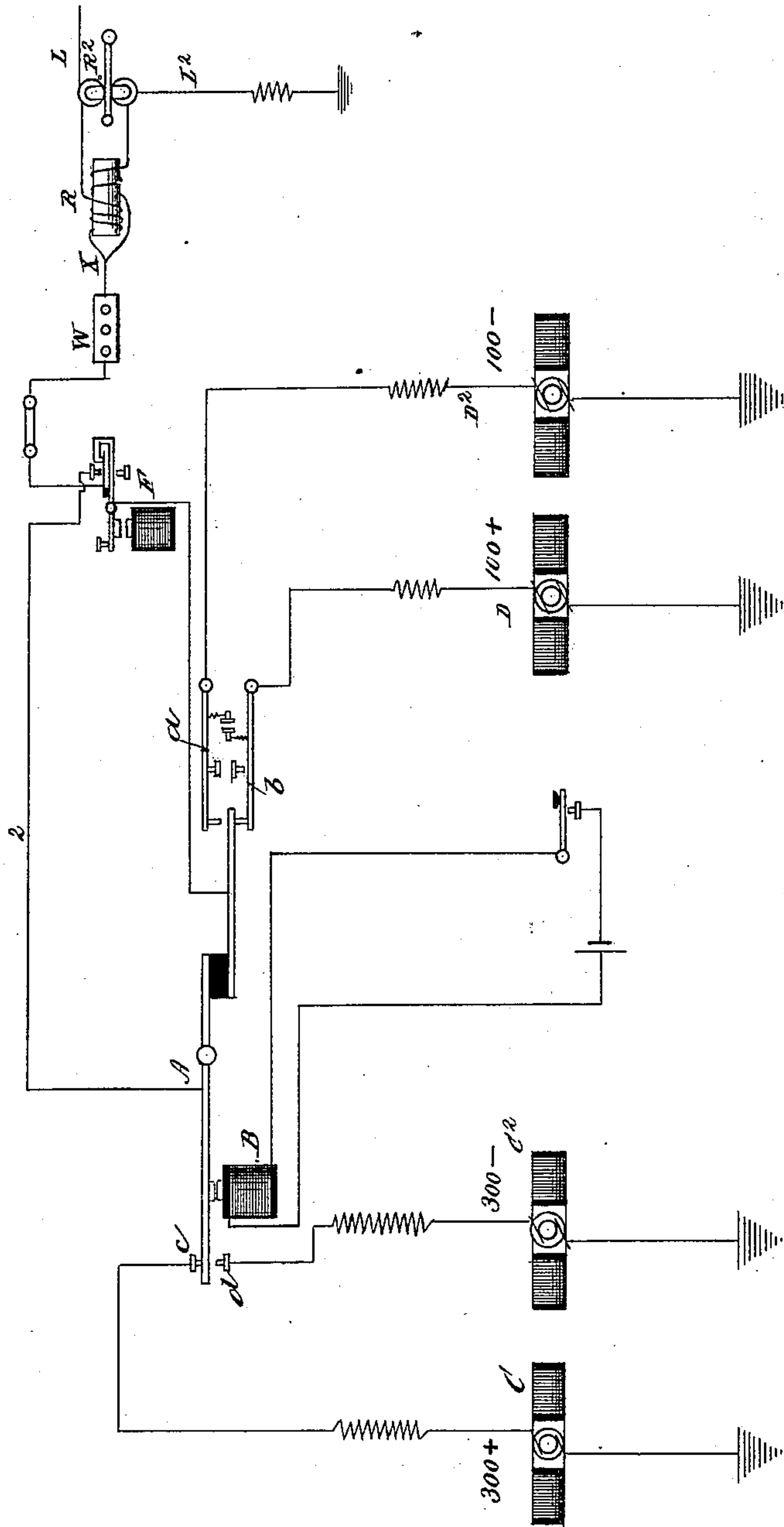


(No Model.)

F. W. JONES.  
DUPLEX AND QUADRUPLIX TELEGRAPH.

No. 426,819.

Patented Apr. 29, 1890.



Witnesses:  
D. W. Gardner  
J. H. Capel

Inventor:  
Francis W. Jones  
By H. C. Townsend Atty

# UNITED STATES PATENT OFFICE.

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

## DUPLEX AND QUADRUPLIX TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 426,819, dated April 29, 1890.

Application filed June 11, 1889. Serial No. 313,920. (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 certain new and useful Improvements in Duplex and Quadruplex Telegraphs, of which the following is a specification.

My invention relates to certain improvements in arrangements of resistance and construction of transmitting apparatus in duplex and quadruplex telegraphs, and is designed more particularly for use with that class of telegraphs in which dynamo-machines are used to supply the current for working the apparatus. In applying dynamo-machines for this purpose it is common to interpose artificial resistances to reduce the strength of the current passing through the apparatus in order to prevent injury to the same. It has heretofore been the practice to place such resistance in the main and artificial lines beyond the dividing-point of such lines.

My invention relates, first, to the location of this resistance; and it consists, essentially, in placing the same in the circuit between the dynamo or other source of current and the dividing-point of the main and artificial lines, where it may not only act to cut down the current, but will also operate to force more of the incoming current through the artificial line for the purpose of working the receiving-instruments. When this resistance is made as an adjustable resistance, it may also be readily employed to adjust the current to different circuits, as will hereinafter appear.

My invention relates, also, to the transmitting-instrument that is described in my prior Patent, No. 381,251, and which is provided with four sets of contacts, controlling, respectively, different sources of current.

The particular improvements constituting my present invention will be more particularly described in connection with the accompanying drawing, and then specified in the claims.

In the drawing I have shown in side elevation and plan a set of apparatus embodying my invention, the various connections of the apparatus being illustrated diagrammatically. The drawing shows the apparatus at one end of a quadruplex-telegraph line.

The transmitting apparatus consists of the following devices: A is the transmitter-lever suitably pivoted and operated by a local-circuit electro-magnet B, as well understood in the art. One part of said lever, electrically connected by a wire 2 with the front stop of a single transmitter F, plays between two solid or fixed contacts *c d*, connected, respectively, with two sources of current *C C*<sup>2</sup>, of opposite polarity, but of considerable potential. In the present instance these sources are supposed to be dynamo-machines of, say, three hundred (300) volts each. Another portion of said lever, as indicated, is insulated from the first and plays between two yielding or spring contacts *a b*, connected, respectively, with two other sources *D D*<sup>2</sup> of opposite polarity, respectively, but of different potential from the sources *C C*<sup>2</sup>.

The contacts *c d* are hard or unyielding contacts for two purposes—first, that the transmitter-lever A in playing between said contacts may act as a sounder-lever to permit the operator to read his own message, and, second, that there may be no short-circuiting from one dynamo *C* to the other *C*<sup>2</sup>. The make and break at the points *c d* is small, but is sufficient to obviate this short-circuiting to a great extent. By making the contact at the other portion of the lever work between two spring-contacts I obviate the difficulty which would arise from using four hard contacts, since in the latter case it is often impracticable to make the contacts bear evenly. This difficulty might be overcome by using separate levers, as suggested in my prior patent; but by my present arrangement of the two hard contacts and the two yielding contacts I am enabled to employ a single lever. The single transmitter F has its lever-hook connected to that portion of the transmitter A which plays between contacts *a b*, while the spring of transmitter F connects to the dividing-point of the main and artificial lines. The wire 2 connects to the stop, which is the front contact-stop of said transmitter, and moves the spring from contact with the hook or back-stop when the transmitter is operated. In this organization of circuits the transmitter A obviously determines the polarity of the current passing to the main line, while the transmitter F de-



termines the tension. The same construction of transmitter A could obviously be used with other arrangements of circuits, such as those described in my Patent No. 381,839.

5 The main line is indicated at L, and the artificial line containing the usual balancing-resistance at L<sup>2</sup>. The usual receiving-instruments connected into or between the main and artificial lines are indicated at R R<sup>2</sup>. The dividing-point of the main and artificial lines is at X, and between such point and the keys and dynamos is placed the adjustable artificial resistance W. By putting this resistance between the keys and the dividing-point in this  
15 manner any given keys and dynamos may be used on any circuit, either long or short, of high resistance or low resistance, provided the dynamo or source is of sufficient potential to yield an effective working-current over the  
20 highest resistance to be encountered. The resistance W not only reduces the strength of the current on short wires, so that the apparatus and cables will not become unduly heated by reason of carrying too heavy a current, but also permits the substitution of a  
25 circuit of greater resistance at pleasure. In this case it is only necessary to reduce the variable resistance until the distant office secures sufficient working margin. The distant station need not increase his battery or  
30 dynamo if it is of the right strength to work the circuit. The incoming current will divide at X, and part will continue around the convolutions in the artificial circuit, being  
35 forced into such circuit in greater amount by the resistance W, thus maintaining the same or very nearly the same maximum effect upon the home relays that would be produced if a direct ground was placed at X and an increased current passed only through the line  
40 convolutions of the receiving-instruments. This arrangement is one of great convenience in battery systems and is very valuable in the case of dynamos.

45 It will of course be understood that while I have shown but one set of apparatus as fed from the dynamo source, in practice a number would be fed from the same source, as described in my prior patents.

50 What I claim as my invention, is—

1. In a quadruplex or duplex telegraph apparatus, an artificial variable resistance W, interposed on the main line between the key system and the dividing-point of the main  
55 and artificial lines, in combination with dynamos and receiving-instruments, substan-

tially as described, for the purpose of regulating the outgoing current and forcing the incoming current into the convolutions of the artificial line around the receiving-magnets. 60

2. In a dynamo-telegraph system, the combination, with dynamos and key systems controlling the connections thereof with telegraph-lines, of an artificial variable resistance W, free from any shunting apparatus, interposed  
65 on the main line between the key system and the dividing-point of the main and artificial lines, substantially as described, for the purposes set forth.

3. The combination, in a dynamo-telegraph  
70 system, of dynamo-machines and transmitting-keys controlling the connections thereof with the line, and an adjustable variable resistance W, interposed in the main line between the key systems and the dividing-point  
75 of the main and artificial lines, substantially as described, for the purpose set forth.

4. In a quadruplex or duplex system of telegraphy, a pole-changing transmitter having a single transmitting-lever A, one of the conducting parts of which is insulated from the  
80 other, two hard or rigidly-fixed non-continuity-preserving contacts, between which one part of said lever is arranged to play, and two yielding or spring continuity-preserving  
85 contacts between which the other conducting part of said lever is arranged to play and each contact-point connected to a generator, all substantially as described, for the purpose specified. 90

5. In a pole-changing transmitter, in combination with a single transmitting-lever having one of its conducting parts insulated from the other, of two hard or rigid non-continuity-preserving contacts connected, respectively,  
95 to opposite polarities of high-pressure generators, between which contacts one conducting part of said lever is arranged to play, and two yielding or spring continuity-preserving contacts, respectively, connected to opposite po-  
100 larities of low-pressure generators, between which the other conducting part of said lever is arranged to play, all substantially as described and shown, for the purpose set forth.

Signed at New York, in the county of New York and State of New York, this 6th day of June, A. D. 1889. 105

FRANCIS W. JONES.

Witnesses:

WM. H. CAPEL,  
THOS. F. CONREY.