

H. K. HITCHCOCK.
ELECTRIC SWITCH.

No. 473,504.

Patented Apr. 26, 1892.

Fig 1.

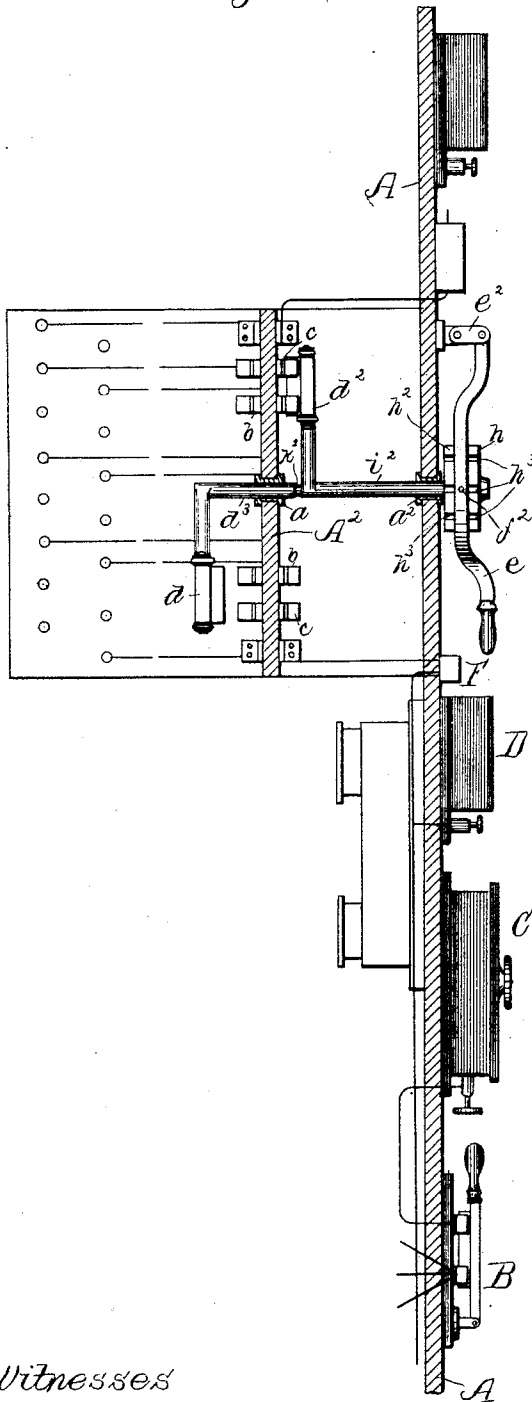
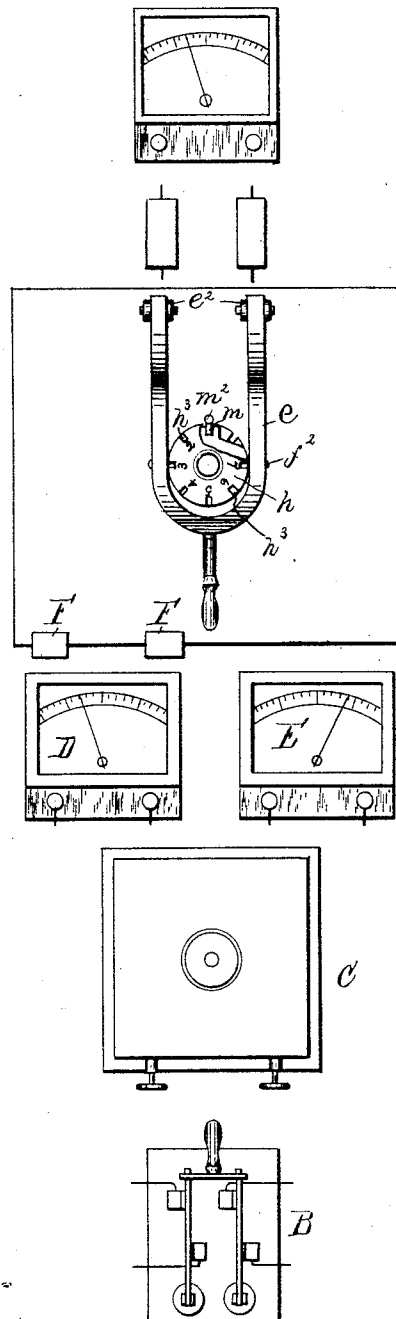


Fig 2.



Witnesses
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Fig. 3.

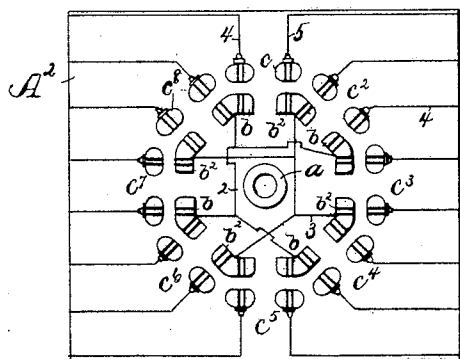


Fig. 4.

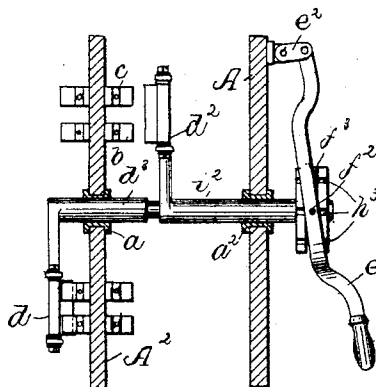


Fig. 5.

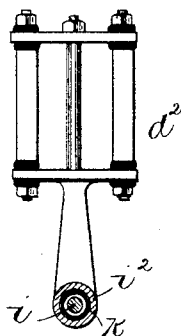


Fig. 6.

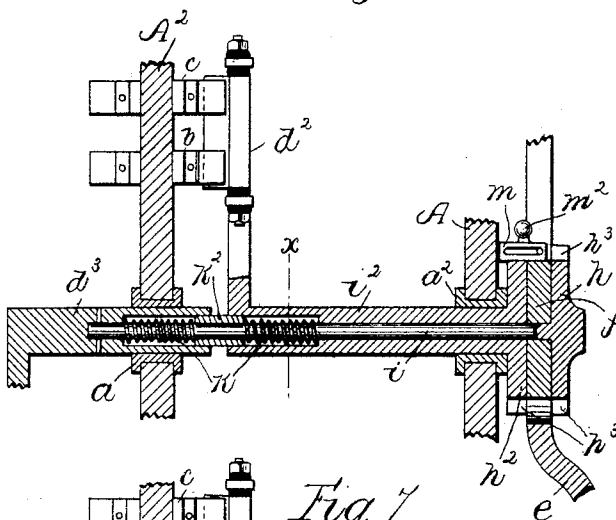


Fig. 8.

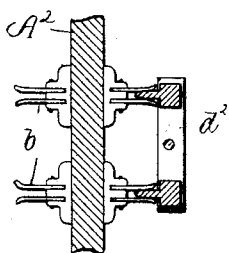
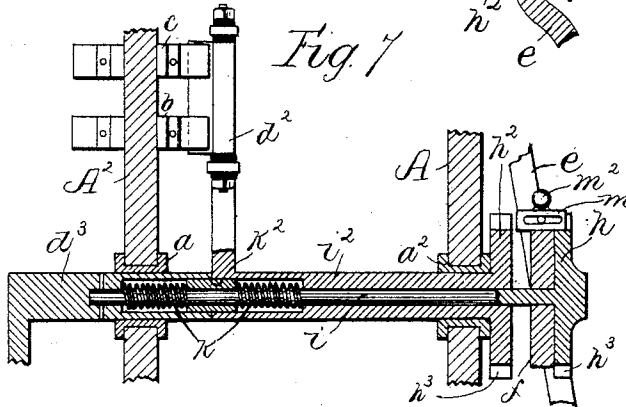


Fig. 7.



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UNITED STATES PATENT OFFICE.

HALBERT K. HITCHCOCK, OF LOUISVILLE, KENTUCKY, ASSIGNOR OF ONE-HALF TO CHAS. W. KELLOGG, OF BROOKLINE, MASSACHUSETTS.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 473,504, dated April 26, 1892.

Application filed September 16, 1891. Serial No. 405,848. (No model.)

To all whom it may concern:

Be it known that I, HALBERT K. HITCHCOCK, of Louisville, in the county of Jefferson and State of Kentucky, have invented an Improvement in Electric Switches, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to an electric switch which may be employed for making connection between an electric circuit to be supplied with current and any desired one of several electric generators, it being especially useful in connection with generators of alternating currents. The switch comprises a number of sets of stationary contacts or spring-sockets, a pair of movable connectors, and an actuator or handle for moving said connectors, so as to cause them to engage with and make the desired connection between any desired set of spring-sockets or to be moved so as to sever such connection. The spring-sockets and the two connectors are so arranged with relation to one another that the movement of the actuator that throws one connector into engagement with the desired set of spring-sockets also throws the other connector out of engagement with the spring-sockets with which it has been engaged, the construction being such that in the continuous movement of the actuator the disengagement between the previously-engaged sockets and connector is effected before the new engagement is made between the other connector and set of contacts, and, furthermore, the said connectors and spring-sockets are so arranged that either connector when disengaged can be placed in position to co-operate with any desired set of spring-sockets at the next movement of the actuating-handle, the said sets of sockets corresponding to the different dynamos or generators, so that while a circuit is being supplied from any one generator through the connection afforded by one connector the other connector can be set in position to make connection between the said circuit and any other generator, and the shifting from the first to the second generator can be made in an instant without possibility of making a cross-

connection between two generators at any time and preventing any arcing and burning of the contacts.

Figure 1 is a side elevation, partly in section, of an electric switch embodying this invention and the co-operating appliances commonly used therewith; Fig. 2, a front elevation thereof; Fig. 3, a front elevation of the set of stationary contacts or spring-sockets of the switch; Fig. 4, a side elevation thereof, partly in section, showing the actuator or operating-handle in the opposite position to that shown in Fig. 1; Fig. 5, an elevation of one of the connectors as seen on the front of the switchboard, the parts that connect the same with the actuating-handle being shown in section on line *x* of Fig. 6; Fig. 6, a longitudinal section of the connections between the contacts and their actuating-handle; Fig. 7, a similar section showing the parts in a different position; Fig. 8, a detail showing one of the connectors in transverse section and a pair of spring-sockets in end elevation.

The switch forming the subject of this invention is shown as connected with a front frame-plate A, which may be a panel or slab of marble, slate, or other suitable non-conducting and incombustible material, in which may be mounted the appliances, such as the field or exciter switch B, rheostat C, ammeter and voltmeter D E, and fuse-boxes F, said instruments being the same as commonly used in electric-supply stations and constituting no part of the present invention.

The operative parts of the switch forming the subject of this invention are connected partly with the front plate A and partly with a second plate A², parallel with and at the rear of the plate A, as shown in Fig. 1, the said plate A² carrying the several stationary contacts or spring-sockets, which project both at the rear and front of said plate, as shown in Figs. 1, 3, and 4, and have socket-springs at both sides of said plates, so that they are adapted to be engaged from both front and rear of the plate. The said sockets are symmetrically arranged around a central bearing *a* in said plate A², and consist of an inner set of pairs *b b*² of sockets and an outer set of

corresponding pairs of sockets, (marked c c^2 c^3 , &c.) one pair of the outer sockets corresponding to a pair of inner sockets and being arranged so that a connection can be made from the inner to the outer sockets of each pair by suitable connectors d d^2 , each of which connectors comprise a pair of bars or plates insulated from the remainder of the apparatus and adapted to be forced into the corresponding spring-socket, so that one pair makes connection from the inner socket b to the corresponding outer socket and the other from the inner socket b^2 to the corresponding outer socket of the same pair. The several pairs of inner sockets have their respective members connected together, the sockets b of all the pairs being connected together by wire 2 (see Fig. 3) and the sockets b^2 of all the pairs being connected together by wire 3, so that an external circuit to be supplied with electricity, having its terminals connected with the wires 2 3, respectively, will have one terminal connected with one inner socket, as b , of each pair and the other terminal connected with the other inner socket b^2 of each pair. The several pairs of outer contacts are connected by wires 4 5, each with a separate dynamo, so that the sockets of the pair c constitute the terminals of one dynamo, the sockets of the pair c^2 of another dynamo, which may be called "dynamo No. 2," the sockets of the pair c^3 with the terminals of No. 3 dynamo, and so on, and consequently if the sockets b b^2 are connected with the pair of sockets c the circuit to be supplied will be connected with dynamo No. 1, while if the pair c^3 of outer sockets is connected with the corresponding pair b b^2 of inner sockets dynamo No. 3 will be connected with the circuit to be supplied, and so on.

In order to enable any desired pair of inner and outer sockets to be connected together and to insure that but one pair shall be connected at any one time, the connectors d d^2 have two movements, one of which may be called the "selecting" or "adjusting" movement, being made for each independently of the other, while the other movement may be called the "shifting" or "operating" movement, and is made substantially simultaneously for both connectors, being such that one is thrown out of contact by the same movement that throws the other into contact, the breaking of the contact being effected by the one just before the closing connection is made by the other.

The operating or shifting movement is made by an actuator or handle e , pivotally connected by links e^2 with the main frame A , so that the said handle may have an oscillating movement toward and from the said frame, as indicated by the positions represented in Figs. 1 and 4. The said handle is, as shown in this instance, constructed in the form of an open frame or fork, (see Fig. 2,) having pivoted between its branches at f^2 an engaging head f , which is thus moved toward and from the frame-plate A as the said handle e is swung on the pivot

e^2 from the position shown in Fig. 1 to that shown in Fig. 4, the said engaging head or block f , being capable of retaining its position parallel with the plate A during such movement by turning on its pivot f^2 . The said head f is engaged at its opposite faces by disks h h^2 , the former of which is fixed upon a shaft i , passing through a suitable opening in the block f and being rigidly connected at its opposite end with the shank d^3 of the connector d , which co-operates with the spring-sockets at the rear side of the frame-plate A^2 . The disk h^3 is rigidly connected with a sleeve or hollow shaft i^2 , which surrounds the shaft i and constitutes or is connected with the shank of the connector d^2 , that co-operates with the spring-sockets at the front side of the frame-plate A^2 , the construction of the parts last described being best shown in Fig. 6. The shank portion d^3 of the inner connector d works in the bearing a at the center of the frame-plate A^2 , and the hollow shaft i^2 works in a similar bearing a^2 in the outer frame-plate A , both shafts being capable of having both rotary and longitudinal movement in their respective bearings. The adjacent ends of the shank portion d^3 and hollow bearing shaft or sleeve i^2 are counterbored or recessed, as shown, so as to afford a space around the shaft i , in which is contained a spring or preferably two springs k and an intermediate sleeve k^2 , which extends across the space left between the adjacent ends of the shank d^3 and sleeve i^2 , for the purpose to be explained.

The pressure of the springs k tends to separate the shank d^3 from the sleeve i^2 , and its effect is to hold both disks h h^2 against the corresponding faces of the carrying-block f , which when moved by the handle e toward either of said disks tends to move it and the corresponding shaft and connector in the direction to force the said connector into the set of contacts at that moment opposite to it, this constituting the operating or shifting movement of the connectors.

Referring to Fig. 3, it will be seen that the several sets of connectors are arranged in a circle around the bearing, and the selecting movement of the connectors d d^2 is produced by rotating the same in their bearings in the plates A A^2 , so as to bring either connector in line with any desired set of sockets, this rotary movement being independent for the two connectors and their shafts. In order to properly determine such rotary movement of either shaft i or i^2 when it is desired to change the position of the connector d or d^2 , the disks h h^2 are provided with locking-notches h^3 , corresponding in position to the several sets of contacts, and the carrier-block f is provided at one point with a lock (shown as a slide m) provided with a suitable handle or knob m^2 , capable of sliding transversely in the block f , so that it may be caused to project wholly from one face or wholly from the opposite face of said block, or partly from both faces. The purpose and mode of operation of these

parts will be best understood by describing the specific operation of the switch in a given case, referring to Figs. 6 and 7.

The switch is shown in Fig. 6 in the position occupied when the connector d^2 is in the set of sockets corresponding to dynamo No. 1. If now it should be desired to shift the connection, so that the circuit connected with the inner pairs of contacts b b^2 might be supplied from dynamo No. 3 instead of from dynamo No. 1, the operation would be as follows: The lock m m^2 would be slipped rearward, as shown in Fig. 6, so as to disengage the disk h , which could then be turned, as desired, and would be turned until its locking-notch (marked 3) was opposite to the said locking-slide m , which would then be moved outward, so as to enter the said notch in the disk h , and thereby lock the said disk with relation to the carrier-block f , so as to prevent any further rotary movement. In this rotation of the disk h the rear connector d was turned with it, and as the notches in the disk h correspond in position and number to the several pairs of contacts the rotation of the disk h , which has been described, has placed the connector d in line with the pair of contacts c^3 , corresponding to dynamo No. 3. Then when it is desired to take dynamo No. 3 off from the circuit and substitute dynamo No. 1 it is merely necessary to move the handle e forward from the position shown in Fig. 1 to that shown in Fig. 4. In such forward movement the block f will engage the disk h and will thus produce a corresponding positive outward movement of the shaft i and of the connector d toward the spring-sockets then in line with said connector d . The other connector d^2 , owing to the fact that its hollow carrying-shaft i^2 and disk h^2 are not positively engaged with the handle e and carrying-block f , will remain held by friction in its set of spring-sockets during a portion of the outward movement of the handle e , which will thus compress the springs k —a condition which will continue if the adjacent hold of the contacts is sufficient until the adjacent ends of the shank d^3 of the rear connector and shaft i^2 of the front connector come into engagement, when the said front connector and its shaft will also be positively moved, and the moment that the frictional hold between the connector and spring-sockets is materially diminished the spring k will expand, and thus produce a sudden movement of the connector d^2 from the spring-sockets, opening the circuit without danger of drawing an arc, this movement taking place just before the rear connector d enters the sockets corresponding to dynamo No. 3, so that no cross connection is afforded between the two dynamos, although the interval between the moment when No. 1 is disconnected from the circuit and No. 3 connected with it is so short as to be scarcely noticeable in the supplied circuit. The return movement of the handle e would produce the reverse operation, disconnecting

the dynamo No. 3 and again connecting dynamo No. 1, or any other dynamo, if desired, the connector d^2 being turned by its disk h^2 to the position corresponding to such dynamo. In this return or rearward movement of the actuator the disk h^2 , shaft i^2 , and connector d^2 would first be positively moved, while the other connector would only be acted upon by the increasing pressure of the spring k up to the time that the parts i^2 and d^3 engaged, when the positive followed by the spring movement of the conductor d would take place, as before described for the connector d^2 .

The invention is not limited to the specific construction thus far described, as it is obvious that numerous modifications can be made without departing from the main features of the invention, which consist, mainly, in the employment of two connectors having an operating movement in common and an independent adjusting or selecting movement, and the co-operating stationary contacts or spring-sockets adapted to be engaged from opposite sides in the line of common movement of the two connectors, so that an engagement of one connector is accompanied by or rather preceded by a disengagement of the other connector, said spring-sockets being all in the path of the independent adjusting or selecting movement of the contacts, so that either connector may be brought into position to co-operate with any desired set of contacts.

The terms "front" and "rear" have been used with relation to the position of the main frame-plates A and A^2 , and the terms "inner" and "outer" with relation to the concentric rows of contacts.

The specific construction of the spring-sockets and connectors is immaterial, that adopted in the present embodiment of the invention being shown clearly in the drawings, the said connectors each comprising, essentially, two bars or blades of conducting material supported in but insulated from arms that project from their controlling-shafts, and the stationary contacts consisting of or being provided with pairs of spring-fingers, between which the said blades are forced, so that each blade connects one inner and one outer spring-socket.

I claim—

1. The combination of a number of stationary contacts with two contact-connectors, each capable of independent movement into position to engage any of said contacts that may be desired, and an actuator connected with both said connectors, whereby both are actuated simultaneously, the said contacts being arranged with relation to said connectors, as described, whereby in the simultaneous movement of the connectors produced by the actuator one of said connectors is disengaged from and the other engaged with the contacts opposite which it is set, substantially as and for the purpose described.

2. The combination of a number of stationary contacts and the supporting-frame there-

for, said contacts being adapted to be engaged at each side of said frame with two connectors and carrying shafts therefor, said carrying-shafts being capable of independent rotary motion, and an actuator for moving both
5 said shafts longitudinally, whereby one connector is engaged with the stationary contacts at one side of their supporting-frame and the other connector disengaged from a
10 set of contacts at the other side of the said supporting-frame, substantially as described.

3. The combination of the circularly-arranged sets of contacts with two connectors and concentric shafts therefor, having an independent movement whereby either of said
15 connectors may be placed opposite any desired set of contacts, an actuator having a block to engage said shafts and produce longitudinal movement thereof, and a lock for

fastening either of said shafts in predetermined angular position, substantially as described.

4. The combination of the circularly-arranged set of contacts with the two connectors and concentric shafts therefor, an actuator
25 movable longitudinally of said shafts, one of which is engaged positively by said actuator when moving in one direction and the other when moving in the other direction, and a spring interposed between the said shafts,
30 substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HALBERT K. HITCHCOCK.

Witnesses:

CLINTON MCCLARTY,
THOS. C. TIMBERLAKE.