bottom or sides of the case B, and may be inspected through the glass cover D, which, when any repairs or changes are seen to be necessary, can be removed altogether by taking out the screws *m*.

The details of the automatic switch will be readily understood by reference to Figs. 3 and 4. It consists of a lever, *a*, pivoted at the point *v*, and furnished with a metal cross-bar, *f*, capable of making contact with circuit-springs *h* to h^3. The bracket *r*, supporting the pivot *v*, is screwed to the bottom of the case, and has a vertical arm, *e*, projecting therefrom, and carrying at its uppermost extremity a horizontal extension, *e'*. When the telephone T is not in its place supported by the yoke *a'* of the arm-lever *a*, the said lever is drawn upward by the spiral spring *g*, which extends from the extension *e'* to a point on the lever in front of the pivot, and the cross-bar *f* is drawn away from the contact-springs *h* and h^3, and brought into contact with the remaining springs *h'* and h^2, thus breaking the normal short circuit round the telephones, and closing the local-battery circuit of the transmitter through the wires 5 and 6, the springs *h* and *h'*, the battery b^2, and the primary coil of the transmitter. When, on the contrary, the telephone T hangs in the yoke *a'*, the lever *a* is depressed against the retractile force of the spring, and the bar *f* is withdrawn from the contact-springs *h'* and h^2, and again brought into contact with the contact-springs *h* and h^1, opening the local-battery circuit and short-circuiting the transmitter E and receiver T. When the cross-bar *f* is elevated, the main line leads through the telephones by wire 8, transmitter E, wire 7, screw *y*, telephone cord *c*, telephone T, cord *c*, screw *y'*, and wire 10. When the cross-bar is depressed, both transmitter and receiver are short-circuited through wire 9, spring h^3, cross-bar *f*, and spring *h*. The direct or conversation line commences in the central station at the connecting-plug P, which may, if desired, be normally disconnected from any terminating apparatus, thus leaving the line normally open. It is, however, preferably united, in common with other lines, to a ground-plate, but this, forming no part of my invention, is not herein shown. Proceeding outward from the central station by wire I, it enters the first station and is led to the binding-screw *x*, and the route of the circuit through the apparatus from that point is by wire 15 to the electro-magnet of signal-bell F, thence to screw 11 by retracting-spring *s* to the armature and armature-spring 12, contact-screw *i*, wire 19, flat spring *l*, insulated plate *o*, spiral spring *s'*, screw 20, wire 10, switch-spring *h*, switch cross-bar *f*, switch-spring h^3, (or alternatively, as hereinbefore explained, through the telephones,) wire 9, wire 8, screw 21, spiral spring s^2, insulated plate *p*, flat spring *n*, wire 16, screw-terminal *x'*, and wire 2 to ground G. The ground G may of course be at the same station or may terminate the circuit after passing through other stations. For satisfactory operation, however, I prefer to connect but one station in circuit on the direct or conversation line.

The call-wire is in practice a "metallic" or "complete wire" circuit. It is connected at the central station with the transmitting-telephone E' and with the receiver T', and proceeds to any number of sub-stations by the wires 3 and 4. Entering the sub-station by the wire 3 it is connected with the binding-screw x^2 and passes through the apparatus by wire 18, flat spring *j*, plate *n'*, spring *k*, and wire 17 to binding-screw x^3, which is connected to the outgoing wire 4.

The circuit-changing switch K is shown in Fig. 2 as occupying one side of the desk-shaped case B, and is also shown in detail in the diagram Fig. 4. It consists of a sliding block of non-conducting material, *u*, carrying a pair of contact-plates, *o* and *p*, which, by being united through the spring *s'* and s^2 with

the wires 10 and 8, constitute the terminals of the telephone-loop, and also two short-circuiting plates, *q* and *n'*, which, when brought under the circuit-springs *j* and *k* or *l* and *n*, serve to connect the two springs of either pair together. The block *u* has a spindle, *b'*, affixed thereto, and the said spindle terminates in a button or handle, *b*. Normally the circuit-changer K is in the position indicated in the diagram, in which the flat spring *l* and *n* of the direct wire rests upon the telephone-loop plates *o* and *p*, whereby the telephone-loop is normally a part of the direct or conversation wire. The springs *j* and *k* in like manner rest on the short-circuiting plate *n'*, whereby the call-circuit is made continous through the station. The circuit-changer is retained in this position by the spiral springs *s'* and *s²*. The button *b* may, however, be pushed inward against the tension of the springs, and the loop-plates *o* and *p* are thus temporarily brought under the call-wire springs *j* and *k*, causing the telephone-loop to become for a time a part of the call-circuit, by which the sub-station operator is enabled to converse with the listening operator at the central station. The springs *l* and *n* of the conversation-line are simultaneously united by the plate *q* which slides under them and the continuity of the direct circuit is maintained.

The call-wire, being in practice of considerable length and common to many stations, is liable to more than an ordinary amount of circuit trouble, and it is obvious that whenever it breaks down all the sub-stations dependent thereon are, if no preventing means are adopted, deprived for the time being of communication with the central station. To obviate such a contingency, I provide a grounding device, which, when the call-wire is broken or from any cause open, is to be used when communication with the central station is desired. This device may be in the form of metal plates to be operated by the insertion of a plug, or it may be applied to the apparatus as a button-switch. I have shown both forms. The former plan is adopted in Figs. 4 and 5, and for convenience the device is placed on the base-board immediately below the instrument-case B and covered by the battery-box C. It consists of three plates, the middle one, Z, being connected by wire 24 with the screw terminal *x* and thus with the ground, the two side plates, *z* and *z'*, being severally united by wires 25 and 26 to the two arms of the call-circuit 17 and 18. The plates *z* and *z'* thus form normally-open branches of the call-wire. A hole for the reception of the plug-connector is made between the middle plate and each of the others. A plug is of course provided, which the sub-station operator may, when necessary, insert in either of the holes. The button-switch, which is an alternative device, is shown in place on the base-board, Fig. 1, the pivoted bar Z corresponding to the middle plate, and the two buttons, *z* and *z'*, the side plates. When the call-wire is found by the central station to be open, the operator there tests by calling different stations over the direct wire until he finds out the two stations that the break is between. He directs these stations to ground the call-wire, designating at the same time the requisite side, which must, of course, be the side which allows the telephones at the same sub-station to be included in the circuit, so that they can speak to the central station.

In the drawings, the station represented by the diagram may be designated by the letter H. The letters I, J, L, and N similarly represent other stations on the same call-circuit. The circuit is supposed to be broken at R, a point on the wire 4 between N and H. The stations N and H are accordingly directed to use the grounding device. That at N is represented by the dotted line uniting the wire with the ground G. That at H is shown in detail. A plug-connector is placed in the hole O between the middle plate, Z, and the side plate, *z*. The call-circuit is now, until the break is repaired, a grounded circuit including all the stations, and extending from the ground at N, *via* wire 4 and station L to the central station, passing through the telephones there and out by wire 3 through sub-stations J and I to station H, there passing by terminal *x²*, wire 18, flat spring J, plate *n'*, spring *k*, wire 26, plate *z*, plug in hole O, center plate, Z, and wire 24 to terminal *x'*, and thence to ground. In the circuit thus formed the telephones of the station H, and of course the telephones of any of the intermediate stations, may be included by pressing the button *b*. If the grounding device shown in Fig. 1 be employed, in lieu of inserting the plug the switch Z is turned onto the button *z*.

In Fig. 5 I show a perspective view of my improved apparatus, showing the way in which the battery-box is attached. A metal plate, W, is screwed by lugs V to the base-board A, and serves for the stand or bracket on which the battery may be placed. The box C is open at the top and bottom, and is hinged at *d* to the base-board. It is therefore capable of being thrown back, as shown in the drawings, and ready access is thus afforded to the battery. The position of the switch Z is also indicated in this figure.

I do not claim the combination of direct and signal wires together with a circuit-changing switch, whereby the sub-station telephones may be transferred from one of the said wires to the other; but

I do claim—

1. The combination, in a telephone-station apparatus, of a main-line loop, a station-loop including a normally-shunted telephone or telephones and ordinarily disconnected from the said main-line loop, but adapted to be included therein when desired, a circuit-changing switch controlling the station-loop, and adapted when operated to include the same in the said main-line loop, and a grounding-switch for the main-line loop, whereby the

same may be grounded upon either side of the station apparatus, so as to complete the circuit in case the main line should be broken, substantially as hereinbefore described.

2. The combination, in a telephone-station apparatus, of a main-line loop constituting a part of a normally-metallic circuit, a station-loop including the station-telephone apparatus and adapted to be included at pleasure in the circuit of said main-line loop, and a grounding-switch consisting of three metal plates or buttons, and means, substantially as indicated, for connecting either of the two side plates with the center plate, the two side plates being connected, respectively, with the two terminals of the said main-line loop, and the center plate with the earth, whereby the circuit of the loop when broken may be temporarily completed by grounding on either side of the station apparatus, for the purposes specified.

3. The combination, in a telephone-exchange system, of a direct or conversation circuit, a signal-circuit extending in metallic circuit from a central station and common to a number of sub-stations, a sub-station loop including a telephone or telephones, a circuit-changing switch adapted to be manually actuated and to transfer the said loop from one line to the other, and means, as indicated, whereby the signal-circuit may be grounded on either side of the station apparatus, substantially as described.

4. The combination, in a telephone-station apparatus, of a base-board and a battery box or case hinged thereto at its lower edge, and inclosing a shelf whereon the battery stands, and which serves as a floor for the case, the said case being adapted to be opened out as described, together with a glass-covered desk-shaped case containing a call-bell and switching mechanism attached to the base-board immediately above the battery-box, and serving as a cover therefor, as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 26th day of April, 1884.

GEO. F. DURANT.

Witnesses:
T. H. MAYHEW,
T. A. MOKE.