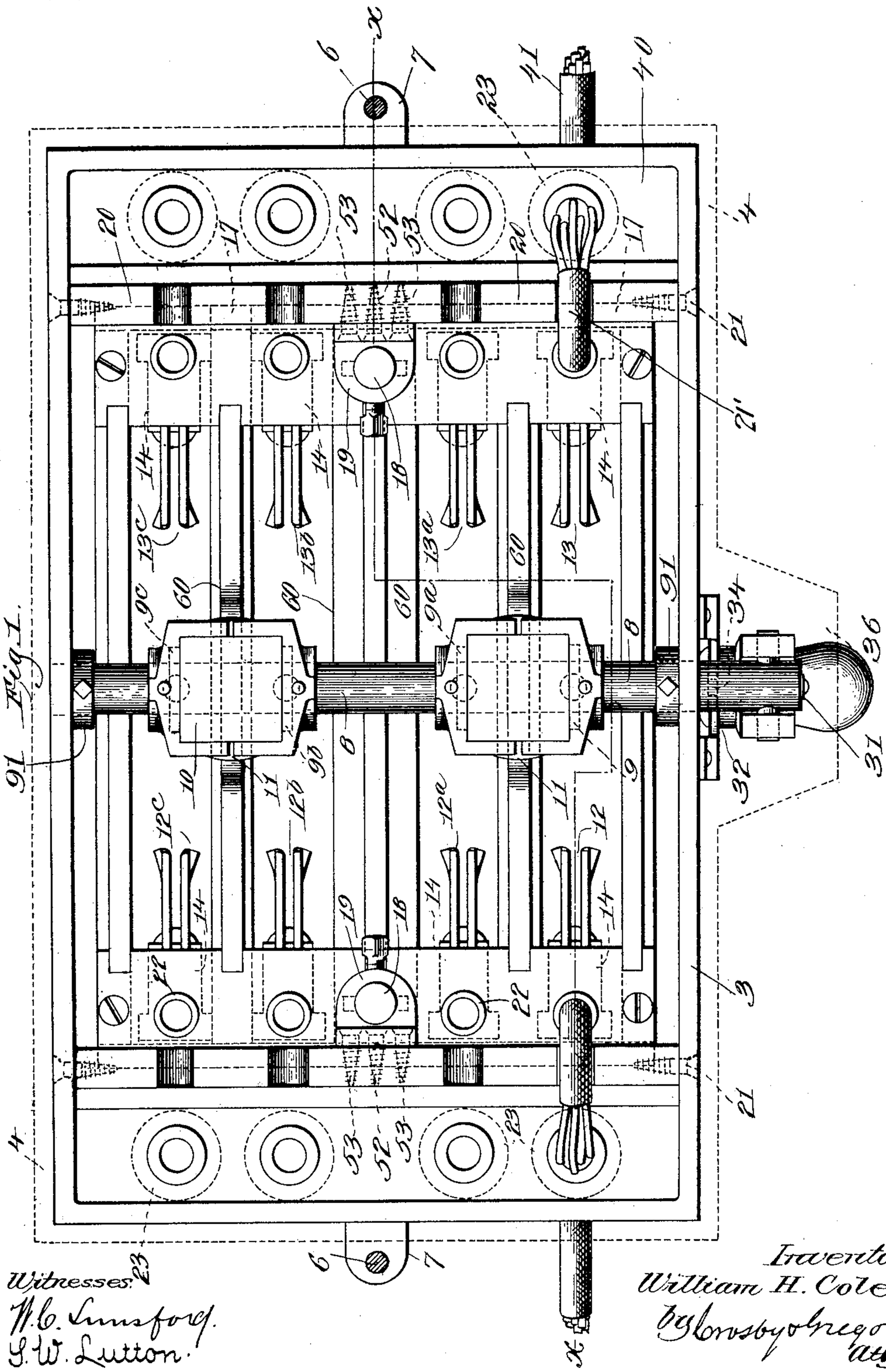
No. 750,811. PATENTED FEB. 2, 1904.

W. H. COLE.

OIL SWITCH.

APPLICATION FILED APR. 29, 1903.

NO MODEL. 3 SHEETS—SHEET 1.



Witnesses:
W. C. Lunsford.
S. W. Lutton.

Inventor:
William H. Cole,
by Lonsby & Gregory
Attys

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 4.

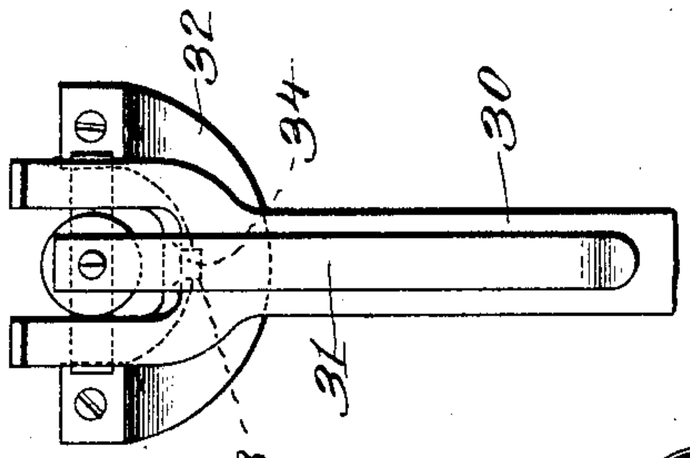

Fig. 2.

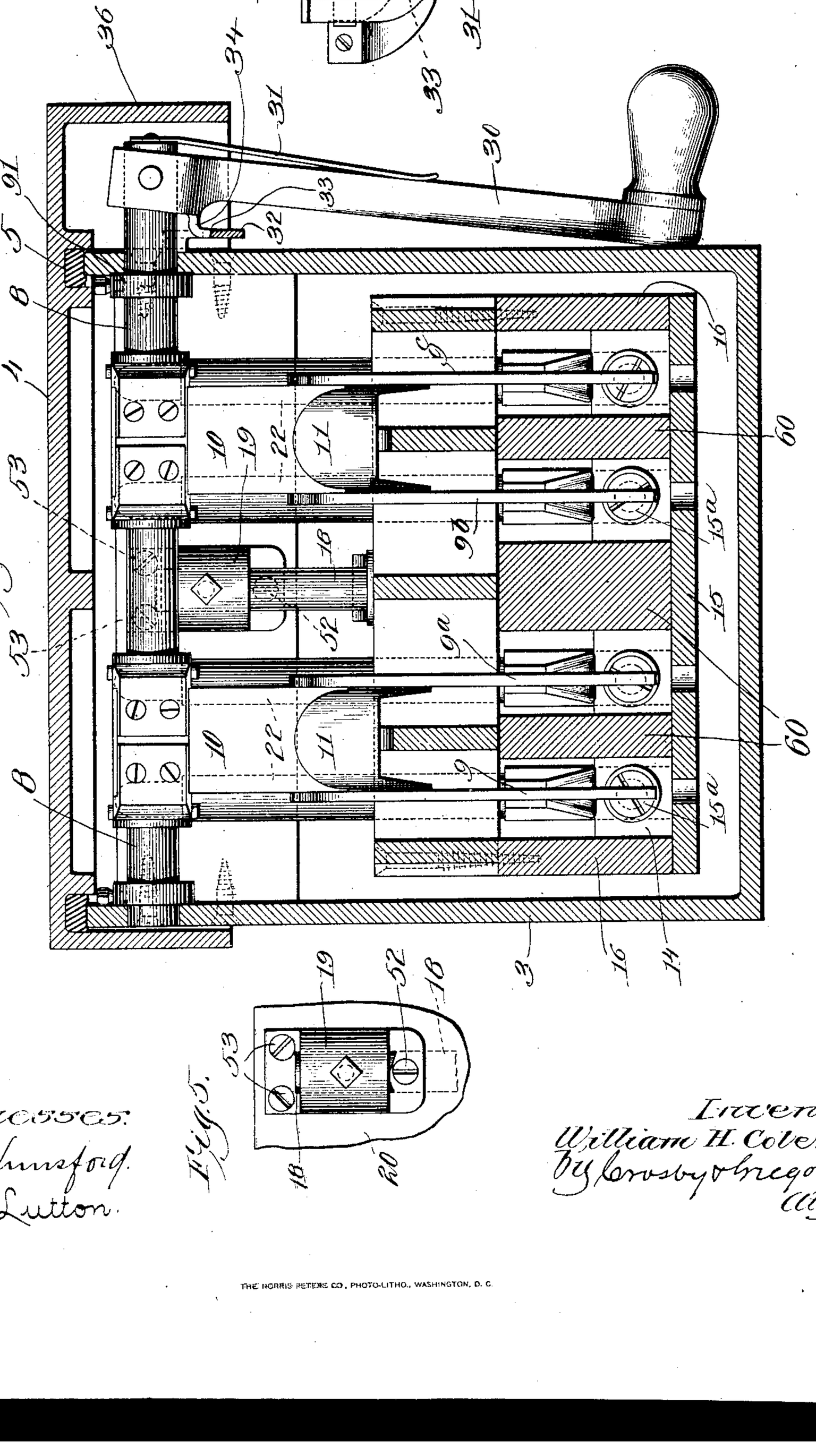

Fig. 5.

Witnesses:
W. C. Linsford.
L. W. Lutton.

Inventor:
William H. Cole.
By Crosby & Gregory
Attys.

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NO MODEL. 3 SHEETS—SHEET 3.

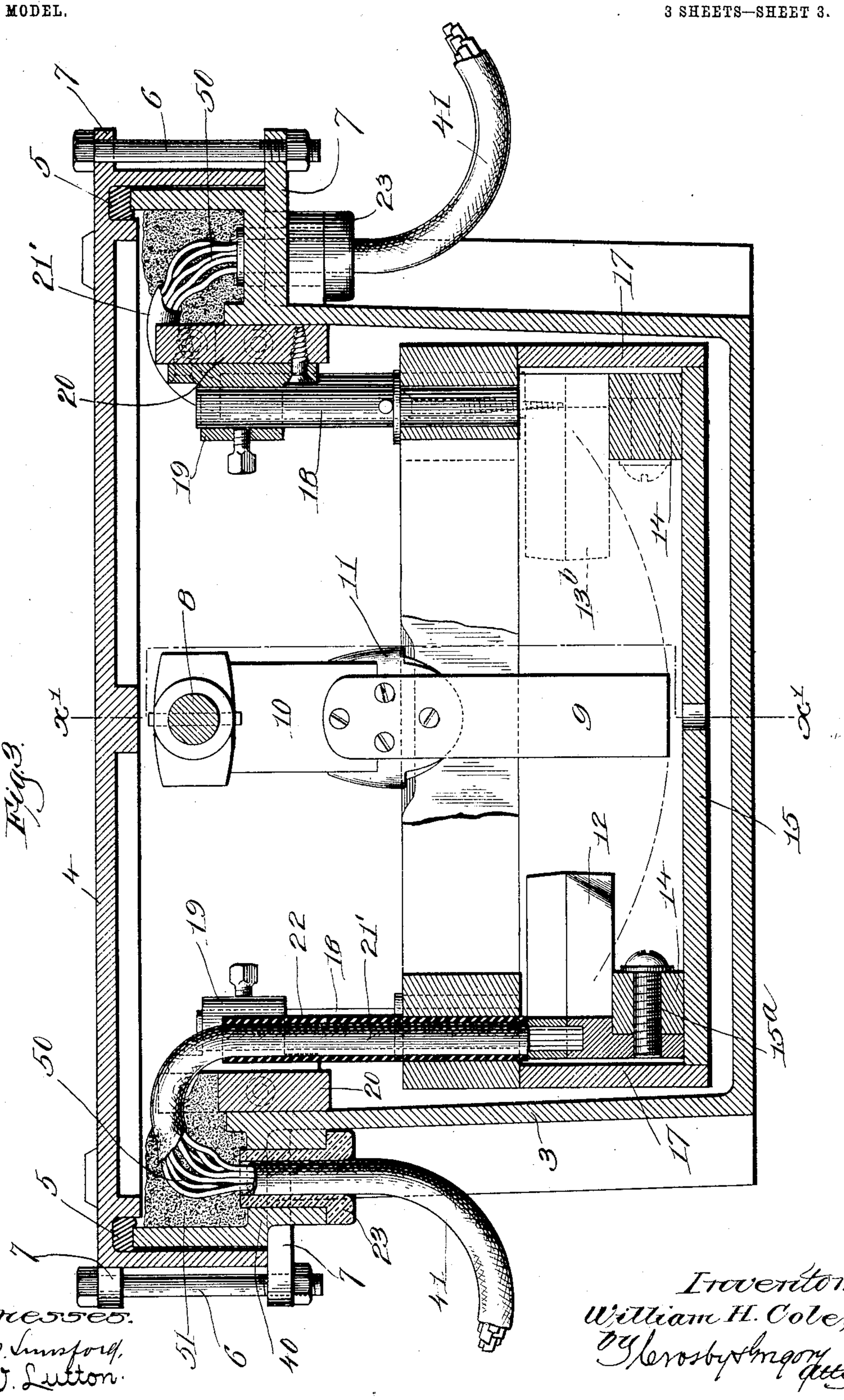

Fig. 3.

Witnesses:
H. C. Simpson.
G. W. Lutton.

Inventor:
William H. Cole,
by Crosby & Gregory Attys.

No. 750,811. Patented February 2, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM H. COLE, OF WATERTOWN, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO WELLES E. HOLMES, OF WATERTOWN, MASSACHUSETTS.

OIL-SWITCH.

SPECIFICATION forming part of Letters Patent No. 750,811, dated February 2, 1904.

Application filed April 29, 1903. Serial No. 154,813. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. COLE, a citizen of the United States, residing at Watertown, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Oil-Switches, of which the following description, in connection with the accompanying drawings, is a specification, like numerals on the drawings representing like parts.

This invention relates to an oil switch—that is, a switch used for high-tension currents and in which the contacts are made and broken in a body of oil to prevent undue sparking.

The novel features wherein the invention resides will be hereinafter more fully described and then recited in the claims.

In the drawings, Figure 1 is a top plan view of my improved switch with the cover removed. Fig. 2 is a section on the line $x' x'$, Fig. 3; and Fig. 3 is a vertical section of the switch at right angles to Fig. 2. Figs. 4 and 5 are details.

The oil-casing in which the contacts are inclosed is designated by 3, and it has a suitable cover 4, which closes the casing water-tight. As herein illustrated, said casing is provided with the packing or gasket 5, which engages the upper edges of the sides of the casing, and said cover is held in place by suitable clamping-bolts 6, which pass through flanges 7 on the cover and casing, respectively. Extending across the casing near its upper edge is a rock-shaft 8, from which depend the swinging switch blades or knives. These blades are herein illustrated as arranged in pairs, and in the form of the invention herein shown I have illustrated two such pairs. The blades 9 and 9^a constitute one pair, and 9^b 9^c constitute another pair. The two blades of any pair are electrically connected together, but are insulated from the blades of the other pair. This is accomplished by suspending the blades of any one pair from a support 10, of insulating material—such, for instance, as wood—which support is rigidly secured to the shaft 8. The filling-block 11 between the blades of any pair is of a material to furnish proper electrical connection between said blades. Each blade works in an oil-chamber. The swinging switch-blades coöperate with stationary contacts in the form of clips or jaws, and in this form of my invention there are two such jaws or clip-contacts for each switch-blade. These clip-contacts or terminals are designated by 12 12^a 12^b 12^c and 13 13^a 13^b 13^c, respectively. These stationary terminals or contacts are arranged on opposite sides of the switch-blades, so that the latter can be closed into the stationary contacts of one series or the other, as desired. These stationary terminals or jaw-contacts are supported upon a suitable framework, which is suspended from the upper end of the casing, as will be presently described. This framework comprises a box-like structure having the bottom 15 and side walls 16 and end walls 17. Extending across the bottom are two cross-pieces 14, to which the jaws of the contacts are secured in any suitable way, as by screws 15^a. Rising from each end of the framework is a supporting rod or hanger 18, each of which extends through and is secured to a suitable eye 19, which in turn is supported by a cross-piece 20. The cross-piece 20 is of wood or some other insulating material and is rigidly secured to the casing in any suitable way, as by screws 21.

The framework above described is also of some suitable insulating material, preferably of wood, so that each jaw-contact is insulated from every other jaw or clip contact.

Each contact has a wire 21′ electrically connected thereto, said wire extending through the protecting-tube 22, of some suitable insulating material, and passing out through a bushing 23, of porcelain or some other suitable insulating material, in the side of the casing.

The shaft 8 extends through the side of the casing and has pivoted to one end thereof an operating lever or crank 30, said crank being normally held in the position shown in Fig. 2 by some suitable means, such as a spring 31. Secured to the side of the casing is a quadrant 32, having a central notch 33, and the crank 30 is provided with a pawl or projection 34, which is adapted to engage said notch and by so doing lock the switch-blades in their central position.

In operating the switch the handle 30 has to be first swung about its pivot and drawn away from the casing to release the projection 34 from the notch, after which the crank may be turned in whichever direction desired.

In opening the switch it is merely necessary to swing the crank so as to disengage the switch-blades from the contacts, and as the hand-crank turns the spring 31 automatically causes the engagement of the projection with the notch 33 when the blades reach their central position. This method of connecting the crank 30 to the shaft is one feature of my present improvement.

In order to protect the crank and the locking device from the weather, the cover 4 is shown as being provided with a protecting-hood 36, which covers the projecting end of the shaft 8.

It is understood, of course, that the casing 3 is filled with oil to a considerable distance above the contacts 12 and 13.

One of the objections to the present oil-switches is the fact that the oil works its way by capillary attraction along the lead-wires, either along the capillary ducts in the insulation or along the spaces existing between the strands of the wires, thus making a constant leakage which drains the oil from the casing and also causes a disagreeable drip.

Another feature of my invention relates to a means to effectively prevent the above operation, and in the best form of my invention now known to me I accomplish this by removing the insulating material from the lead-wires for a portion of their length immediately adjacent the bushing on the inside of the casing and opening up the strands of the wire and embedding said strands in a body of concrete or cement or similar material, which is preferably an insulating material. For conveniently accomplishing this I have herein illustrated my casing as having at its ends the overhanging portion 40, which forms, with the cross-pieces 20, cement-receiving chambers or grooves through the bottom of which the bushings 23 extend.

The portion of each terminal wire 41 immediately adjacent the inner end of the bushing 23 is stripped of its insulating material and the strands opened, as shown at 50 in Fig. 3, and subsequently a body of cement 51 is poured around the naked wire, so that the individual strands are each embedded in this cement. This construction places a substantially non-porous barrier across any and all capillary ducts or passage-ways which exist either in the wire itself or in the insulation, and thus prevents any oil working itself along the wire by capillary attraction. It is necessary, of course, that this barrier be of insulating material. In this form of the invention both the insulating-covering and the wire itself contain capillary ducts, and therefore I place this non-porous barrier so as to intercept all such ducts. My invention, however, can be used where the lead-wires are of any construction, and this feature of my invention consists, broadly, in placing inside of the casing a non-porous or impervious barrier across all the capillary paths in the lead-wires, so as to absolutely prevent any oil from working its way along the wires by capillary attraction.

For the perfect operation of this type of switches it is necessary that the jaws of any one terminal contact stand in planes exactly parallel to the plane of the blade which cooperates with said contact, and the construction of my switch is such that when the parts are being assembled the proper alinement of the jaws and switch-blade can readily be secured.

It will be noted from Fig. 5 that each eye 19 is secured to the corresponding cross-piece 20 by three screws, one of which, 52, is situated centrally, while the others, 53, are situated at one side.

In assembling the parts the supporting-framework for the stationary or clip contacts is set into the casing and the eyes 19 slipped over the supporting-rods 18 and the screws 52 driven home to retain the eyes in approximately their correct positions. Since, however, the supporting-framework is suspended on the two screws 52, it follows that it can swing slightly about said screws as pivots. Thereafter the shaft 8, with the switch-blades depending therefrom, is placed in position and said shaft turned to bring the blades between the jaws of the terminals.

If the jaws of the terminal contacts do not stand in exactly the same plane as the switch-blades, the movement of closing the switch operates to swing the frame slightly about the screws 52 as pivots until the jaws and blades are properly alined, and when this has occurred the screws 52 can be brought in place, thus permanently holding the framework in its proper position and the collars 91 made fast to the shaft 8 to hold said shaft from lateral movement.

I have found from practice that this method of alining the jaws and switch-blades is simple and effective, and the construction which permits of this I consider as an important part of my invention.

I prefer to divide the space in which these switch-blades swing into separate chambers by suitable partitions 60, of insulating material, there being one chamber to receive each switch-blade.

The construction herein illustrated is what I have termed the "unit" system, each unit comprising two pairs of clip-contacts and one pair of swinging switch-blades—as, for instance, the pairs 12 12^a and 13 13^a of clip-contacts and the pair of swinging switch-blades 9 9^a. In the form of the invention herein shown two units are employed; but it will be

obvious that by making the chambers larger, adding another pair of switch-blades to the shaft 8 and two more corresponding pairs of clip-contacts, another unit may be added to the system, and this increase of the number of units employed may be made to any desired extent. The changing of the switch, therefore, from a one-unit switch to a two, three, or four unit switch merely requires the addition of certain parts and does not require the alteration of the existing parts. It will be understood, of course, that the specific manner of wiring the switch may be changed in various ways, according to the situation in which the switch is to be used.

While I have herein described one form in which my invention may be embodied, it will be understood that I have not attempted to show all forms in which it may be embodied, and therefore reserve the right to make such changes in the structure as come within the scope of the appended claims.

Some of the features of this invention obviously are not limited in their use to oil-switches. For instance, the means for preventing the oil from working its way along the wires by capillary attraction could be applied to transformers and similar devices in which an oil-casing containing coils or contacts were employed and through which casing the lead or terminal wires were extended.

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

1. In an oil-switch, an oil-containing casing, contacts therein, lead-wires extending through the casing and connected to certain of the contacts, said wires each being formed of a plurality of strands and means to prevent the oil from working its way along each wire by capillary attraction.

2. In an oil-switch, an oil-containing casing, switch-contacts therein below the normal level of the oil, said casing having openings in its side, a stranded insulated conductor passing through each opening and connected to one of the contacts, and means on the inner wall of the casing to prevent the oil from working its way along each conductor by capillary attraction.

3. In an oil-switch, an oil-containing casing, contacts in said casing below the level of the oil, openings in the side of the casing, and terminal wires extending through said openings and connected to the switch-contacts, the portion of each wire immediately inside of the casing being stripped of its insulating-covering and buried in cement or similar material, whereby the oil is prevented from working its way along the wire by capillary attraction.

4. In an oil-switch, an oil-containing casing, contacts in said casing below the level of the oil, openings through the side of the casing, and terminal wires extending through said openings and connected to the contacts, the portion of the casing through which the wires pass being formed to present a cement-receiving groove or pocket, and the portion of each wire extending through said pocket being stripped of its insulating material and cement or similar insulating material in the pocket which prevents the oil from working its way along the wire by capillary attraction.

5. In an oil-switch, an oil-containing casing having at each end an overhanging portion forming a cement-receiving pocket in the bottom of which are openings to receive terminal wires, contacts in said casing, terminal wires extending through said openings and connecting the said contacts, the portions of the wires extending through the pockets being stripped of insulating material, and cement in said pockets and in which the naked portion of the wire is embedded.

6. In an oil-switch, an oil-containing casing, a rock-shaft extending across the casing and having switch-blades depending therefrom, a contact for each blade, said contacts each having a pair of jaws between which the corresponding blade is received, an insulating-support for the contacts, rods rising from said support, and eyes secured to the casing and in which said rods are clamped.

7. In an oil-switch, an oil-containing casing, jaw or clip contacts therein, a rock-shaft extending across the casing and having switch-blades depending therefrom, a crank pivoted to the shaft on the outside of said casing, a locking-quadrant having a locking-notch, a projection on the crank to engage said notch and hold the switch open, and means tending normally to swing the projection into the notch.

8. In an oil-switch, an oil-containing casing, jaw or clip contacts therein, a rock-shaft supported by the casing and having switch-blades depending therefrom, a spring-pressed crank pivoted to the shaft on the outside of the casing, a fixed quadrant having a locking-notch and a projection on the crank to engage said notch.

9. In an oil-switch, an oil-containing casing, a framework of insulating material suspended from the upper portion thereof, a plurality of opposed pairs of jaw or clip contacts supported on said framework, a shaft extended across the upper end of the casing, a corresponding number of pairs of switch-blades depending from said shaft and coöperating with the opposed pairs of contacts, a supporting-rod rising from each end of said framework, an eye through which each rod passes and to which it is clamped, and three screws securing each eye to the casing, one screw being situated centrally of each eye, whereby by securing the eyes to the casing by the centrally-situated screws only the framework may be centered or alined by closing the switch-blades into the jaw-contacts prior to permanently securing the eyes in place.

10. An oil-containing casing, insulated conductors extending through the wall of the casing, and means to prevent the oil in the casing from working its way by capillary attraction along that portion of each conductor extending through the casing.

11. An oil-containing casing, stranded conductors extending through the casing and into the interior thereof, and a barrier of non-porous insulating material disposed to intercept any and all capillary ducts extending along each conductor through which oil might leak by capillary attraction.

12. An oil-containing casing, conductors extending through the walls and into the interior thereof, and a non-porous barrier of insulating material situated inside of the casing and arranged to intercept any and all capillary ducts extending along each conductor through which oil might leak by capillary attraction.

13. In an oil-switch, an oil-containing casing having at its ends overhanging portions, conductors extending vertically through the bottom of said portions into the casing, and a barrier of cement or similar insulating material on said overhanging portions and through which the conductors pass, said barrier intercepting all capillary ducts extending longitudinally of each conductor.

14. In an oil-switch, an oil-containing casing, contacts therein, lead-wires extending through the casing and connected to the contacts, said wires having a porous insulating covering and a non-porous barrier on the interior of the casing and arranged to intercept all capillary ducts in the insulating-covering through which oil might escape by leakage.

15. In an oil-switch, an oil-containing casing, stationary contacts therein, a rock-shaft extending across the casing and through the sides thereof and having switch-blades coöperating with the contacts, the end of the shaft projecting beyond the casing, a crank on said projecting end of the shaft, and a cover sealing the casing, said cover having integral therewith a hood to protect the projecting end of the shaft.

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

WILLIAM H. COLE

Witnesses:

LOUIS C. SMITH,

GEO. W. GREGORY.