No. 891,306. PATENTED JUNE 23, 1908.

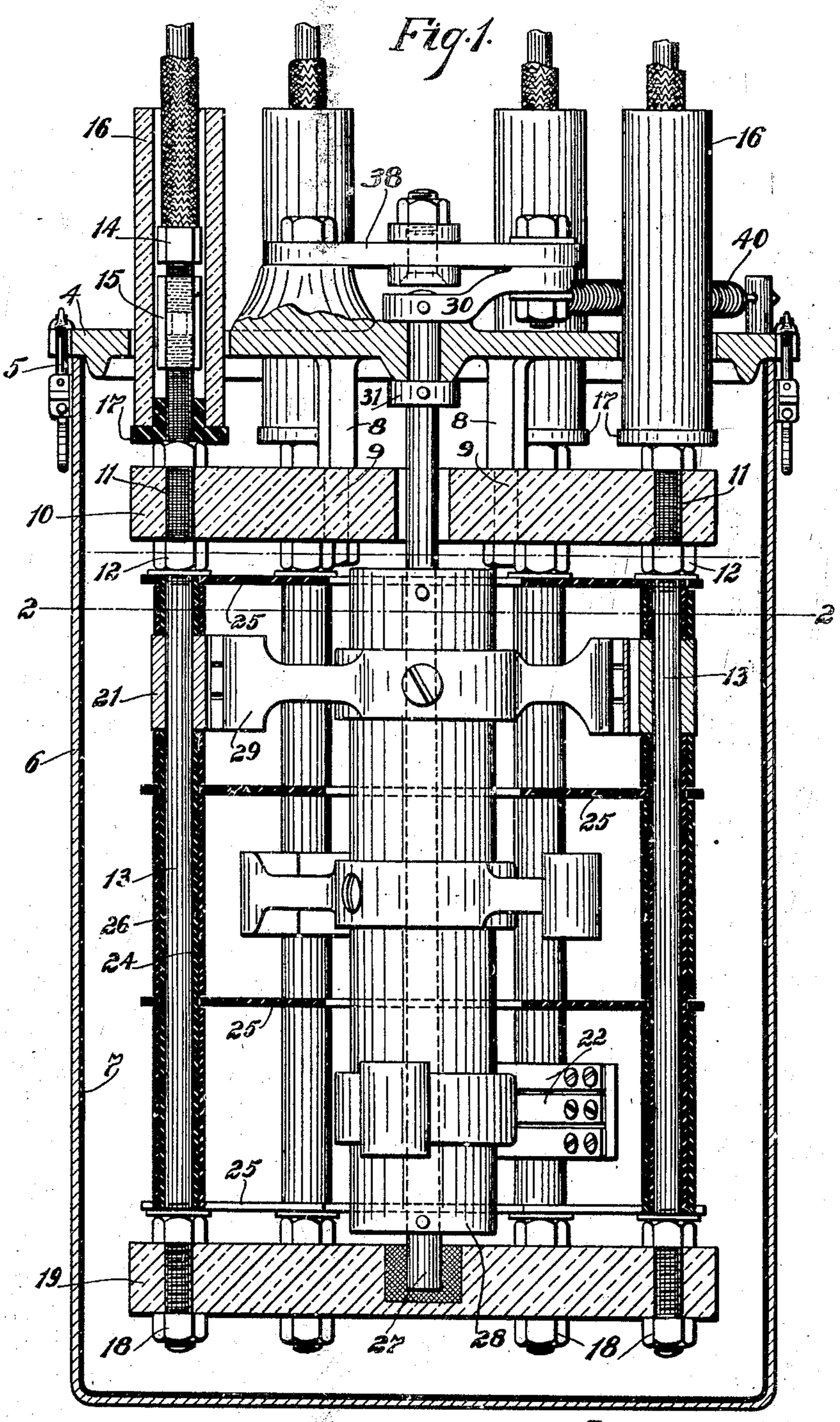
H. L. VAN VALKENBURG.

ROTARY OIL SWITCH.

APPLICATION FILED AUG. 21, 1905.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

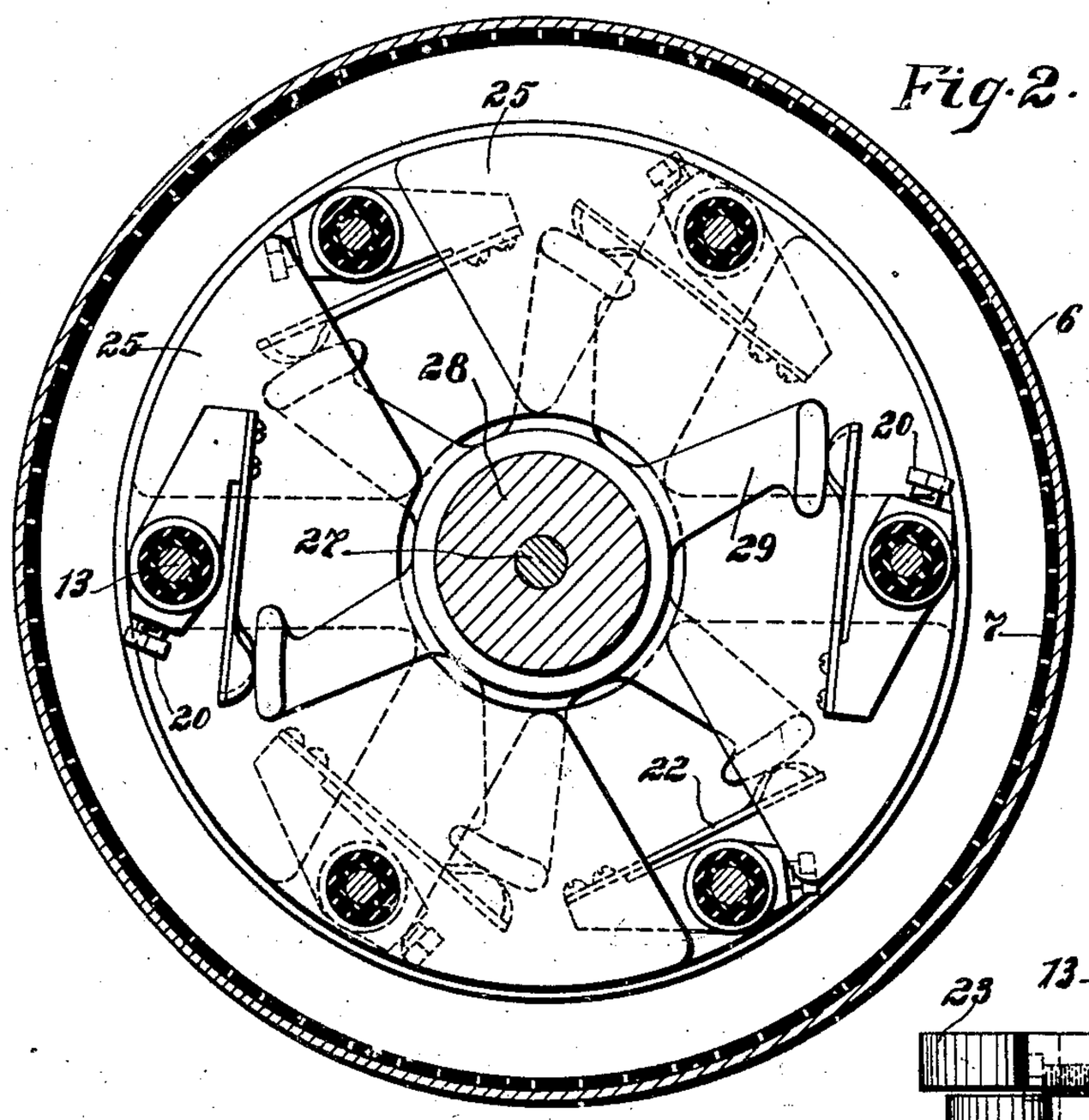


Fig. 4.

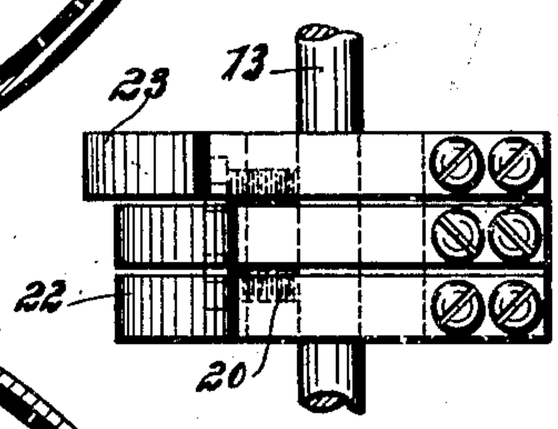
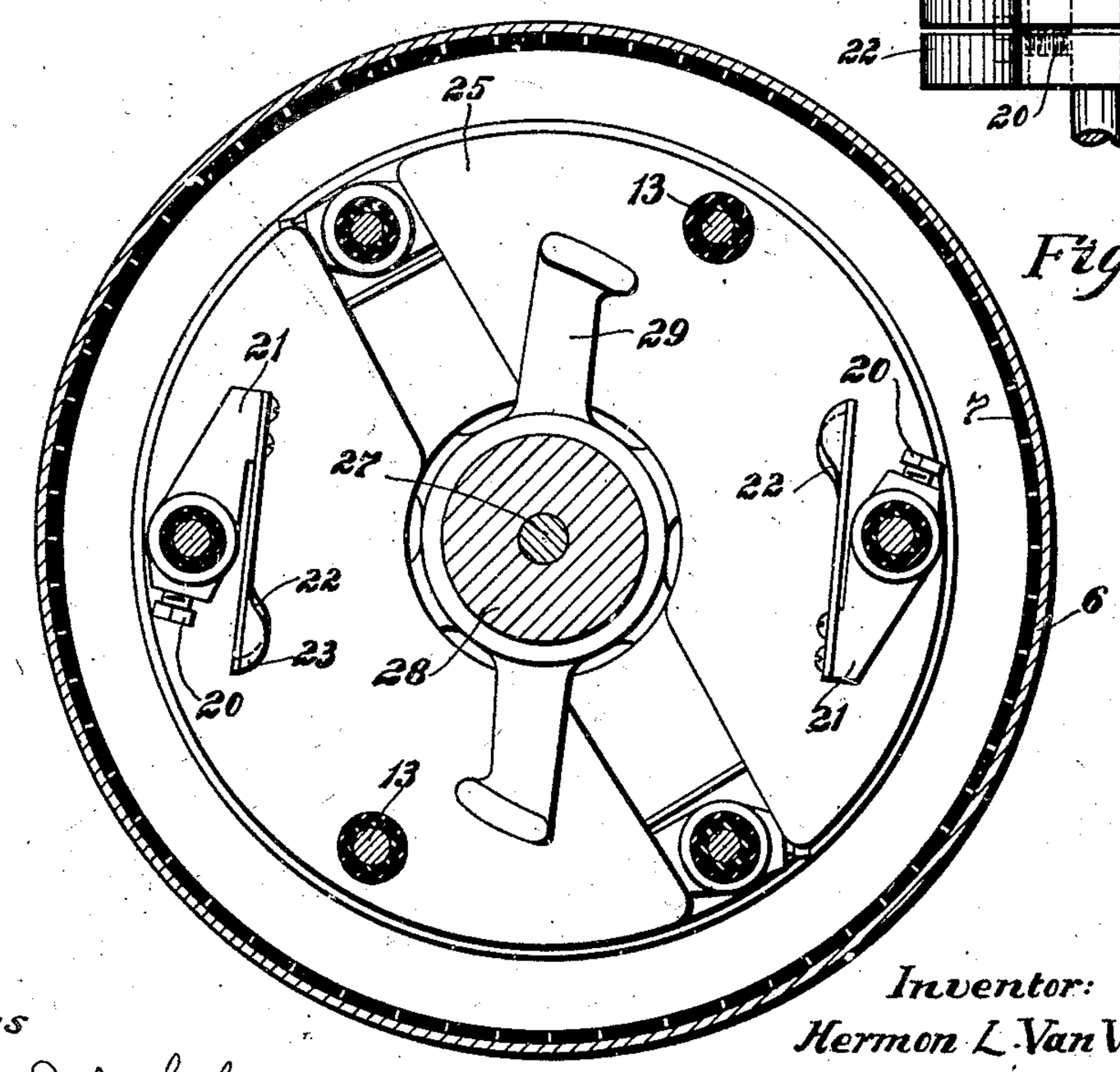


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 5.

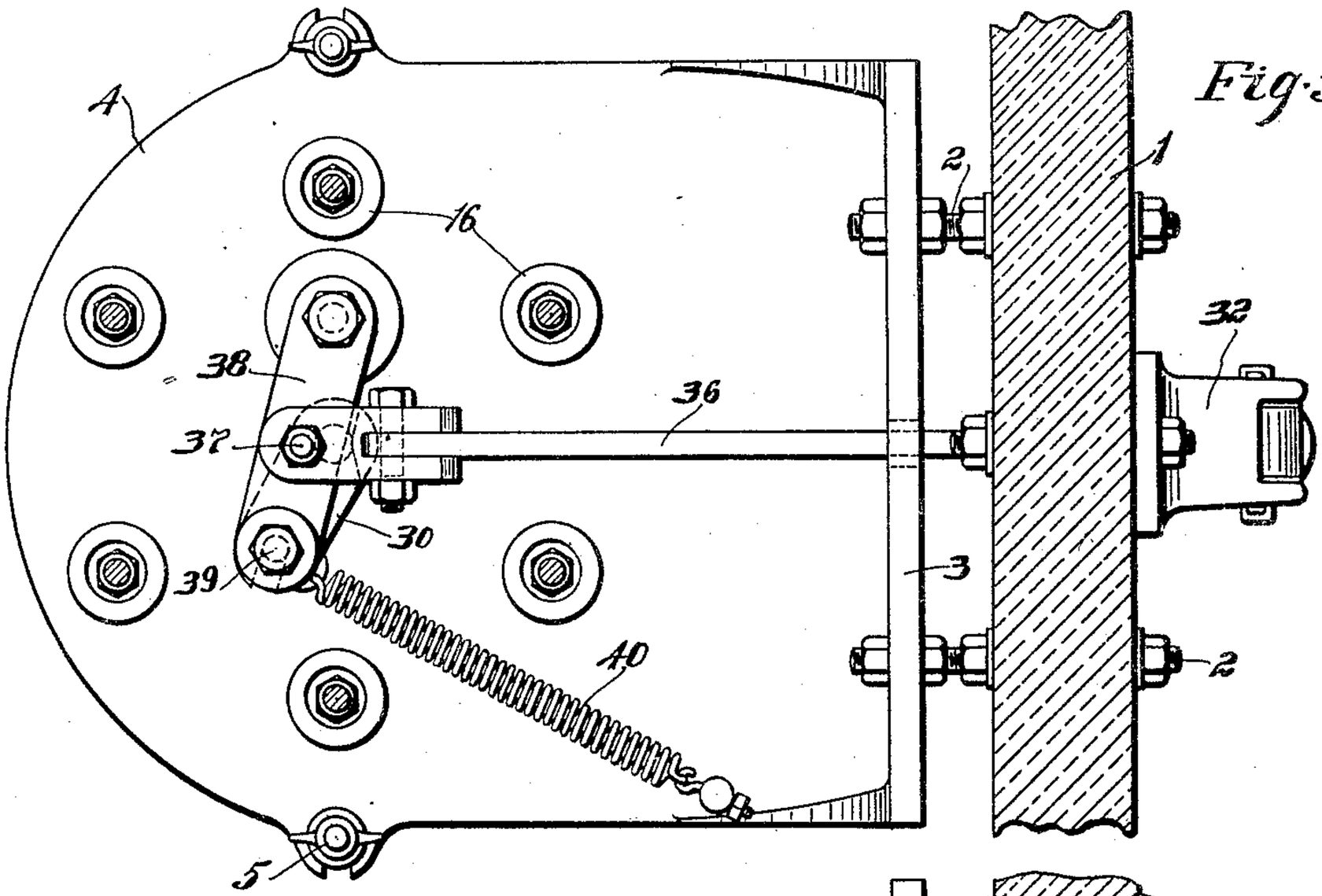
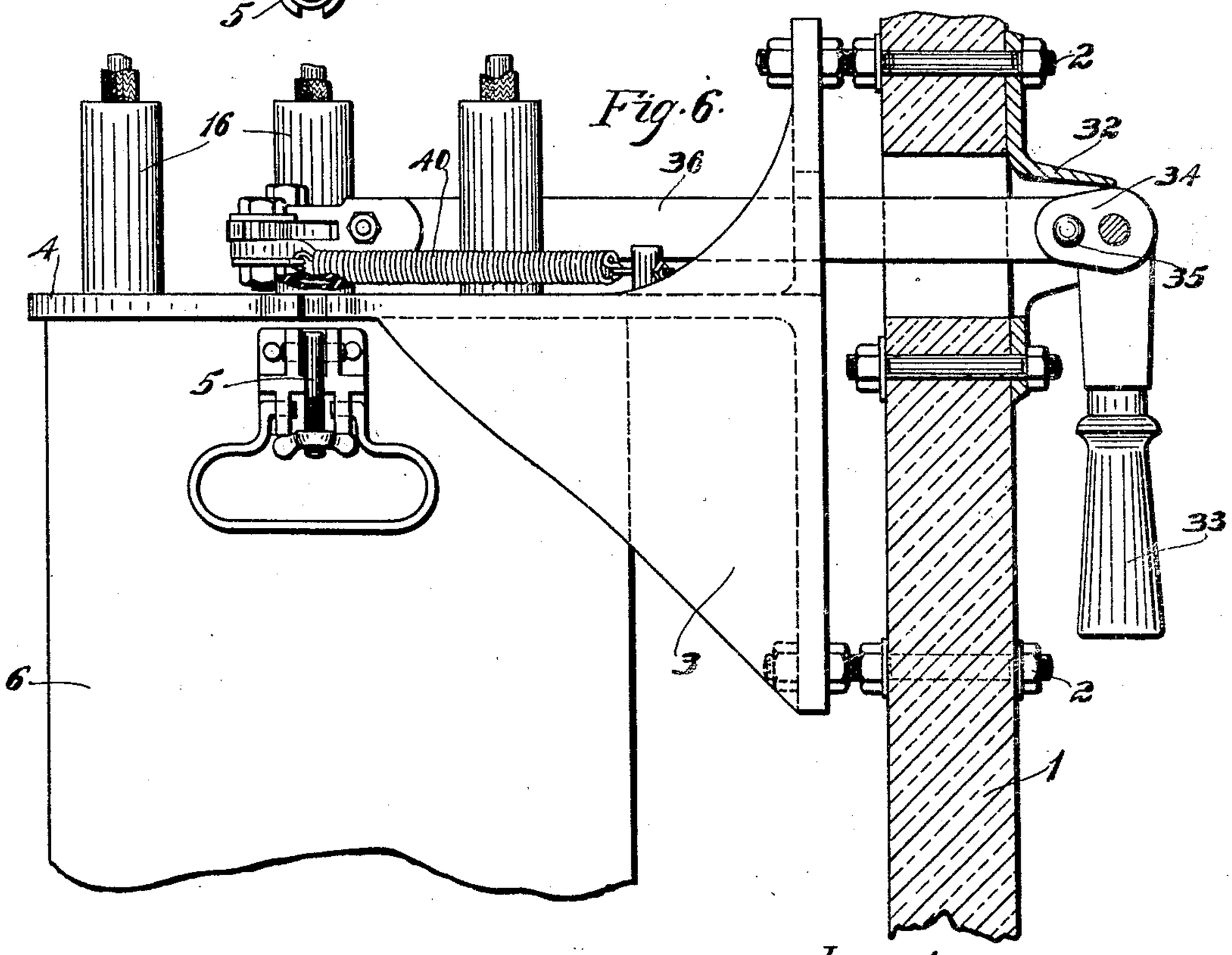


Fig. 6.



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UNITED STATES PATENT OFFICE.

HERMON L. VAN VALKENBURG, OF NORWOOD, OHIO, ASSIGNOR TO THE BULLOCK ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF OHIO.

ROTARY OIL-SWITCH.

No. 891,306. Specification of Letters Patent. Patented June 23, 1908.

Application filed August 21, 1905. Serial No. 275,126.

To all whom it may concern:

Be it known that I, HERMON L. VAN VALKENBURG, 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 Rotary Oil-Switches, of which the following is a full, clear, and exact specification.

This invention relates to rotary oil switches of the double-break type in which all contacts are surrounded by oil to minimize the danger of injury by arcing.

The object of my invention is to improve in a general way this type of switch and to provide a switch which will be simple in construction, effective in operation, easy to assemble, and one in which all parts are accessible and easily removable in case of injury.

My invention consists in certain novel details of construction and combinations of elements described in detail in this specification and set forth in the appended claims.

Reference is had to the accompanying drawings, in which,

Figure 1 is a vertical sectional view of a switch embodying my invention, some of the parts being shown in elevation; Fig. 2 is a section along the line 2—2 of Fig. 1; Fig. 3 is a section along the same line showing only one pair of contacts and in their open position; Fig. 4 is a detail of one group of contact fingers; Fig. 5 is a plan view of the switch attached to a switch-board, the latter being shown in section; and Fig. 6 is a partial elevation of the same, the switch-board being shown in section.

At 1, I have shown a portion of a switch-board panel to which my switch is attached. To the rear side of the switch-board is attached by bolts 2 a bracket 3, having a rear horizontal extension 4. This extension supports by pivoted bolts and wing-nut 5 the cylindrical oil tank 6, and forms the cover for the same. This oil tank may be made of any suitable material, as galvanized iron, and is made oil tight and suitably lined with insulating material 7. Extending from the lower side of the bracket are a plurality of lugs 8, to which is held by bolts 9 (two of which are shown in Fig. 1) a disk or slab 10 of insulating material, preferably soapstone, which is centrally supported in the tank.

Arranged in a circle and near the periphery of the insulating slab are a plurality of equally spaced holes 11. Passing through these holes 11 and secured to the slab 10 by nuts 12, are a plurality of long, vertical contact-rods or contact terminals 13, which extend through the cover of the tank and are connected to the main line leads. I have here shown six such contact-rods for a three-pole switch adapted for a three-phase circuit, but I wish it understood that my invention is not confined to a switch having this specific number of poles. These contact rods extend out through the cover of the tank and are connected to the threaded terminals 14 of the main leads by threaded collars 15. Porcelain tubes 16 pass freely through the cover and rest upon insulating washers 17 within the tank. These tubes insulate and protect the connections, and can be slipped along the main leads when it is desired to disconnect the leads from the contact-rods.

Supported on the lower ends of the contact-rods by means of nuts 18 is a second slab of insulating material 19. The holes which receive the rods are arranged circularly around the center of the slab, as in the upper insulating slab, and are equally spaced. This slab spaces the rods apart and holds them firmly in a vertical parallel position.

The downwardly extending spaced rods 13 support the stationary contacts of the switch. I have shown, as stated above, a three-pole double-break switch, the poles being arranged in different horizontal planes. The diametrically opposite contact-rods support the contacts of each pole. The pairs of contacts are therefore staggered with respect to each other and the contacts of each pair are spaced angularly 60° from those of the adjacent pair. Mounted on each contact rod by set screws 20 are the contact finger holders 21 which can be adjusted at any angle about the rods 13. Each finger holder supports a plurality of spring contact fingers 22; I have here shown three on each holder. As shown in Fig. 4, one of the fingers 23 is slightly longer than the other two in order to take the arc at the break of the circuit. Surrounding each rod, except where the finger holder is attached is an insulating sleeve 24. Mounted on the insulating tubes are four barriers of insulating material 25, being spaced apart by

insulating collars 26. The shape and arrangement of these barriers will be explained later.

Journaled in the lower slab 19 and passing freely through the upper slab 10 and cover 4 is the rotatable shaft 27. The shaft supports within the tank the insulating drum 28, made preferably of wood. Spaced vertically on the drum are the three brass or copper cross-arms or bridging contacts 29. The cross-arms are arranged one for each switch pole to engage the contact fingers, and are staggered or are angularly spaced 60° apart, as are the stationary contacts, in such a manner that the circuits controlled by the switch will be made or broken simultaneously at the three poles. The outer contacting faces of the cross-arms are not concentric with the axis of rotation, but are so inclined, that is, the angle of contact with the spring fingers is such, that when the switch is closed (Fig. 2), friction is almost balanced. In other words, although there is always firm and close engagement between the switch contacts when the switch is closed, the tendency for the contacts to separate is only slightly greater than the friction holding the contacts together. In view of the fact that pitting or roughening of the contacts will increase the coefficient of friction, I so incline the faces of the bridging contacts that the switch contacts will tend to separate even after considerable use. Thus the frictional resistance between the contact faces does not add to the force required to open the switch. The rotatable shaft 27 is fixed by a pin or set screw to the arm 30 of the operating mechanism and is held in place from vertical movement by the collar 31.

The shaft, drum, and cross-arm contacts can be removed if desired without disturbing the insulating barriers, the form and arrangement of which will now be described. The upper barrier 25 is circular in shape, being preferably formed of a single piece, and rests on the insulating sleeves of the six contact rods. The three remaining barriers are each composed of two segmental pieces as clearly shown in Fig. 2. These two pieces of each barrier are cut away at the center to receive the drum and are spaced apart far enough to permit a cross-arm to pass between them. Each part of the barrier is supported on the insulating sleeves of two contact rods. The remaining two barriers are similar in shape, but the slot or opening between the two parts is displaced from the one immediately above by 60°, as is shown by dotted lines in Fig. 2. Now, when it is desired to remove the shaft, drum, and cross-arms for repairs, or any other purpose, the tank and lower slab 19 are removed, as are also the pins or set screws holding the arm 30 and collar 31. The shaft is now turned so that each cross-arm is in line with a slot in the adjacent barrier, and is lowered one step, or the space of one compartment. The shaft is then turned 60° when the two upper cross-arms are again in line with the slots in the two adjacent barriers and is again lowered. This operation is again repeated and the shaft is removed. It is to be noted that by the lowering and turning process the shaft and the cross-arms are "screwed" out of the switch structure.

The switch operating mechanism will now be described. Pivoted at the front of the switch-board on plate 32 is the operating handle 33. Attached to the handle and extending at a suitable angle thereto is the arm 34. This arm is pivoted at 35 to the long arm 36, which extends through the panel and is connected at 37 with the pivoted arm 38. The arm 38 is connected at 39 with the arm 30 previously referred to, which arm 30, as was explained, is connected to the rotatable shaft 27 carrying the contact arms. Secured to the arm 38 and near its outer end is the tension spring 40, which spring is connected at one end to a stationary lug on the bracket. This spring is put under tension when the switch is closed and quickly separates the contacts when the switch is opened. It is to be noted that the arms 34 and 36 constitute a toggle which, when the switch is closed hold the contacts firmly together.

It is seen that my switch is compact, that all parts are firmly held together, but are easily removable in case of injury. As the contacts are surrounded by oil, there is little danger of injury by sparking. The level of the oil is indicated in Fig. 1 by the dot and dash line.

The insulating barriers 25 will prevent the arcs from communicating from one pole to another. The contacts are held firmly together, but nevertheless the switch can be easily operated.

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

1. In a rotary oil switch, an oil tank, a horizontal disk or slab of insulating material supported therein, contact-rods extending downwardly into said tank and passing through and supported by said disk or slab of insulating material, a contact finger carried by each of said contact-rods, a second horizontal disk or slab of insulating material at the lower part of the tank, said disk or slab spacing apart and holding the contact rods in relatively fixed position, a rotatable rod or drum in said tank, and a contact carried by said drum and adapted to engage the said contact fingers.

2. In a rotary oil switch, an oil tank, a cover therefor, vertical contact rods passing through the cover into the tank, a contact member carried by each rod the several contact members being arranged in different planes, a disk or slab of insulating material at the ends of said rods for holding the same

in relatively fixed position, a rotatable member supported in said tank on the lower insulating disk or slab, and contact arms carried by said member in different horizontal planes in position to engage the contact members on the respective rods.

3. In combination, a supporting bracket, an oil tank carried thereby, an insulating slab supported within said tank on the lower side of said bracket, a plurality of vertical contact rods entering said tank, passing through and being supported by said insulating slab, said rods being arranged in a circle pairs of contact fingers supported on said rods, the fingers of each pair being on diametrically opposite rods and the pairs being mounted in different planes, a drum mounted to rotate within said tank, and contact arms carried by said drum in different planes for engaging said contact fingers.

4. In a rotary oil switch, an oil tank, a horizontal slab of insulating material supported within said tank and near the upper end thereof, a plurality of contact-rods entering said tank and being supported at regular intervals in a circle in said slab, means near the lower end of said tank for holding the arms in fixed relative position, a rotatable drum passing through the center of the first named slab and carrying contact arms which engage contacts on said contact rods, and means for rotating said drum.

5. In a rotary oil switch, an oil tank, a slab of insulating material supported in and near the top of the tank, vertical contact-rods in said tank and supported in a circle by said slab and about the center thereof, contact fingers carried by said rods and arranged in pairs, the pairs being arranged in different horizontal planes, a second insulating slab near the bottom of said tank supported by and holding in fixed relative position the contact-rods, a vertical drum journaled on said last named slab and arranged centrally of said contact rods, contact arms on said drum arranged in different horizontal planes in position to engage said contact fingers, and means for operating said drum.

6. In a rotary oil switch, an oil tank, a plurality of rods having contact fingers, and a rotatable switch member having a contact cross-arm adapted to engage the contact fingers, the contact faces of the arm being so inclined that when the parts are in firm contact the separating force is almost balanced by the force of friction.

7. In a rotary switch, a plurality of stationary contact members and a rotary bridging contact member, the faces of the contact members when in engagement being at such an angle that the separating force between the contacts will always be slightly greater than the retaining force of friction.

8. In a rotary switch, a plurality of stationary, adjustably mounted contact fingers, and a rotary bridging contact member, the contacting parts of the bridging member being so inclined to the contacting faces of the stationary members that the force tending to separate the contacts will be always slightly greater than the frictional retaining force.

9. In a rotary oil switch, a plurality of contact rods arranged in a circle, contact fingers arranged in pairs on said rods, the pairs being in different planes and relatively staggered, a rotatable member provided with bridging cross-arms arranged in different planes and staggered with respect to each other, and insulating barriers separating the contacts of the several planes, each barrier being slotted the width of the cross-arm and having the slots staggered by the same angle as said cross-arms.

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

HERMON L. VAN VALKENBURG.

Witnesses:
SANFORD KLEIN,
FRED J. KINSEY