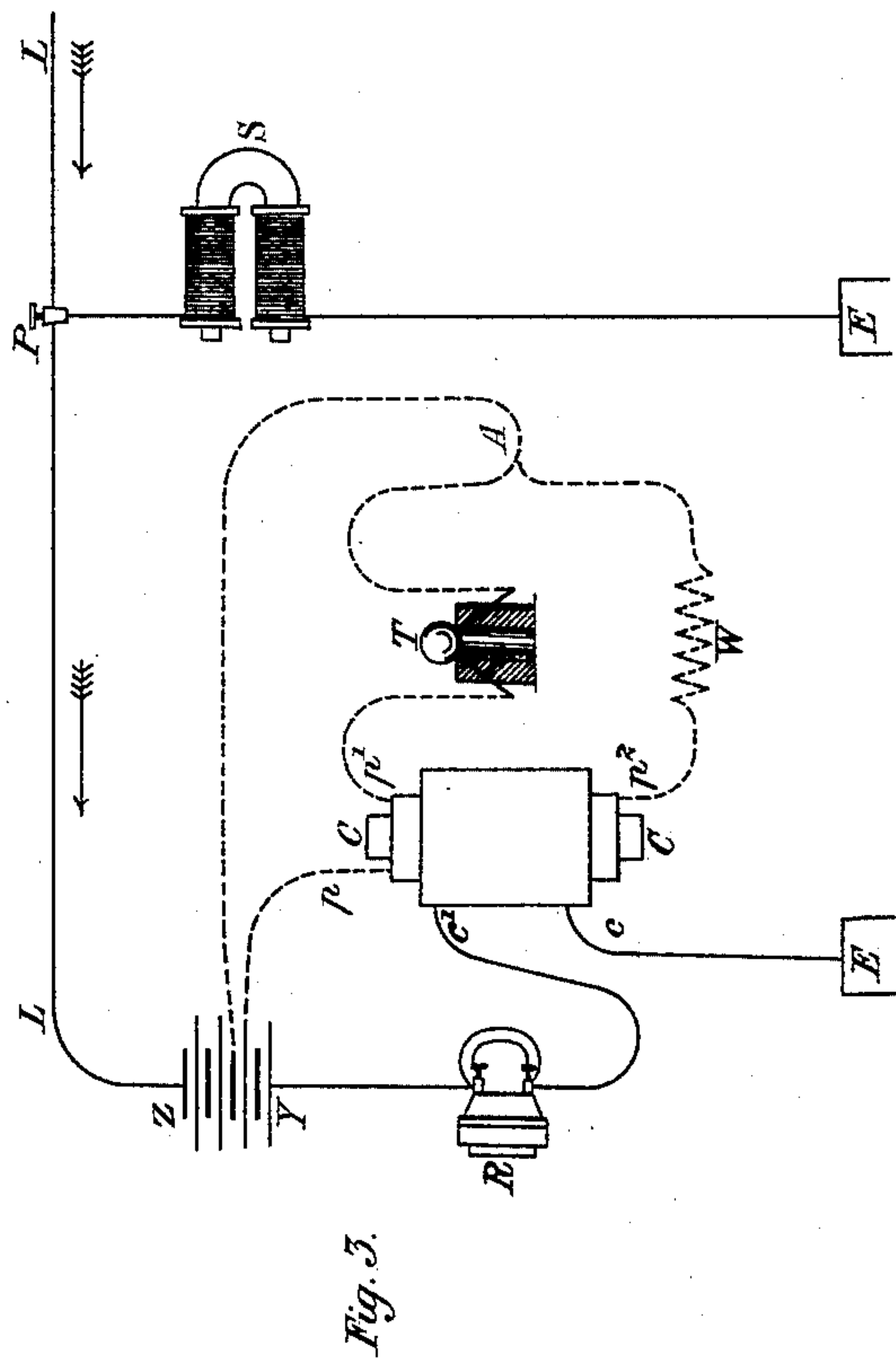
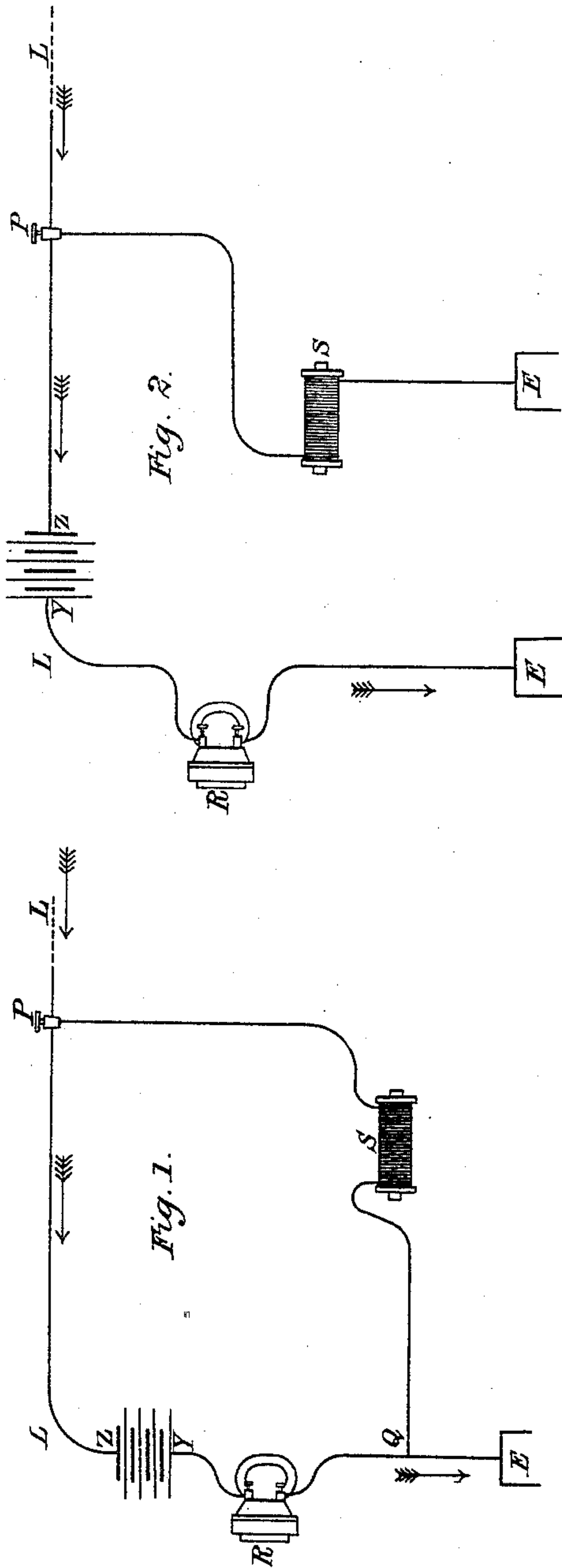


(No Model.)

S. P. THOMPSON.  
TELEPHONIC APPARATUS.

No. 327,837.

Patented Oct. 6, 1885.



*Philip M. Adams*  
C. J. Hedrick

*Silvanus P. Thompson*  
by  
*A. Pollok*  
his attorney.

# UNITED STATES PATENT OFFICE.

SILVANUS PHILLIPS THOMPSON, OF BRISTOL, ENGLAND.

## TELEPHONIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 327,837, dated October 6, 1885.

Application filed April 25, 1885. Serial No. 163,425. (No model.) Patented in England March 19, 1885, No. 3,564.

*To all whom it may concern:*

Be it known that I, SILVANUS PHILLIPS THOMPSON, doctor of science and professor of experimental physics, a subject of the Queen of Great Britain and Ireland, and residing at University College, Bristol, England, have invented certain new and useful Improvements in Arrangements of Telephonic Apparatus, (for which I have made application for patent in Great Britain, No. 3,564, dated 19th March, 1885,) of which the following is a specification.

My invention consists in the arrangement of telephonic circuits, in the manner hereinafter described, and illustrated by the drawings.

15 In electro-magnetic telephone-instruments—that is to say, instruments in which the voice-currents influence the armature by means of an electro-magnet instead of a permanent magnet—the difficulty found hitherto in working  
20 arises from the lack of sensitiveness of the instrument, and this in turn is chiefly due to the high resistance of the wire ordinarily used on the line, the effect whereof is to diminish the initial current in the receiver-coil, which current should be sufficient to magnetize the core of the electro-magnet somewhat strongly. To obviate this difficulty and attain the requisite sensitiveness of the instrument without being obliged to use an inordinate number of cells,  
30 I connect with the line-wire a loop or shunt circuit, as shown in Figure 1, extending from a point, P, in the anterior to the line-battery Z Y, through an electro-magnet, S, to a point, Q, posterior to the receiving-telephone R. If  
35 this shunt-circuit were merely a shunt with a resistance of more or less value or amount, it would not satisfactorily serve the purpose of my invention. For, although it would by reason of its greater or less resistance allow a considerable part of the battery-current to run through it, thereby causing an increased current through the receiver, and insuring an adequate magnetization of the core of its electro-magnet, yet it would not attain my purpose,  
45 because the “working-currents” or “voice-currents,” coming through the main line, would be partially diverted into the shunt, and would without passing through the receiver leak through the said shunt to earth. This  
50 method of working—that is to say, by shunting or diverting a portion of the current from the receiver—is altogether distinct and differ-

ent from and would prevent the attainment of the object of my invention, which is based upon the principle of blocking the loop or shunt circuit against the rapidly-fluctuating voice-currents or telephonic currents coming along the main line while allowing the steady flow of the battery-current through the said loop. For this purpose it is necessary to interpose in the loop or shunt circuit a device or organ which, while having very little resistance, possesses great electric inertia, or, in other words, has a high co-efficient of self-induction. I therefore insert in this loop-circuit an electro-magnet, S, constructed with a large number of turns of wire surrounding an iron core to insure the required co-efficient of self-induction in order that by its great electric inertia it will block or “plug” the loop or shunt circuit with respect to the rapidly-fluctuating telephonic currents, and insure their traversing the main line, the battery in the line, and the receiver, which is also in the main line. The electro-magnet, which for the purpose of my invention must in all cases have a high co-efficient of self-induction relatively to its electrical resistance, I call an “induction-plug,” because of the well-known property of such an electro-magnet of obstructing by its great electro-magnetic inertia the passage of rapidly-fluctuating currents. An electro-magnet so constructed and arranged will prevent the rapidly-fluctuating current from being diverted through the shunt-circuit to earth, and will force them almost entirely to traverse the main line through the receiving-telephone.

I have hereinabove stated that this plugged loop-line is not a mere shunt through which the voice-currents would leak away. Furthermore, I wish it understood that my invention is distinct from any system of simultaneous telegraphy and telephony in which an electro-magnet or coil is used for the purpose of separating the telephonic from the telegraphic currents. For my purpose the resistance should be as small as possible, and it would best answer my purpose to have, if practicable, an electro-magnet without any resistance. The wires that connect the electro-magnet with the main circuit should also have an inappreciably small resistance.

In some instances I adopt the arrangement



shown in Fig. 2—that is to say, I extend a loop-line or shunt-circuit from a point, P, on the main line anterior to the line-battery, and connect it through an electro-magnet or induction-plug, S, of great electric inertia to the earth at E.

In Fig. 3 I have illustrated an arrangement of the circuit which may advantageously be adopted when this invention is used in connection with the valve-telephones described in the specification of British Letters Patent granted to myself and P. Jolin, No. 8,254, A. D. 1884.

In the drawings which I have hereinabove partly described, Fig. 1 shows a portion of the main-line wire at L L, with the battery Z Y included therein. The loop or shunt circuit is shown extending from the point P, anterior to the battery, to the point Q, posterior to the instrument R, which is between the point Q and the battery. S is the electro-magnet or induction-plug in the said loop or shunt circuit. The end of the main line below or posterior to the point Q is connected to earth, as shown at E, or to a return-wire.

The arrangement shown in Fig. 2 differs from that in Fig. 1 only in respect of the direction of the loop or shunt circuit, which extends from the point P to earth, as above specified.

In Fig. 3 the main circuit or line wire L, the position of the battery Z Y, and the connection of the loop or shunt circuit with the point P are the same as in Figs. 1 and 2. C is an induction-coil. T is the transmitter. The line-circuit is through the battery Z Y, the receiver R, and the secondary wire *c c'* of the said induction-coil, to earth. The trans-

mitter-circuit starts from the battery Z Y, part of which is utilized for the primary circuit, and divides, preferably, into two branches. One branch extends through *p p'*, and through the transmitter T. The other branch extends through *p p''*, and through a compensating resistance, W. These two branches, which form a double primary of the induction-coil C, reunite at A, whence the circuit returns to the battery.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is—

1. The combination, with an electro-magnetic telephone instrument and battery, of a shunt-circuit, and an induction-plug therein, whereby the steady battery-current is permitted to flow through the electro-magnet of the telephone-instrument, but the fluctuating voice-currents are prevented from flowing through said shunt-circuit, substantially as described.

2. The combination, with an electro-magnetic telephone-instrument, of a shunt-circuit around said instrument, and an induction-plug in said shunt-circuit, said induction-plug having low resistance, but a high co-efficient of self-induction, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SILVANUS PHILLIPS THOMPSON.

Witnesses:

BERNARD DRAKE,

4 Carteret St., Queen Anne's Gate, S. W.

I. W. BARNARD,

6 Great James St., W. C.