

June 14, 1932.

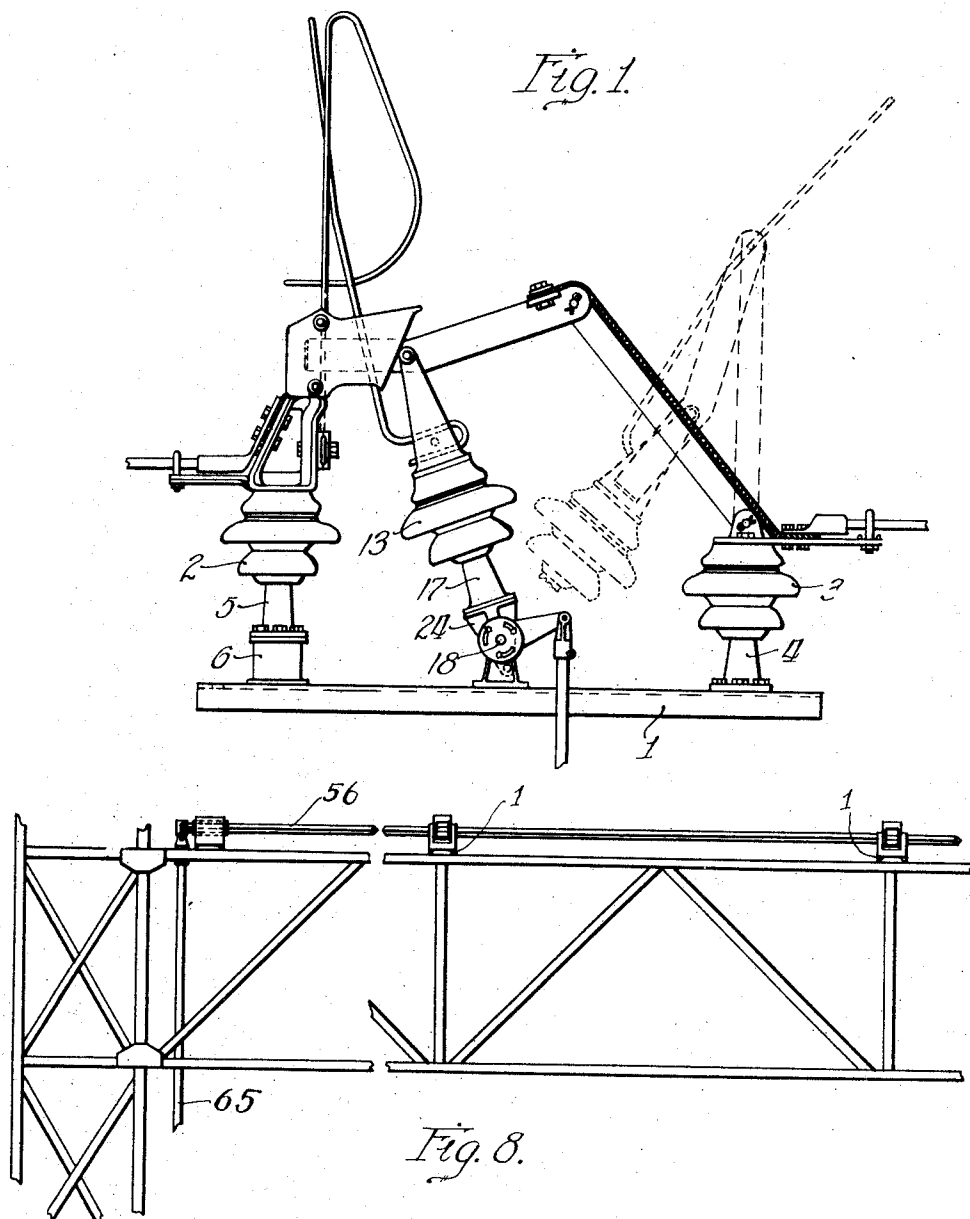
P. B. HOYE

1,863,405

ROCKING INSULATOR

Filed Oct. 19, 1928

4 Sheets-Sheet 1



Inventor  
Peder B. Hoyer  
By *Amos Jacobson* Attorney  
Attys.

June 14, 1932.

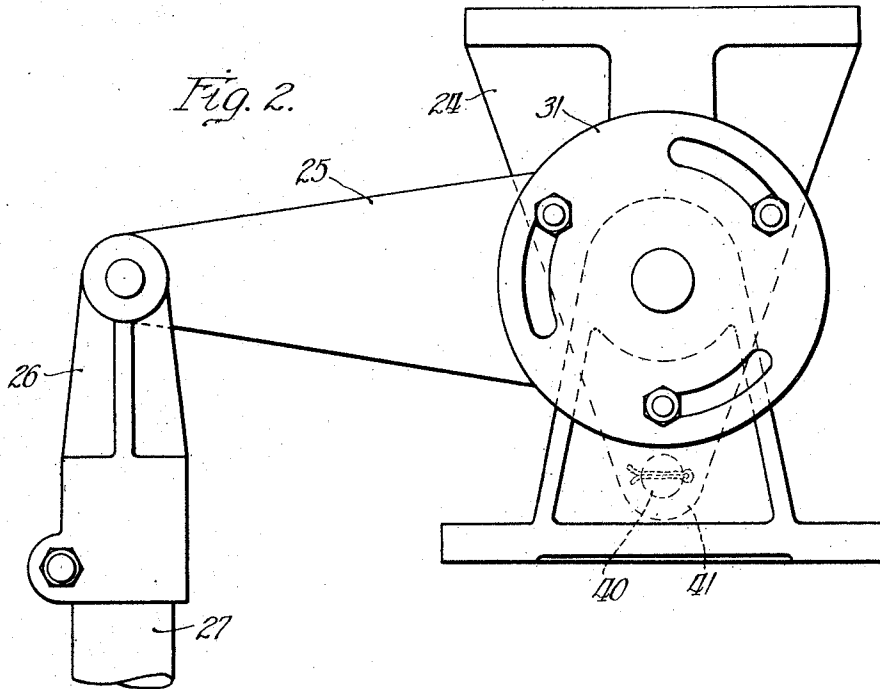
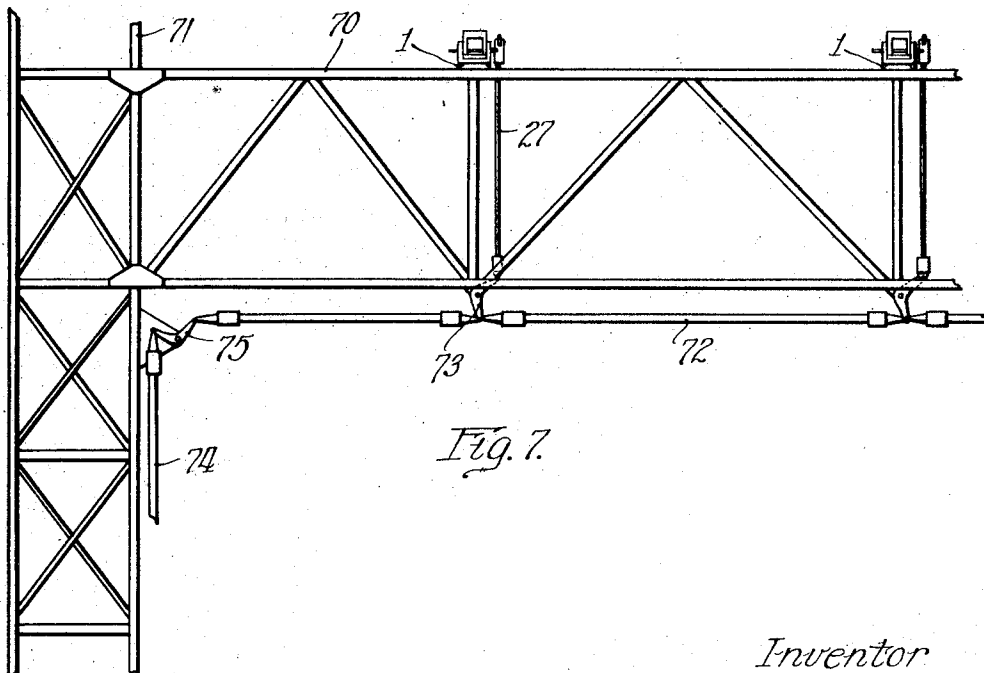
P. B. HOYE

1,863,405

ROCKING INSULATOR

Filed Oct. 19, 1928

4 Sheets-Sheet 2



Inventor  
Peder B. Hoyer  
By *Morgan Jackson Porter & Skinner*  
Attys

June 14, 1932.

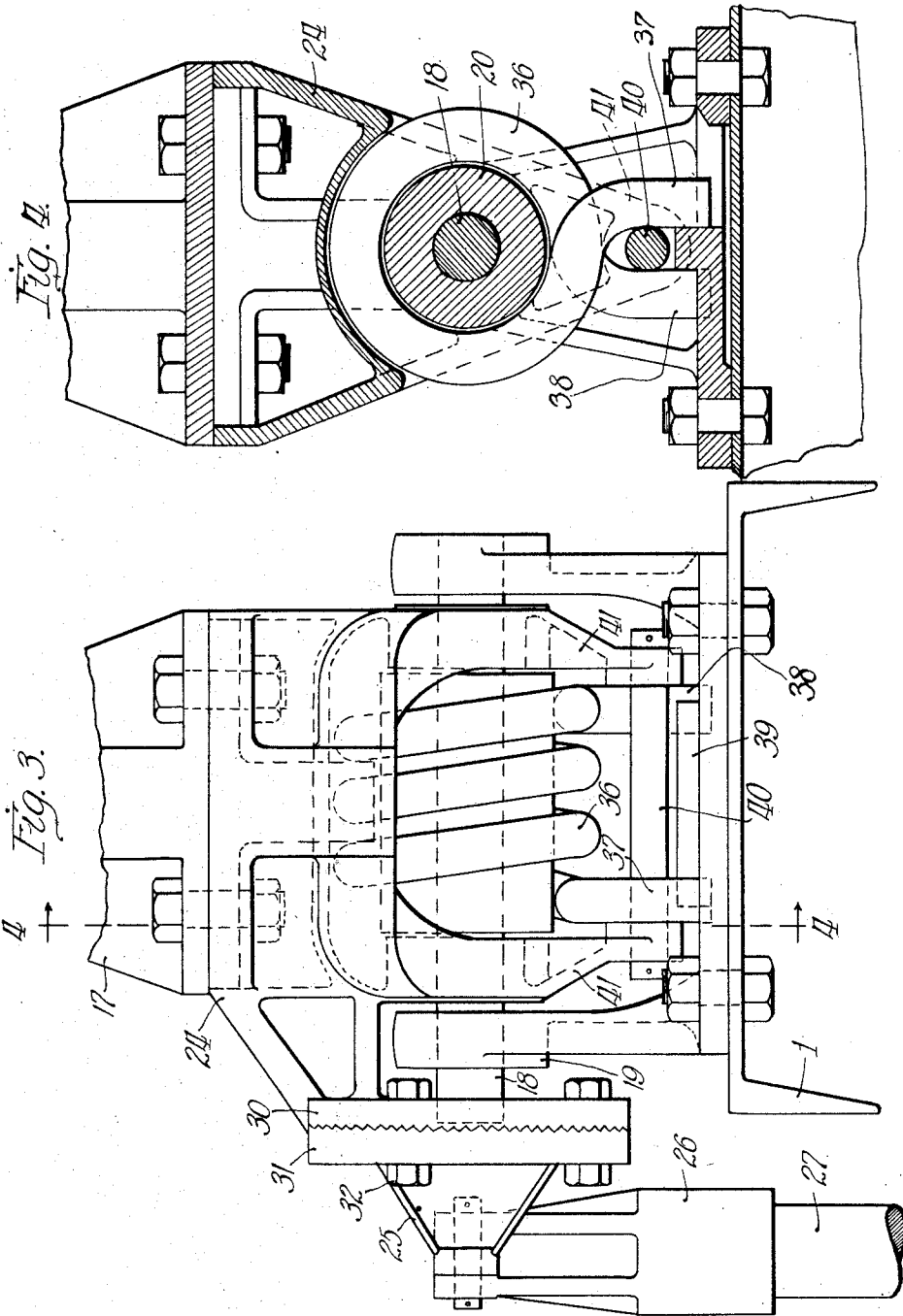
P. B. HOYE

1,863,405

ROCKING INSULATOR

Filed Oct. 19, 1928

4 Sheets-Sheet 3



Inventor  
Peder B. Hoyer  
By *Mason Jackson Porter* *Att'y's*

June 14, 1932.

P. B. HOYE

1,863,405

ROCKING INSULATOR

Filed Oct. 19, 1928

4 Sheets-Sheet 4

Fig. 6.

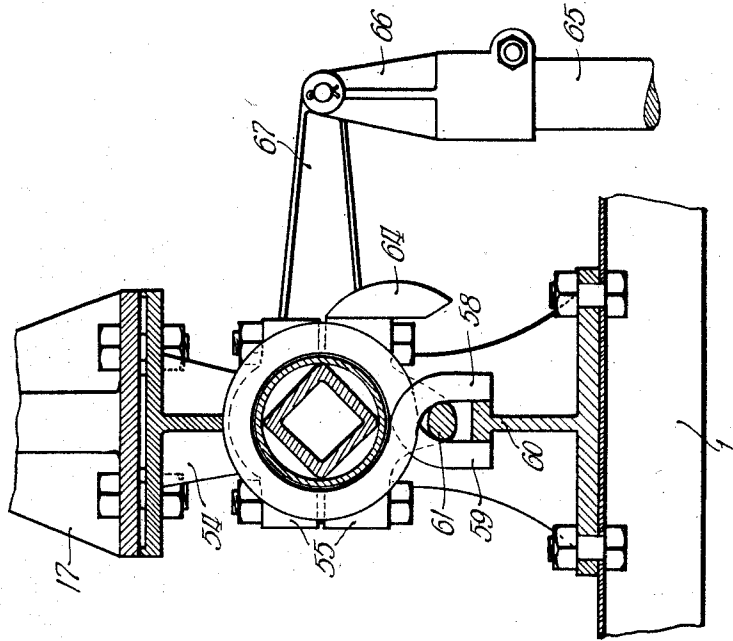
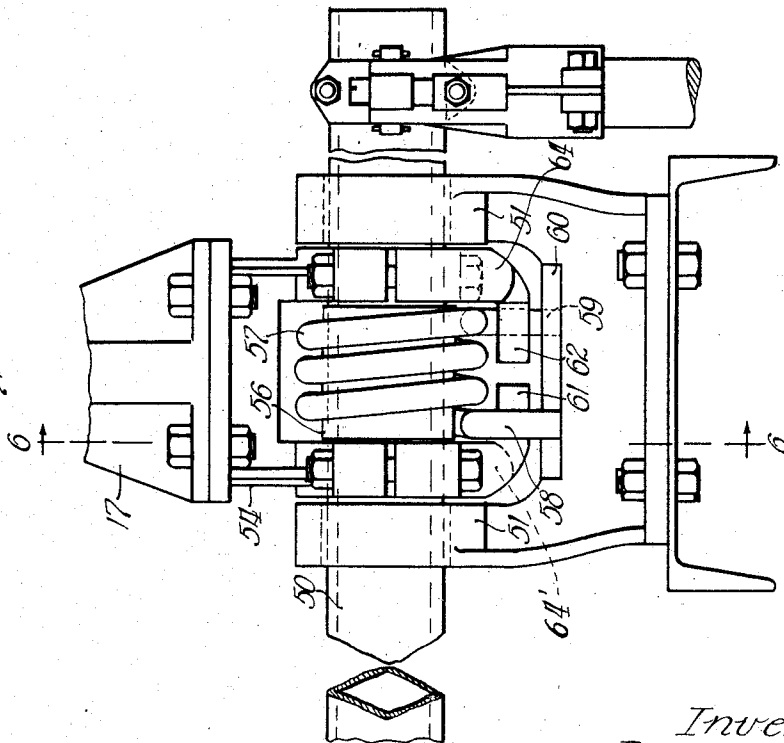


Fig. 5.



Inventor  
Peder B. Hoyer  
By *Marjorie R. Porter*  
Att'y's

# UNITED STATES PATENT OFFICE

PEDER B. HOYE, OF MAYWOOD, ILLINOIS, ASSIGNOR TO ELECTRICAL ENGINEERS EQUIPMENT CO., OF MELROSE PARK, ILLINOIS, A CORPORATION OF ILLINOIS

## ROCKING INSULATOR

Application filed October 19, 1928. Serial No. 313,428.

This invention appertains to electric power disconnect switches and more particularly to the outdoor, gang operated type, wherein a swinging insulator moves the switch contact from the closed to the open position. While the invention is particularly applicable to this type of apparatus, it is not limited to such use.

It is well known that in opening electric circuits wherein an appreciable voltage or current is involved, the separation of the contacts should be made at a reasonable rate of speed. In considering a high voltage switch where the swinging insulator may be upward of five feet long, the mass that must be accelerated and decelerated is appreciable and it is, therefore, the usual practice to provide springs to counterbalance this mass and to assist in supporting the mass, so as to facilitate the operation of the switch and prevent the violent jarring of the same, as it is brought to rest at the end of the stroke.

While the problem of accelerating the movement of the contact is of utmost importance, means must also be provided for decelerating the moving mass near the end of the stroke and, further, the structure must be such that upon closing the switch, the contacts are not slammed together at a high velocity, for if this were done, the resulting jar might seriously affect the apparatus. It is an object of this invention to so mount the swinging insulators that the desired behavior is obtained by the use of a single spring, which will accelerate or decelerate the moving parts as they approach or recede from a predetermined intermediate position. The spring is so mounted with respect to the insulator as to always oppose the gravitational force tending to move the insulator. The arrangement is such that upon the initial opening movement of the switch, the spring acts to accelerate the insulator and towards the end of the stroke, the switch opposes the movement of the insulator. The reverse action is repeated upon the closing movement of the switch.

It is a further object of this invention to provide a switch wherein a single spring is arranged to be stressed or released by the

movement of the switch, the arrangement being such that the sum of the potential energy in the spring, plus the potential energy in the movable switch parts, is substantially constant for every position of the switch from the full open to the full closed position.

The attainment of the above and further objects of the invention will be apparent from the accompanying specification taken in conjunction with the drawings forming a part thereof.

In the drawings:

Figure 1 shows a switch to which the applicant's invention is particularly applicable;

Figure 2 shows an end view of an insulating support embodying my invention;

Figure 3 shows a plan view of the same;

Figure 4 is a view taken on the line 4—4 of Figure 3;

Figure 5 shows a modified form of construction;

Figure 6 is a section taken along the line 6—6 of Figure 5; and

Figures 7 and 8 show two forms of truss mountings for supporting the switches.

Referring now to Figure 1, the switch disclosed is of the type shown in the co-pending application of Ernest H. Jacobs, Serial No. 266,167, filed March 31, 1928. Although the invention has been shown as applied to a switch of a particular construction, it is to be understood that the invention is not limited to such a switch, being applicable to other types of switches. The common base member 1, which is preferably a channel bar in inverted position, supports at its opposite ends stationary insulators 2 and 3. The stationary insulator 3 has its pedestal 4 mounted directly on the inverted web of the channel bar 1, whereas the insulator 2 has its pedestal 5 mounted upon a spacing block 6 that in turn rests upon the frame member 1.

While, in Figure 1, the elements for a single phase only appear, it is to be understood that directly back of the switch shown in Figure 1, there are placed two other identical units for a three phase line, the channel faces 1 being suitably connected together by a framework on which the gang switch is mounted.

Referring more particularly to Figures 1,

2, 3 and 4, the insulator pin 17, which carries the rocking insulator support 13, is bolted to the tilting insulator support or mounting 24. The mounting 24 is carried by a shaft 18 which is mounted in suitably bushed bearings 19. The two serrated discs 30 and 31 are adapted to be locked in any desired angular position with respect to one another by means of bolts 32 which pass through slots in the disc 31. The disc 30 is integral with the insulator support 24 and the disc 31 carries an operating crank 25 to the other end of which is attached the operating lever 26 which is operated by means of the operating rod 27. Surrounding the shaft 18 is a centering sleeve 35 about which is coiled a spring 36. The two ends 37 and 38 of the spring abut against the opposite sides of the stationary stop 39. The spring actuating rod 40 is carried by the depending arm 41 of the tilting insulator support 24 and extends between the ends 37 and 38 of the spring.

If the insulator support is tilted either to the right or to the left of the position shown in Figure 4, the arm 40 will move one end of the spring away from the stationary support 39, while the other end of the spring is retained against the support. It is thus apparent that the spring will be placed under a torsional stress. When the switch is in the closed position, as shown in Figure 1, the spring is twisted and, being under torsion, it tends to accelerate the movement of the insulator 13 and assists the operating mechanism in moving the switch contact to the open position. As the insulator support moves from the position shown in full lines in Figure 1 to the position shown in dotted lines in the same figure, it passes through the center position shown in Figures 2 and 4, in which position the spring neither assists nor opposes the movement of the insulator. As the switch moves beyond the position shown in Figures 2 and 4 to the full open position, the spring exerts a decelerating force to gradually bring the moving parts to rest without a violent jar.

In the modification shown in Figures 5 and 6, the hollow square shaft 50 is supported in bearings 51 bolted to a suitable channel frame such as shown at 1 in Figure 1. The shaft 50 extends through the switches of each phase and is supported by a suitably bushed bearing, such as 51, at each switch.

The insulator pin or cap 17 is bolted to the tilting insulator support 54, which in turn is bolted to the operating shaft 50 by a split bracket 55. The centering sleeve 56 supports the coiled torsion spring 57, the ends 58 and 59 of which bear against the spring stop 60 of the bearing support. Two spring actuating arms 61 and 62 each integral with the lower half of one of the split bearings, bear against the ends 58 and 59 of the spring.

The operating shaft 50 may be rocked by means of the rod 65 through the clevis 66 and the crank 67 which is secured thereto and is bolted to the shaft 50. The arms 64—64', integral with the lower bracket member 55, abut against the stop 60 to limit the movement of the switch.

The operation of the modification shown in Figure 5 and Figure 6 will now be apparent. When the shaft is rotated counterclockwise as seen in Figure 6, to close the switch, the spring actuating arm 61 bears against the end 58 of the spring and, as the arm moves, it places the spring under torsion, since the end 59 bears against the stationary stop 60. The spring thus has a decelerating effect upon the movement of the switch contact so that when the switch contacts close, the members are not moving at a very high velocity. When the switch is being opened, the spring exerts an accelerating force upon the moving parts, the force being the greatest in the closed position of the switch, thereby producing the maximum acceleration at the instant the contacts are open. The accelerating force decreases as the switch support approaches the position shown in Figure 6. As the switch passes through the position shown in Figure 6, the spring arm 61 swings free of the end 58 of the spring, said end abutting against the stop 60, and the arm 62 bears against the end 59 of the spring, moving the same away from the stop 60. The spring thus exerts an increasing decelerating force bringing the swinging member to rest without jar.

Figure 7 shows one form of supporting and operating means for switches of the type here disclosed. The channel members 1 of the various switches are mounted on the truss 70 supported by two columns 71, of which one only has been shown. Each of the operating rods 27 is connected to the tie pipe 72 by means of a bell crank 73. The tie pipe 72 is moved by the operating handle 74 through an intermediate bell crank 75.

The structure shown in Figure 8 differs from that shown in Figure 7, in that here the operating rods, such as 27 of Figure 7, are eliminated and the hollow square operating shaft extends through all the switches, the shaft being rotated by the rod 65 through a suitable lever, such as 67 of Figure 6.

In compliance with the requirements of the patent statutes, I have herein shown a few preferred embodiments of my invention. The invention is, however, not limited to the structure shown, the same being merely illustrative. What I consider new and desire to secure by Letters Patent is:—

1. In an electric switch, a supporting member, a rocking insulator mounting member, each of said members having a pair of spaced arms, the arms of one of the members extending between the arms of the other member, a

shaft extending through both sets of arms and supported by the arms of the supporting member and constituting a support for the arms of the rocking insulator mounting member, and a counterbalancing spring for counterbalancing the mass supported by the rocking insulator mounting member, said spring being disposed between the inner set of arms.

cated between said last mentioned arms and coiled about the shaft, and means for rocking said insulator mounting, said means comprising an extension on the insulator mounting embracing a portion of one of the arms of the support, and an actuating lever connected to said extension. 70

6. In an electric switch, a support for a rocking insulator, said support comprising a base having a pair of spaced arms extending therefrom, a shaft extending between and supported by said arms, a rocking insulator mounting including a pair of arms supported on said shaft, a counterbalancing spring located between said last mentioned arms and coiled about the shaft, means carried by and movable with the insulator mounting for taking the thrust of the spring, said means bearing against the two ends of the counterbalancing spring and acted upon by one end of the spring when the insulator mounting rocks to one side of the vertical position and by the other end of the spring when the insulator mounting rocks to the other side of the vertical position, and means for rocking said insulator mounting, said means comprising an extension on the insulator mounting embracing a portion of one of the arms of the support, and an actuating lever connected to said extension. 75 80 85 90 95

In witness whereof, I hereunto subscribe my name this 13th day of October, 1928.

PEDER B. HOYE.

3. In an electric switch, a support for a rocking insulator, said support comprising a base having a pair of spaced arms extending therefrom, a shaft extending between and supported by said arms, a rocking insulator mounting including a pair of arms supported on said shaft, and a counterbalancing spring located between said last mentioned arms and coiled about the shaft. 100

4. In an electric switch, a support for a rocking insulator, said support comprising a base having a pair of spaced arms extending therefrom, a shaft extending between and supported by said arms, a rocking insulator mounting including a pair of arms supported on said shaft, a counterbalancing spring located between said last mentioned arms and coiled about the shaft, and means carried by and movable with the insulator mounting for taking the thrust of the spring, said means bearing against the two ends of the counterbalancing spring and acted upon by one end of the spring when the insulator mounting rocks to one side of the vertical position and by the other end of the spring when the insulator mounting rocks to the other side of the vertical position. 105 110 115 120

5. In an electric switch, a support for a rocking insulator, said support comprising a base having a pair of spaced arms extending therefrom, a shaft extending between and supported by said arms, a rocking insulator mounting including a pair of arms supported on said shaft, a counterbalancing spring lo- 125 130