H. W. CHENEY.

MULTIPLE UNIT SWITCH.

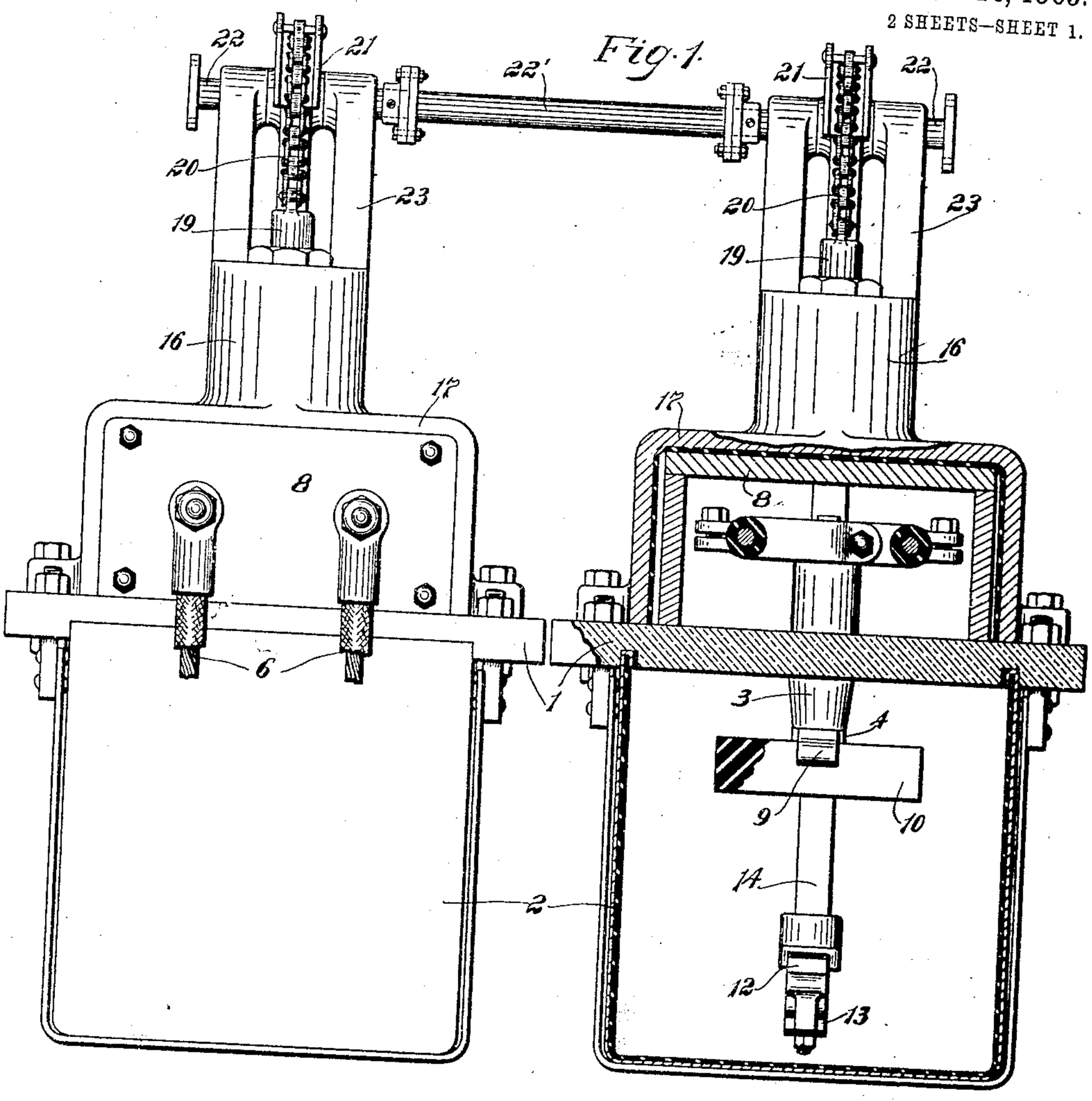
APPLICATION FILED AUG. 30, 1905.

912,542.

Patented Feb. 16, 1909.

2 SHEETS—SHEET 1.

Fig. 1.



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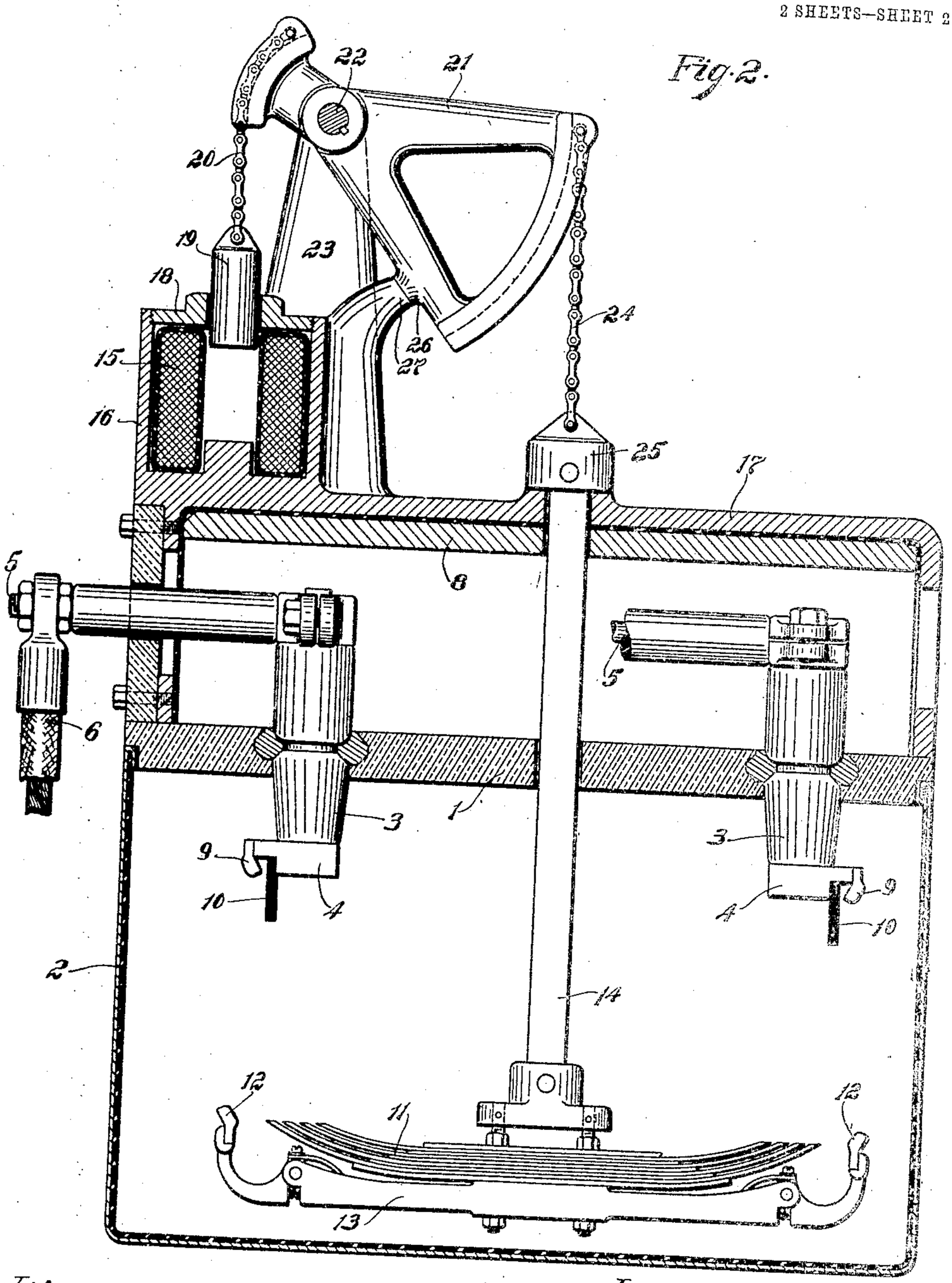
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

HERBERT W. CHENEY, OF NORWOOD, OHIO, ASSIGNOR TO THE BULLOCK ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF OHIO.

MULTIPLE-UNIT SWITCH.

No. 913,562. Specification of Letters Patent. Patented Feb. 23, 1909.

Application filed August 20, 1895. Serial No. 559,363.

To all whom it may concern:

Be it known that I, HERBERT W. CHENEY, citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Multiple-Unit Switches, of which the following is a full, clear, and exact specification.

My invention relates to remote controlled electrically operated oil switches.

It is frequently desirable to operate two or more adjacent single pole switches simultaneously by a single electrically controlled operating mechanism. It is customary in such cases to provide movable switch members which are connected to the operating mechanism and move simultaneously in parallel lines. To obtain this parallel motion it has been necessary to resort to a complicated system of links and levers.

It is the object of my invention to provide an operating mechanism for obtaining the parallel motion which will be simple and consist of few parts, and still be effective and highly efficient.

In carrying out my invention, I provide an electrically operated switch with an operating solenoid and a single lever for transmitting motion from the solenoid core to the movable contacts.

My invention consists further in a plurality of electrically operated single-pole switches which have an operating solenoid and each a rotary or oscillatory member for transmitting motion from the solenoid core to the movable switch member, the rotary or oscillatory members being so connected together that all the switches will be operated simultaneously when the solenoid coil is energized.

More specifically considered my invention consists in an improved operating mechanism for a plurality of electrically operated single-pole switches which comprise a rotatable shaft mounted in bearings above the switch casing, which shaft has a plurality of parallel arms extending from one side thereof, each being connected to a movable contact of a switch, and extending from the other side thereof a plurality of shorter lever arms, and a plurality of operating solenoids each connected to one of said shorter lever arms.

My invention still further consists in the details of construction and combination of elements described in detail in the specification and set forth in the appended claims.

Reference is had to the accompanying drawings in which—

Figure 1 is a rear view showing two adjacent single-pole oil switches connected to the same operating mechanism, a part of one switch mechanism being shown in section for the sake of clearness; and Fig. 2 is a vertical section through one of the switches; parts of the operating mechanism being shown in elevation.

I have shown at 1, two adjacent slabs of insulating material on each of which may be mounted one or more single-pole switches, having shown in this instance only one. These slabs may be supported in any convenient manner. Connected to each slab is an oil tank 2. Passing through the slab and secured thereto in any suitable manner and extending into each tank are two porcelain bushings 3. At the lower ends of the bushings are secured the stationary switch contacts 4, which are connected in any suitable manner to insulated terminal rods 5, which extend rearward and are connected to the main line at 6. Removably mounted above the slab and inclosing the connections are the protecting casings 8, which may be made of any suitable material. The stationary contacts 4 have adjacent thereto the arcing tips 9 which are preferably separated from the main contacts by barriers of insulating material 10.

Mounted within each tank is a bridging contact consisting of the laminated contact 11 and the arcing tips 12, the laminæ are held to the base 13 by bolts which in turn engage the bottom of a vertically movable plunger 14.

The tanks are made of any suitable material and are oil tight, being filled up to a suitable distance above the contacts with a good insulating oil. Thus the danger of destructive sparking as the circuits are opened is eliminated.

Mounted above each oil tank in any suitable manner in line with the center of the tank is a solenoid coil 15. I have in this instance shown each solenoid coil seated in a cup 16 of the cast metal cover 17 for a casing. The coils just described are the switch operating coils, and may be connected to any suitable source of current, being intended to be energized at the same time. The cups in

which the coils are mounted are provided with covers 18 which in this instance are screwed into the tops of the cups. Solenoid cores, one of which is shown at 19 are adapted to move into and out of the coils through the cup covers to operate the switches, as will be explained later. Each core is connected at its upper end to a flexible chain or cable 20, which is connected to the upper end of the shorter arm of a walking-beam lever 21. These walking-beam levers are rigidly connected to the short, horizontal shafts 22, mounted to revolve or oscillate in the upwardly extending bearings 23. These short shafts are preferably joined together by the flanged connecting rod 22′ thereby forming a single, long shaft, so that both beams will rock in unison. These walking-beams have forwardly extending arms, longer than the rearwardly extending arms previously described. The two lever arms of each beam have enlarged outer faces which are arcs of circles concentric with the pivotal center of the beam.

Attached to the top of each longer lever arm is a second flexible chain or cable 24, which extends downward and is connected in any suitable manner to the vertically movable plunger 14 previously described. Each lever arm is grooved to receive the chain, as is clearly shown. The lever arms are of such lengths that vertical tangents to the arcs of the longer arms always coincide with the longitudinal axes of the plungers 14 and the vertical tangents of the arcs of the shorter arms always coincide with the axes of the solenoid cores. Thus as the beams are rocked about the horizontal axis, each core 19 and each plunger 14 will always move in a vertical direction. It will thus be seen that if the beams are each set at the proper angles, and if the corresponding chains or cables on the beams are of the proper lengths, all circuits will be closed simultaneously. I have shown at 25, counterweights on each plunger 14 in order that the switch may be quick acting. A lug 26 on each walking-beam is adapted to engage a stationary lug 27 on the casing to limit the downward movement of the movable switch member. By making the lever arm connected to the plunger longer than the lever arm connected to the core I am able to obtain a considerable movement of the switch contact from a comparatively small movement of the core and the ratio of movements may be varied to any extent by changing the relative lengths of the lever arms.

It will be seen that the plungers 14 carrying the bridging contacts will move simultaneously in parallel lines, and therefore all the circuits will be closed or opened simultaneously. The mechanism by which I accomplish this result is exceedingly simple and composed of very few parts, and is therefore positive in its action and not liable to get out of order. By curving the outer faces of the walking beam arms on arcs of circles concentric with the center of rotation, the effective lever arms will always be the same in length, no matter to what angles the beams are inclined. Thus the plunger will move at a uniform speed throughout the stroke if the solenoid core moves at uniform speed.

It will also be seen that each of my unit-pole switches is absolutely self-contained and can be operated independently of the other unit-pole switches. I can unite any number of these independent switches into a multipole switch by simply connecting the short shafts 22 so that all the switches will be operated simultaneously. The number of unit-pole switches so employed can be changed at will for use in transmission systems, having any desired number of phases.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is—

1. In an electrically operated switch, a horizontal support, a pair of stationary contact members secured to the lower side thereof, a movable bridging contact member, a vertically movable plunger secured to said bridging contact member, means for raising the plunger and bridging contact member and for holding the latter in firm engagement with the stationary contact members comprising a solenoid supported on said horizontal support, a horizontal shaft mounted in bearings on said support, a lever carried by said shaft, flexible means connecting one end of said lever to said plunger, and flexible means connecting the other end of said lever to the core of the solenoid.

2. In combination, a plurality of unit-pole switches each having a stationary and a movable contact, a shaft or spindle supported on the top of each unit-pole switch, all said shafts being in horizontal alinement and connected together so as to rotate in unison, an operating lever secured to each shaft, one end of each lever being substantially vertically above the corresponding movable contact and connected thereto, and a solenoid for operating said shafts and levers.

3. In combination, a plurality of unit-pole switches each having a movable contact and a stationary contact, a solenoid for operating each switch, a walking-beam mounted on each switch for transmitting motion from the solenoid core to the movable contact, connecting means between each solenoid core and one end of the corresponding beam and the movable contact and other end of the beam, and means connecting the walking-beams integrally together.

4. In combination, a plurality of single-pole switches having stationary and mov-

able contacts, a pair of upright bearing posts on each switch, a horizontal spindle or shaft in each pair of bearing posts, a plurality of lever arms mounted on said spindles in position to operate the movable contacts and electromagnetic means for moving the levers said spindles being mechanically connected together whereby all the switches will be operated simultaneously.

5. In combination, a plurality of single-pole switches having stationary and movable contacts, an operating solenoid for each switch, a walking beam lever mounted above each switch, connecting means between each solenoid core and one arm of a walking-beam lever, connecting means between the corresponding movable contact and the other arm of the walking-beam lever, and means connecting all the walking beams together whereby all the switches will be operated in unison.

6. In combination, a plurality of switches having stationary and movable contacts, an operating solenoid for each switch, a horizontal shaft mounted in bearings on said switches, lever arms extending from one side of said shaft and connected to the solenoid cores, and oppositely extending lever arms connected to the movable contacts.

7. In combination, a plurality of adjacent single-pole switches having each a stationary contact and a movable contact, a rotatable shaft mounted in bearings above said switches, parallel lever arms extending from said shaft over the movable contacts of said switches, means connecting each movable contact with the end of one of said arms, and a plurality of switch operating solenoids connected with said shaft.

8. In combination, a plurality of switches having movable and stationary contacts, a rotatable shaft mounted in bearings over the switches, a plurality of parallel lever arms extending from one side of said shaft and each connected to a movable contact, a plurality of parallel shorter lever arms extending from said shaft in an opposite direction, and a plurality of operating solenoids each connected to one of said last named lever arms, whereby all the switches will be operated simultaneously.

9. In a multipole oil switch, a plurality of single pole switches, each comprising an insulating support, an oil tank suspended therefrom and contacts within each tank, terminal rods connected to the contacts and extending through the corresponding insulating supports, a protecting casing mounted on each insulating support, conductors connected to said terminal rods and extending through the casing wall, and a switch operating mechanism mounted on each of said casings.

10. In combination, a plurality of single pole oil switches, each including an insulating support, a tank secured thereto, stationary and movable contacts in said tank, a frame mounted on said support, and a complete operating means including a solenoid and a pivoted walking beam mounted on said frame.

11. In combination, a plurality of self-contained electrically operated unit pole switches, each having a separate and complete operating mechanism including an electromagnetic motive closing device, and means for mechanically connecting together two or more of said switches for simultaneous operation to form a multipole switch.

12. In combination, a plurality of self-contained unit pole switches each having a separate and complete operating mechanism including an electro magnetic motive closing device, and means for mechanically connecting together the operating mechanisms of any number of said switches for simultaneous operation to form a multipole switch.

13. In combination, a plurality of self-contained electrically operated unit pole switches, each having a separate operating mechanism comprising a rotatable shaft a walking beam lever and a solenoid, and means for connecting together any desired number of said shafts, said solenoids being energized simultaneously to operate the connected switch units in unison.

14. In combination, a multipole switch composed of a plurality of self-contained units, each unit consisting of coöperating contact members, a separate and complete operating mechanism including electrically operated switch closing means, and means for mechanically constraining said switch units to operate simultaneously.

15. In combination, a plurality of self-contained unit pole electrically operated switches, each having a separate operating mechanism including an electromagnetic motive device, and means for mechanically connecting together said operating mechanisms so that said unit pole switches will be operated in unison.

In testimony whereof I affix my signature, in the presence of two witnesses.

HERBERT W. CHENEY.

Witnesses:
ARTHUR F. KIVIS,
FRED J. KINSEY.