THE UNITED STATES OF AMERICA.

No. 426,583

To all to whom these presents shall come:

Whereas Minor M. Davis of Brooklyn, New York, has presented to the Commissioner of Patents a petition praying for the grant of **Letters Patent** for an alleged new and useful improvement in

Switch Apparatus

a description of which invention is contained in the Specification of which a copy is hereunto annexed and made a part hereof, and has complied with the various requirements of Law in such cases made and provided, and

Whereas upon due examination made the said Claimant is adjudged to be justly entitled to a Patent under the Law.

Now therefore these **Letters Patent** are to grant unto the said Minor M. Davis his heirs or assigns for the term of Seventeen years from the twenty-ninth day of April one thousand eight hundred and ninety the exclusive right to make, use and vend the said invention throughout the United States and the Territories thereof.

In testimony whereof I have hereunto set my hand and caused the seal of the **Patent Office** to be affixed at the City of Washington this twenty-ninth day of April in the year of our Lord one thousand eight hundred and ninety and of the Independence of the United States of America the one hundred and fourteenth.

Cyrus Bussey
Assistant Secretary of the Interior.

Countersigned. Robert J. Fisher
Acting Commissioner of Patents.

(No Model.)

5 Sheets—Sheet 1.

M. M. DAVIS.

SWITCH APPARATUS.

No. 426,583. Patented Apr. 29, 1890.

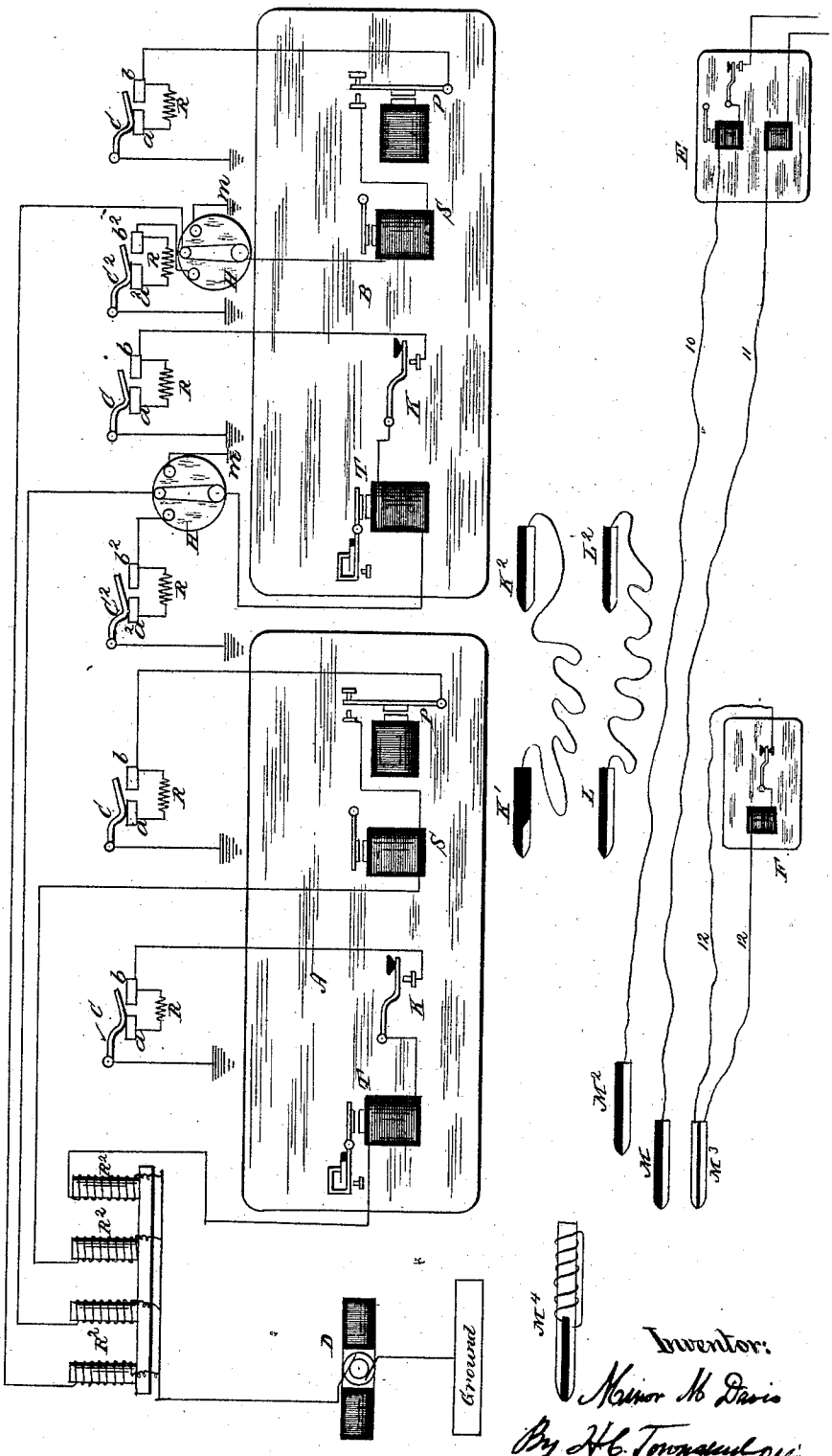

Fig. 1.

Witnesses:
D. W. Gardner
Thos. H. Capes

Inventor:
Milton M. Davis
By H. C. Townsend Atty

(No Model.)

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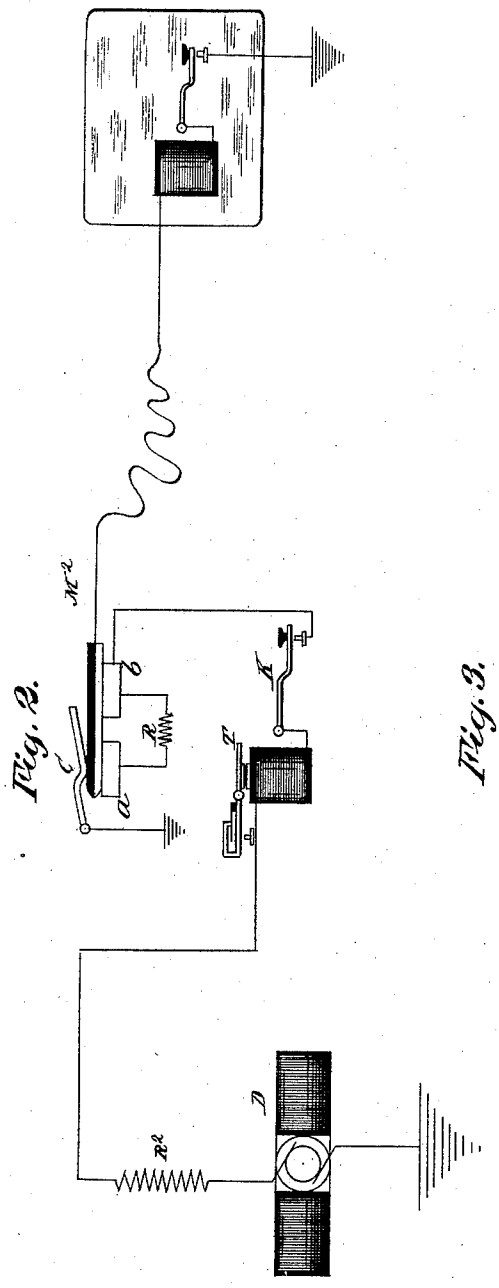

Fig. 2.

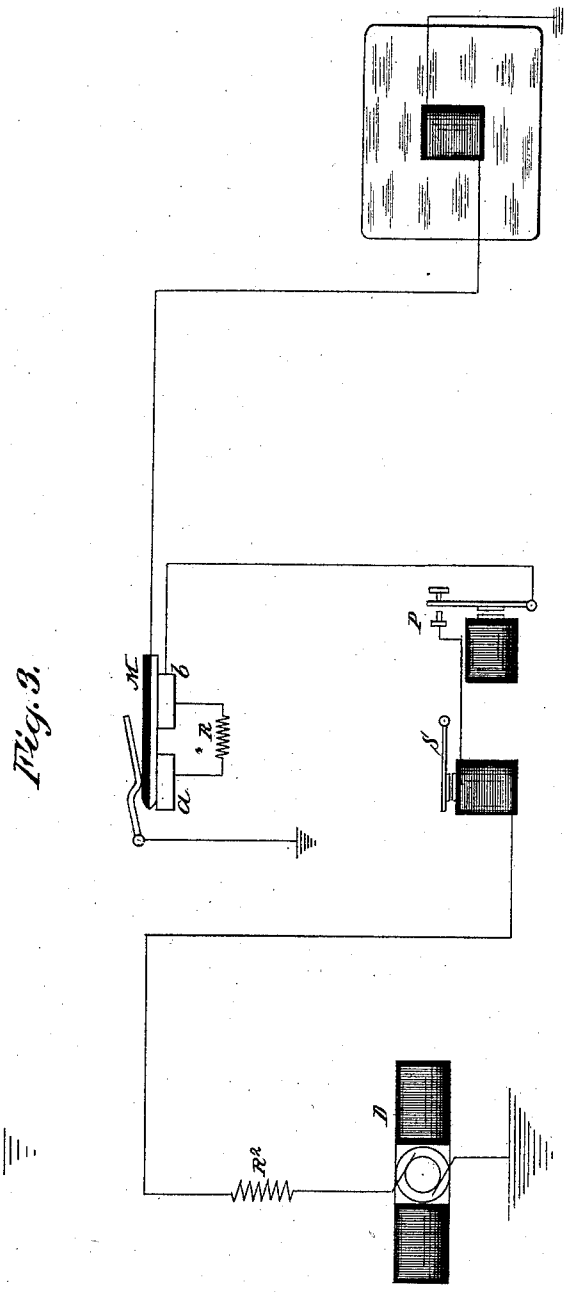

Fig. 3.

Witnesses:
D. W. Gardner
Thos. H. Capes

Inventor:
Meinor M. Davis
By H. G. Townsend Atty

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M. M. DAVIS.

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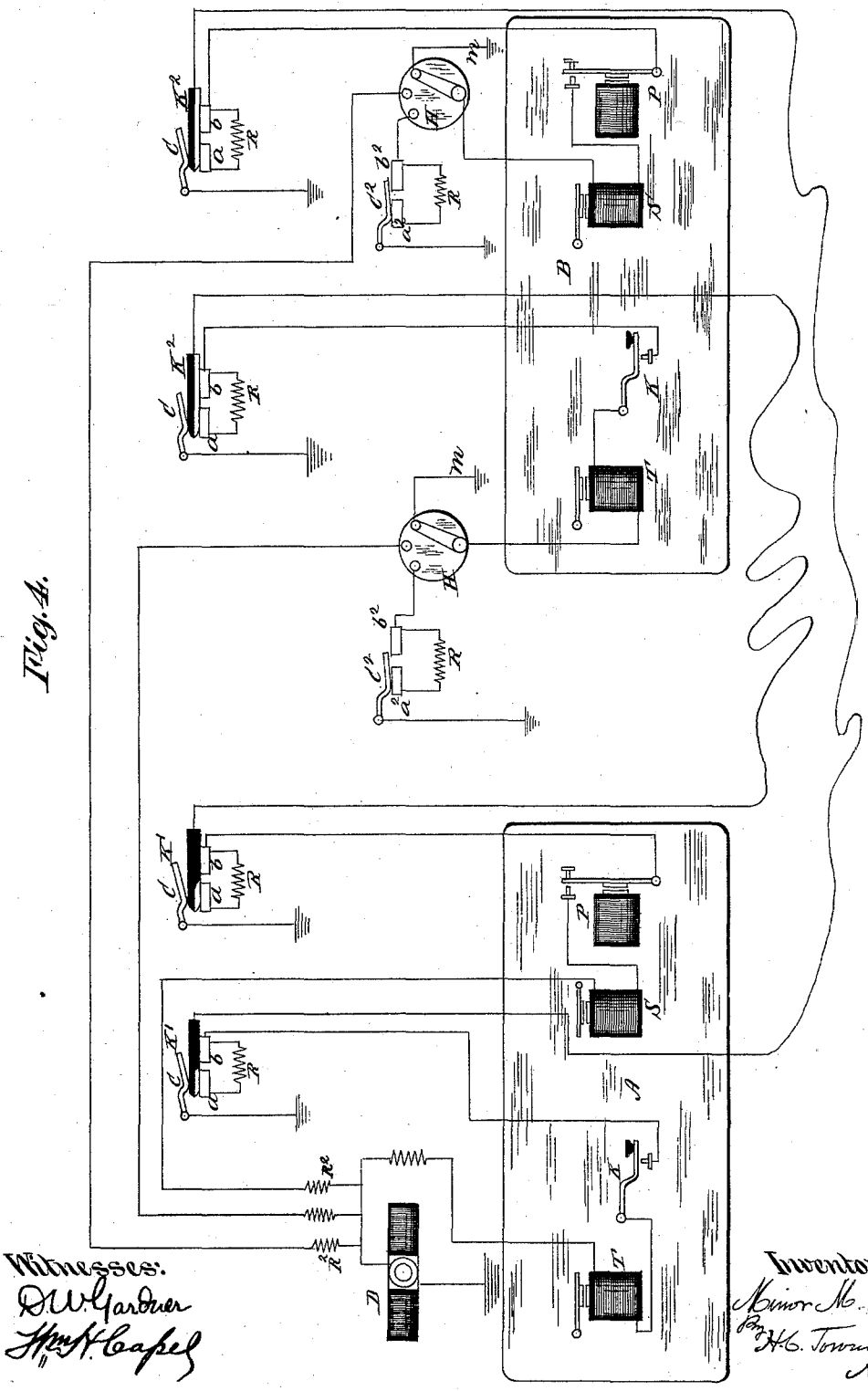

Fig. 4.

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

Inventor:
Minor M. Davis
By H. C. Townsend
Atty

(No Model.) 5 Sheets—Sheet 4.

M. M. DAVIS.

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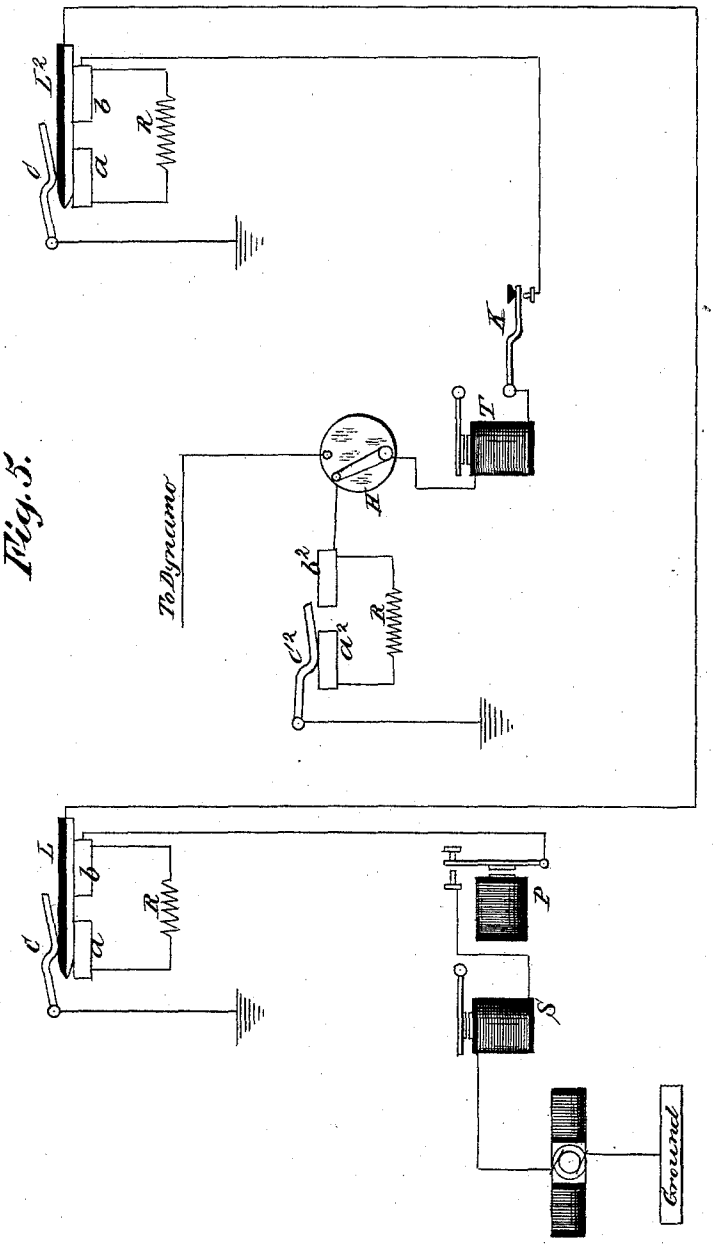

Fig. 5.

Witnesses:
D. W. Gardner
Thos. H. Capes

Inventor:
Minor M. Davis.
By H. C. Townsend
Atty

(No Model.)

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M. M. DAVIS.

SWITCH APPARATUS.

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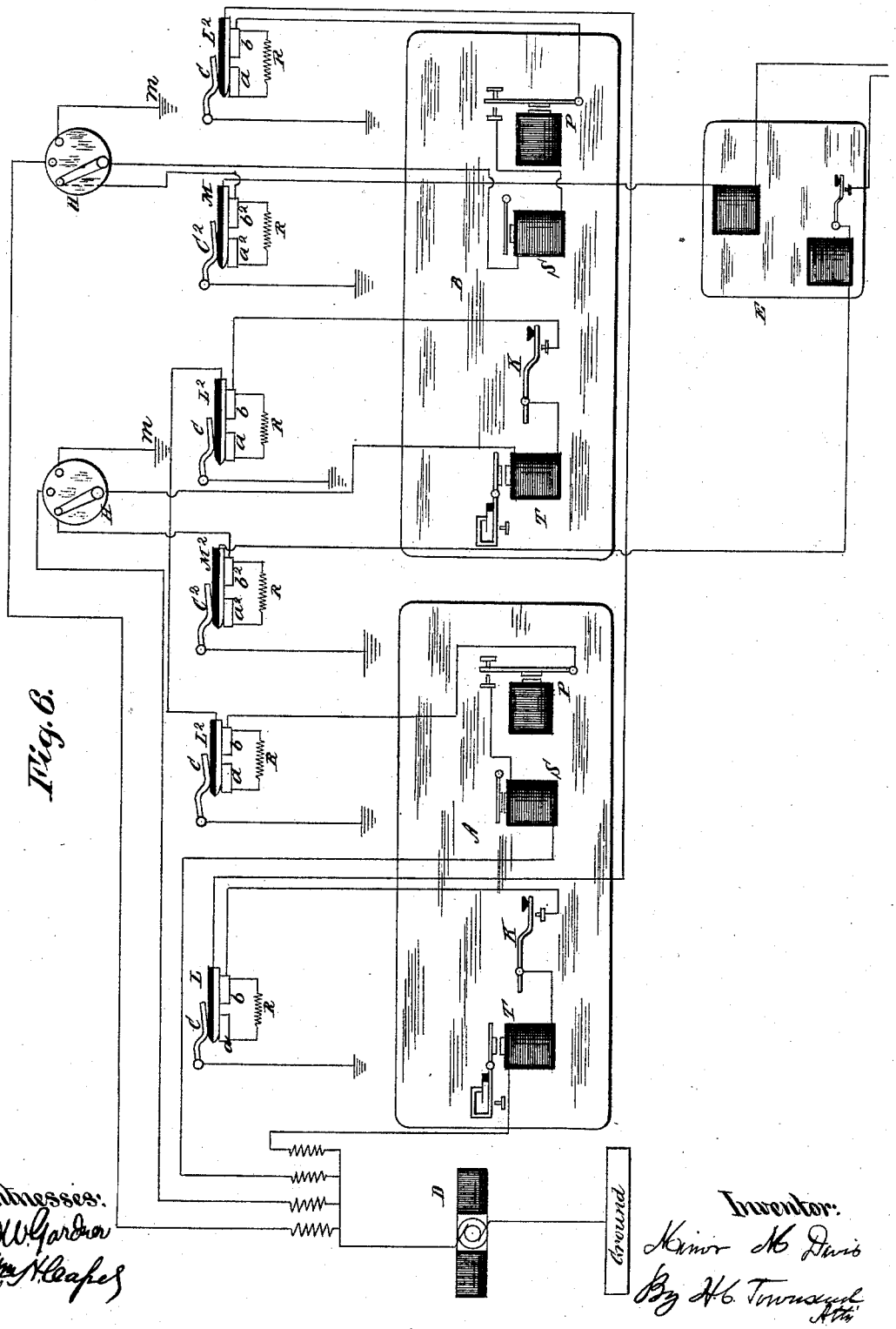

Fig. 6.

Witnesses:
D. W. Gardner
Thos. H. Cooper

Inventor:
Homer M. Davis
By H. G. Townsend
Atty

UNITED STATES PATENT OFFICE.

MINOR M. DAVIS, OF BROOKLYN, NEW YORK.

SWITCH APPARATUS.

SPECIFICATION forming part of Letters Patent No. 426,583, dated April 29, 1890.

Application filed June 11, 1889. Serial No. 313,827. (No model.)

To all whom it may concern:

Be it known that I, MINOR M. DAVIS, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Switch Apparatus, &c., of which the following is a specification.

My invention relates to apparatus designed, primarily, for use at a main telegraph-office in which local circuit and branch lines are supplied from dynamo-machines.

In the use of the apparatus at a telegraph-office it frequently becomes necessary to connect various local circuits, as in the case of duplex or quadruplex locals, in order that a message may be repeated from one line to another, or to connect a branch or office line to a local circuit in such way that the leg or loop leading to the branch office shall become in effect an extension of the sending or receiving local of a duplex or quadruplex set. In the absence of any special provision these various changes would obviously be accompanied by changes in the resistance in circuit with the dynamo, and consequently damaging or troublesome changes in the flow of current in the circuit for which it is necessary to make some compensation or adjustment. Thus, for instance, the introduction of a branch-office loop or wire would increase the total resistance and perhaps cut down the current below the working margin; or if the current flows in proper amount when the branch wire is in circuit with the local sending or receiving circuit the withdrawal of the branch wire would so reduce the resistance that the current would increase sufficiently to heat the local-circuit instrument. To overcome this difficulty, compensating or equalizing resistances may be introduced or withdrawn under the various conditions, so that the current shall not differ greatly.

To interpose or withdraw such resistances automatically is the object of my invention; to which end my invention consists in the combination, with the spring-jacks through which the local circuits are formed, of suitable equalizing-resistances permanently connected to the normal spring-jack circuits or to the spring-jack jaws and automatically shunted or cut out of or into circuit by the spring-jack wedge when the latter is inserted into or withdrawn from the spring-jack.

My invention consists further in a certain novel form of spring-jack involving the use of a double contact-jaw, or jaw made in two pieces insulated from one another, but adapted to be connected by the live or conducting side of a wedge when the latter is inserted into the spring-jack.

My invention consists, also, in certain improved combinations of switches and spring-jacks, whereby the various connections may be made, and whereby, among other things, a branch wire or loop may be connected into a local formed of two locals connected for repeating, and the equalizing-resistances may at the same time be properly manipulated to keep the strength of the current uniform.

In the accompanying drawings, Figure 1 is a general diagram of apparatus and circuits embodying my invention. Figs. 2, 3, 4, 5, and 6 are diagrams illustrating various conditions of the same in use.

C indicates the movable jaws of a number of spring-jacks, and *a b* two opposite contact jaws or plates of each jack, which plates are separated or insulated from one another, as shown, but are connected to the terminals of an artificial resistance R, preferably adjustable, and forming the equalizing or compensating resistance. The movable jaw C normally bears on plate *a*. The supplemental plate *b* is adapted to be engaged by the spring-jack wedge when inserted with the jack and to make contact with a conducting side thereof when the conducting side is of sufficient length.

D is a dynamo-machine or other source of electrical energy, as shown through various resistances R^2 R^2, &c., with the various local circuits to be operated. Such resistances are employed for the purpose of cutting down the dynamo current to prevent injury to the apparatus under abnormal conditions or to adjust the current to locals of different resistance. The various local circuits are completed through the resistances R and the spring-jack jaws C to earth or return-circuit.

A B indicate, respectively, the local-circuit apparatus of two sets of duplex or quadruplex apparatus. In the case of a quadruplex

telegraph they may be either the No. 1 side or the No. 2 side. The transmitter indicated is, however, the transmitter for the No. 2 side working by changes of tension. Main lines and other parts are omitted for the sake of simplicity.

In the set A the sounder in the receiving-local is indicated at S and the relay through whose contacts the local is formed by the letter P. The transmitting-local of this set includes the usual Morse key K and the magnet T, which works the transmitter-lever. Similar instruments in the two locals of the set B are indicated by the same letters.

In connection with the set B, which may of course be connected to any main line by the usual switch-board, are shown supplemental spring-jacks C^2 C^2, similar to those already described. By means of suitable switches H in the locals the local may be disconnected from the dynamo and connected to the supplemental jack, its circuit then being through such jack, resistance, and ground when no wedge is in place. By means of a suitable switch in the local circuit, which switch may be the lever of H, working in connection with a stud in the switch-board connected to earth at *m*, each local of set B may be connected directly to earth.

K' K^2 indicate a pair of spring-jack wedges connected by a suitable flexible cord, and each having a live or conducting side and a dead or insulated side. The live side of K' is short and adapted to bear on plate *a* of the spring-jack, being out of contact with *b* when it is inserted. The live side of K^2 is longer and adapted to bear on both *a* and *b*, so as to connect them directly and shunt resistance R.

L L^2 is another pair of wedges connected electrically by a flexible cord and each like wedge K^2.

M is a wedge like K^2, connected to a branch wire or leg 11, leading to the receiving side of a branch office E, at which it is desired to receive a message received at the main office on one of the sets of duplex or quadruplex telegraph apparatus, while M^2 is a similar wedge connected to the wire 10, leading to the sending side of the branch office.

M^3 is a wedge having both sides formed of conducting material for use with a loop or metallic circuit 12, formed through the sending or receiving apparatus of a branch office F.

It will be understood that the resistance R should be approximately equal to the resistance of the branch or local which is to be placed in circuit with the local to which said resistance R is normally connected. Adjustments of such resistance may be made by the ordinary means; or minor adjustments of resistance may be made, when necessary, by resistance-plugs such as indicated at M^4, and consisting of a coil of fine wire on a handle terminating in two plates insulated from one another like M^3, and adapted to be inserted into a spring-jack in contact with a conducting side of a wedge already inserted or separately.

Fig. 2 shows the condition when the sending side of the branch office is in circuit with the sending-local of a duplex or quadruplex set. The resistance R, approximately equal to the resistance in the sending side of the branch-office leg, is shunted, and the current is the same as when the local circuit is completed at the main office through the spring-jack.

Fig. 3 shows the receiving side of the branch office similarly connected to and forming an extension of the receiving-local for a duplex or quadruplex set. It is obvious that a loop could be connected to the local by a wedge M^3, and that the equalizing-resistance R would be shunted in the same way and be automatically restored to the local circuit on withdrawal of the wedge. The only difference in the circuits would be that the circuit, instead of going to ground at the branch office, would return by one side of the loop and go to ground through the jaw C of the spring-jack.

Fig. 4 shows the two sets connected by wedges K' K^2 for repeating from one set to the other. The locals of one set, as B, are disconnected from the dynamo by the switches between the local-circuit apparatus and dynamo, and the side so disconnected is connected directly to earth or return-wire. The connected locals are fed through the dynamo-connections of the other set. On tracing the circuits shown it will be found that the receiving-local of set A finds circuit through its resistance R, which is not cut out by K', through the sending-local of set B, and by switch H directly to earth or return-wire and back to the dynamo. The resistance R at set B is cut out by wedge K^2. In a similar way the circuit of the sending-local of set A finds circuit through the receiving-local of set B and to ground through the grounding or disconnecting switch of each receiving-local.

On disconnecting the sets the switches of set B are turned to connect the locals directly to the dynamo. In each case it will be seen that one of the equalizing-resistances only is retained in circuit, the other being removed, so as to leave the resistance of the connected locals substantially the same as each of them when disconnected from one another. There is of course the added resistance of the instruments themselves and connecting-wire on one local; but the artificial resistances R are made large as compared with these. The difference of total resistance need not be sufficiently large to produce any harmful effect.

The locals might be connected by the wedges L L^2, as shown in Fig. 5, and these are preferably employed when it is desired to leave the sets in condition for connection of a branch wire to the connected locals, so as to form an extension of the local after the manner shown in Fig. 6.

In Fig. 5 the local of one set, as B, is connected to the supplemental spring-jack, and through the resistance connected to the ground by means of the shifting switch H in the local circuit to the dynamo. The sending and receiving local of one set may be both connected to the locals (receiving or sending) of the other in the same way. As both wedges $L L^2$ here act to cut out equalizing-resistances, and as spring-jack C^2 retains its resistance R in circuit, the practical result is the same as in the case of Fig. 4, but with the addition that, as shown in Fig. 6, the branch circuit may be made an extension of each connected pair of locals by simply inserting a wedge M or M^2 into C^2, so as to cut out resistance R connected therewith in the same manner as was done with the resistance of C in the case of Figs. 2 and 3.

The purpose of connecting in the manner shown in Fig. 6 is to permit the branch office to also receive the message received in the set B and repeated by set A.

While I have described my invention as applied to telegraph apparatus, I do not limit myself in this respect, since it is obvious that the same combinations of circuits and devices might be used in connection with other apparatus.

What I claim as my invention is—

1. In an electrical switch apparatus, the combination, with a spring-jack having one of its contact-jaws subdivided, and a branch or circuit connecting the divisions of the contact, of a wedge having a live side adapted to bear on both subdivisions simultaneously, and an appendant circuit, substantially as shown, for the purpose of replacing the former circuit with the latter.

2. The combination, in a spring-jack, of a contact *a*, a jaw normally bearing on the same, a second contact *b*, connected with the first through a separate conductor, and a spring-jack wedge, as and for the purpose described.

3. The combination, with telegraph local and branch circuits supplied from dynamos, of spring-jacks in the several circuits, equalizing-resistances in the permanent spring-jack connections, and spring-jack wedges for shunting or cutting out said resistances.

4. The combination, with telegraph local and branch circuits, of spring-jacks in said circuits, equalizing-resistances in the circuits leading to the spring-jack jaws, and spring-jack wedges controlling said resistances.

5. The combination, with the locals, spring-jacks, and connecting-wedges, of a supplemental spring-jack and a switch in one local for disconnecting such local from its source of supply and connecting to the supplemental spring-jack.

6. The combination, with the local circuit normally completed to ground or return through a spring-jack, of a circuit-breaking switch in the connection to the dynamo, a ground-circuit, and a switch-contact whereby said ground may be substituted for the connection to the dynamo.

7. The combination, with the local circuits normally completed through spring-jacks and equalizing or substitute resistances, of a supplemental spring-jack, an equalizing-resistance normally in the circuit thereof, and a spring-jack wedge therefor having connection to a branch or loop wire, as and for the purpose described.

8. In a telegraph-station apparatus, the combination, with duplex or quadruplex sending and receiving locals, of spring-jacks through which said locals are normally completed, and equalizing-resistances placed in the normal spring-jack circuits and controlled by the spring-jack wedges, for the purpose described.

9. In an electrical switching apparatus, the combination, with the spring-jack and connecting-wedges, of the supplemental contact *b*, connected to the main contact through a resistance, as and for the purpose described.

10. In an electrical switching apparatus, the combination, with a series of circuits, each completed through the jaws of a spring-jack, of equalizing-resistances placed in the connections between the divisions of the subdivided jaw of said spring-jack in each circuit, and connecting-wedges arranged to automatically cut out said resistances on the insertion of the wedges, as and for the purpose described.

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

MINOR M. DAVIS.

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