

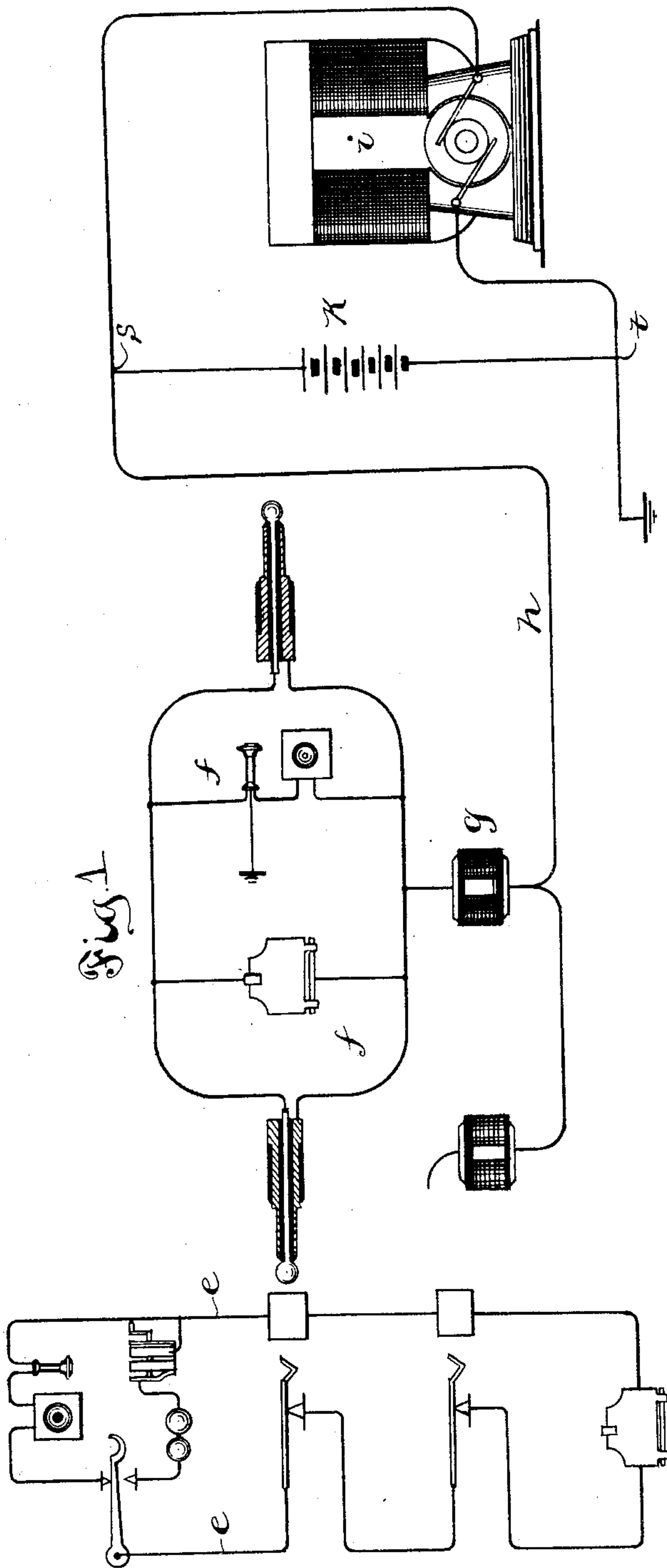
(No Model.)

C. E. SCRIBNER.

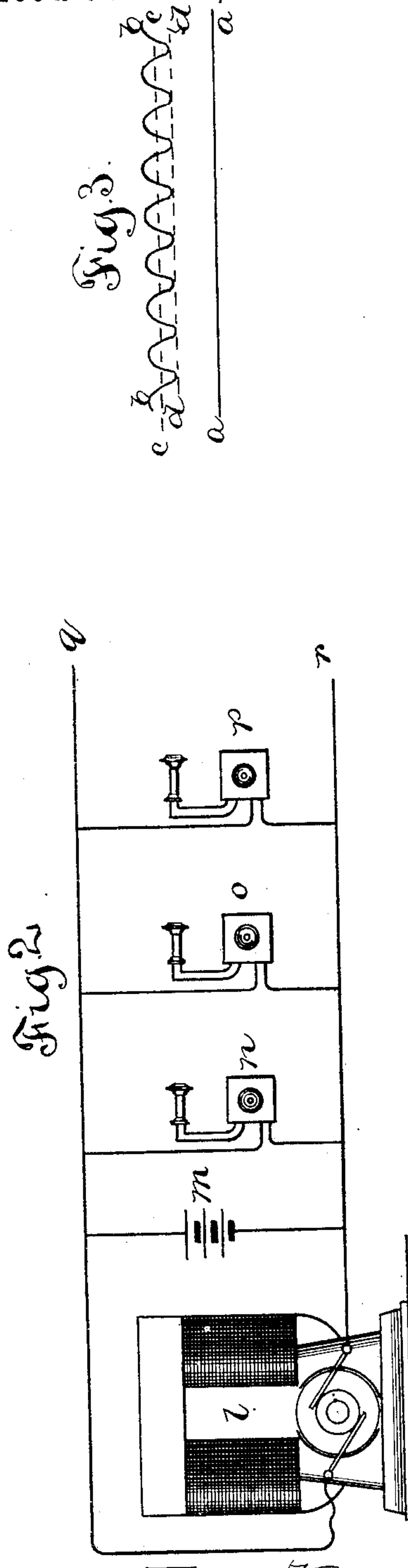
APPARATUS FOR SMOOTHING CURRENTS OF DYNAMO ELECTRIC MACHINES.

No. 533,146.

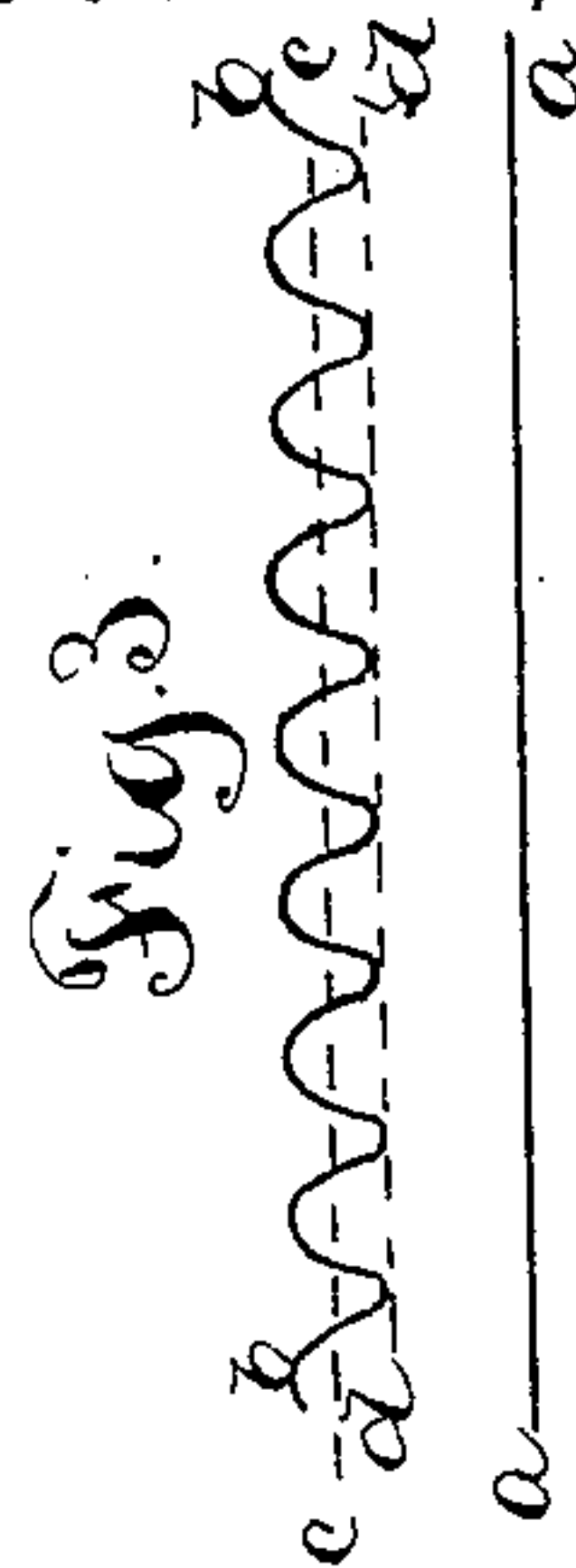
Patented Jan. 29, 1895.



Witnesses  
George L. Cragg  
Geo. McMahon.



Inventor  
Charles E. Scribner.  
By Barton & Brown  
Attys.





# UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

APPARATUS FOR SMOOTHING CURRENTS OF DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 533,146, dated January 29, 1895.

Application filed January 16, 1892. Serial No. 418,334. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Apparatus for Smoothing the Currents of Dynamo-Electric Machines, (Case No. 285,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

Heretofore the dynamo machine has not been found available for supplying current to telephone lines, and for other similar uses where currents without undulations are required. It has, therefore, been found necessary in all such cases to use batteries, which are much more expensive to maintain in operation than dynamo machines capable of giving the same electro motive force.

My invention herein consists primarily in the discovery that a dynamo machine, adapted to give an undulatory current, when connected in parallel with a source of constant electro motive force not exceeding, or preferably less than, the electro motive force of the dynamo, may be utilized for supplying current without objectionable undulations.

The mode of operation is briefly that the portion of the circuit, including the source of constant electro motive force, being of low resistance, any excess of electro motive force produced by the dynamo beyond that of the normal or constant amount produced by the generator of such constant electro motive force will spend itself in producing current through the low resistance circuit or wire containing said generator of constant electro motive force.

Heretofore dynamo machines have been connected in parallel with storage batteries in order that the batteries may be charged by the dynamo at the same time electric lamps are being burned upon the circuit. The storage battery, however, has not in any instance been adjusted as to electro motive force with reference to the amount of the electro motive force of the dynamo for the purpose of disseminating or preventing the undulations upon the circuit where the work is being done.

More particularly my invention consists in

such adjustment of the constant source of electro motive force to the normal electro motive force of the dynamo in connection with the discovery that by the adjustment the objectionable undulations may be prevented, the current upon the working circuit being thereby rendered, so to speak, smooth and uniform. This smooth current results from providing a path of low resistance which contains the source of constant electro motive force, over which path the excesses of electro motive force from the dynamo find vent.

Viewed in another light, my invention consists in the method of maintaining a constant electro motive force from a source of supply, which consists in shunting by a path of low resistance, having an electro motive force counter to that of the source of supply, all excess of electro motive force due to said source of supply above the said counter electro motive force of said path of low resistance.

My invention will be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a diagram illustrative of my invention utilized for supplying current for testing purposes to a telephone exchange. Fig. 2 illustrates the invention used for the purposes of supplying current to several telephone transmitters. Fig. 3 is a graphic representation of the ordinary undulatory current of the dynamo machine.

In case the dynamo is connected in circuit without the source of constant electro motive force in parallel therewith, the current will be of the undulatory character illustrated in Fig. 3. The line *a—*a** of said figure represents the base or zero line. The fluctuations or undulations are represented by the undulatory or sinuous line *b—*b**.

The average electro motive force or average current of the dynamo or the current produced by such average electro motive force may be considered as represented by the dotted line *c—*c**. The line *d—*d** may be considered as representing on the same scale the minimum electro motive force or the minimum current produced by the minimum electro motive force of the dynamo. The electro motive force of the generator, which is placed in parallel with the machine, should be pref-



erably equal to this minimum electro motive force of the dynamo, though it might be equal to that represented by the line  $c-c$ .

Referring now to Fig. 1, the telephone circuit  $e$  may be considered as having the usual connections at the subscriber's station and central office. The operator's cords and plugs and telephone outfit  $f f$  are also of usual construction. An ordinary retardation coil  $g$  is shown in the branch  $h$  leading from the strand connecting the sleeves of the plugs, which branch ordinarily contains a test battery. In such test systems heretofore, a battery has been considered necessary as a source of current, in order that the current may be smooth. By the use of my invention, the necessity of using a battery in this wire is avoided. I have discovered that a dynamo machine  $i$  placed in its branch  $h$  and connected in parallel with a storage battery  $k$  of the proper electro motive force and of low resistance so as to shunt the dynamo, that is to furnish a short circuit over which the excesses of electro motive force developed by the dynamo above the constant electro motive force of said battery  $k$  may find vent, will prevent fluctuations or undulations from being sent over the branch  $h$ .

For the purposes of my invention, a battery of small storage capacity is all that is required, since the ordinary function of a storage battery is of no utility in connection with my invention. The old storage battery of Planté would be as efficacious as any of the most approved storage batteries of recent date. The battery  $k$  illustrated may be considered as an ordinary primary battery of the required electro motive force, but of low internal resistance as compared with the resistance of the circuit of which branch  $h$  is adapted to become a part.

In Fig. 2, the dynamo  $l$  is shown connected in parallel with the secondary or primary battery  $m$  to supply current to the telephone transmitters  $n o p$ , which are adapted to be connected between the mains  $q r$ . Thus Fig. 2 simply shows another use to which my invention may be put.

Speaking generally my invention may be used whenever it is desired to employ a dynamo machine for furnishing current free from objectionable undulations or fluctuations.

It will be seen that the shunt circuit or circuit parallel with that containing the dynamo is connected with the mains  $q r$  at points  $s t$ . By furnishing this path of low resistance the potential of the circuit outside these points is prevented from raising. The maximum difference of potential of the circuit outside these points  $s t$  being determined by the constant electro motive force of the battery included in the shunt or parallel circuit, any excess of electro motive force of the dynamo in the parallel circuit will find vent over said parallel circuit, and will not cause an increased difference of potential outside the

points  $s t$ ; that is on the portion of the circuit containing the translating devices.

My invention is particularly adapted to the supply of current to a number of telephone transmitters connected in multiple, as shown in Fig. 2. It has heretofore been found impracticable to connect two or more telephone transmitters in multiple and supply the same from a generator having an appreciable internal resistance. It is a well known fact that if the external resistance of a circuit supplied by a source of electricity be varied, the voltage of the source, or difference of potential at the terminals, will be varied. Thus, if the external resistance be increased the voltage will be increased, while if the external resistance be decreased the voltage will be diminished. If a number of telephone transmitters be connected in multiple in the external circuit, the actuation of any one of the transmitters to thereby vary its resistance will vary the external resistance of the circuit, and in consequence the voltage of the source; but an increased voltage causes an increased current to flow through the induction coils of the idle transmitters, currents being thus caused to traverse the receivers of all the transmitters, when any one of the transmitters is operated. It has been proposed to prevent this effect by making the internal resistance of the source so low that its change of voltage due to changes of resistance in the external circuit, will be inappreciable and thus produce no effect on the idle telephones. (See Patent No. 518,392, granted April 17, 1894, to John J. Carty.) My invention in this particular designs to prevent this deleterious effect without necessarily dispensing with the source of electricity having a high internal resistance, and I accomplish this result by placing in shunt with the working circuit a battery having a low internal resistance and a counter electro-motive-force adjusted to equal the voltage desired to be maintained in the working circuit. When a change of resistance takes place in the external circuit due to the actuation of a transmitter, the tendency is to correspondingly vary the voltage of the source, but, the battery having a very low resistance compared to the resistance of the working circuit, any excess of current due to an increase of the voltage above the normal, passes through the battery, while, when the voltage of the source falls below the normal, the working circuit is subjected to the voltage of the battery and the voltage to which the external circuit is subjected is thus constant, irrespective of the change of external resistance. Consequently, current of the same value traverses at all times the parallel paths containing the idle telephones, and no noise is produced therein.

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

1. The combination with a source of electricity, of telephone transmitters connected



in parallel between the poles of said source and deriving current therefrom, and a source of counter-electro-motive force connected in shunt with the working circuit containing said telephone transmitters, substantially as described.

2. The combination with a source of electricity, of telephone transmitters connected in parallel between the poles of said source and deriving current therefrom, and a storage battery or secondary battery connected in a low resistance shunt across the working circuit containing said telephone transmitters, substantially as described.

3. The combination with a direct current dynamo, of telephone transmitters connected in parallel between the terminals of said dynamo and deriving current therefrom, and a storage battery of low internal resistance connected in shunt with the working circuit containing said telephone transmitters, substantially as described.

4. The combination with a source of elec-

tricity, of several parallel branches between the poles of said source, a telephone transmitter and the primary helix of an induction coil in each branch, and a source of counter-electro-motive force connected in shunt with the working circuit, substantially as described.

5. The combination with a source of electricity, of separate parallel branches joining the poles of the source, a telephone transmitter and the primary helix of an induction coil included in series in each of said branches, a telephone line circuit connected with a telephone receiver and including the secondary helix of each induction coil, and a source of counter-electro-motive force connected in shunt with the working circuit, substantially as described.

In witness whereof I hereunto subscribe my name this 18th day of December, A. D. 1891.

CHARLES E. SCRIBNER.

Witnesses:

M. JEANE TALLETT,  
GEORGE P. BARTON.