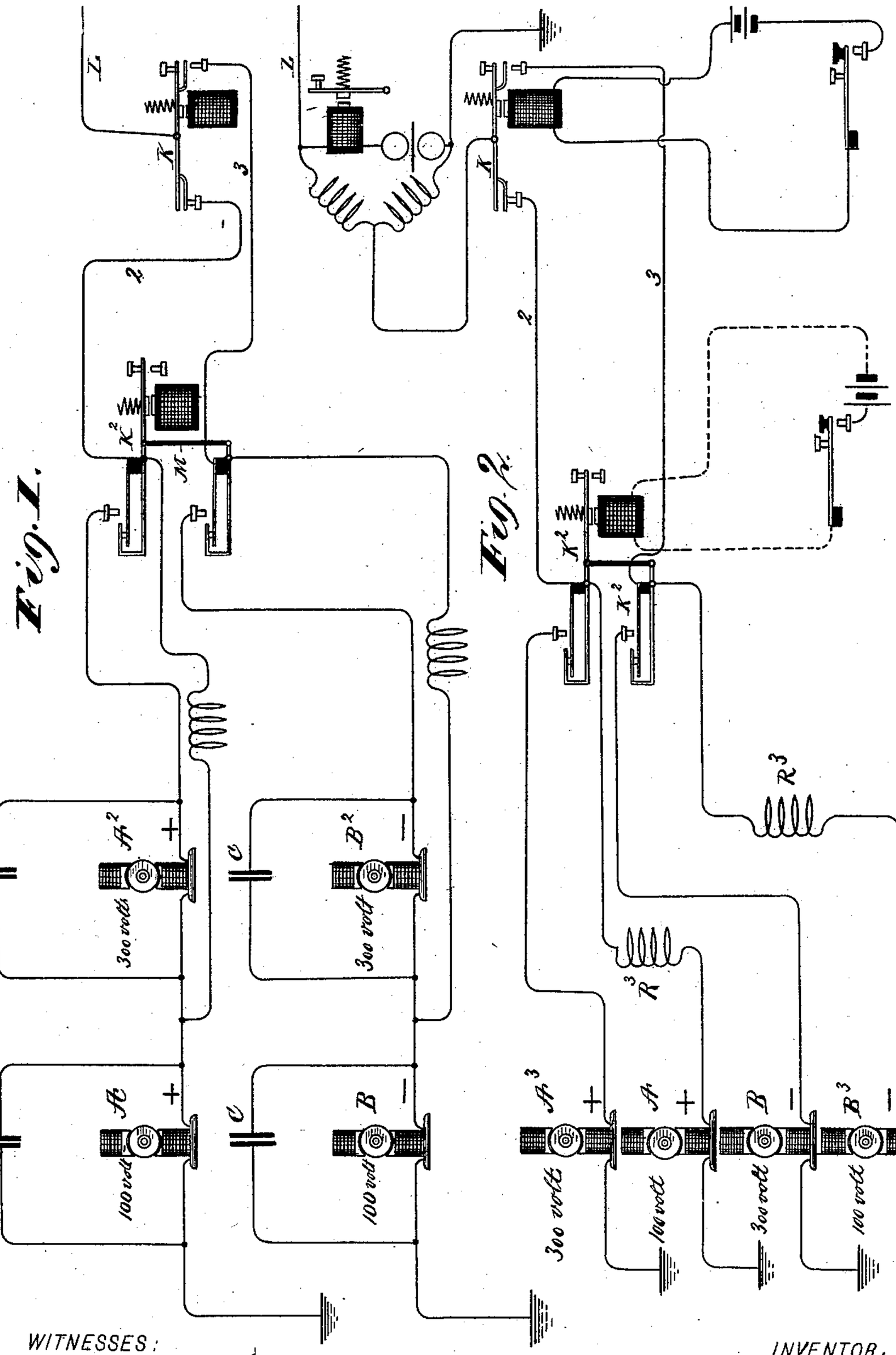
(No Model.) 2 Sheets—Sheet 1.

F. W. JONES.

DYNAMO TELEGRAPHY.

No. 381,839. Patented Apr. 24, 1888.



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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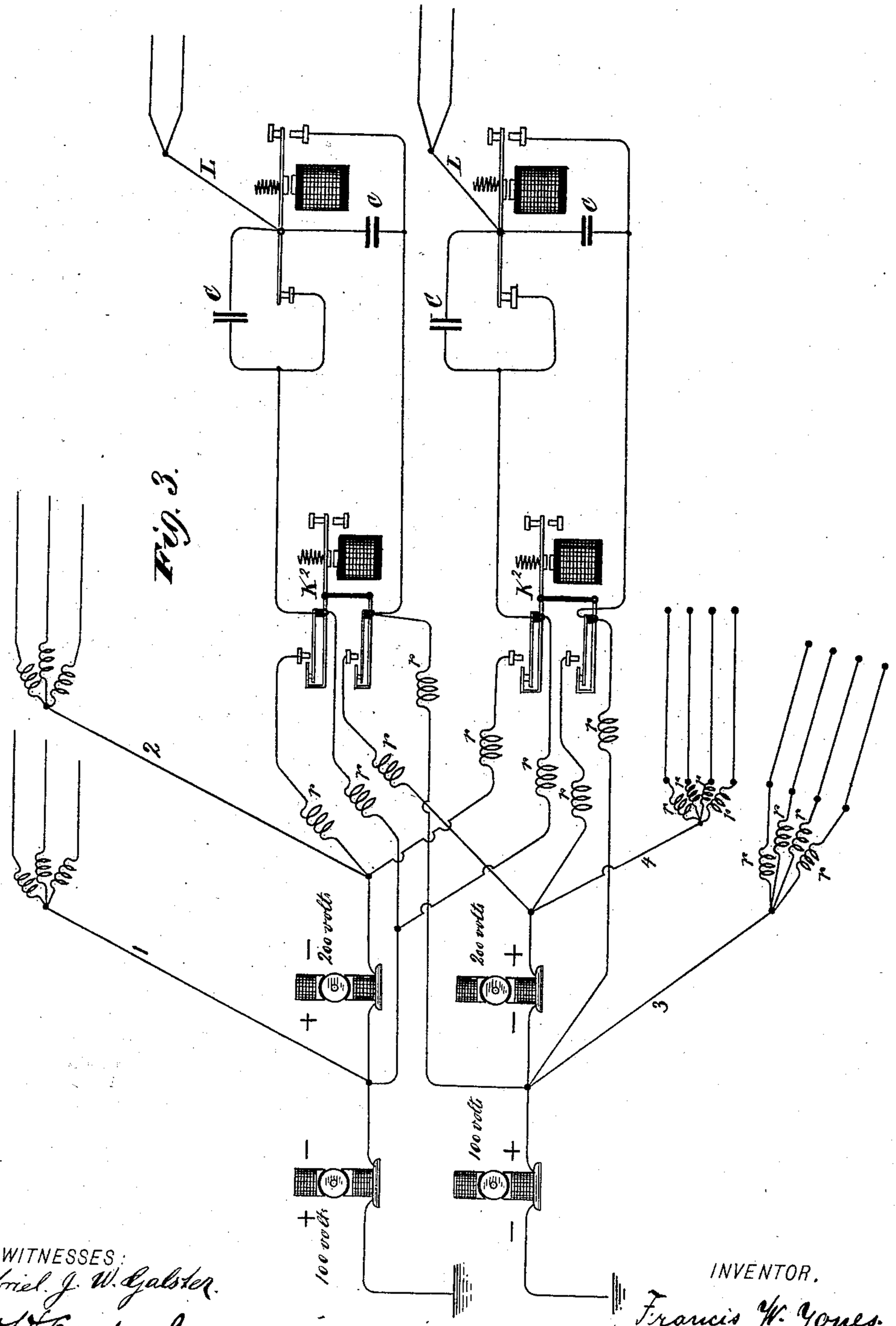
Fig. 3.



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UNITED STATES PATENT OFFICE.

FRANCIS W. JONES, OF NEW YORK, N. Y.

DYNAMO-TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 381,839, dated April 24, 1888.

Application filed July 13, 1887. Serial No. 244,159. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS W. JONES, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented a certain new and useful Dynamo-Telegraphy, of which the following is a specification.

The object of my invention is to provide a simple and practical arrangement of apparatus, whereby dynamo-machines or secondary batteries of low internal resistance may be employed for working duplex and quadruplex telegraphs.

It has heretofore been proposed to employ dynamo-machines for the purpose of working telegraph-lines by arranging a number of dynamo-machines in series with one another and taking off the various currents for the lines at various points of the series according to the potential desired. Other arrangements have been employed in which leaks to earth and artificial resistances are used for working quadruplex lines and use the full potential of the battery of dynamos at all times, the resistance being introduced when it is desired to reduce the tension in the line. The arrangements heretofore proposed are subject to various objections, which by my arrangement are avoided.

In my system I do not keep the full potential on the line at all times, but use the higher potential of dynamo only when the same is required for the purpose of operating one of the distant relays. My arrangement also eliminates the employment of artificial resistances in the line and the additional features of the leak or branch resistances to compensate for the employment of the same, thus greatly decreasing the amount of current used. The arrangements of dynamos and keys devised by me also afford a means whereby any number of single-line wires may be worked from the dynamos employed in working the quadruplex or duplex line or lines, and whereby also any number of quadruplex or duplex lines may be worked from the same sets of dynamos.

My invention consists in the peculiar arrangement of keys and dynamos, which will be described in connection with the accompanying drawings, and then specified in the claims.

Figure 1 is a diagram illustrating one arrangement of apparatus embodying my invention. Fig. 2 illustrates another arrangement differing from Fig. 1 in the fact that the dynamos are at no time used in series with one another. Fig. 3 is a diagram showing the manner of working two quadruplex lines from the same set of dynamos, and showing, further, the manner of attaching other circuits to the set of dynamos employed in working the quadruplex.

Referring to Fig. 1, K indicates a telegraph-key of any desired construction, whose normal or back contact is connected to a branch or wire, 2, leading to a dynamo-machine, A, and to the earth. The front contact of the key connects by a branch or wire, 3, with a dynamo, B, of substantially the same potential as A, but having its opposite pole connected to the key K, as indicated by the signs positive and negative.

In the normal position of the key K the dynamo A is connected to the line L, but on operating the key by any of the means known in the art the dynamo A is removed from connection to line by the breaking of the circuit at the back contact of the key, and the dynamo B is put to line through the closing of the front contact of the key. The key may be arranged with suitable springs, so as to be practically a continuity-preserving key—that is to say, so that there shall be no appreciable interval between the breaking of one connection and the making of the other.

As will be seen, the key K reverses the polarity of current flowing to the line L, and serves the purpose of the ordinary pole-changing key employed in quadruplex telegraphs.

In the branches or connections leading from the key K to the dynamo-machines A B is a tension-changing key. (Indicated by the letter K^2.) This key is provided with two sets of contacts, insulated from one another and included, respectively, in the branches 2 3. The two sets of contacts work together by any suitable means, and in practice would, as is well understood in the art, be mounted upon

the same lever; but for the sake of clearness I have shown them as mounted upon separate supports, connected by an insulating-link, M, whereby the two levers and their corresponding contacts are moved in unison.

The keys may be operated by any suitable means.

The set of contacts in the branch 2 control the connection of the dynamo-machine A^2 with said branch 2, which dynamo-machine has the same pole connected to the branch 2 as the dynamo A. The contacts are suitably constructed, so that when the key is at rest the circuit 2 shall include a branch around the dynamo containing an artificial resistance substantially equal to that of the dynamo A^2; but when the key is operated the branch containing the resistance is broken and the dynamo A^2 is included in the circuit or branch 2 with dynamo A, thus re-enforcing the potential of dynamo A.

The contacts of the tension-changing key K^2, included in branch 3, operate in the same manner upon a dynamo-machine, B^2, which is arranged to deliver a current of the same polarity as dynamo B in branch 3.

It will be understood that the dynamo-machines may be of any desired construction, with an internal resistance much less than that of ordinary batteries. Condensers are arranged in branches around the same, as shown, and serve to obviate the detrimental effects of the sparks at the contacts of the transmitters. The potential of dynamos A^2 B^2 may be, for instance, three hundred volts, while that of dynamos A B is one hundred volts. In that case when the key K is on its back contact dynamo A will send a current of one hundred volts' potential to line L, and if at the same time key K^2 be operated the potential for dynamo A^2 will be added to that of A, making a potential of four hundred volts. When the key K^2 returns to its normal position, dynamo A^2 is removed and the dynamo A sends its normal current to the line. If the key K be closed, the connection 2 is broken and dynamo B sends a current of negative polarity, but of a potential of one hundred volts to line. If now key K^2 be operated, this potential is re-enforced by that of the dynamo B^2 and becomes four hundred volts.

It will be seen from the foregoing that key K may send currents of opposite polarity to line irrespective of the position of key K^2, and that, likewise, key K^2 may increase the potential on the line whether that be a negative or a positive potential—that is to say, it may change the tension irrespective of the polarity. This arrangement therefore provides for the sending of two messages over the same wire, one by changes of polarity irrespective of tension, and the other by changes of tension irrespective of the polarity of the current. This is a system that is well understood in the art.

In the arrangement shown in Fig. 1 the dynamos A^2 B^2 are thrown into and out of connection with the branches 2 3, so that when connected they shall be in series with dynamos A B, which latter will therefore have to work under such conditions through the dynamos A^2 B^2. This feature is sometimes objectionable, and is entirely avoided by the arrangement shown in Fig. 2, where I have shown the dynamos A^3 B^3 as in independent branches to earth around dynamos A B. The contacts of the key K^2 are properly arranged, as indicated, so that when the keys are at rest the branches 2 3, leading from key K, shall connect to earth through the dynamos A B; but when the key is operated the connections from the dynamos A B shall be broken and the dynamos A^2 B^2 shall be connected directly to the branches 2 3. In this arrangement it is of course necessary that the contacts of the key K^2 should be continuity-preserving contacts—that is to say, should not disconnect one dynamo before connecting the other. Dynamos A^2 B^2 are arranged to deliver a current of the same polarity as dynamos A B, respectively. Their potentials may be, as indicated, three hundred volts, or might be four hundred, in which case the differences of potential on the line produced by the operation of the key K^2 would be the same as in Fig. 1.

In Fig. 3 two key systems connected to an arrangement of dynamos such as shown in Fig. 1 are indicated. Others might be similarly attached. Leading-wires 1 2 3 4 connect to the dynamo system, as shown, and serve for the attachment of single or duplex wires in the ordinary way. Artificial resistances for the purpose of equalizing the currents on the various circuits are indicated by the letter *r*. The potential delivered to said circuits of course depends upon the point of connection of the leader-wires to the dynamo system. Leaders 1 3 give a potential of one hundred volts and leaders 3 4 a potential of three hundred volts, which is the sum of the potential of the two dynamos in either branch. Condensers C may be placed in branches around the contacts of the key for the purpose of preventing any injurious spark.

I have described the employment of dynamos of low internal resistance; but it will be understood that the system is applicable to a case where secondary batteries of low internal resistance should be employed in the place of the dynamo.

By the arrangement shown in Fig. 2, where the dynamos A^2 B^2 are in sub-branches, it will be seen that I avoid entirely the necessity of either dynamo working through the other at any time whatever. If the resistance in the circuits of the two dynamos A A^2 should be different, an equalizing resistance, R^3, may be employed in the branch or connection to the dynamo of lower resistance for the purpose of equalizing the resistance in the two sub-branches. A resistance is used similarly with dynamos B B^2.

What I claim as my invention is—

1. The combination, with a key, K, having separate connections from its back and front

contacts, respectively, of dynamo machines of opposite polarity in said connections, respectively, and a tension-changing transmitter, K^2, having two sets of simultaneously-acting contacts placed in said connections, respectively, for varying the amount of electric energy, as described, irrespective of the position of the key K.

2. The combination of the key K and branches 2 3, leading, respectively, from the front and back contacts of the key to dynamo-machines or their equivalent, as described, having, respectively, opposite poles connected to the branches, and a tension-changing key having two sets of contacts insulated from one another in said branches and governing the connections of additional dynamo-machines with the branches, whereby the machine potential may be varied irrespective of the position of key K.

3. The combination of a key, K, having branches 2 3, leading, respectively, from front and back contacts of the same, dynamo-machines A B, of opposite polarity in said branches, respectively, dynamo-machines A^2 B^2, of the same polarity, respectively, as machines A B, and a tension-changing key having two sets of simultaneously-moving contacts insulated from one another and governing, respectively, the connections of machines A^2 B^2 with the branches, whereby the electric energy delivered to the back and front contacts of the key K may be varied, as and for the purpose described.

4. The combination, with the key K, having separate branches or connections from its front and back contacts, of dynamo-machines A B, or their equivalent, as described, of opposite polarity in said branches, respectively, a tension-changing key, K^2, having two sets of simultaneously-movable contacts insulated from one another and placed in said branches, and dynamo-machines A^2 B^2 in sub-branches leading from the key K^2 to earth independently of the dynamo-machines A B, as and for the purpose described.

Signed at New York, in the county of New York and State of New York, this 11th day of July, A. D. 1887.

FRANCIS W. JONES.

Witnesses:
WM. H. CAPEL,
FRANK. MACARTHUR.