(No Model.) 3 Sheets—Sheet 1.

H. J. HAIGHT.

ELECTRIC SWITCH.

No. 467,504. Patented Jan. 26, 1892.

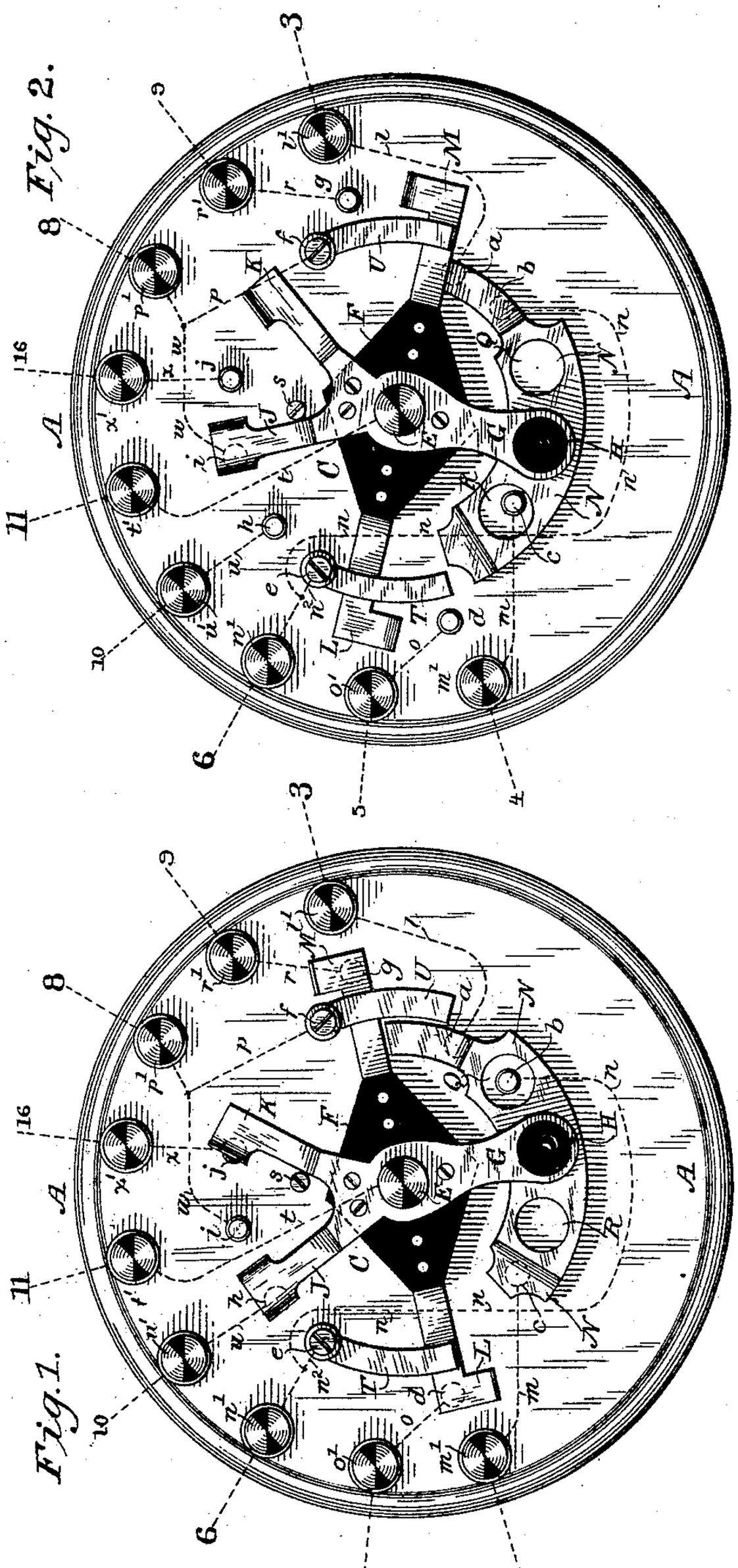

Fig. 1.

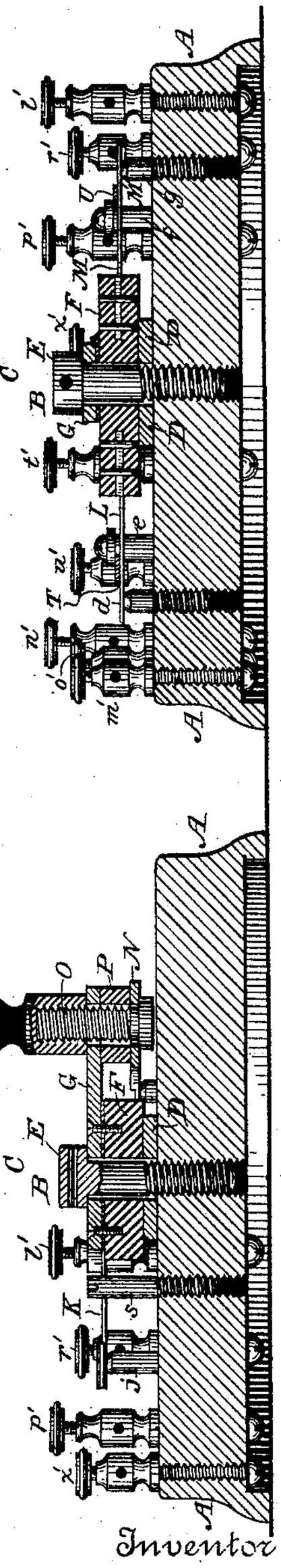

Fig. 2.

Fig. 4.

Fig. 3.

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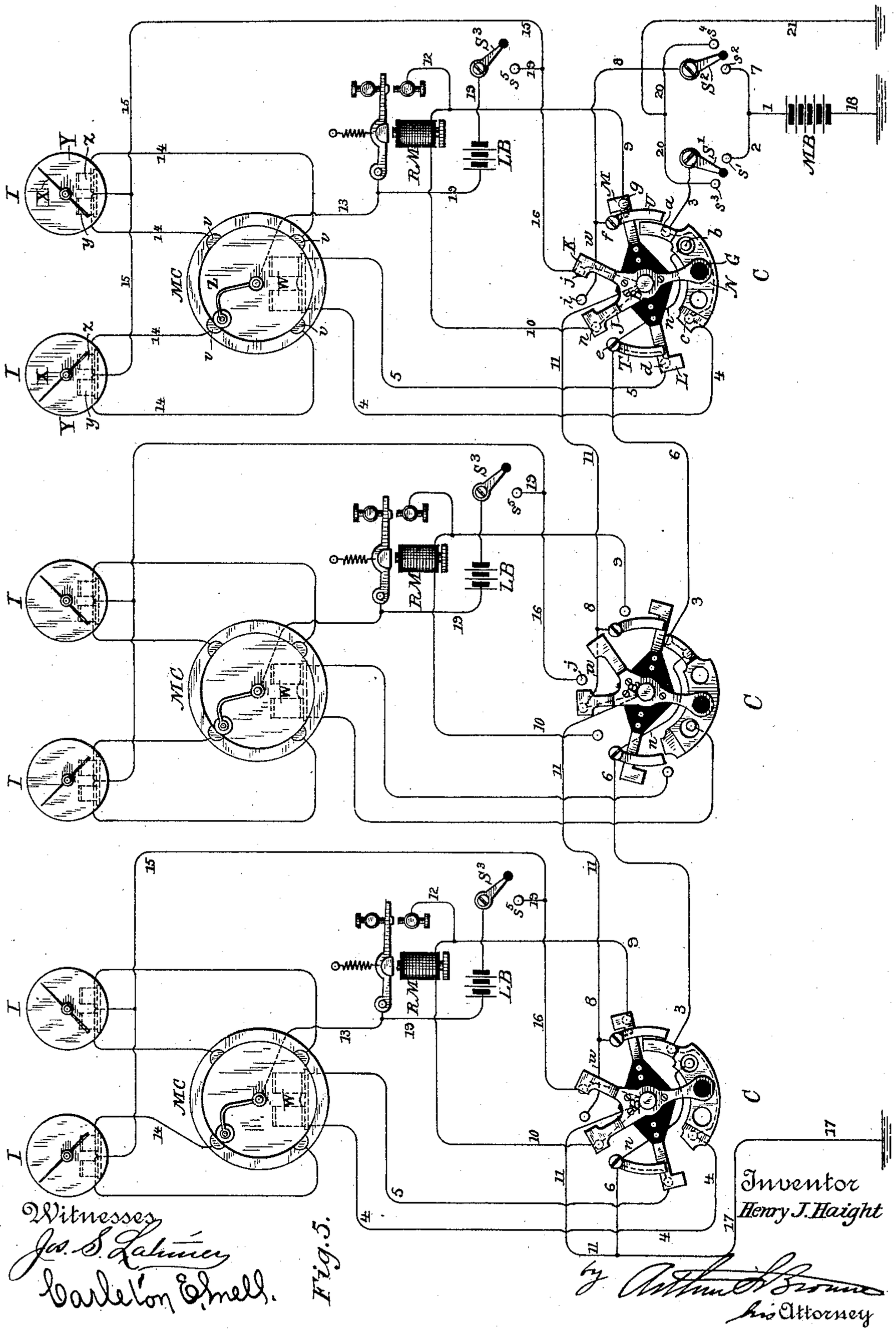
(No Model.) 3 Sheets—Sheet 2.

H. J. HAIGHT.

ELECTRIC SWITCH.

No. 467,504. Patented Jan. 26, 1892.



Witnesses
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Fig. 5.

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(No Model.) 3 Sheets—Sheet 3.

H. J. HAIGHT.

ELECTRIC SWITCH.

No. 467,504. Patented Jan. 26, 1892.

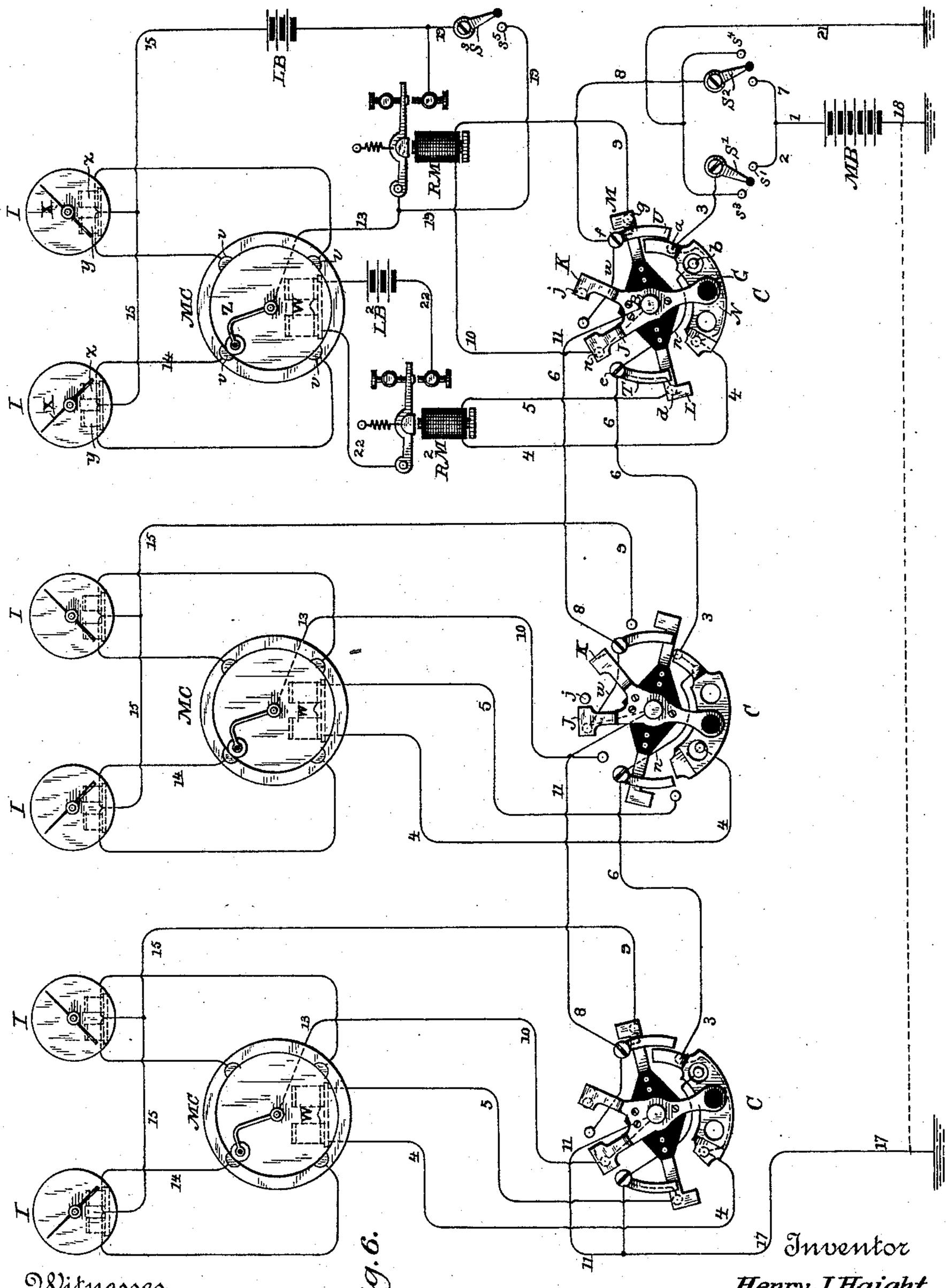

Fig. 6.

Witnesses
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UNITED STATES PATENT OFFICE.

HENRY JANSEN HAIGHT, OF NEW YORK, N. Y.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 467,504, dated January 26, 1892.

Application filed December 24, 1890. Serial No. 375,728. (No model.)

To all whom it may concern:

Be it known that I, HENRY JANSEN HAIGHT, of the city, county, and State of New York, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

The object of the present invention is to produce a switch for use in connection with electric indicating, telegraphing, signaling, or telephonic circuits, wherein a plurality of local circuits are connected with one or more line-circuits.

The object of the improved switch is to cut out a local circuit or a group of local circuits without affecting the continuity of the line-circuits.

The improved switch and its mode of application are illustrated in the accompanying drawings, wherein—

Figure 1 is a plan view of a switch-board, showing the improved switch in its closed position. Fig. 2 is a similar view showing the switch in its open position. Figs. 3 and 4 are vertical sections of the switch-board and switch in planes at right angles to each other. Fig. 5 is a diagram showing the improved switches in connection with a system of circuits for electric indicating. Fig. 6 is a similar diagram showing a modified arrangement of electric indicating-circuits.

First will be described the mechanical construction of the improved switch, and then its mode of operation and connection with the systems of circuits.

A is a switch-board of suitable insulating material, such as wood, and of a proper size and shape. To this switch-board is attached a perpendicularly-projecting spindle B.

C is a switch as a whole, which is mounted and turns on the spindle B, being held and guided thereon by a metallic plate D and the head E of the spindle.

The central hub or body portion F of the switch, which immediately surrounds the spindle, is composed of hard rubber or other suitable insulating and non-conducting material. To this hub F is secured a metallic crank arm or lever G, which carries the manipulating-knob H, of hard rubber or other non-conducting material. The hub and arm G serve as supports for a plurality of metallic contact-plates, which are insulated from each other as required, and which partake of the rotary movements of the hub and manipulating-arm.

J and K are two branch arms of a single contact-plate, which is secured to the hub immediately beneath and in contact with the manipulating-arm. These contact-arms are thus in metallic and electric connection with the spindle B, since the metallic head E thereof is in frictional contact with the upper surface of arm G. These contact arms or plates J and K extend out from the hub opposite to the arm G.

L and M are two contact-plates on opposite sides of the hub, which are attached to the hub, as shown in Fig. 4, so that they are insulated from each other.

Beneath the knob H the arm G carries a curved contact-plate N, which is supported from the arm by means of a hard-rubber screw O, which screws into the knob H, a hard-rubber washer P being interposed between the arm G and the contact-plate N. This plate has two apertures Q and R, the functions of which will hereinafter appear. The plate N, it will be seen, is insulated from the other contact-plates J, K, L, and M. The movement of the switch in either direction is limited by a stop-pin *s*, which is located between the two contact-arms J and K.

Co-operating with the plate N are three electrodes *a b c*, which are secured to the board A. When the switch occupies the position shown in Fig. 1, the electrodes *a* and *c* are both in contact with the plate N. The electrode *b*, however, is not in contact, registering with the aperture Q. Consequently the two electrodes *a* and *c* are in electric connection with each other through the plate N. Electrode *a* is connected by wire 1 and binding-post *l'* with main-circuit wire 3, and electrode *c* is connected by wire *m* and binding-post *m'* to local-circuit wire 4. Consequently in the position of the switch shown in Fig. 1 main-circuit wire 3 is connected with local-circuit wire 4. When, however, the switch

is moved to its open position, as shown in Fig. 2, the electrodes *a* and *b* are in contact with plate N and electrode *c* is cut out, since it registers with aperture R. Electrode *b* is connected by wire *n* and binding-post *n'* with main-circuit wire 6. Consequently when the switch is in this position the main-circuit wires 3 and 6 are connected and the local-circuit wire 4 is cut out.

The contact-plate L co-operates with the electrodes *d* and *e*. The electrode *e* carries a spring-metal tongue T, which at all times bears upon the plate L. Electrode *d* is connected by wire *o* and binding-post *o'* with local circuit 5, and electrode *e* is connected by wire n^2 and binding-post *n'* with main-circuit wire 6. When the switch is in its closed position, Fig. 1, wires 5 and 6 are connected; but when the switch is in its open position, Fig. 2, the connection between wires 5 and 6 is broken, local wire 5 being thus cut out.

The contact-plate M co-operates with electrodes *f* and *g*. The electrode *f* carries a spring-metal tongue U, which at all times bears upon plate M. Electrode *f* is connected by wire *p* and binding-post *p'* with main-circuit wire 8, and electrode *g* is connected by wire *r* and binding-post *r'* with circuit-wire 9. When the switch is in its closed position, Fig. 1, wires 8 and 9 are connected; but when the switch is open, Fig. 2, the connection between wires 8 and 9 is broken, the local wire 9 being thus cut out. It will hereinafter appear that the line-circuit, of which wire 8 is a part, is not broken by the opening of the switch. The central spindle B is connected by a wire *t* and binding-post *t'* with a main-circuit wire 11. The contact-plate J co-operates with two electrodes *h* and *i* and the contact-plate K co-operates with an electrode *j*. Electrode *h* is connected by wire *u* and binding-post *u'* with local-circuit wire 10. Electrode *i* is connected by wire *w* and binding-post *p'* with main-circuit wire 8. Electrode *j* is connected by wire *x* and binding-post *x'* with local-circuit wire 16. When the switch is in its closed position, Fig. 1, both local wires 10 and 16 are in connection with main wire 11, while the direct connection from main wire 8 to main wire 11 is broken at electrode *i*. When the switch is open, Fig. 2, the connections between local wires 10 and 16 and main wire 11 are broken at electrodes *h* and *j*, respectively, while a direct communication is established between main-circuit wires 8 and 11 through wire *w*, electrode *i*, plate J, and spindle B. It will thus be seen that when the switch is closed, Fig. 1, the main wires 3, 6, and 8 are connected with local wires 4, 5, and 9, respectively. The main wire 11 is connected with two local wires 10 and 16, and there is no direct connection between any of the four main wires. When, however, the switch is open, Fig. 2, all five of the local wires are cut out, the two main wires 3 and 6 constituting part of one main circuit, are directly connected, and the two other main wires 8 and 11, constituting part of another main circuit, are also directly connected. Thus a single movement of the compound switch controls the operativeness of a large number of circuits.

Several details of construction may be here referred to. The contact portions of the several contact-plates J, K, L, M, and N are made of thin spring metal, so that proper contact with the fixed electrodes is insured. The wire connections between the fixed electrodes and the binding-posts are indicated only by dotted lines and only in Figs. 1 and 2. It will be understood that these connections are made under the switch-board A in the manner usual in switch-boards. In order that the main wires may be readily distinguished from the local wires, the binding-posts for the main wires are made higher than those for the local wires, as shown in Figs. 3 and 4.

The diagrams, Figs. 5 and 6, will now be described. In these diagrams the switches C and the fixed electrodes are shown; but the switch-boards, binding-posts, and wire connections between the binding-posts and electrodes are omitted. The circuit-wires are shown connected directly with the electrodes and the paths of the current through the contact-plates are indicated by dotted lines. In both diagrams the switches are shown as used in connection with electric indicating systems which in their main features are now old and well known. The systems illustrated are substantially the same as those set forth in Letters Patent of the United States granted to me December 16, 1890, and numbered 442,880 to 442,883, inclusive. These electric indicating systems are used for the transmission to a plurality of stations of information capable of being rendered intelligible through the movement of the indices of electric indicating-instruments. For example, such systems have been used for the transmission from a central station to a plurality of receiving-stations of stock quotations, meteorological indications, and the like. In such systems a number of electric indicating-instruments are employed at each station, each having a suitable scale for the indication of a particular character of information, and each having an index capable of movement in either direction, which on being moved by electric impulses designates, in connection with the scale, the information transmitted from the central station. In the indicating systems shown in the present case all of the indicating-instruments at each station are electrically connected to a circuit-closing instrument, the movable circuit-arm of which determines the indicating-instrument, which for the time being is in electric communication with the central station. All of the circuit-closing instruments at all of the stations are arranged in series and are in electric communication with the central station. Accordingly there are two circuits connecting the

several stations with the central station, the circuit-closing-instrument circuit and the indicating-instrument circuit.

In each of the diagrams, Figs. 5 and 6, a main or central station is shown at the right and two local stations at the left, each station being equipped with the proper instruments, which are shown diagrammatically only. There are employed at each station an instrument MC, called by me a "multiple-circuit closer," and a plurality of electric indicating-instruments I. Each indicating-instrument I is an instrument of well-known character and construction, having an index X, which is capable of a step-by-step movement in either direction and which co-operates with a suitable graduated dial Y, to indicate the information for which it is furnished. The index X is moved in opposite directions by means of two electro-magnets *y z* and suitable well-known intervening mechanism. There are at each station as many of the indicating-instruments as circumstances require; but only two are shown for the purposes of illustration. All of the magnets *y z* of all the indicating-instruments at one station are electrically connected in multiple to a wire 15. Each of these electro-magnets is connected by a separate and independent wire 14 with a fixed electrode *v* of the multiple-circuit closer MC. The object of the multiple-circuit closer is to bring the magnets *y z* successively into the same circuit which includes the wire 15. To this end it is provided with a circuit-closing arm Z, which is in communication with a wire 13. This circuit-closing arm Z is given a step-by-step movement in a single direction, so that it may be brought into contact with the several electrodes *v*. Whenever the circuit-closing arm Z is at rest, one of the indicating-magnets *y z* of one of the instruments is in circuit. Opening and closing this circuit will accordingly demagnetize and magnetize the particular magnet *y* or *z* which is in circuit, and consequently move the particular index X forward or back, as the case may be. This circuit is controlled by means hereinafter specified. The step-by-step movement of the circuit-closing arm Z is effected by means of an electro-magnet W and suitable intervening mechanism of any well-known character. The magnet W is located in a local circuit, which is controlled by means hereinafter specified. These indicating-instruments and their circuits as thus far described are not here claimed, not being new in this application.

Referring now to Fig. 5, the several circuits and their connection with the indicating-instruments, multiple-circuit closers, and compound switches will be described. MB is a main electric generator at the central station, one pole of which is connected by wires 1 and 2 with a switch-point *s'*. S' is a hand-operated switch co-operating with switch-point *s'*, and it is connected by main-circuit wire 3 with electrode *a* of the switch C. This switch at the main or central station is shown closed, so that the main wire 3 is in circuit with local wire 4. Local wire 4 is connected with the coils of the actuating-magnet W of the multiple-circuit closer MC at the central station, from which magnet also leads the local wire 5. Local wire 5 is connected through the switch with the outgoing main-circuit wire 6. This wire 6 is a line-wire, and it extends to the first (or intermediate) local station and is connected with the incoming main-circuit wire 3 thereof, the incoming wire 3 of a local station being a continuation of the outgoing main wire of the preceding station in the series. At the intermediate local station the compound switch C is shown open. Consequently incoming main wire 3 is connected directly with outgoing main wire 6, which leads to the next local station in the series. Consequently the multiple-circuit closer MC at the intermediate local station is cut out. At the second or terminal local station the compound switch is closed, so that the incoming main-circuit wire 3 is connected with the local wire 4, which leads to the actuating-magnet W of the multiple-circuit closer at this local station. The return-wire 5 from magnet W is connected with outgoing main wire 6, which (this being the terminal local station) is connected to earth by the ground-wire 17. The circuit is completed through the earth (or by a special return-wire) and wire 18, which leads to the opposite pole of the generator MB. The main-circuit wires 3 and 6 thus constitute a single circuit, which may be diverted to include in series the actuating-magnets of the multiple-circuit closers MC of all or any lesser number of the stations in the system by means of the compound switches. When this main circuit, which may be termed for convenience the "multiple-circuit-closer circuit," is established, the circuit-closing arms Z of all the multiple-circuit closers in the circuit are simultaneously and synchronously moved by the manipulation of the switch S', the movements of the arms Z being effected in a manner well known and which will be found fully described in my aforesaid patents. The effect of this manipulation is to bring into circuit with the arms Z at each station corresponding magnets *y* or *z* of corresponding indicating-instruments I, as shown in the diagram.

The circuit which controls the movements of the indices of the indicators I may be conveniently termed the "indicating-circuit," and is as follows: Wires 1 and 7 lead from the main generator MB to the switch-point s^2, with which co-operates a switch S^2. This switch is connected by wire 8 to the compound switch C at the central station. The compound switch C at the central station being closed, main wire 8 is thereby connected with local wire 9, which leads to a relay-magnet RM, from which the local wire 10 leads to the

electrode *h* of the compound switch C. Wire 10 is connected by switch C with the incoming main indicating-circuit wire 8, leading to the compound switch C of the first intermediate local station. Since the compound switch of this intermediate local station is open the local-circuit wires 9 10 thereof are both cut out and the incoming main wire 8 is connected directly by wire *w*, and the switch C with the outgoing main indicating-circuit wire 11, which leads to the next and terminal local station. Consequently at the intermediate local station the relay-magnet RM is cut out. The compound switch C at the terminal local station being closed, the relay magnet RM at said station is in circuit, the circuit connection being through wire 8, through switch C, wire 9, relay RM, wire 10, switch C, wire 11, wire 17 to earth, and through wire 18 to opposite pole of generator MB. Consequently main wires 8 and 11 constitute the main line of the indicating-circuit, and this main line can be controlled to include any, all, or none of the relay-magnets RM by means of the several compound switches, and the indicating-circuit itself is always continuous in whichever of its two positions each of the compound switches may be.

The relay-magnets RM included in the indicating-circuit are operated by the manipulation of the hand-switch S^2. The excitation of the relay-magnets closes a new circuit, which may be considered and termed a "shunt-indicating circuit," which is as follows: The excitation of the relay-magnet RM at each station which is in circuit closes a shunt-circuit and a portion of the current is diverted into this shunt-indicating circuit. A portion of the current leaves the local wire 9, enters shunt-wire 12, and thence goes through the relay-magnet armature-lever through wire 13, circuit-closing arm Z, wire 14, actuating-magnet *z* or *y*, as the case may be, of one of the indicators I, through wire 15 and wire 16 to the electrode *j* of the compound switch. The wire 16 is connected by the compound switch to the main indicating-circuit wire 11, which leads to the local stations in series. At each local station where the compound switch C is closed there is the same diversion of the current into a shunt-indicating circuit which includes one of the local indicators. The passage of the current through the indicator-magnets moves the indices thereof in a well-known manner, all of the indices of the several indicators in the circuit moving in unison. When the compound switch C is open, as at the intermediate station, the wire 16 is cut out, as shown. The compound switches C are thus seen to be specially adapted to a system of electric circuits, wherein there are two main circuits which are always in operative condition, and a plurality of local circuits which are cut out of operation when the switch is open and which when the switches are closed constitute portions of the main circuits, the direct connections of the main circuits being then closed.

Aside from the employment of the compound switches, the general system of circuits as thus far described differs from the systems set forth in my aforesaid Letters Patent in one respect only. The location of the indicator-magnets in a shunt to the circuit which includes the relay-magnet which controls said shunt-circuit is new in this application.

Fig. 5 also shows means not shown in my said patents for moving the indices at each station independently of the main switch S^2 and the relay RM. LB is a local battery which is situated in a branch circuit 19, which includes a local switch S^3 and switch-point s^5 and which is connected with the local-circuit wires 13 and 14, so as to exclude the relay-magnet RM and its armature-lever, but to include the multiple-circuit closer MC and the indicator I. This enables the position of the indices X to be corrected in case they should become different from the positions of the indices of corresponding instruments at other stations.

The compound switches not only enable any station to be cut out of the system without affecting the other stations, but also serves to protect the instruments from lightning. For this purpose, also, additional switch-points s^3 and s^4 are provided for the switches S′ and S^2, said switch-points being connected to earth by wires 20 and 21.

The diagram Fig. 6 shows a few modifications in the circuits. At the central or main station (at the right) the local wires 4 and 5 do not connect with the primary actuating-magnet W of the multiple-circuit closer MC, but with a relay-magnet RM^2. This relay-magnet controls a local circuit 22, which includes a local battery LB^2 and the primary actuating-magnet W. The relay-magnet thus controls and actuates the multiple-circuit closer through the local circuit 22. The indicator-magnets *y z* are not located in a circuit which includes the main generator MB, but are in an exclusively local circuit including the local generator LB, this local circuit being controlled by the relay RM, and also by the hand-switch S^3, which is located in a branch around the relay, as in Fig. 5. This arrangement of local circuits for the multiple-circuit closer and indicators is not new, being set forth in my patents above named. This arrangement, it will be noted, involves an omission of the local wire 16, so that the electrode *j* and contact-plate K of the compound switch C are in this instance without function. At both of the local stations in Fig. 6 the circuit connections for the local wires 4 and 5 and the magnets W are the same as in Fig. 5. The circuit connections of the local wires 9 and 10 are, however, different from Fig. 5, and also from the main station in Fig. 6. At each local station in Fig.

6 the relays RM and local batteries LB, with their adjuncts, are omitted. Wire 9 is connected directly with wire 15, (being practically a continuation thereof,) and wire 10 is connected directly with wire 13, (being practically a continuation thereof.) The wire 16 is also omitted at both local stations, so that at each local station the electrode *j* and plate K is without function. The essential operation of the compound switch may therefore be thus stated: There are two main circuits 3 6 and 8 11, and at each station two local circuits 4 5 and 9 10. When the compound switch is open, there is direct connection for the two main circuits, and both local circuits are cut out. When, however, the compound switch is closed, the direct connections of the main circuits are broken. The main circuit 3 6 is completed through the local circuit 4 5, said local circuit then constituting a part of said main circuit 3 6, and the other main circuit 8 11 is completed through the local circuit 9 10, said local circuit then constituting a part of said main circuit 8 11.

I claim as my invention—

1. Two main electric circuits and two local electric circuits, one of said local circuits being a multiple-circuit-closer circuit and including the operating means of a multiple-circuit-closing instrument and the other of said local circuits being an indicating-circuit and including the operating means of an indicating-instrument, said multiple-circuit-closer circuit co-operating with said indicating-instrument circuit, substantially as set forth, whereby the operativeness of said indicating-circuit is determined by action of said multiple-circuit-closer circuit, and said main and local circuits all terminating in electric terminals or fixed electrodes on a single switch-board, in combination with a compound switch located in said circuits for controlling the same, said switch in its open position cutting out both of said local circuits and closing said main circuits and said switch in its closed position breaking said main circuits, but closing said local circuits in such manner that each local circuit becomes a part of one of said main circuits, each main circuit being completed through one of the local circuits, said compound switch having contact-plates movable therewith, substantially as described, which co-operate with said fixed electrodes or terminals of said several circuits, substantially as set forth.

2. Two main electric circuits 3 6 and 8 11, two local circuits 4 5 and 9 10, and fixed electrodes *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, and *i*, said electrode *a* being connected with circuit-conductor 3, electrode *b* being connected with circuit-conductor 6, electrode *c* being connected with circuit-conductor 4, electrode *d* being connected with circuit-conductor 5, electrode *e* being connected with circuit-conductor 6, electrode *f* being connected with circuit-conductor 8, electrode *g* being connected with circuit-conductor 9, electrode *h* being connected with circuit-conductor 10, and electrode *i* being connected with circuit-conductor 8, in combination with a compound switch having an open and a closed position, said switch having contact-plates J, L, M, and N movable therewith and insulated from each other, said plate J being always connected with circuit-conductor 11 and adapted to be brought into and out of contact with said electrodes *h* and *i*, successively, said plate L being always connected with said electrode *e* and adapted to be brought into and out of contact with said electrode *d*, said plate M being always connected with said electrode *f* and adapted to be brought into and out of contact with said electrode *g*, and said plate N being always connected with said electrode *a* and adapted to be brought into and out of contact with said electrodes *b* and *c*, successively, substantially as set forth.

3. A main electric circuit 3 6, having terminal electrodes *a*, *b*, and *e*, a local circuit 4 5, having terminal electrodes *c* and *d*, and a compound switch having an open and a closed position, said switch carrying contact-plates L and N, which establish a direct connection between said terminals of the main circuit and cut out the local circuit when the switch is open, and which, when the switch is closed, break said direct connection between the terminals of the main electric circuit and establish connection between the terminals of the local and main circuits, respectively, so that the local circuit constitutes a part of the main circuit, in combination with a main electric circuit 8 11, having terminal electrodes *f*, *i*, and B, a local circuit 9 10, having terminal electrodes *g* and *h*, and contact-plates J and M, carried by said compound switch, which, when the switch is open, establish a direct connection between said terminals of the main circuit 8 11 and cut out said local circuit 9 10, and which, when the switch is closed, break said direct connection between the terminals of said main circuit 8 11 and establish connection between the terminals of the main circuit 8 11 and of the local circuit 9 10, respectively, so that the said local circuit constitutes a part of said main circuit, substantially as set forth.

4. The compound switch having a contact-plate having two contact-arms J and K and an electric conductor 11, with which said contact-arms are in constant connection, in combination with fixed electrodes *h* and *j*, both of which are in connection with said contact-arms when the switch is closed and both of which are cut out when said switch is open, electric conductors 10 and 16, in connection with said electrodes *h* and *j*, respectively, an electrode *i*, with which said arm J co-operates when the switch is open, and an electric conductor 8, in connection with said electrode *i*, substantially as set forth.

5. An electric switch having the contact-plate N, having apertures Q and R, in combination with fixed electrodes *a*, *b*, and *c*, *a*

and *c* being in contact with said plate, and *b* registering with aperture Q when the switch is in one position, and *a* and *b* being in contact with said plate, and *c* registering with aperture R when the switch is in its other position, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HENRY JANSEN HAIGHT.

Witnesses:
ARTHUR S. BROWNE,
GEO. R. BYINGTON.