E. M. HEWLETT.

ELECTRIC SWITCH.

APPLICATION FILED SEPT. 15, 1909.

1,029,366.

Patented June 11, 1912.

2 SHEETS—SHEET 1.

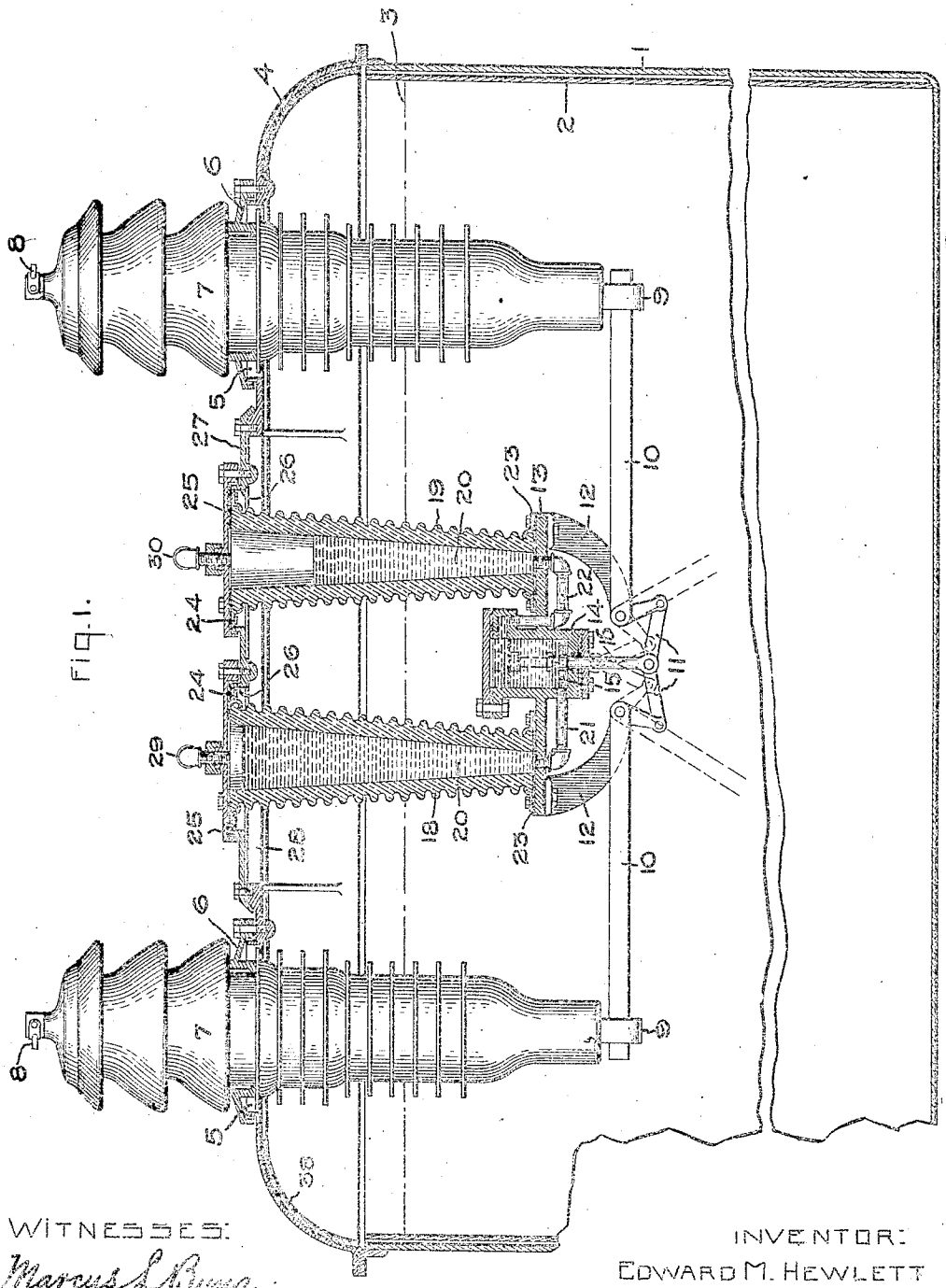

Fig. 1.

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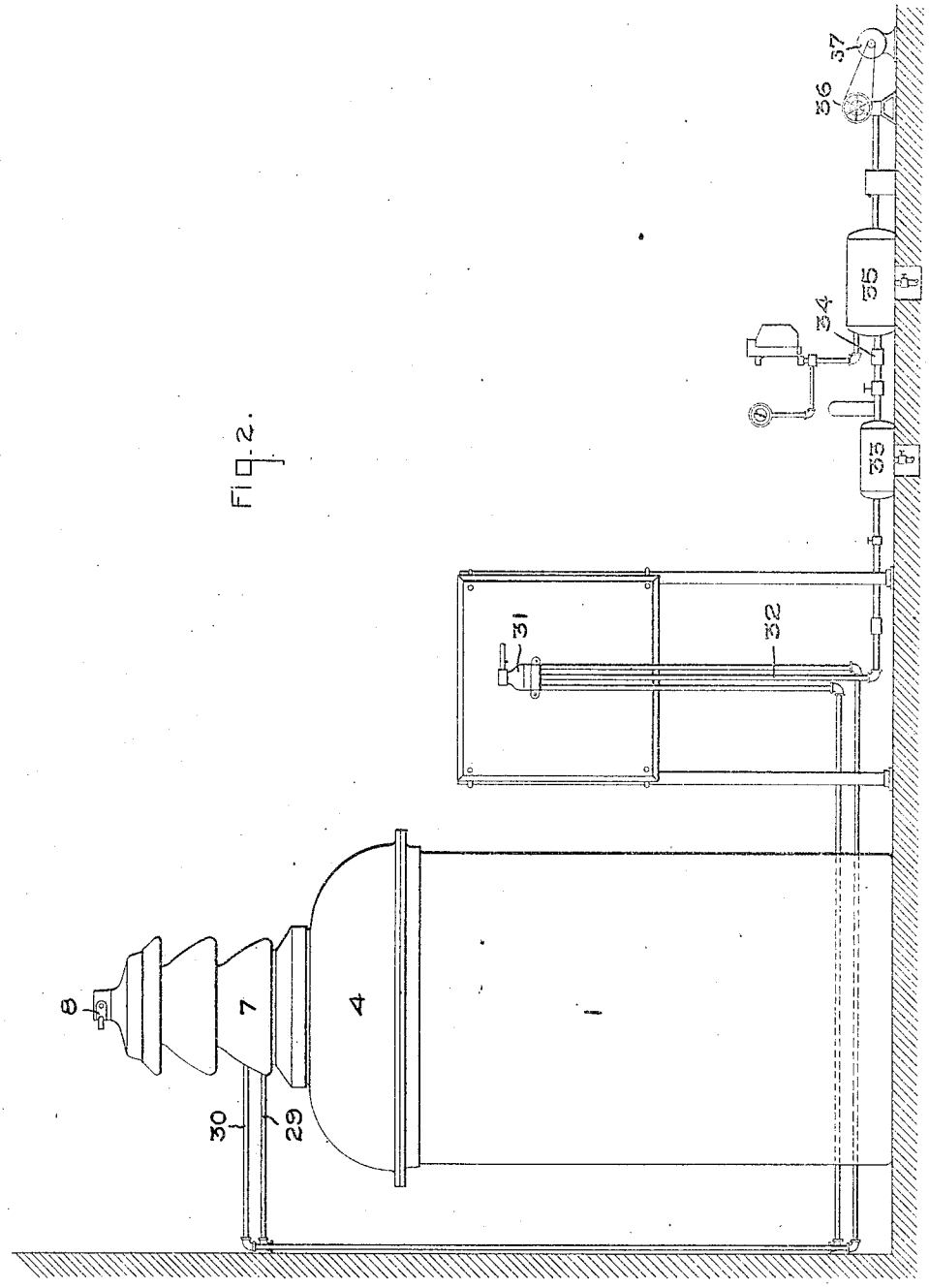
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

1,029,366. Specification of Letters Patent. Patented June 11, 1912.

Application filed September 15, 1909. Serial No. 517,816.

To all whom it may concern:

Be it known that I, EDWARD M. HEWLETT, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

My invention relates to electric switches and more particularly to switches which are operated by power and are controlled from a station or switchboard remote from the main switch and its object is to provide an electric switch by means of which circuits of high potential may be quickly and safely controlled; in which all the operating parts of the switch are thoroughly insulated from the ground; which may be operated by means of compressed air or other fluid under pressure delivered to the switch through a system of metallic piping which is grounded; in which the operating mechanism of the switch is a unitary structure which may be easily and quickly removed and replaced without disturbing the connections or other parts of the switch and in which the condensation of moisture on the interior of the tank is very greatly hindered and in most cases prevented.

In carrying out my invention, the cooperating contacts of the switch are operated by means of a fluid pressure motor which is thoroughly insulated from ground and to which pressure is delivered through a column of insulating fluid such as oil, contained in an insulating tube or holder and of sufficient length to insulate thoroughly all parts of the motor mechanism against ground. The pressure on the column of insulating fluid may be varied in any suitable way for operating the fluid pressure motor and thereby operating the switch, but in the preferred construction a pressure fluid, such as compressed air, is delivered through a system of metallic piping to one end of the column of insulating fluid and thereby the pressure of the compressed air or other pressure fluid is transmitted through the insulating fluid to the fluid pressure motor.

In the preferred construction the insulating fluid is contained in a tubular insulator which supports the motor mechanism and also insulates it from ground the compressed air or other suitable pressure fluid being delivered to the interior of the tubular insulator through any suitable system of piping.

In order to provide a positive control for the moving element of the switch, two tubular insulators are preferably provided, both containing insulating fluid and so connected to the motor mechanism that when pressure is exerted upon the fluid in one insulator the motor mechanism is move in one direction and when pressure is exerted upon the fluid in the other insulator the motor mechanism is moved in the other direction.

In the preferred construction all the operating parts of the switch are submerged in oil contained in the tank, which is provided with a cover from which the various parts of the switch are suspended and in order to enable the operating mechanism of the switch to be removed and inspected without disturbing the connections of the switch or the stationary contacts, the operating mechanism is secured to a cap member or plate which covers an opening in the top of the switch of sufficient size to permit the entire operating mechanism to be lifted out without disturbing the switch or removing the cover. The tubular insulators which contain the oil or other insulating fluid for transmitting pressure to the fluid pressure mechanism are suspended from the removable cap member or base plate and the fluid pressure motor is mounted on the lower ends of the tubular insulators, the entire mechanism being so proportioned that it can all be lifted through the opening in the cover of the tank.

Where switches provided with metallic oil tanks are exposed to changes of temperature, it has been found that water collects on the interior of the tank above the surface of the oil and eventually drops from the cover into the oil, thereby decreasing the insulating value of the oil, and in order to avoid this I provide the interior surface of the oil tank above the level of the oil with a heat insulating covering or lining, preferably of asbestos or some similar fibrous material, and preferably arrange this lining around the edges of the cover where the condensation is most apt to occur. This lining of asbestos or similar material very greatly hinders the condensation of moisture and in most cases will entirely prevent it, thereby

preventing deterioration of the oil due to the presence of water.

My invention will best be understood in connection with the accompanying drawings, which show merely for purposes of illustration one of the various forms in which the invention may be embodied and in which—

Figure 1 is a longitudinal section of an oil switch embodying my invention; and Fig. 2 is a view showing the switch and the control mechanism for it in elevation.

In the specific form of switch shown in the drawings, the switch mechanism is all contained in a metallic oil tank 1 designed to stand on the floor of the station and to contain and support all the parts of the oil switch, the tank being preferably, though not necessarily, provided with an insulating lining 2. The tank is filled with oil to the level of the line 3 and has a cover 4 which, in the specific form of switch shown in the drawings, is provided with two openings 5 having upturned flanges which fit inside of cover plates 6 which in turn carry insulators 7 with their lower ends projecting into the oil tank and provided with terminals 8 by means of which connection may be made with the circuit controlled by the switch. The cover 4 therefore acts not only as a closure for the tank but also as a horizontal support for the insulators 7. Each insulator 7 carries at the bottom, beneath the surface of the oil in the tank 1, a stationary or fixed contact 9 in electrical connection with the terminal 8 at the top of the insulator, the circuit being closed between the two fixed contacts 9 by means of a bridging contact 10 which, in the specific form of switch shown in the drawings, is composed of two pivoted blades electrically and mechanically connected by means of links 11 and pivotally mounted on arms or supports 12 which in turn are secured to the plate 13 supported on and insulated from the cover 4 of the switch. When the bridging contact 10 is in the position shown in Fig. 1, the circuit between the fixed contacts 9 is closed. The bridging contact 10 may be operated by means of any suitable fluid pressure motor which is preferably mounted on the plate 13 and is therefore insulated from the cover 4 of the tank and from ground. In the preferred construction as shown in the drawing the fluid pressure motor comprises a casing or cylinder 14 mounted on the plate 13 and provided with a movable member or piston 15 which is connected through the rod 16 to the links 11 and thereby actuates the bridging contact 10. In the preferred construction, as shown in Fig. 1, the plate 13 is mechanically supported on and electrically insulated from the cover 4 by means of two tubular insulators 18 and 19, each of which is partially filled with insulating fluid 20, preferably some liquid such as oil, which has a high insulating value.

One end of the casing or cylinder 14 is connected to the interior of the insulator 18 through the pipe 21, while the interior of the other insulator 19 is connected to the other end of the cylinder 14 through the pipe 22, so that the piston or movable member 15 forms a movable partition between the insulating fluid in the two tubular insulators. Each insulator is firmly closed at the lower end by means of a clamp 23 which holds it in oil tight relation to the plate 13 and each insulator is secured at its upper end by means of a similar clamp 24 to supporting plates 25, each of which fits over the flange 26 of a flanged opening in the cap member or cover plate 27, which in turn bridges and preferably closes the comparatively large opening 28 in the cover 4, the outer edge of the cap member or cover plate 27 fitting over the rim or flange of the opening 28, as shown in Fig. 1. As a result of this construction, each tubular insulator 18 and 19 has a cover or cap at the top and at the bottom and in addition the two insulators as well as the operating mechanism secured to the plate 13 and the bridging contact 10 are carried upon the cap member or cover plate 27 which in turn is carried by the cover 4.

As clearly shown in Fig. 1, the plate 13 is smaller than the cover plate 27 and will easily pass through the opening 28, while the bridging contact 10 is so pivoted on the plate 13 that when the piston 15 is at the upper end of its stroke and the two blades which form the bridging contact are substantially vertical, as shown in dotted lines in Fig. 1, the entire operating mechanism consisting of the tubular insulators 18 and 19 and all the parts supported by them can be lifted out through the opening 28 without in any way disturbing the fixed contacts 9 or the connections of the leads of the terminals 8.

In order to actuate the bridging contact, pressure is transmitted to the movable member or piston 15 of the motor mechanism through the insulating fluid 20 contained in the two tubular insulators. Since in the particular form of switch shown in the drawings the insulators are vertical and the operating mechanism and movable contact are mounted on the lower end of the insulators, the pressure for operating the switch is applied to the upper end of the insulating fluid contained in each insulator. This pressure may be applied in any desired way, but preferably by means of a pressure fluid of a less density than the insulating fluid 20. Where the parts are arranged as shown in Fig. 1 and the density of the pressure fluid is less than the density of the insulating fluid 20 there is no tendency for the pressure fluid to settle down through

the insulating fluid and displace it. In the construction shown in Fig. 1, the pressure fluid is compressed air which is delivered to the interior of the insulators 18 and 19 through pipes 29 and 30, passing through the supporting plates 25 and opening into the interior of the tubular insulators. Since these pipes are separated from the bridging contact and the operating mechanism by the insulators 18 and 19 and by the insulating fluid 20 they may be grounded without causing a ground on the circuit to which the switch is connected and therefore the pipes may be made of iron and connected in any suitable way to the controlling valve 31, which is mounted in any suitable position, as shown in Fig. 2, and supplied with compressed air or other suitable pressure fluid through a supply pipe 32, which forms the outlet of the tank 33 of sufficient size to operate the switch several times, even though no more air is supplied to it. A pipe having a check valve 34 therein supplies the tank 33 from the reservoir 35 which in turn is supplied with air at any desired pressure from the compressor 36 driven by any suitable motor 37.

It has been found in practice that with an iron oil tank provided with an iron cover, moisture will condense on the cover as the temperature of the air surrounding the tank changes and drops of water will form which eventually fall into the oil and impair its insulating value. In order to greatly hinder this action and in most cases prevent it entirely, I line the metallic surfaces of the tank above the surface of the oil, with some lining which will greatly hinder the condensation of moisture. It has been found that most of the condensation takes place around the edges of the cover and in accordance with my invention, I line the cover, near the edge, with a lining 38 of asbestos or some similar non-metallic fibrous material for the purpose of preventing the condensation of moisture and the resulting deterioration of the oil due to the presence of water.

The operation of the switch shown in the drawings is as follows: With the parts in the position shown in Fig. 1, the switch is closed and if it is desired to open the switch, air under pressure is admitted through the pipe 29 by means of the control valve 31 while at the same time the pipe 30 is opened to the atmosphere. Compressed air entering through pipe 29 exerts a pressure on the upper surface of the insulating fluid or oil 20 in the insulator 18 and this pressure is transmitted to the piston 15 which moves upward, forcing oil out of the upper end of the cylinder 14 into the interior of the tubular insulator 19. This movement results in swinging the plates of the bridging contact 10 into the dotted line position and the circuit is opened. When it is desired to close the circuit, the control valve 31 is moved into a position where the pipe 29 is opened to the atmosphere and compressed air is admitted through the pipe 30 to the interior of the insulator 19 above the insulating fluid or oil. The pressure upon the oil forces the piston 15 downward into the position shown in Fig. 1, thereby swinging the bridging contacts up into the full line position into engagement with the stationary contacts and closing the circuit.

In case it is desired, for any reason, to examine the operating mechanism and the bridging contacts, the pipes 29 and 30 may be disconnected and the bolts which hold the cap member or cover plate 27 in position loosened and then the base plate 27, together with the insulators 18 and 19 and all the parts supported by them may be lifted up through the opening 28 without in any way disturbing or affecting the insulators 7 or the connections of the terminals 8 to the leads of the circuit, and thereby inspection and repair of the switch is greatly facilitated.

My invention may be embodied in many other forms than that described and I therefore do not limit my invention to the precise arrangement herein disclosed, but aim in the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. An electric switch comprising a movable contact, a fluid pressure motor mechanism connected to said contact to actuate it, an insulating conduit connected to said motor mechanism and containing an insulating fluid, a pressure conduit connected to said insulating conduit and containing a pressure fluid of a density different from that of said insulating fluid, and means for varying at will the pressure of the pressure fluid in said pressure conduit.

2. An electric switch comprising a movable contact and a fluid pressure motor mechanism connected to said contact, a pipe containing pressure fluid, means for varying at will the pressure of said fluid in said pipe, and an insulating conduit connected to said pipe and to said motor mechanism and containing insulating fluid of a density different from the density of said pressure fluid, said insulating conduit being mounted in a position to cause said insulating fluid to separate said motor mechanism and said pressure fluid.

3. An electric switch comprising a movable contact, a fluid pressure motor mechanism for actuating said contact, means for supplying a pressure fluid to actuate said motor mechanism, and an insulating conduit connected to said motor mechanism and to

said means and containing insulating fluid which forms an insulating movable partition between the pressure fluid and said motor mechanism.

4. An electric switch comprising a movable contact, a fluid pressure motor mechanism connected to said contact to actuate it, a pipe for supplying pressure fluid to actuate said motor mechanism, means for varying at will the pressure of the pressure fluid in said pipe, and an insulating conduit between said pipe and said motor mechanism containing insulating fluid of a different density than the pressure fluid and mounted in a position to cause the insulating fluid to remain in said insulating conduit.

5. An electric switch comprising a movable contact, a hollow insulator containing insulating fluid, a support for said insulator, a fluid pressure motor mechanism for actuating said movable contact, said mechanism being mounted on said insulator and in communication with the interior of said insulator near one end thereof, and means connected to the interior of said insulator near the other end for varying at will the pressure of said insulating fluid and thereby operating said motor mechanism.

6. An electric switch comprising a movable contact, a tubular insulator containing insulating fluid, a motor mechanism mounted near one end of said insulator in communication with the interior thereof and connected to said contact, a conduit opening into the interior of said insulator near the other end, and means for supplying elastic fluid under pressure to the interior of said insulator through said conduit.

7. An electric switch comprising a movable contact, a tubular insulator containing an insulating fluid, a fluid pressure motor mechanism mounted on said insulator in communication with the interior thereof and connected to said contact, a metallic pipe connected to the interior of said insulator, a control valve in said pipe, and means for supplying compressed air to said pipe.

8. An electric switch comprising a movable contact, a tubular insulator provided with a cap at each end and containing insulating fluid, a fluid pressure motor mechanism connected to said contact and mounted on one cap in communication with the interior of said insulator, a pipe in communication with the interior of said insulator through the other cap, and means for supplying fluid under pressure to said pipe to vary the pressure on said insulating fluid and thereby actuate said motor mechanism.

9. An electric switch comprising a movable contact, a fluid pressure motor mechanism connected to said contact to actuate it, an insulating conduit containing insulating fluid and connected to said motor mechanism with one end above said mechanism, and means connected to the upper end of said conduit for introducing into said conduit under pressure a fluid of less density than said insulating fluid and thereby actuating said motor mechanism by pressure transmitted through said insulating fluid.

10. An electric switch comprising a movable contact, a rigid tubular insulator vertically mounted and containing insulating fluid, a fluid pressure motor mechanism connected to said contact and mounted on the lower end of said insulator in communication with the interior thereof, and means connected to the upper end of said insulator for introducing into said insulator under pressure a fluid of less density than said insulating fluid.

11. An electric switch comprising a movable contact, a rigid tubular insulator vertically mounted and containing oil, a fluid pressure motor mechanism connected to said contact and mounted on the lower end of said insulator in communication with the interior thereof, and means for supplying air under pressure to the interior of said insulator at the upper end thereof and thereby actuating said motor mechanism by pressure transmitted through the oil.

12. An electric switch comprising a horizontal support, a fixed contact mounted beneath and insulated from said support, a rigid tubular insulator connected at its upper end to said support and containing insulating liquid, a movable contact mounted on said insulator to coöperate with said fixed contact, a fluid pressure motor mechanism connected to said movable contact and mounted on the lower end of said insulator in communication with the interior thereof, and means for supplying air under pressure to the interior of said insulator at the upper end thereof, whereby the pressure on said insulating liquid is varied and said motor mechanism is operated.

13. An electric switch comprising a movable contact, a fluid pressure motor mechanism having a movable member connected to said movable contact, two insulating conduits connected to said mechanism on opposite sides of said member and containing insulating fluid in contact with said member, means for supplying to said conduits pressure fluid which differs in density from the insulating fluid and thereby maintains the insulating fluid in said conduits, and means for varying the pressure of the pressure fluid in said conduits to actuate said member.

14. An electric switch comprising a movable contact, a fluid pressure motor mechanism having a movable member connected to said movable contact, two vertically disposed insulating conduits connected to said mechanism on opposite sides of said member and containing insulating liquid in con-

tact with said member, means for supplying compressed air to the upper ends of said conduits, and means for varying the pressure of the air in said conduits to move said member and thereby actuate said contact.

15. An electric switch comprising a support, two insulators projecting from said support adjacent each other, one of said insulators being tubular and containing insulating fluid, coöperating contacts mounted on said insulators, a fluid pressure motor mechanism connected to one of said contacts and mounted on said tubular insulator in communication with the interior thereof, and means for varying at will the pressure of the insulating fluid in said tubular insulator to operate said motor mechanism.

16. In an electric switch, the combination of a support, two insulators mounted on said support to project therefrom parallel to each, one of said insulators being tubular and containing insulating fluid, coöperating contacts mounted on said insulators, means for varying at will the pressure of the insulating fluid in said tubular insulator, and a fluid pressure motor mechanism mounted on one end of said tubular insulator and connected to one of said contacts, said motor mechanism comprising a casing in communication with the interior of said insulator and an actuating member connected to one of said contacts and movable in said casing in response to variations in pressure of the fluid in said insulator.

17. An electric switch comprising a support, two insulators mounted on said support side by side, one of said insulators being tubular and containing insulating fluid, a contact clip on one insulator, a coöperating contact blade pivoted on said tubular insulator, means for varying at will the pressure of the insulating fluid in said tubular insulator, and a fluid pressure motor mechanism mounted on said tubular insulator, said motor mechanism comprising a cylinder in communication with the interior of said insulator and a piston connected to said blade to swing it about its pivot.

18. An electric switch comprising a horizontal support, insulators depending from said support adjacent each other, one of said insulators being tubular and containing insulating fluid, coöperating relatively movable contacts mounted on said insulators, a fluid pressure motor mechanism mounted on the lower end of said tubular insulator in communication with the interior thereof and connected to one of said contacts to actuate it, and means for varying the pressure of the insulating fluid in said insulator.

19. An electric switch comprising a horizontal support, a tubular insulator depending from said support and containing oil, a movable contact mounted on the lower end of said insulator, a fluid pressure operating mechanism connected to said contact and mounted on the lower end of said insulator in communication with the interior thereof, and means for supplying elastic fluid under pressure to the upper end of said insulator to vary the pressure of the oil in said insulator.

20. An electric switch comprising a movable contact, two tubular insulators mounted adjacent each other and containing insulating fluid, a fluid pressure motor mounted on said insulators and comprising a movable member connected to said contact and arranged to form a movable partition between the interiors of said insulators, and means for at will increasing the pressure of the fluid in one insulator and decreasing the pressure of the fluid in the other insulator to operate said member and thereby actuate said contacts.

21. An electric switch comprising two fixed contacts, two tubular insulators containing insulating fluid and mounted side by side between said fixed contacts, a plate secured to both said insulators, a bridging contact movably mounted on said plate to coöperate with said fixed contacts, a fluid pressure motor mechanism mounted on said plate comprising a casing with its opposite ends in communication with the interior of said tubular insulators and a movable member mounted in said casing to form a partition between said insulators and connected to said bridging contact to actuate it, and means for varying at will the pressure of the insulating fluid in said insulators to move said member and thereby actuate said bridging contact.

22. An electric switch comprising a support, two fixed contacts mounted on and insulated from said support, two tubular insulators containing insulating fluid and mounted side by side between said fixed contacts, a fluid pressure motor mechanism mounted on the adjacent ends of said tubular contacts and in communication with the interior thereof, electrically connected contact blades pivotally mounted on said insulators to coöperate with said fixed contacts and connected to said motor mechanism to be actuated thereby, and means for varying the pressure of the insulating fluid in said insulators to actuate said motor mechanism.

25. An electric switch comprising a horizontal support, fixed contacts mounted beneath said support, two tubular insulators containing insulating fluid and vertically suspended from said support, a conducting plate mounted on the lower ends of said tubular insulators, conducting blades pivoted to said plate to coöperate with said fixed contacts to form a pivoted bridging contact, a fluid pressure motor mechanism mounted on said plate and comprising a cylinder having one end in communication

with the interior of one insulator and the other end in communication with the interior of the other insulator, a piston in said cylinder connected to said pivoted blades, and means for varying the pressure on the insulating fluid in said insulators to move said piston and thereby actuate said blades.

24. An electric switch comprising a horizontal support provided with an opening, a cap for closing said opening, two tubular insulators containing insulating fluid and vertically suspended from said cap, a conducting plate smaller than said opening secured to the lower ends of said insulators, two switch blades pivotally mounted on said plate within the periphery thereof, a fluid pressure motor mechanism mounted on said plate in communication with the interior of said insulators and connected to said blades to operate them, and means connected to said cap for varying the pressure on the upper surface of the insulating fluid in said insulators and thereby actuating said switch blades.

25. In an electric switch, the combination of a horizontal support having a central opening through it, a cap member secured to said support to bridge said opening, fixed contacts mounted on said support on opposite sides of said opening, a bridging contact mounted on said cap member in position to coöperate with said fixed contacts, and constructed to pass through said opening, and actuating mechanism for said bridging contact mounted on said cap member.

26. In an electric switch, the combination of a horizontal support having a central opening through it, fixed contacts mounted on the said support on opposite sides of said opening and beneath said support, a cap member detachably secured to the upper side of said support to bridge said opening, a bridging contact mounted on said cap member beneath said support to coöperate with said fixed contacts and constructed to pass through said opening, and operating mechanism for said bridging contact proportioned to pass through said opening and mounted on said cap member below said support.

27. In an electric switch, the combination of a tank, a cover provided with a central opening, a cap member detachably secured to said cover to bridge said opening, fixed contacts mounted on said cover on opposite sides of said opening to project into said tank, and a bridging contact capable of passing through said opening and mounted on said cap member to coöperate with said fixed contacts.

28. In an electric switch, the combination with a tank, a cover provided with a central opening, a cap member detachably secured to said cover to bridge said opening, fixed contacts mounted on said cover on opposite sides of said opening, a bridging contact mounted on said cap member to cooperate with said fixed contacts and constructed to pass through said opening, and operating mechanism controlled from outside of said tank mounted on said cap member and connected to said bridging contact.

In witness whereof, I have hereunto set my hand this 14th day of September, 1909.

EDWARD M. HEWLETT.

Witnesses:

BENJAMIN B. HULL,

THOMAS W. NOONAN.