(No Model.) 4 Sheets—Sheet 1.

R. N. DYER.

TELEPHONE SYSTEM.

No. 382,461. Patented May 8, 1888.

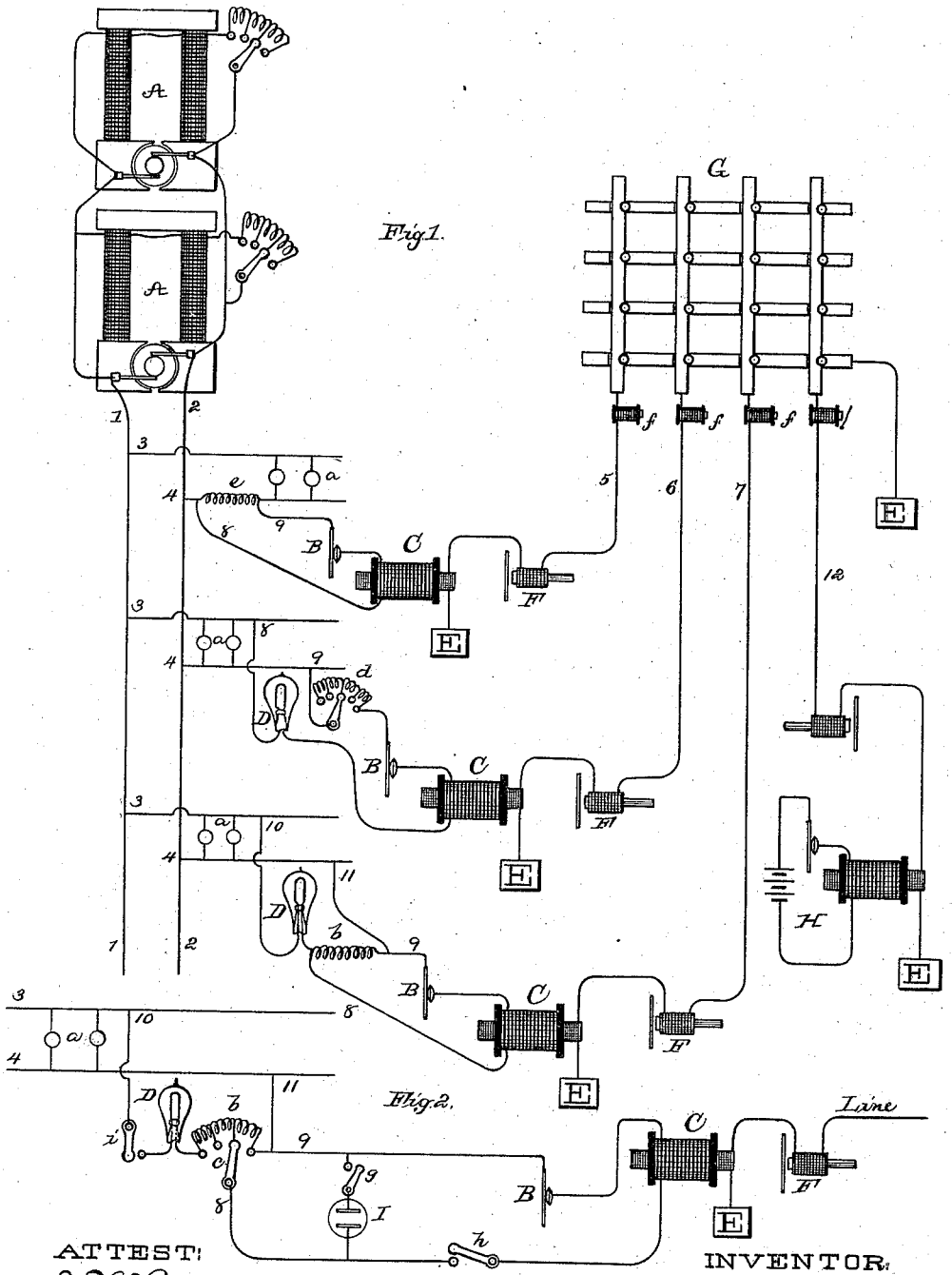

Fig. 1.

Fig. 2.

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INVENTOR:

Richard N. Dyer.

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(No Model.)

4 Sheets—Sheet 2.

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TELEPHONE SYSTEM.

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Fig 3.

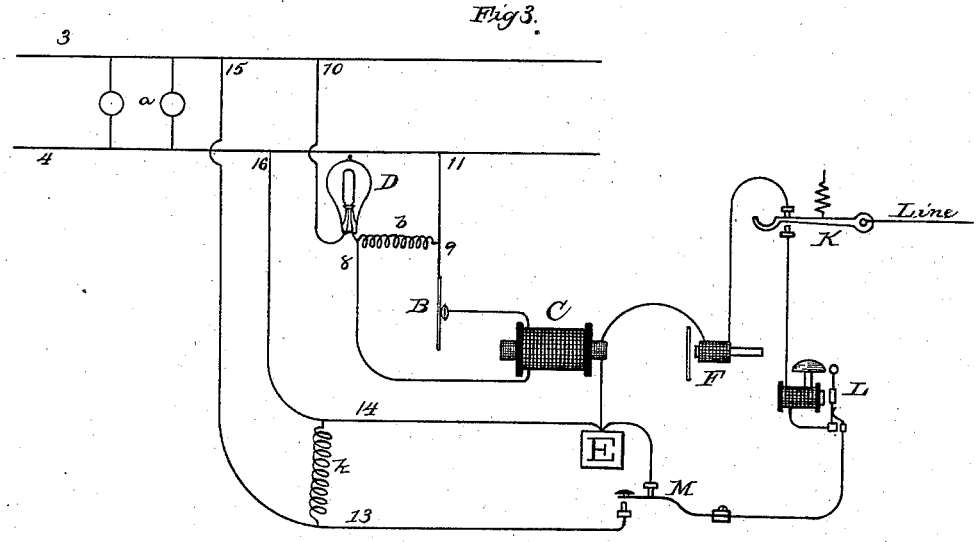
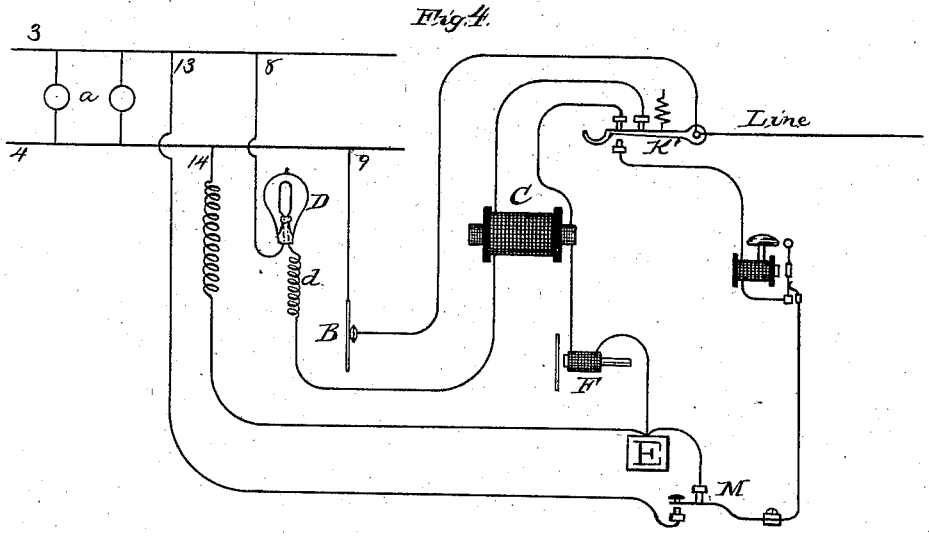


Fig 4.



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(No Model.) 4 Sheets—Sheet 3.

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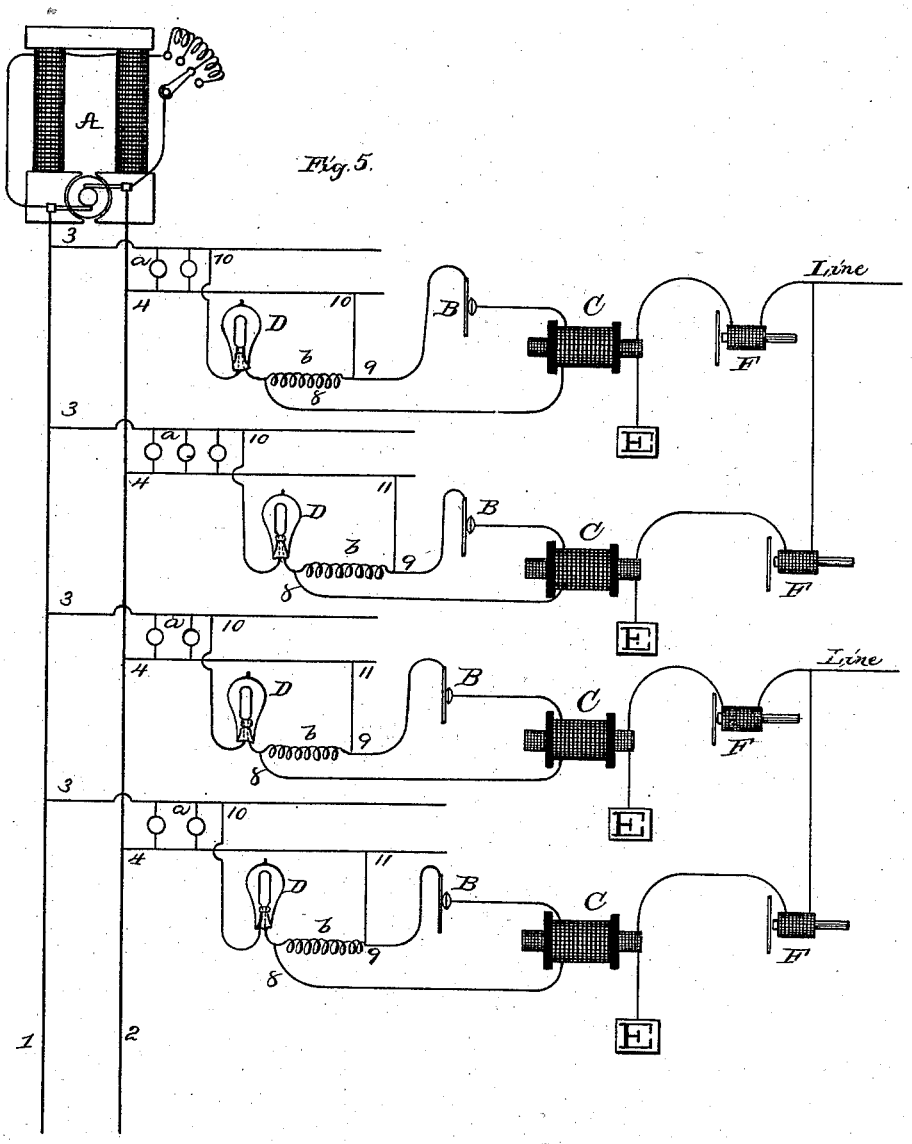
Fig. 5.



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TELEPHONE SYSTEM.

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Fig. 6.

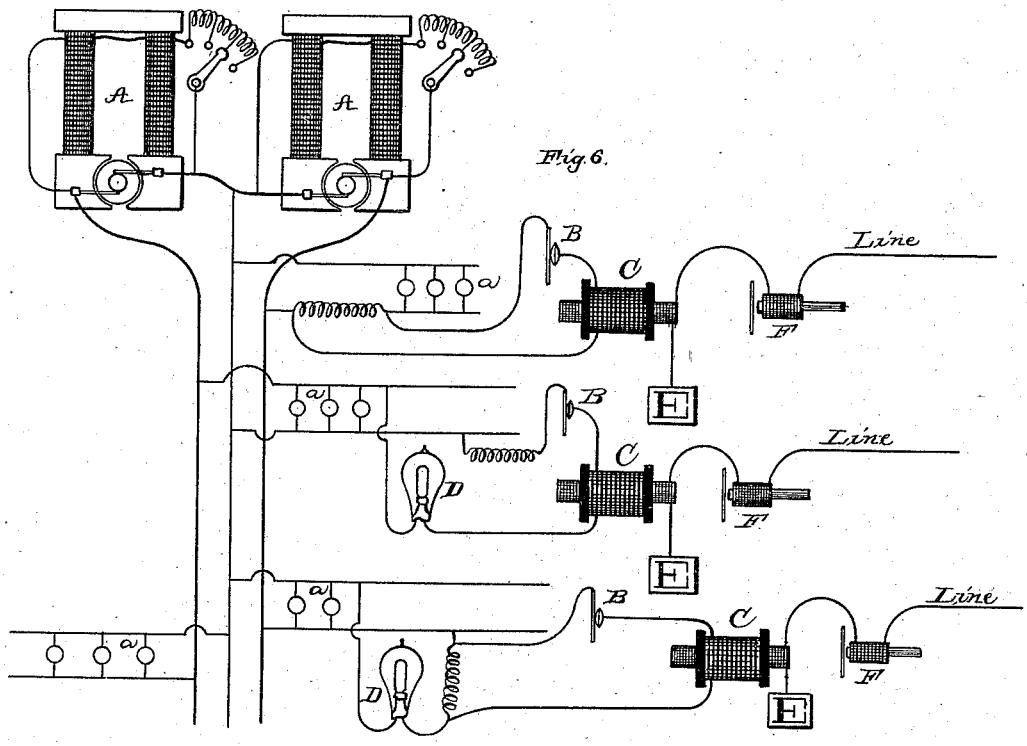
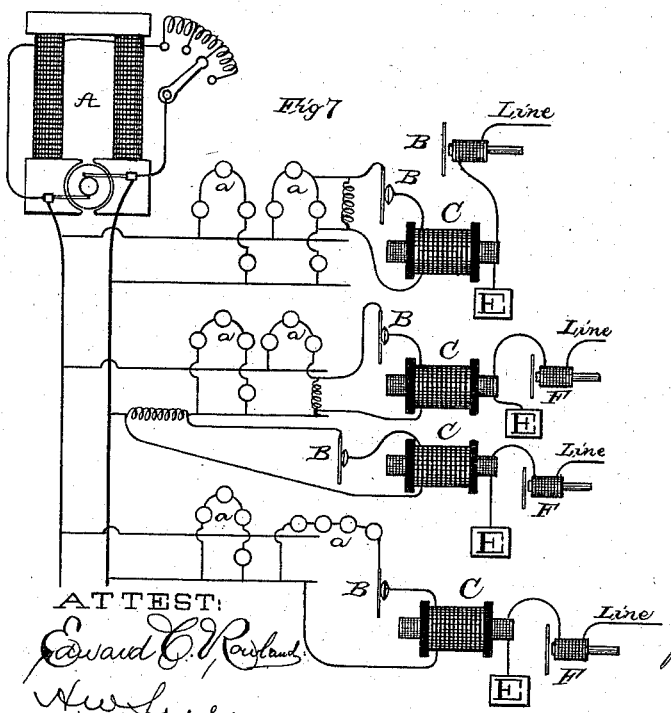


Fig. 7



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UNITED STATES PATENT OFFICE.

RICHARD N. DYER, OF NEW YORK, N. Y.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 382,461, dated May 8, 1888.

Application filed October 9, 1883. Serial No. 108,528. (No model.)

To all whom it may concern:

Be it known that I, RICHARD N. DYER, of New York city, in the county and State of New York, have invented a certain new and useful Improvement in Telephone Systems, of which the following is a specification.

My object is to provide a source of electrical energy for telephones and telephone-lines, for transmitting and receiving articulate speech thereby, which source will be of a constant character and will not be subject to the numerous objections of the galvanic batteries now in use.

In carrying out my invention I employ dynamo currents, or such as are generated by dynamo or magneto electric machines. In adapting machines of this character to the operation of telephones and telephone-lines obstacles are met with arising from the nature of the current to be dealt with, it being far more powerful than required for telephone use, and from the imperfect commutation of such machines causing a vibration in the receivers, producing a noise which interferes to some extent with the reproduction of articulate speech; but such a source when adapted for this use has the obvious advantages over galvanic batteries of being practically constant in its energy, and since, in using dynamo or magneto electric machines, a common source of supply must be employed for a large number of telephones, the subscribers are relieved of the annoyances experienced with separate galvanic batteries, of having sources of energy which require frequent attention, often get out of order, and seldom have the standard power.

An efficient method of applying dynamo currents to the operation of telephones and telephone-lines I find to be as follows: A circuit independent of the telephone-circuit is constructed, and this circuit is provided with current from one or more dynamo or magneto electric machines located at any suitable point. The local transmitter-circuit of each telephone-set is connected in multiple arc with this dynamo-supply circuit, each connection being a circuit independent of all other connections, and by means of a suitable arrangement of resistances the dynamo-current is reduced and modified and the proper energy is supplied to each telephone. The telephone-transmitters being located each in a local circuit, including also the primary of an induction-coil, and the receivers being each in connection with the line and the secondary of an induction-coil, the connections with the independent dynamo-circuit will be made so as to supply the energy to the local transmitter-circuits, each transmitter having an independent connection with the dynamo-circuit, and this whether each telephone-line is provided with one or more instruments.

I have found that the obstacle arising from the imperfect commutation at the dynamo or magneto electric machines can be obviated by the use of two or more machines, which serve to destroy the individual vibrations of the currents produced by the machines by a neutralization of such vibrations. With large and perfectly-constructed machines I am of opinion that this obstacle will not be met with, and a plurality of machines may not be essential; but it is met with in the machines at present generally used, and with such the use of a plurality of machines obviates the difficulty.

In applying dynamo currents to telephones in the manner already explained it is convenient to use for the source of electrical energy the circuit of a system of electrical distribution for light or power, or both, which system is supplied by dynamo or magneto electric machines located at a central station, from which extends the distribution-circuit, including electric lamps or motors, or both. The conductors of the system of electrical distribution extend to the buildings in which the telephones are located, and connections are made with each telephone by means of an arrangement of resistances, which reduce and modify the current of the distribution-circuit to adapt it for supplying the telephones. This reduction and modification may be carried to the extent that the same telephone system may be provided with telephones worked by galvanic batteries, and the telephones supplied by dynamo currents may be worked in connection with those supplied by galvanic batteries without rendering the galvanic batteries inoperative.

The resistances used to reduce and modify the current may be adjustable, so that they can be set to divert the proper amount of energy, although this is not essential, since if such resistances are properly proportioned and connected no adjustment will be required. Since

the throwing into the circuit of a number of electric lamps or other translating devices would produce a drop in the tension of the current in the distribution system, which drop is compensated for by regulation at the central station of the distribution system, I may provide means for maintaining the standard tension in the telephone-circuit during the time that elapses before the regulation of the distribution system is performed. This means consists of a secondary cell located at each connection between the distribution and telephone circuits and charged to the standard tension by the distribution-circuit. So long as the tension in the distribution-circuit is normal, the cell is neutralized and does not discharge; but when there is a drop in tension in the distribution-circuit the cell discharges into the telephone-circuit and maintains therein the standard tension until the regulation of the distribution system is performed. Since currents of any desired power may be obtained from the distribution system, the dynamo currents obtained in this way can be used effectively for operating the signals connected with the telephone-lines. I have devised means for this purpose, which, as well as the matters before referred to, will be fully hereinafter explained.

The method of supplying telephones with electrical energy (before described) by providing a separate supply-circuit independent of the telephone-circuit and common to all the telephones, and with which the transmitters are connected in multiple arc, is novel with me independent of the nature of the source, whether it be dynamo-electric machines, galvanic batteries, or secondary batteries.

In the accompanying drawings, forming a part hereof, Figure 1 is a view, partly diagrammatic, of a telephone system embodying my invention, showing connections with a simple multiple-arc system of electrical distribution; Fig. 2, a similar view, more in detail, of one of the telephone-connections; Figs. 3 and 4, views of signaling arrangements; Fig. 5, a view similar to Fig. 1, showing telephone-lines, each with two telephones; Fig. 6, a diagrammatic view showing connections with a compensating system of electrical distribution; Fig. 7, a diagrammatic view showing connections with a multiple-series system.

With reference more especially to Figs. 1 and 2, A A are dynamo or magneto electric machines, of which there are preferably two or more connected to the conductors 1 2, forming the dynamo-circuit. These conductors 1 2 are shown as the main conductors of a simple multiple-arc system of electrical distribution, of which 3 4 represent the house-circuits, in which are located electric lamps, motors, or other translating devices, *a*. The machines A are regulated in any suitable way, adjustable resistances in their field-circuits being shown for this purpose. It will be understood that the machines, conductors, and translating devices shown are intended to represent a complete system of electrical distribution, which will be provided with any of the known means of indication, regulation, and measurement. A number of telephone-lines, 5, 6, and 7, are supplied with electrical energy from the dynamo-circuit.

B represents telephone-transmitters, of any ordinary construction, which are placed in local circuits 8 9, also including the primary of induction-coils C. These local telephone-circuits are provided with current from the dynamo-circuit by connection with the house-conductors 3 4 of the distribution system or circuits derived therefrom.

A convenient method (shown at the bottom of Fig. 1 and in Fig. 2) is to make each local telephone-circuit a shunt around a resistance, *b*, located in a multiple-arc circuit, 10 11, derived from 3 4. An electric lamp, D, is preferably used in each circuit 10 11 as a protecting resistance, and in addition to the lamp there is employed the resistance *b* in the form of metallic wire or a material of higher resistance—such as carbon—around which the telephone local circuit is a shunt.

With a distribution system having at the dynamos an electro-motive force of about one hundred volts, I have obtained good results with telephones in the system worked by galvanic batteries by the use of a lamp, D, of one hundred ohms resistance, and a shunting resistance, *b*, of from one and one half ohms to two ohms; but of course these proportions could be changed to meet the requirements of the particular form of transmitter employed. They could be varied considerably to divert greater energy into the telephone-circuits, the sources of electrical energy of all the telephones being increased likewise.

The shunting resistance *b* may be made adjustable by an arm, *c*, to adjust the energy diverted into the telephone circuit in accordance with the requirements of the system; but a fixed resistance may be used. Instead of shunting around a resistance in a circuit, 10 11, derived from the house circuit 3 4, the telephone-circuits 8 9 may be themselves multiple-arc circuits from 3 4. This arrangement is shown at the center of Fig. 1, an electric lamp, D, being preferably used in the circuit for a resistance and an additional resistance, *d*, which may be adjustable or not, as desired; or each local telephone-circuit may be a shunt around a resistance, *e*, in one of the conductors of the house-circuit 3 4, as shown at the top of Fig. 1, and this shunt may be adjustable to include more or less of the resistance, or it may be fixed. Any one or more of the connections with the dynamo-circuit described may be employed.

The telephone-lines 5 6 7 include the telephone-receivers F and the secondary of the induction-coils C, and terminate in ground-connections E, or a complete metallic circuit may be employed.

The telephone-lines extend to the telephone central station, where they run to a switch-board, G, through drop-magnets *f*, and one

or more signal-bells may be arranged for operation at that point, or any usual or suitable central office or exchange arrangement may be employed.

All the telephones of the system may be supplied with current from the dynamo-circuit; but some may be worked by galvanic batteries, and this latter arrangement is desirable in case the dynamo-circuit is a distribution system which does not extend throughout the territory occupied by the telephone system.

At H the local circuit of the telephone is supplied by a galvanic battery, the telephone-line 12 extending to the switch-board, and there may be a number of telephones in the system worked in this manner by galvanic batteries, the dynamo-connections of the other telephones being adjusted or proportioned to operate with the galvanic batteries.

Each telephone-line may have more than one telephone connected therewith, in which case the local circuit of each telephone would have a separate connection with the dynamo-circuit, as shown in Fig. 5.

To maintain the standard tension in the telephone-circuit while the regulation of the distribution-circuit is being performed, a secondary cell, I, may be placed across the local telephone-circuit 8 9 between the transmitter and induction-coil and the connection with the dynamo-circuit. This secondary cell may be a small bottle or jar sealed air tight to prevent evaporation and placed out of sight in the telephone box. It will not need replenishing. The secondary cell being an accumulator of electrical energy, it is charged from the distribution-circuit, and whenever the electro-motive force of the distribution-circuit drops, the cell discharges a current into the telephone-circuit, and in this way it serves to prevent fluctuations in the distribution-circuit from affecting the telephone. A circuit-controller, *g*, may be provided for the secondary-cell circuit and other circuit-controllers, *h i*, may be used for the local telephone-circuit 8 9 and the circuit 10 11. These circuit-controllers may be combined to work simultaneously, or may be operated separately.

My signaling arrangements, to be used with the system described of operating telephones by dynamo currents, are shown in Figs. 3 and 4, to which reference is now especially made.

In addition to the telephone-connection with the dynamo-circuit, another connection therewith for signaling is made, which latter connection is of greater power, being arranged to divert a stronger current than the telephone-connection. The signaling-connection is a circuit, 13 14, which may be a shunt around resistance *k* in a multiple-arc circuit, 15 16, from 3 4, Fig. 3; or the circuit 13 14 may be itself a multiple-arc circuit from 3 4, Fig. 4.

By the arrangement shown in Fig. 3 a two-point hook-switch, K, is employed, the receiver being connected to the back point of the switch, and a vibrating bell, L, to the front point. The receiver is connected with the secondary of the induction-coil and with the ground-plate E, while the bell has a connection with E through a two-point push-switch, M, and its back point, as shown. The signaling-circuit 13 14 is connected on one side with earth and on the other with the front point of the switch M. When the parts are in the position shown, the line is closed through the receiver and the bell is cut out of circuit. The receiver being hung on the hook of switch K, it will cut itself out of circuit and throw in the bell, which will then receive signals through it to ground from the line. To signal the opposite end of the line the switch M is operated as a push-button, breaking its direct ground-connection and closing the signaling-circuit 13 14 from ground through the bell-magnet to the line, throwing upon the line a strong dynamo-current well adapted to operate the signals.

In Fig. 4 a three-point hook-switch, K′, is employed. The vibrating bell is connected with the back point of the hook-switch and through the two-point push-switch to ground. The local telephone-circuit is connected to the pivot of switch K′ and to one of the front points of the switch, while the receiver is connected with the other front point of the switch. The operation is the same as with the simpler form of switch, with the exception that the three-point switch opens the transmitter as well as the receiver circuit.

The use of a compensating system of electrical distribution such as described in Edison's patent, No. 274,290, for the dynamo-circuit is illustrated in Fig. 6. The employment of a multiple-series system for this purpose is illustrated in Fig. 7.

What I claim is—

1. The combination, with two or more telephone-transmitters and induction-coils through which the transmitters are connected with the telephone-lines, of a current-supplying circuit extending to said two or more telephone-transmitters and independent multiple-arc connections between such transmitters and said current-supplying circuit, substantially as set forth.

2. The combination, with two or more telephone-transmitters and induction-coils through which the transmitters are connected with the telephone-lines, of a current-supplying circuit extending to said two or more telephone-transmitters, one or more dynamo-electric machines generating current in said supply-circuit, and independent multiple-arc connections between such transmitters and said current-supplying circuit, substantially as set forth.

3. The combination, with two or more telephone-transmitters and induction-coils through which the transmitters are connected with the telephone-lines, of a current-supplying circuit extending to said two or more telephone-transmitters, two or more dynamo-electric machines generating current in said sup-

ply-circuit and acting to neutralize their individual vibrations, and independent multiple-arc connections between such transmitters and said current-supplying circuit, substantially as set forth.

4. The combination, with two or more telephone-transmitters and induction-coils through which the transmitters are connected with the telephone-lines, of a current-supplying circuit extending to said two or more telephone-transmitters and formed by the conductors of a multiple-arc system of electrical distribution, and independent multiple-arc connections between such transmitters and said current-supplying circuit, substantially as set forth.

5. The combination, with a supply-circuit—such as an electrical-distribution system common to a number of telephone-transmitters and having a higher electro-motive force than is required for operating the telephones—of two or more telephone-transmitters, independent multiple-arc connections from such supply-circuit to said transmitters, and resistances or other current-reducing devices located in or forming part of such connections and acting to reduce the current passing through the transmitters, substantially as set forth.

6. The combination, with a dynamo-current supplying-circuit common to a number of telephones, of two or more telephone-transmitters connected in multiple arc with said supply-circuit, and an electrical accumulator for each transmitter located between the supply-circuit and the transmitter, said accumulator being charged from the supply-circuit and discharging in the transmitter-circuit to maintain the current uniform in the latter, substantially as set forth.

7. The combination, with a dynamo circuit, of telephones connected therewith and signaling devices also connected with said dynamo-circuit, substantially as set forth.

8. The combination, with a dynamo-circuit, of telephones connected therewith, signaling devices also connected with said dynamo-circuit, and resistances whereby greater energy is diverted from said dynamo-circuit for signaling than for the transmission of articulate speech, substantially as set forth.

9. In a telephone system, the combination, with a current-supplying circuit, of a telephone-transmitter and induction-coil connected with said circuit, and a connection from such supply-circuit to the telephone-line through a circuit-controller for producing signals, whereby the telephone and signal devices are both operated from the same source of electrical energy, substantially as set forth.

10. In a telephone system, the combination, with a current-supplying circuit, of a telephone-transmitter and induction-coil connected with said circuit, and a connection from such supply-circuit to the telephone-line through a circuit-controller for producing signals, such connections with the supply-circuit having a multiple-arc relation, substantially as set forth.

11. In a telephone system, the combination, with a telephone-line, a telephone-transmitter, a telephone-receiver, an induction-coil, and a signaling-bell, of a current-supplying circuit, a connection from such supply-circuit to the telephone-transmitter and induction primary, another connection from the supply-circuit through the bell, a circuit-controller in the latter connection for producing signal impulses, and a switch alternately shifting the line-connection from the telephone receiver to the bell, substantially as set forth.

12. In a telephone system, the combination, with a telephone-line, a telephone-transmitter, a telephone-receiver, an induction-coil, and a signaling-bell, of a current-supplying circuit, a connection from such supply-circuit to the telephone-transmitter and induction primary, another connection from the supply-circuit through the bell, a circuit-controller in the latter connection for producing signal impulses, and a switch alternately shifting the line-connection from the telephone-receiver to the bell and opening and closing the connection from the supply-circuit to the telephone-transmitter, substantially as set forth.

This specification signed and witnessed this 6th day of September, A. D. 1883.

RICHARD N. DYER.

Witnesses:
H. W. SEELY,
EDWARD H. PYATT.