No. 728,785. PATENTED MAY 19, 1903.

E. UMDENSTOCK.

TELEPHONE SYSTEM.

APPLICATION FILED APR. 21, 1902.

NO MODEL.

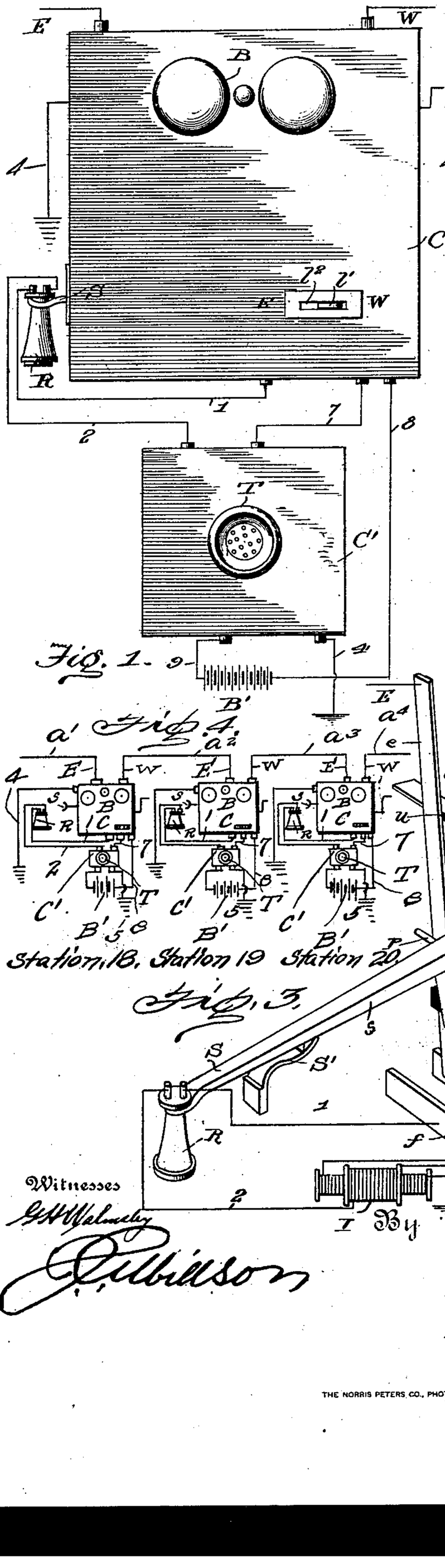

Fig. 1.

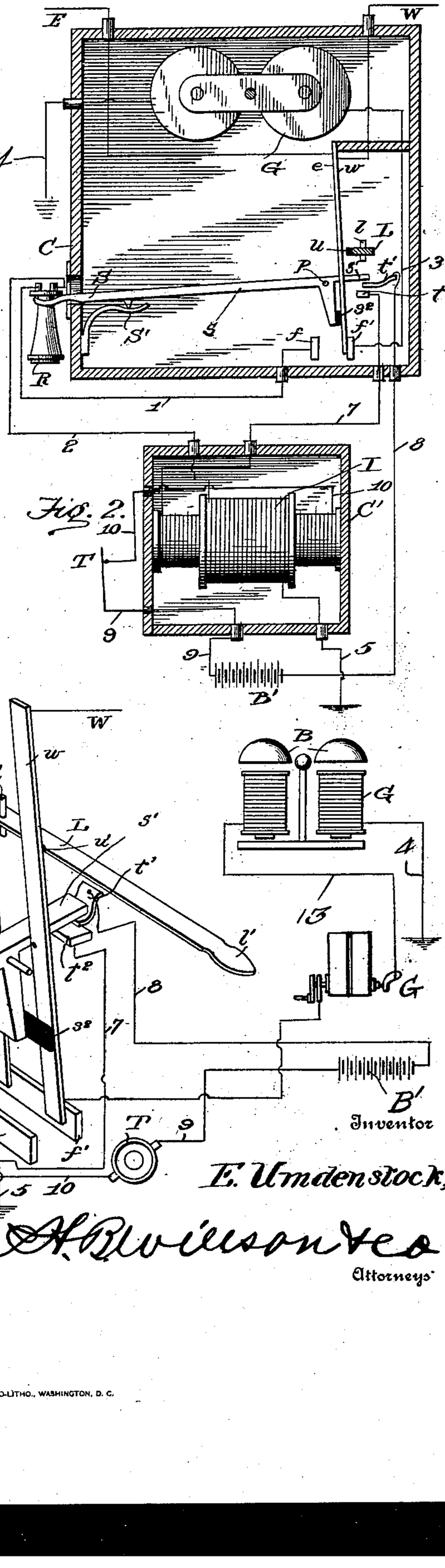

Fig. 2.

Fig. 3.

Fig. 4.

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No. 728,785. Patented May 19, 1903.

UNITED STATES PATENT OFFICE.

ERNEST UMDENSTOCK, OF READING, KANSAS.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 728,785, dated May 19, 1903.

Application filed April 21, 1902. Serial No. 103,930. (No model.)

To all whom it may concern:

Be it known that I, ERNEST UMDENSTOCK, a citizen of the United States, residing at Reading, in the county of Lyon and State of Kansas, have invented certain new and useful Improvements in Telephone Systems; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in telephone systems, and particularly to systems of the party-line type, wherein a number of telephones are in series arranged along a common line.

The object of the invention is to provide simple and effective means whereby any two telephones in the system may be placed in connection to the exclusion of the others, thereby enabling conversations between any two of the subscribers to be held secret.

With the above and other objects in view, which will readily appear as the nature of the invention is better understood, said invention consists in certain novel features of construction and combination and arrangement of parts, which will be hereinafter fully described, defined in the appended claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a front view of a telephone-box embodying the invention. Fig. 2 is a vertical transverse section of the same. Fig. 3 is a diagrammatic view showing the circuit connections, the reversing-lever being in neutral position. Fig. 4 is a diagram showing the manner of connecting up the telephones along the line.

Referring now more particularly to the drawings, a', a^2, a^3, and a^4 represent line-wire sections from which extend legs, branches, or bridge-wires E and W, connecting the several telephone-stations 18 19 20 in series, as shown in Fig. 4. The said legs E and W may be termed "east" and "west" line connections with regard to any certain station, as they connect the station with line-wire sections leading therefrom in opposite directions. At each telephone-station R is the receiver, T the transmitter, I the induction-coil, B the bell, G the generator, and B′ the local battery, all of which may be of the ordinary type now in use.

S is the telephone switch or hook, mounted upon the pivot p and having a long arm s, hooked to hold the receiver and a short arm s'. The receiver when applied to the hook tilts the long arm of the switch downward in the usual way against the pressure of a spring S′, which forces said switch upward when the receiver is removed. As shown, the switch and the signaling and reversing mechanism are contained in a box or casing C and the induction-coil and transmitter in a box or casing C′; but they may be inclosed in a single casing or in any other preferred way.

The legs E and W are connected to two flexible spring-strips e and w, the lower free ends of which are normally adapted to come between two contact-bars f and f'. The bar f is connected with one of the binding-posts on the receiver by a conductor 1, the other binding-post on the receiver being connected to the secondary coil of the induction-coil I by a conductor 2. From the bar f' leads a conductor 3, which connects the same with the bell and generator B and G, which are in turn connected with the ground through the medium of a conductor 4. The telephone-switch S carries an insulated bridge-piece s^2, which holds the two strips e and w pressed into contact with the bar f', when said lever is held down by the receiver R, making a bridging-circuit through the bell and generator to the earth; but when said receiver is removed and the long arm of the switch is tilted up by the spring S′ the bridge-piece is swung out of contact with said strips, leaving the latter free to move between the bars f f'. When thus tilted upward, the short arm s' of the switch-lever comes into contact with and depresses a spring-plate switch t', which engages a contact t^2, which is connected to the primary coil of the induction-coil I by means of a conductor 7. The switch t' is connected with one pole of the local battery B′ by way of a conductor 8, and the other pole of said battery is in electrical connection with one of the binding-posts of the transmitter T through the conductor 9, while a conductor 10 leads from the opposite

post of the transmitter to the primary coil of the induction-coil I, whereby the parts of the talking-circuit are adapted to be connected up for use when the receiver is detached from the telephone-hook. A ground-tap 5 connects the secondary coil of the induction-coil with the earth.

To control the action of the contact-strips *e* and *w*, a reversing-lever L is employed, which is pivoted at *l* at a point between and in rear of the strips and terminates at one end in a handle *l'*, which projects through a slot l^2 in the front of the box C to the exterior. This lever carries blocks *u u'* of non-conducting material to engage said strips *e* and *w*.

When the lever L is in its normal or neutral position, as shown in Fig. 3, both strips *e w* are out of engagement with the contact-bars *f f'*.

The lever L cannot be used to press either strip *e* or *w* into contact with the bar *f* until the receiver has been removed from the switch-hook, because the bridge-piece s^2 until withdrawn from engagement with said strips by the upward swing of the arm *s* prevents movement of the strips toward said bar. Assuming, however, that the receiver has been removed and the switch-lever tilted by the spring S', it will be seen that when the lever L is in its normal or neutral position both contacts *e* and *w* will be out of engagement with the bars *f f'*, so that in neither position of the switch-hook S can the instrument be used for directly receiving and transmitting messages, although when the switch is held down by the receiver the instrument is in circuit with the line through said strips *e* and *w*, the bar *f'*, and the associated parts of the signal-circuit, so that a current may be transmitted to sound the bells B or a conversation carried on between any other two phones along the line, using the particular instrument under discussion as an intermediate station. When the lever L is moved in one direction, however, one of the strips—say the strip *e*—will be moved to engage the contact *f*, while the strip *w* will remain out of engagement with either contact *f* or *f'*, so that the talking-circuit will be closed through the receiver, secondary coil of the induction-coil, transmitter, local battery, and ground-tap 5, thus connecting the telephone with the east wire E and cutting out the west wire W. On the other hand, when the lever L is moved in the reverse direction from its neutral position the strip *w* will be forced into contact with the bar *f* and the strip *e* allowed to move out of contact with said bar, thereby connecting the west wire W with the parts of the talking-circuit and closing said circuit, while at the same time cutting out the east wire E. The restoration of the lever L to its normal position causes both strips to assume their normal positions between the contacts *f f'* and throws the talking-circuit out of connection with both line-wires. Thus it will be seen that by the adjustment of the lever L the telephone may be connected up to carry on a conversation over one line-wire in one direction while cutting out the other line-wire leading in the reverse direction, thus enabling any two subscribers in the system to hold communication without the conversation being overheard by any of the others. Should any attempt be made by a party at a station intermediate to the two talking-stations to overhear the conversation, such attempt would be defeated, for the reason that the removal of the receiver at the intermediate station would cause the cutting out of circuit of one of the line-wires, thus interrupting the conversation and notifying the communicating parties of the interposition in circuit of the line of the said intermediate station.

When the parts are in the normal position, (shown in Fig. 3,) the signal-circuit is closed and in electrical connection with both line-wires, as will be readily seen. The movement of the lever L in one direction when the receiver is removed causes one of the line-wires to be cut out and the other line-wire to be connected with the closed talking-circuit, while the reverse action is effected upon the movement of the lever in the opposite direction. Hence it will be seen that any one subscriber along the line may converse with another subscriber on either side of him without liability of the conversation being overheard by a third party.

The foregoing description of the operation will be better understood by reference to Fig. 4, which shows three stations 18, 19, and 20, connected by the legs E and W with the line-wire sections *a'*, a^2, a^3, and a^4. Now assuming that stations 18 and 20 are conversing, it will be readily understood that the contact *w* at station 18 will connect line-wire section a^2 with the bar *f*, that the contact *e* at station 20 will connect said station with its bar *f* and the line-wire section a^3, while the two line-wire sections a^2 and a^3 will be connected by the engagement at the intermediate station of the strips *e* and *w* with the bar *f'*. The movement of the switch-levers S upon the removal of the receivers at the two stations 18 and 20 closes the local talking-circuits and permits strip *w* at station 18 and strip *e* at station 20 to be moved in engagement with the bars *f* at said stations and causes strip *e* at station 18 and strip *w* at station 20 to move out of engagement with the bars *f'* at the two stations, thus cutting out of connection with said stations all the stations east of station 18 and west of station 20, so that none of these stations can under any circumstances overhear the conversation going on between stations 18 and 20.

The course of the vocal currents may be traced as follows: Referring more particularly to station 18, when the switch $t' t^2$ is closed and the strip *w* engaged with bar *f* current from the local battery B' flows through con-

ductor 8 to and through switch t' t^2, thence through conductor 7 to and through primary of induction-coil I, thence to transmitter T through conductor 10, and back to the battery through conductor 9. The passage of the current through the primary of coil I causes the production of a current by induction in the secondary of coil I, and this current passes through the conductor 2 to transmitter T, conductor 1, bar f, strip w, west wire W, to line-wire a^2, thence through station 19, by way of conductors E, e, f', w, and W, to line-wire a^3, thence to strip e at station 20, to bar f, conductor 1, receiver R, conductor 2, secondary of coil I at said station 20, and thence to ground at 5. The circuit from station 20 to station 18 is as follows: from battery B' at station 20 through conductor 8, switch t' t^2, and conductor 7 to primary of coil I, thence to transmitter T through conductor 10 and back to battery through conductor 9, the current induced in the secondary of the coil I passing through conductor 2 to receiver R, thence to bar f through conductor 1, through strip e and leg E to line-wire a^3, and back along same and through station 19 in a reverse manner to that previously described along line-wire a^2 to leg W, strip w, and bar f of station 18, and finally through conductor 1 to receiver R, to secondary of coil I, through conductor 2, and thence to ground at 5. In thus passing through the receivers and transmitters at the two stations the current pulsations affect the diaphragms of these instruments and transmit sound in the well-known way. It will be understood that as the ringer-coils at each station are wound to a higher resistance than the receiver-coils the electric inertia of the ringer-coils at station 19 will prevent the talking-currents from going to ground at 4 and will cause them to pass from one section to the other of the line through the bar f' and strips e and w. Now as station 19 only is in circuit of the line with stations 18 and 20 it will be apparent that should the subscriber at 19 remove his receiver both strips e and w will spring out of engagement with the bar f, thus interrupting the conversation between stations 18 and 20 and notifying the conversing parties of the action of the party at the intermediate station 19. If, then, the subscriber at station 19 should connect his phone with either station 18 or 20 and commence conversation with one of the interrupted parties, he would be notified of the state of affairs and restore the parts at his station to their normal positions, thus connecting up stations 18 and 20 again. The same operation would ensue if stations 18 and 20 were divided by a plurality of stations, as the attempt of a subscriber at either of the intermediate stations to place the talking-circuit of his phone into circuit of the line would cut off communication between the talking-stations.

In signaling any certain station from any other certain station the generator at the calling station is operated to send a determined number of current pulsations along the line, as each telephone bears a distinctive number, thus giving notice to the party at the called station that some other station along the line desires to hold communication with him. The subscriber at the called station then removes his receiver and operates the lever L to connect his phone to one part of the line—say east—and on failing to communicate with the calling party is made aware of the fact that the calling station lies in the opposite direction, or west, and reverses the switch L accordingly to connect with the west instead of the east bridge-wire. The current impulse furnished by the generator is broken up and transmitted to all the phones along the line, and that portion of the current furnished each phone passes from the strip e or strip w, as the case may be, to the bar f', thence through the conductor 3 and sounds the bells B, and finally passes to the earth through the ground-tap 4.

It will be seen that the bars or contacts f form part of the main circuit, which includes the receivers at the two connected stations, the secondary of the induction-coils, and one or the other of the strips e and w; that the bar f' forms a part of the signal-circuit, which includes the bells B, generator G, and ground-tap 4; that the strips e and w are adapted to open and close either of said circuits, and that the switch S alternately opens and closes the local talking-circuit, consisting of the battery B', transmitter T, primary of coil I, switch t' t^2, and the interconnecting conductors, while the switch S may be operated to adjust the strips e and w, connect the telephone with either section of a divided line extending in opposite directions from the telephone.

From the foregoing description, taken in connection with the accompanying drawings, it is thought that the construction, mode of operation, and advantages of my improved telephone system will be readily apparent without requiring a more extended explanation.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a telephone system, the combination with line-wires; of a telephone having a signal-circuit provided with a contact, a local talking-circuit containing a transmitter and provided with a closing-switch, main talking-circuit connections including a receiver and a contact, the latter being located in juxtaposition to said signal-circuit contact, a switch-hook for operating said switch to close the local talking-circuit when the receiver is removed, contacts connected to the line-wires

and arranged between said main talking and signal circuit contacts, said line-wire contacts being held in engagement with said signal-circuit contact by the switch-hook when the receiver is on, and a reversing device for moving either line-wire contact into engagement with the main talking-circuit contact when the receiver is removed, substantially as described.

2. In a telephone system, the combination with line-wires; of a telephone having a signal-circuit provided with a contact, a local talking-circuit containing a transmitter and provided with a closing-switch, main talking-circuit connections including a receiver and a contact, the latter being located in juxtaposition to said signal-circuit contact, a switch-hook for operating said switch to close the local talking-circuit when the receiver is removed, contacts connected to the line-wires and arranged between said main talking and signal circuit contacts, said line-wire contacts being held in engagement with said signal-circuit contact by the switch-hook when the receiver is on, and a pivoted reversing-lever movable in reverse directions to effect the engagement of either line-wire contact with the talking-circuit contact, substantially as set forth.

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

ERNEST UMDENSTOCK.

Witnesses:
EVA UMDENSTOCK,
HENOITT UMDENSTOCK.