(No Model.) 2 Sheets—Sheet 1.

G. F. SHAVER.

TELEPHONE.

No. 545,416. Patented Aug. 27, 1895.

Fig. 1

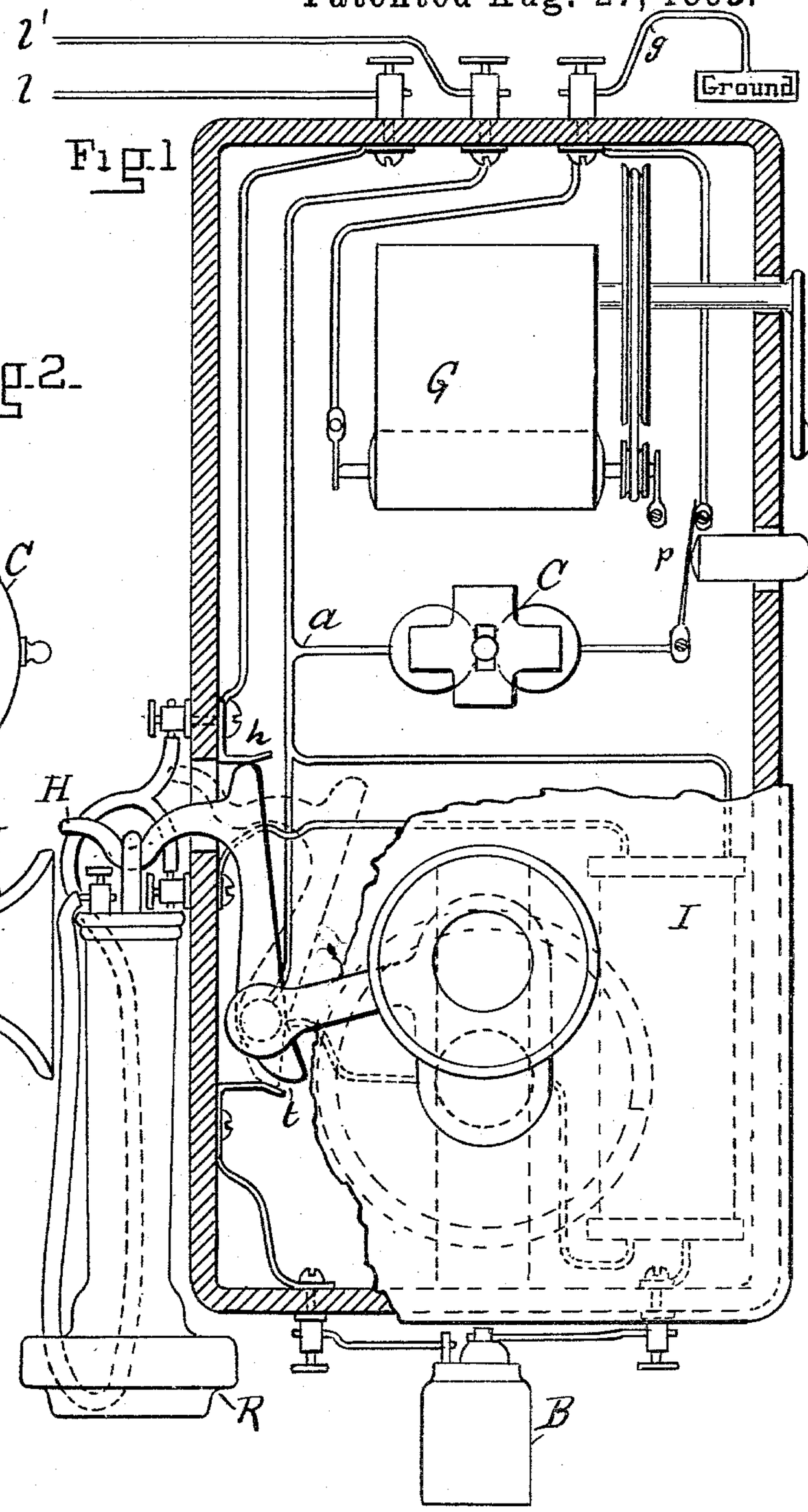
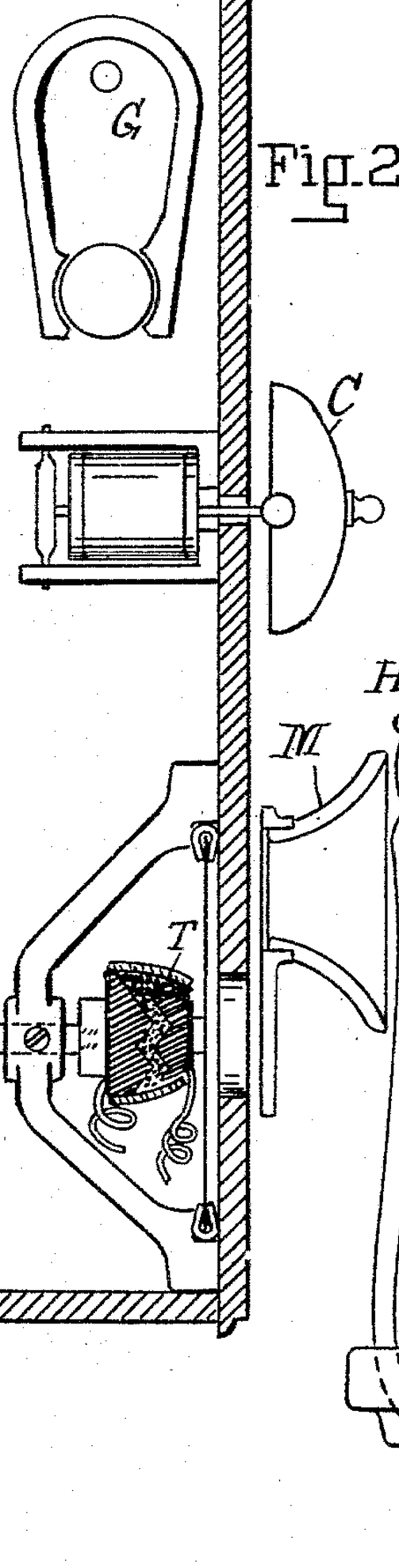


Fig. 2.



Witnesses:
Samuel H. Balch
Hy. M. Whitman

Inventor,
George F. Shaver.
By Thomas Ewing, Jr.,
Attorney.

(No Model.) 2 Sheets—Sheet 2.

G. F. SHAVER.

TELEPHONE.

No. 545,416. Patented Aug. 27, 1895.

Fig. 3.

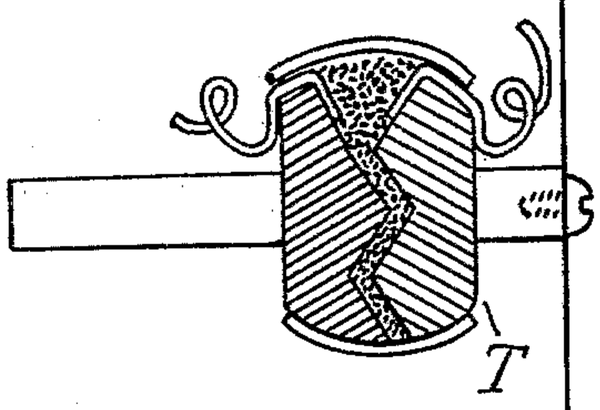


Fig. 4.

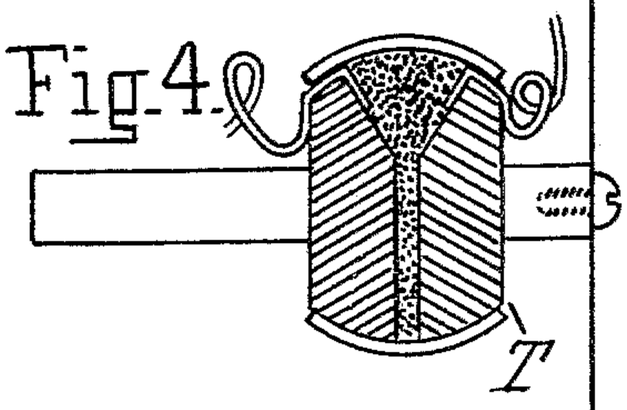
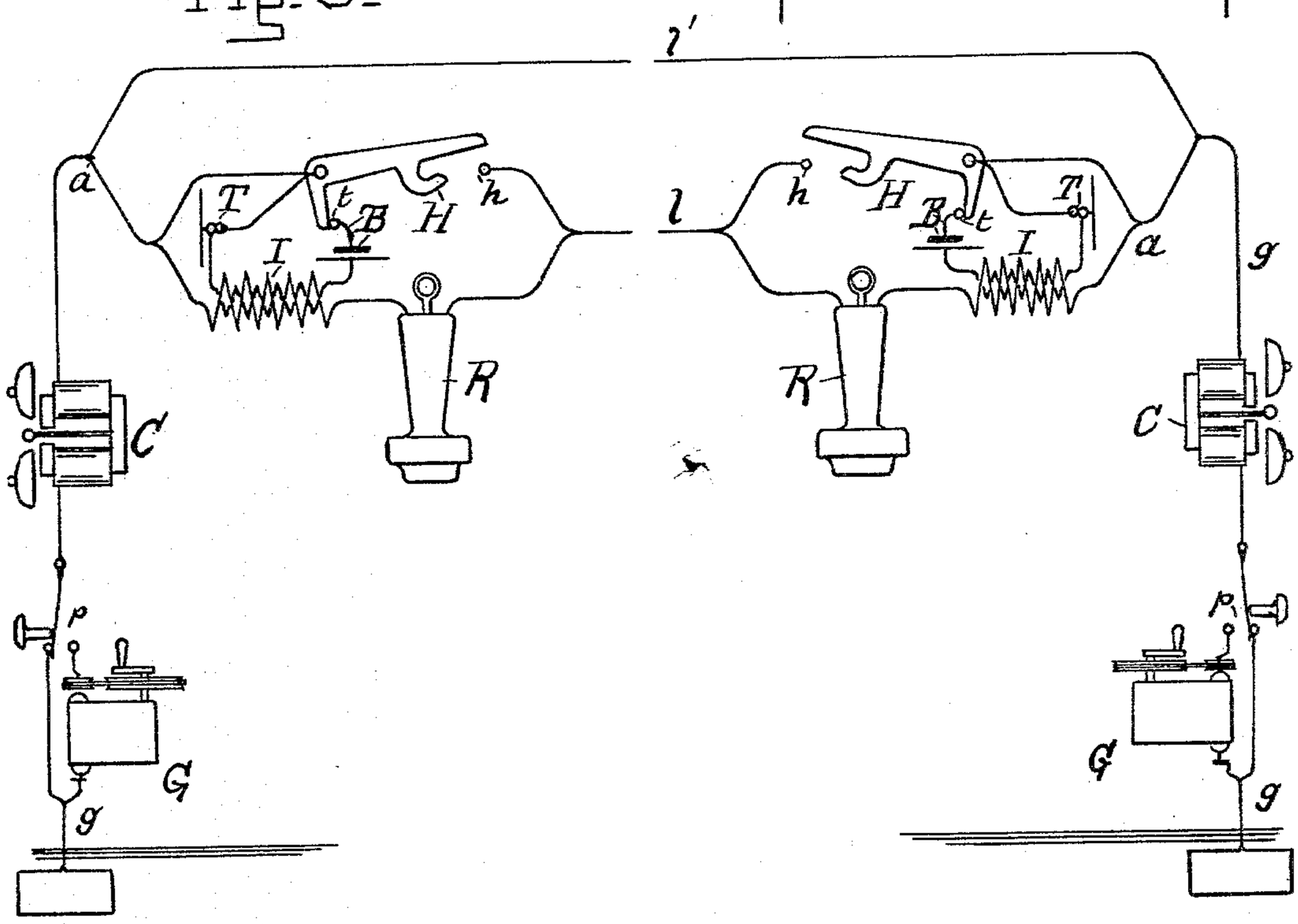


Fig. 5.



Witnesses:

Samuel W. Balch

H'y A. Whitman

Inventor,

George F. Shaver,

by Thomas Ewing, Jr.,

Attorney.

UNITED STATES PATENT OFFICE.

GEORGE F. SHAVER, OF YONKERS, NEW YORK, ASSIGNOR TO AMY R. SHAVER, OF SAME PLACE.

TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 545,416, dated August 27, 1895.

Application filed June 8, 1895. Serial No. 552,058. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. SHAVER, a citizen of the United States of America, residing at Yonkers, county of Westchester, State of New York, have invented certain new and useful Improvements in Telephones, of which the following is a specification.

The object of my invention is to improve the quality of the carbon-transmitter and to produce a system in which the connections of the signaling devices are not changed on taking down or putting up the receiver. The carbon-transmitter consists, essentially, of two electrodes, which may be shaped as blocks and are preferably of carbon and have two parallel faces turned toward each other and two divergent faces forming a trough or hopper-like space between the two blocks, the whole space between the blocks being filled with carbon, which is loose and preferably powdered. Part of the sides of the trough are covered with metallic clips. The blocks are both inclosed in a piece of soft-rubber tubing stretched over the blocks so as to draw them together. The diaphragm vibrates one of these blocks in front of the other. The system consists, essentially, of a two-wire circuit between the communicating stations, with a permanent grounding branch at each station to contain the signaling apparatus and a shunt across the line-terminals to cut out the conversing apparatus—to wit, the transmitters and receivers—when these are not in use but open, so as to throw these instruments into the circuits when they are in use.

In the accompanying drawings, which form a part of this specification, Figure 1 is a front view of a subscriber's box with most of the cover broken away, so as to expose the interior, the sides of the box being shown in cross-section, but the other parts mainly in elevation. Fig. 2 is a cross-section on a plane which passes through the box from front to back and along the line through the middle of the transmitter to the bell of the magneto-generator. Some of the parts are shown in elevation. Fig. 3 is a detail, drawn to a larger scale, of parts of the transmitter parts, the electrodes being shown in vertical longitudinal section; Fig. 4 a similar detail of a modification. Fig. 5 is a diagrammatic representation of the circuits, showing two subscribers' stations in communication.

Referring to Figs. 1 and 5, it will be seen that leading in through binding-posts at the top are three connections to the instrument. Two of these are the line-wires *l l'* and the third is a ground-wire *g*. The line-wire *l* leads through the telephone-receiver R and induction-coil I, and the ground-wire *g* leads through the signaling apparatus. All these wires unite at *a*.

The signaling apparatus consists of a magneto-generator G, a switch P, operated by a push-button for throwing the magneto-generator in and out of the circuit, and a call-bell C, which is in circuit no matter at which contact the switch is closed. The telephone-receiver R is hung upon a hook H, which is connected with one of the line-wires. This hook has two positions, one of which is shown in full lines and one in dotted lines in Fig. 1. When in the full-line position, it closes a contact *h*, which connects the line-wire *l* to the junction *a* and shunts the receiver and induction-coil. When in the dotted-line position of Fig, 1, which is the position of Fig. 5, this contact is open, and a local circuit through the battery B, the primary of the induction-coil, and the transmitter, is closed at *t*.

In front of the transmitter is a mouthpiece M, mounted on the same axis with the receiver-hook. There is a hole through the middle of it, and when drawn down so that the mouthpiece shall be brought to register with the face of the transmitter—that is, brought so that the center of the diaphragm of the transmitter lies immediately behind the hole in the mouthpiece M—it throws the receiver-hook from the full-line position to the dotted-line position of Fig. 1. It is necessary to remove the receiver before this mouthpiece can be pulled down, and to return the mouthpiece to place and with it the receiver-hook before the receiver can be hung up.

The circuits will be most readily understood by reference to Fig. 5. No central-office apparatus is shown, since there is no novelty in the form of the central-office apparatus, and the invention is completely disclosed by merely showing two subscribers' stations. When conversing, the circuit is through the

two connecting-lines *l l'*, which are joined in the instruments at *a a*, thus forming a loop or circuit. At each station the loop is grounded, and in the grounding branch is a call-bell, push-button, and magneto-generator. The parts are shown in Fig. 5 in the position in which they are placed when two subscribers are talking. The grounding branches are always closed, but little or none of the conversing-current will pass through them owing to the resistances of the bell. When the hook H is turned so that the receivers can be hung up, the receivers and induction-coils are shunted out and the calling-current generated in one instrument will divide and pass over both lines to the other instrument, where it is brought together and passes through the call-bell to ground. Should either of the line-wires be broken the calling-current will pass over the other.

Referring now particularly to Fig. 3 for a description of the transmitter, it may be stated that it is made up of two electrodes in the form of blocks, preferably of carbon, inclosed in a hollow elastic tube, which is stretched over the ends of the two blocks and tends to draw them together. One of these blocks is indicated in the drawings as held stationary. The other is mounted in front of the stationary block, and attached thereto is the diaphragm by which it can be moved toward and from the stationary block. If the apparatus shown in Fig. 3 were looked at from one end, it would appear substantially round or oval in outline. These two blocks have faces which are parallel to each other. As shown in Fig. 3, these parallel faces are serrated, the faces of the teeth being parallel. As shown in Fig. 4, the two faces are straight. These parallel faces extend only through a portion of the width of the blocks, and through the other portion of the width the faces diverge, so as to form a V-shaped trough or hopper. Near the edge of each is laid a metallic strip. As shown in the drawings, the electrical connection of the blocks in the primary transmitter circuit is effected through these strips. The space between the blocks contains finely-divided carbon, which in that portion that lies between the parallel faces is subjected to more or less pressure by the elastic and stretched inclosing-tube. In operation, this transmitter combines the principle of the ordinary granulated carbon-transmitter in which the mass of the carbon is subjected to variations of pressure, with the principle of that type of granulated carbon-transmitters in which there is a mere rearrangement of the particles under the influence of the vibrations of the diaphragm, for the part of the carbon which lies between the parallel faces and the blocks is compressed and released as the diaphragm moves one of the blocks toward or away from the other, and by the same force the mass of carbon in the V-shaped trough or hopper is shaken up and rearranged, thus altering the resistance between the metallic strips. The circuit of the transmitter is never entirely broken, no matter how much the carbon between the parallel faces may pack nor how violently the diaphragm may be vibrated by the sound of the waves impinging thereon, for the connection between the metallic strips through the carbon in the trough is never entirely severed. This results in a very loud-speaking transmitter, which is free from the crackling sounds due to the interruption of the circuit.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a telephone system a primary circuit which includes a battery the primary coil of an induction coil and a transmitter, in combination with a switch-lever and a mouthpiece attached to the lever and constructed and connected so that the primary circuit shall be opened by moving the mouthpiece and lever away from the transmitter and closed by moving the mouthpiece and lever into such position that the mouthpiece shall register with the face of the transmitter, substantially as described.

2. In a telephone system, the combination of a conversing circuit, conversing apparatus therein, a shunt for shunting out the transmitting apparatus, and a transmitter mouthpiece for operating the shunt which opens the shunt when brought to register with the face of the transmitter, substantially as described.

3. In a telephone system, the combination of a conversing circuit, transmitter and receiver apparatus included therein, a shunt for shunting out this apparatus, a primary transmitting circuit, a circuit closer in the transmitting circuit operated with the shunt, so as to be opened whenever the shunt is closed and vice versa, and a mouthpiece for the transmitter to operate the shunt and circuit closer, substantially as described.

4. In a telephone system, the combination of a two-wire conversing circuit, conversing apparatus consisting of a receiver and a secondary induction coil included therein, a shunt for shunting out the conversing apparatus, a primary transmitter circuit including the transmitter battery and primary induction coil, a circuit closer included therein and operating with the shunt, and a permanent grounding branch in which is included the signaling apparatus, substantially as described.

5. In a telephone system, the combination of a two-wire conversing circuit, conversing apparatus therein, a shunt to shunt out the conversing apparatus, a mouthpiece for the transmitter to operate the shunt, and a permanent grounding branch in which is included a signaling apparatus, substantially as described.

6. In a telephone system, a two-wire conversing circuit, conversing apparatus and a secondary induction coil included therein, a

shunt for shunting out the conversing apparatus, and a primary transmitting circuit including a transmitter battery and primary induction coil, a circuit closer included therein, a mouthpiece to operate the shunt, and circuit closer, and a permanent grounding branch in which is included a signaling apparatus, substantially as described.

7. A telephone transmitter consisting of electrodes having faces presented toward each other and making an angle so as to form a trough, the loose carbon filling the trough, substantially as described.

8. A telephone transmitter having two electrodes with adjacent faces parallel throughout a portion thereof and diverging throughout a portion thereof with loose carbon filling the space between their faces, substantially as described.

9. A telephone transmitter having two electrodes with adjacent faces which are serrated and parallel throughout a portion thereof and diverging throughout a portion thereof, the space between the electrodes being filled with loose carbon, substantially as described.

10. A telephone transmitter consisting of electrodes having faces which are divergent throughout a portion thereof, metallic strips attached to their faces at their most widely separated points, the strips being connected to the line wires, with loose carbon filling the space between the faces of the electrodes, substantially as described.

Signed by me in New York city on this 7th day of June, 1895.

G. F. SHAVER.

Witnesses:
THOMAS EWING, Jr.
GEORGE S. ADAIR.