(No Model.)

W. MAVER, Jr.

BRANCH CIRCUIT FOR QUADRUPLEX TELEGRAPHS.

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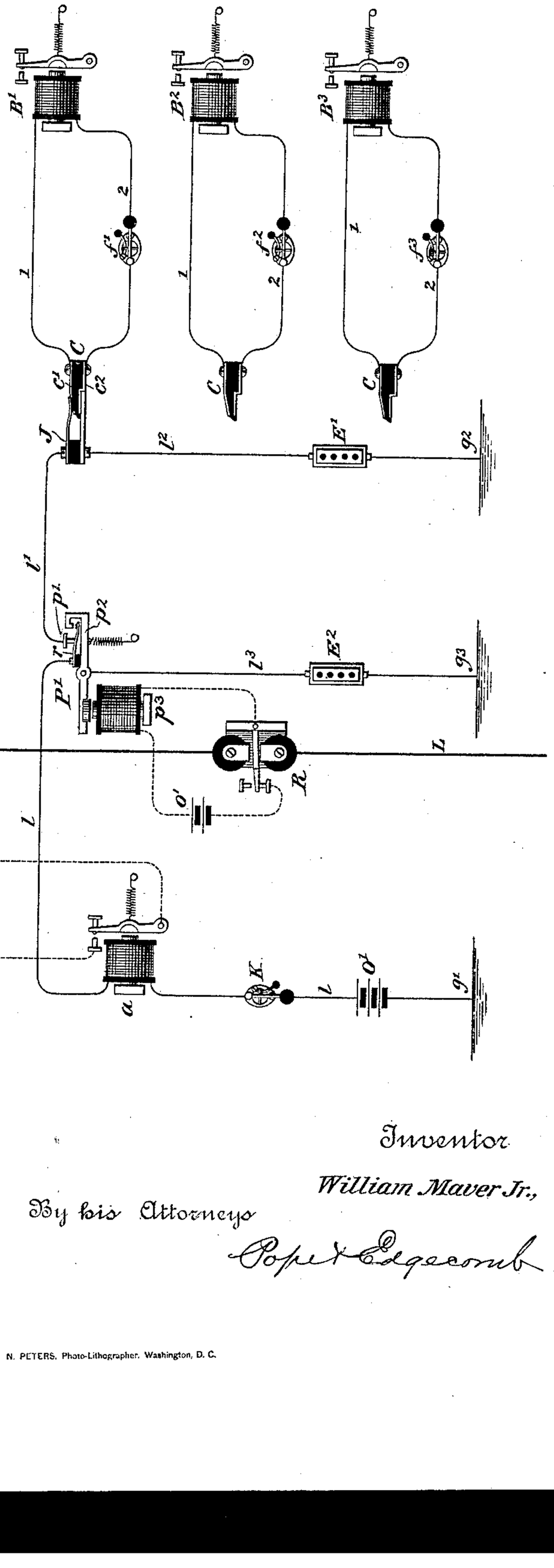

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UNITED STATES PATENT OFFICE.

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BRANCH CIRCUIT FOR QUADRUPLEX TELEGRAPHS.

SPECIFICATION forming part of Letters Patent No. 338,996, dated March 30, 1886.

Application filed October 9, 1885. Serial No. 179,417. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MAVER, Jr., a citizen of the United States, residing in Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Circuits for Quadruplex Telegraphs, of which the following is a specification.

In organizing duplex and quadruplex telegraph systems it is sometimes desired to extend the circuits to include instruments located in neighboring stations—such, for instance, as brokers' offices. This may be accomplished by operating, through a local circuit controlled by one of the relays of the system, a transmitter which in turn controls the connections of a circuit including relays for operating the instruments in the different sub-stations or lessees' offices. Where but one such office is required, little or no difficulty is experienced; but when the number is increased a serious difficulty arises from the change in resistance of the relay-circuit due to the cutting in and out of circuit of the different instruments, on account of the consequent readjustment of the main-line relay which is required.

The object of my invention is to provide means whereby the cutting in and out of circuit of the different branch or sub-station relays will not materially affect the resistance of the circuit in which they are included.

In carrying out the invention there is applied to one of the main-line relays a local circuit controlling the operation of a branch-line transmitter. This transmitter operates to make and break the circuit-connections of a battery through a series of branch-line relays in response to the movements of the main-line relay when the latter is actuated by incoming currents. A key and local relay are also included in this circuit, and the connections of the latter may be made and interrupted by this key for the purpose of transmitting simultaneously upon the main line through the instrumentality of the usual transmitter and upon the branch line in precisely the same manner as when the branch-line transmitter is operated. It is evident that under ordinary circumstances the cutting in and out of circuit of the branch-circuit relays would so vary the resistance in the circuit of the corresponding battery that a constant adjustment of the local relay would be required. To overcome this defect I include in the branch circuit an artificial resistance of such amount that the comparative change caused by the insertion and withdrawal of the relays will not be appreciable. As it is necessary that the main-line transmitter should not respond to the completions and interruptions of the branch circuit, occasioned by the movements of the branch transmitter in response to incoming main-line currents, means must be provided for maintaining the circuit of the branch-line battery complete in whatever position this transmitter may be. For this reason the branch-line transmitter is preferably a continuity-preserving key, and while its spring is connected through the local relay with the battery and its contact-point through the branch relays to earth, its lever is also connected with the earth through an artificial resistance. This last-named resistance is equivalent to the resistance in the portion of the circuit including the branch relays. In some cases the same artificial resistance may be employed, the lever being connected with the earth-conductor between the branch relays and the first-mentioned artificial resistance.

The accompanying drawing is a diagram illustrating the organization of the apparatus and circuits.

Referring to this diagram, L represents a main line of a quadruplex system, and R and P a polar relay and a pole-changing transmitter, respectively, applied thereto in the usual manner. The transmitter is designed to be operated by means of currents from a local battery, *o*, caused to traverse an electro-magnet, *p*. The circuit of the battery *o* is controlled by the lever of a relay *a*, included in the branch-line circuit *l*. The line *l* leads from one pole of a battery, O′, the other pole of which is connected with the earth at *g′*, through the coils of the relay *a* to the contact-spring *r* of the transmitter P′. The contact-point *p′* of this transmitter is connected by a conductor, *l′*, with one arm of a spring-jack, J. The other arm of the spring-jack is connected by a conductor, l^2, with the earth at g^2 through a resistance, E′. The lever p^2 of the transmitter P′ is connected with the earth

through a conductor, l^3, at the point g^3. An artificial resistance, E^2, is included in the conductor l^3. The transmitter P′ is operated by an electro-magnet, p^3, included in the circuit of a local battery, o', and the circuit-connections of this battery are controlled by the operation of the relay R.

Whatever currents are sent to line from the transmitter P do not affect the polar relay R, for the reason that it is differentially wound or otherwise made unresponsive to outgoing currents; but incoming currents cause the lever of the polar relay to make and break the connections of the battery o', thereby causing the transmitter P′ to be operated. When in the position shown in the drawings, the circuit of the battery O′ will be complete through spring r and stop p' of the transmitter P′, and thus to the spring-jack J. By operating the key K, which is included in the line l, the circuit of the battery O′ may therefore be made and broken. As represented in the drawing, the circuit is supposed to be open at the key K, and therefore the lever of the relay a is against its back-stop. By closing the key K, however, the transmitter P will be operated and currents sent upon the main line L.

B′, B^2, and B^3 represent three relays, designed to control the connections of loop or brokers' circuits. It may be desired to include one or more of these in the circuit controlled by the key K, or by the polar relay R. For this reason the conductors 1 and 2, which include the coils of the relays, respectively lead to the respective plates c' and c^2 of switch-pins C. These pins are designed to be inserted in the spring-jack J, any number at a time. When more than one is placed in the jack, they are placed with their faces in contact, so that the relays will be included in series. When, therefore, currents are transmitted over the line I′, the relays B′, B^2, and B^3 will respond, provided they are included in the circuit. Suitable keys, f', f^2, and f^3, are employed for interrupting the circuit thus formed, for the purpose of breaking in and transmitting from the office containing the relays, as desired.

It is evident that the resistance included in the line will be varied by the insertion and removal of the various relays B′, B^2, and B^3. Difficulty has been experienced in maintaining the adjustment of the relay a on this account. For this reason I insert in the conductors l^2 and l^2, respectively, the resistances E′ and E^2, and these are of such proportion that the comparative change made by the insertion of the coils of the relays B′, B^2, and B^3 will not materially affect the strength of current sent to line, and whether the transmitter P′ be in position to connect the conductor l with the conductor l' or with the conductor l^3, the total resistance of the circuit of the battery O′ will be approximately the same on account of the high resistance included in the conductors l^2 and l^3. It is evident that the conductor l^2 might be led back to the conductor l^3 at a point above the resistance E^2, and in this manner the resistance E′ might be dispensed with.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a relay, a transmitter controlled thereby, a battery the circuit-connections of which are controlled by the movements of said transmitter, an artificial resistance included in the said circuit, a series of relays and means for including the same in said circuit between the transmitter and the earth.

2. The combination, substantially as hereinbefore set forth, with the main line of a telegraph system and a relay included therein, of a series of relays for controlling branch circuits, a battery, a continuously-preserving transmitter for controlling the connections of said battery, an artificial resistance through which the circuit of said battery is completed, and means for inserting more or less of said series of relays in the circuit of said battery.

In testimony whereof I have hereunto subscribed my name this 8th day of October, A. D. 1885.

WILLIAM MAVER, Jr.

Witnesses:

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