(No Model.) 2 Sheets—Sheet 1.

J. S. STONE.

DEVELOPMENT AND DISTRIBUTION OF ELECTRICITY.

No. 487,102. Patented Nov. 29, 1892.

Fig. 1.

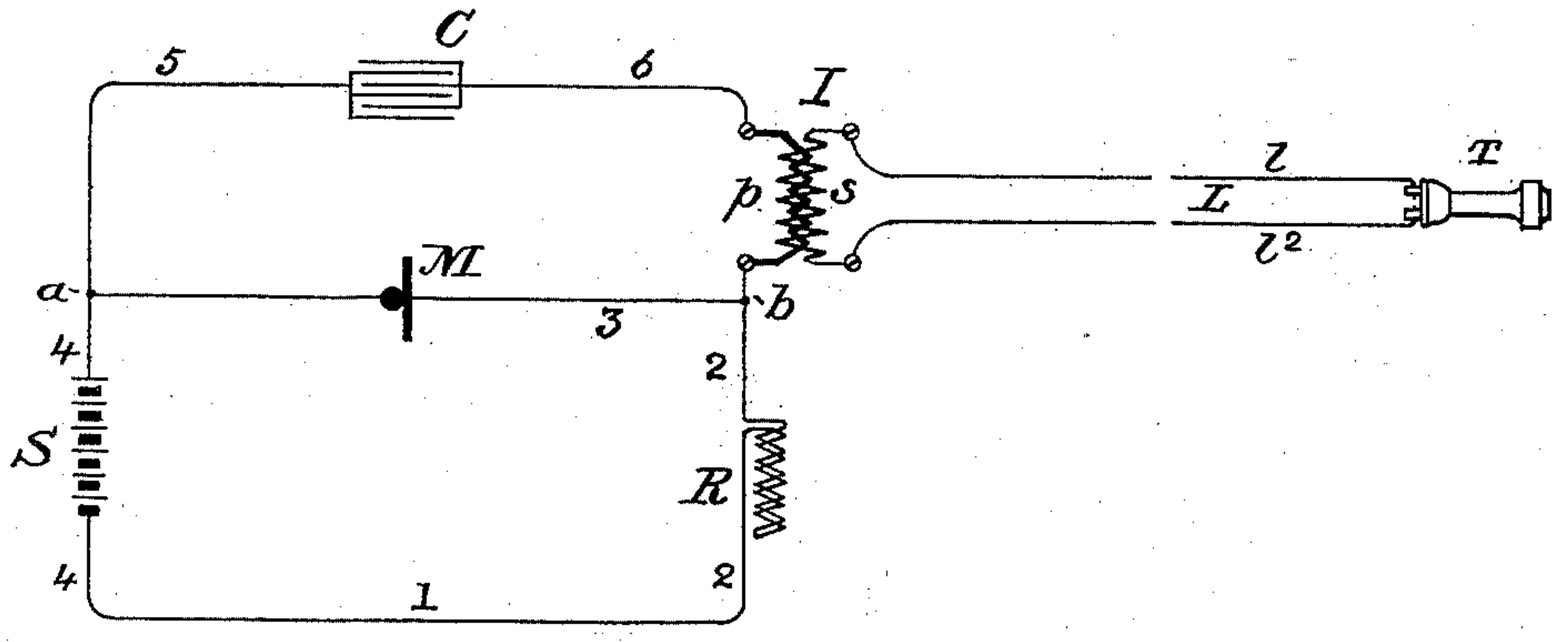


Fig. 2.

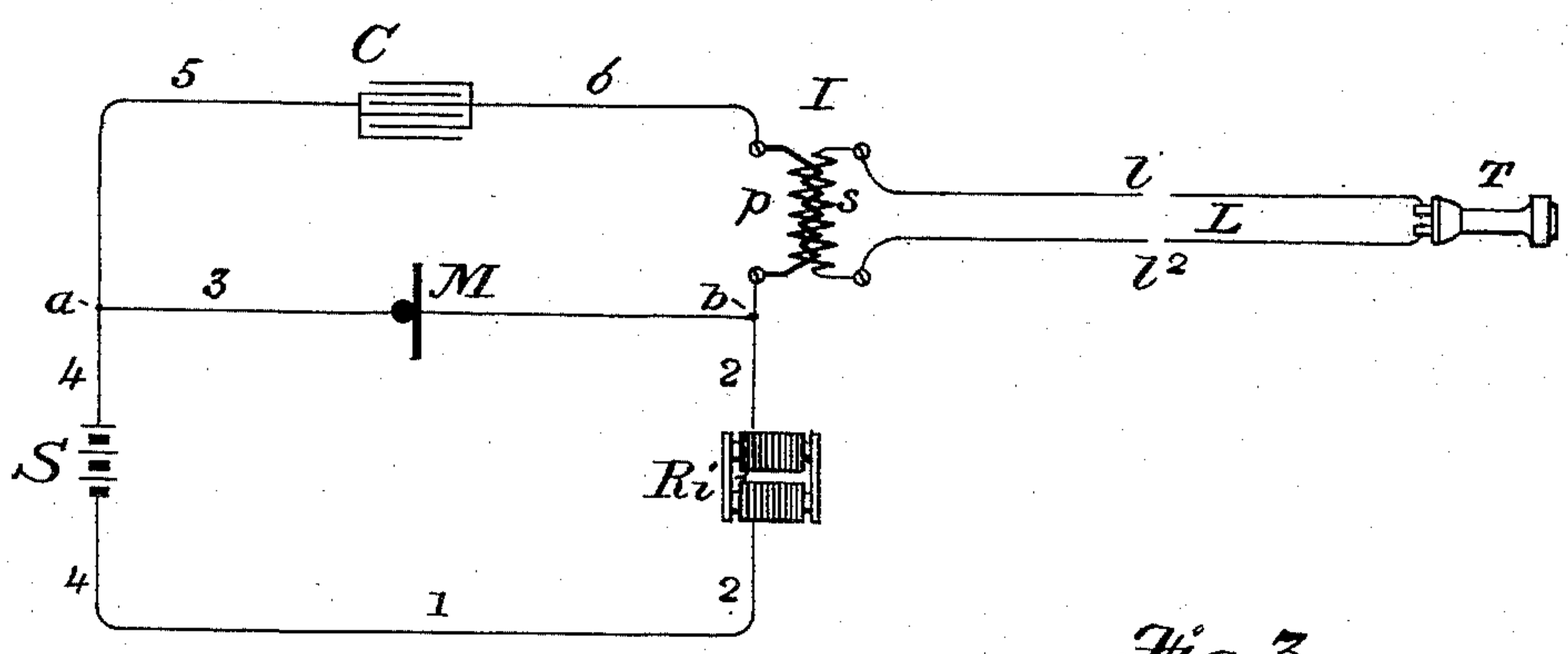
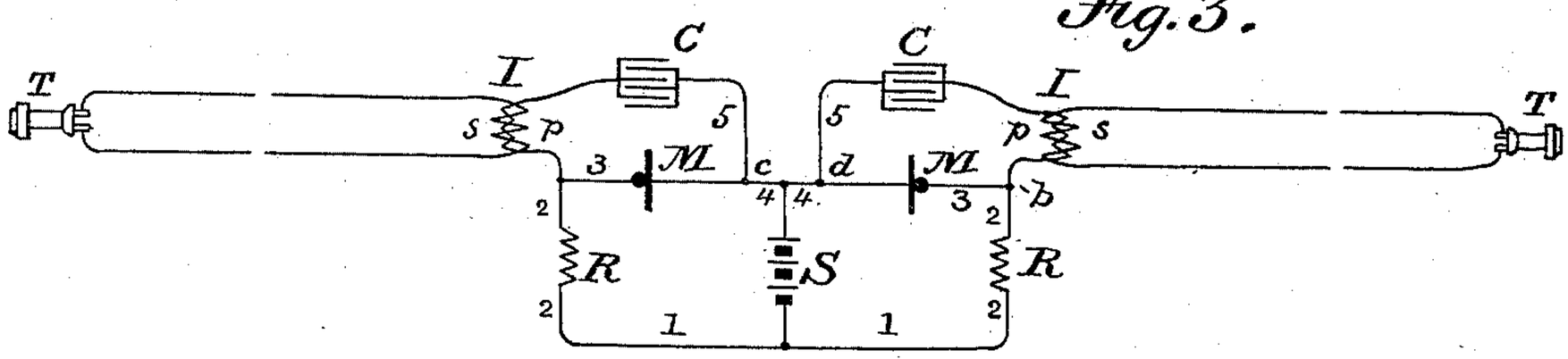


Fig. 3.



Witnesses.
Franklin Pierce
Joseph A. Gately

Inventor.
John S. Stone

(No Model.) 2 Sheets—Sheet 2.

J. S. STONE.

DEVELOPMENT AND DISTRIBUTION OF ELECTRICITY.

No. 487,102. Patented Nov. 29, 1892.

Fig. 5.

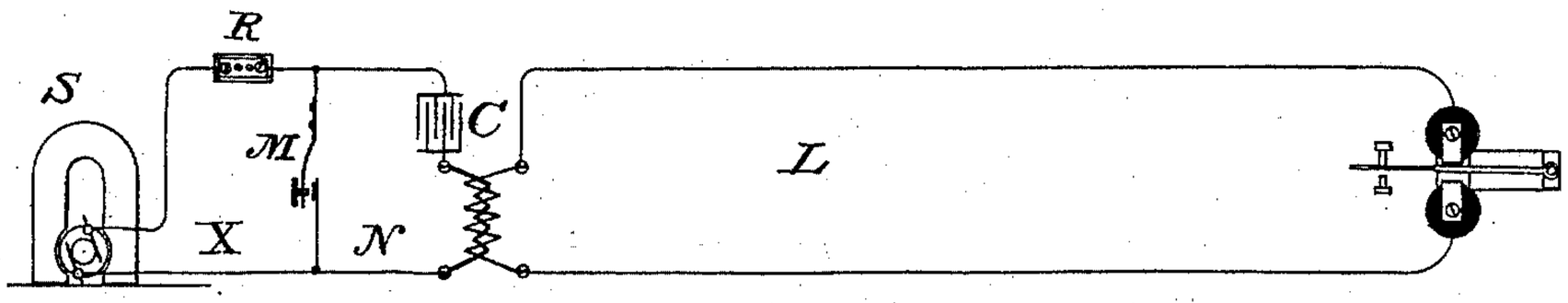


Fig. 4.

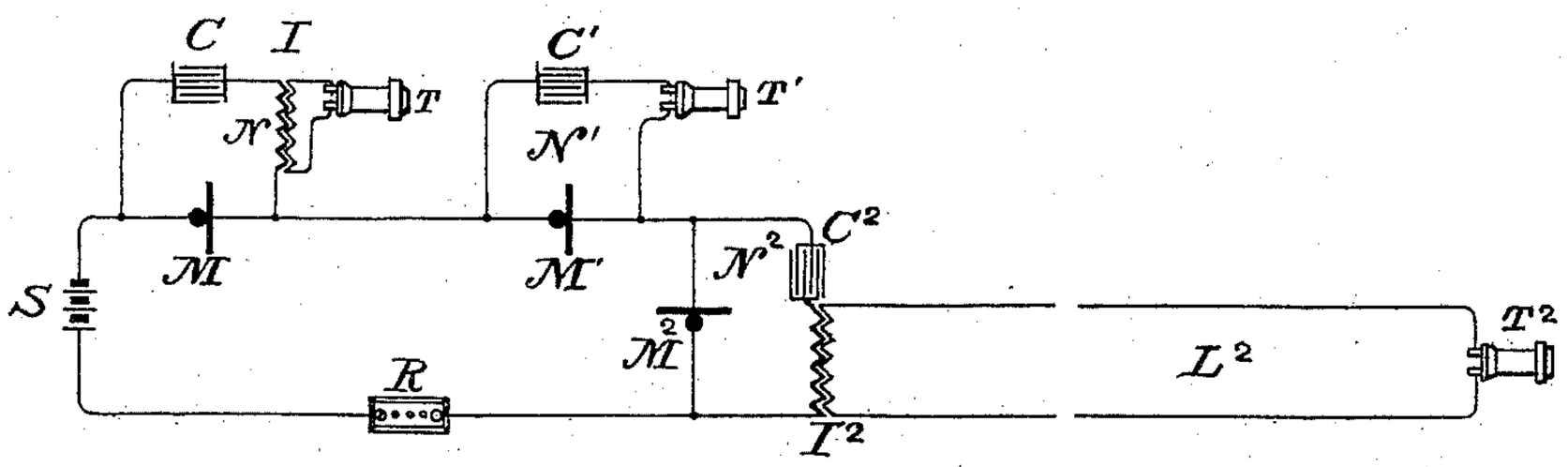
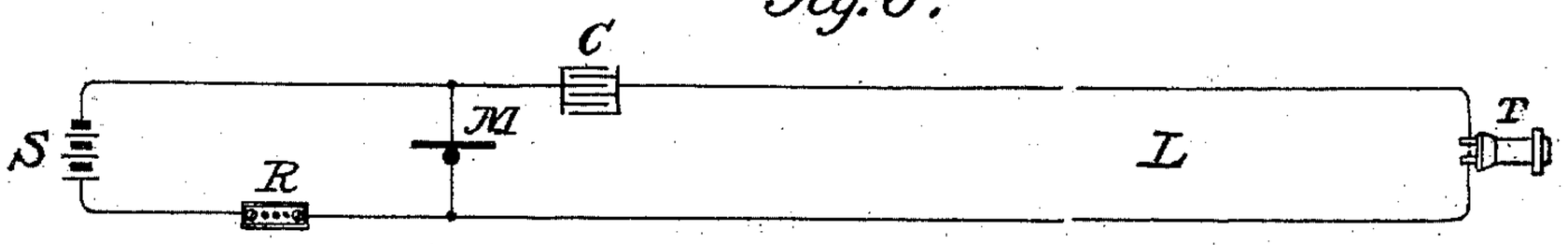


Fig. 6.



Witnesses,
Franklin Pierce
Joseph A. Gately

Inventor
John S. Stone.

UNITED STATES PATENT OFFICE.

JOHN S. STONE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE AMERICAN BELL TELEPHONE COMPANY, OF SAME PLACE.

DEVELOPMENT AND DISTRIBUTION OF ELECTRICITY.

SPECIFICATION forming part of Letters Patent No. 487,102, dated November 29, 1892.

Application filed October 10, 1891. Serial No. 408,330. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. STONE, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in the Development and Distribution of Electricity, of which the following is a specification.

My invention comprises an improvement in the art of transforming, modifying, and controlling electric currents, an improvement in the art of electrically transmitting speech, and appropriate combinations of appliances for carrying out the said improvements.

It consists in causing the operation of a suitable circuit-changer—such as a telegraph-key, a sparking-point, or a variable-resistance transmitter, according to the character of the work to be accomplished—included in the circuit of a source of electricity to vary the potential of the charge of a condenser shunting the said circuit-changer and then in utilizing the variable alternating currents developed thereby in the inductive circuit of said condenser for the operation of translating or electro-receptive devices included in said inductive circuit.

It further consists in combining with an electric circuit, including a circuit-changing or current-varying appliance and a fixed simple or inductive resistance, a shunt for the said appliance, which shunt includes a condenser and directly or inductively a translating device.

It further consists in combining an electric circuit, including a telephone-transmitter and a simple or inductive resistance, with a shunt for the said transmitter, including a condenser, and a telephone directly or through the intermediation of an induction-coil in circuit therewith.

The invention also consists in the combination, with a single source of electricity, of a plurality of utilization-circuits, each including its own circuit-changer or current-varyer and its own condenser-shunt, and each including conductively or inductively a receptive device—such, for example, as a telegraph or telephone receiving-instrument or an electric lamp.

In the drawings which accompany and form a part of this specification, Figure 1 is a diagram showing one form of the arrangements of circuits I have devised as applied to telephony, a simple resistance being associated in the original circuit. Fig. 2 is a similar diagram in which an inductive resistance is shown as being employed. Figs. 3 and 4 are diagrams illustrative of the applicability of my invention to a plurality of independent utilizing-circuits, including translating devices. Fig. 5 indicates the operation of my invention in connection with a telegraph-circuit; and Fig. 6 is in substance the same as Fig. 1, with the exception that the translating or receiving instrument is included directly in the condenser-shunt, the interposed induction-coil being dispensed with.

In Figs. 1 and 2, S is a suitable source of electricity, such as a primary or secondary battery or a dynamo. M is a current-changer, (in this instance a variable-resistance transmitter.) R in Fig. 1 and R^1 in Fig. 2 are resistances, in the first instance simple and in the latter inductive, and these instrumentalities are serially associated in an electric circuit by the conductors 1, 2, 3, and 4. C is a condenser having one of its plates united by wire 5 to a point, as *a*, of the circuit on one side of M and its opposing plates united by wire 6 to a point, as *b*, on the other side of M. The electro-receptive or utilizing device T (in this instance a receiving-telephone) is connected with one of the condenser connections through the intermediation of an induction-coil I, which has its secondary helix connected with the two conductors *l* and l^2 of the circuit L, leading to the said receptive device, and its primary helix in circuit with the condenser. In the operation of this arrangement of circuits and appliances it is evident that the current from the source S cannot circulate in the primary helix of the induction-coil, such current as does flow therein being alternating and due to the variation of the charge of the condenser as the difference of potential between its terminals is varied by the operation of the variable-resistance transmitter. It is consequently possible to use a greater current than would otherwise be practicable with the same size of primary wire and still obtain improved effects.

By employing a source of considerable elec-

tro-motive force and then bringing the normal current to its proper value by means of suitable resistance R, I am enabled in the operation of the transmitter to develop a greater variation of potential between the two sides of the condenser than would be possible with the same normal current developed by a lower electro-motive force in a circuit where there is no other resistance than the transmitter M. Good results, for example, may be obtained by employing a source having an electro-motive force of one hundred volts, a resistance of, say, ninety-two ohms, and a transmitter having a normal resistance of eight ohms, or thereabout. The condenser may have a capacity of four microfarads. In circuits through which steady currents only flow there is, of course, little or no difference between the action of simple and inductive resistances; but during the operations contemplated by my invention the changes of current are in virtue of the operation of the circuit-changer always relatively and in some cases absolutely of high frequency, and the introduction of an inductive resistance—that is to say, of a resistance constructed in a manner well understood in such a way as to have a high coefficient of self-induction—acts to choke the current, so that by employing such a resistance as is shown at R^1, Fig. 2, the same potential variations may when desirable be produced with a resistance which, measured in ohms, is comparatively low, and consequently with a much lower original electro-motive force.

Fig. 6 is a modification of Figs. 1 and 2, in which the translating device T is directly connected with the condenser connection, or, as it may alternatively be stated, is included, together with the condenser, in an inductive circuit, which also includes the current-varying device, this latter element being in a branch common to the conductive and inductive circuits and the induction-coil I being dispensed with. This change can under certain circumstances be advantageously made, and tends toward simplification.

In Figs. 3 and 4 the same source S is common to two or more current-varying devices M. In Fig. 3 each of the current-changers M has a circuit 1 2 3 4 and the resistance R or its equivalent. The condenser C in both cases is connected to shunt its own current-changer M and is associated with the induction-coil I, through which the circuit leading to the translating device is connected. The two sets of conductive and inductive circuits in this instance are connected in parallelism with each other.

In Fig. 4 the independent current-varying devices M, M′, and M^2 are all in series with one another and with the source S and the resistance R, while their respective inductive or dielectric circuits N, N′, and N^2 constitute condenser-including shunts, each of its own current-varyer. The inductive circuits N and N^2 are both shown as operating their respective translating devices T and T^2 inductively through the interposed coils I and I^2, while inductive circuit N′ has its translative or receptive device T′ included directly in circuit with the condenser. A number of transmitters may in practice be connected in like manner with a single source without reciprocal interference or other disturbance.

For the sake of precision it may be here stated that by the term "inductive circuit" as used in this specification is meant a circuit conductively discontinuous, but having associated a condenser or equivalent appliance through whose agency either terminal of the circuit may on any change of its electrical condition inductively act upon the other and produce by such action a variation of its charge and consequent movement of electricity in the remaining portions of the circuit, and by the term "conductive circuit" is meant an electric circuit which is continuously conductive throughout in such a way that a voltaic cell included therein will of itself develop a continuous current, which will circulate until the said cell is exhausted or the circuit at some point broken. Thus in Fig. 1 the conductive circuit, beginning at the plus pole of battery S, may be traced through conductor 4, point *a*, variable resistance M, conductor 3, point *b*, conductor 2, fixed resistance R, and conductor *l* to the minus pole of the battery, while in the same system the inductive circuit is traceable from point *a*, through conductor 5, condenser C, conductor 6, induction-coil helix *p*, point *b*, conductor 3, and variable resistance M back to *a*, the condenser constituting an inductive but non-conductive connection between the severed ends of the circuit, and the section included between *a* and *b* through the variable resistance being common to both circuits. In the same way, referring to Fig. 6, the conductive circuit leads from one pole of the battery through the fixed resistance R and variable resistance M back to the other pole of said battery, while the inductive circuit extends from one plate of the condenser through the conductors L, the distant telephone T, and by way of the variable resistance M to the other condenser-plate.

Fig. 5 is illustrative of the application of this invention to telegraphy. The source S (shown as a dynamo) is connected up in a circuit X with the resistance R and key M. The condenser C, as before, is included in an inductive circuit of which the current-changer M likewise forms a part, and a loop extends from the condenser connections to the electro-receptive device—in the present instance a polarized telegraphic receiving-instrument.

It will thus be seen that my invention has a wide applicability; and,

Having fully described the same, I claim—

1. The combination of a conductive circuit, an inductive circuit, and a single-bridge connection forming a conductive section common to both of said circuits with an electrical gen-

erator in the said conductive circuit, a translating device in the said inductive circuit, and a current-varying device included in the said bridge connection, substantially as described.

2. The combination, substantially as hereinbefore described, in an electrical developing and distributing system, of a source of electricity, a current-varying device, and a suitable resistance associated in a conductive electric circuit with a condenser connected up in an inductive electric circuit comprising that portion of the conductive circuit which includes the said current-varying device and an electro-receptive or translating device included directly or inductively in said inductive circuit.

3. The combination, in a system of telephonic transmission, of a variable-resistance transmitter, a source of electricity, and a suitable resistance associated in an electric circuit with a condenser connected in a shunt of the said circuit round the said transmitter and a receiving-telephone connected directly or inductively with the said condenser-shunt, substantially as described.

4. The combination, substantially as hereinbefore described, in a system of telephonic transmission, of a variable-resistance transmitter, a source of electricity, and a suitable resistance associated in an electric circuit with a condenser connected in a shunt of the said circuit round the said transmitter and an induction-coil having its primary helix included in the condenser-shunt and its secondary helix in main telephone-circuit.

5. In a system of telephonic transmission, a variable-resistance transmitter, a source of electricity, and an inductive resistance associated in a local electric circuit, combined with an electrostatic shunt for the said transmitter, which shunt contains a condenser and is connected with a main telephone-circuit including a receiving-instrument.

6. In a system of telephonic transmission, a series of independent current-varying transmitters, each shunted by a condenser, and a working circuit associated therewith, including a receiving-telephone electrically connected with the said condenser-shunt and adapted to be energized by the currents circulating therein, combined with a source of electricity connected with and common to the said series of transmitters and a suitable resistance to determine the normal current flowing through the transmitters, substantially as shown and described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 6th day of October, 1891.

J. S. STONE.

Witnesses:
GEO. WILLIS PIERCE,
JOSEP A. GATELY.