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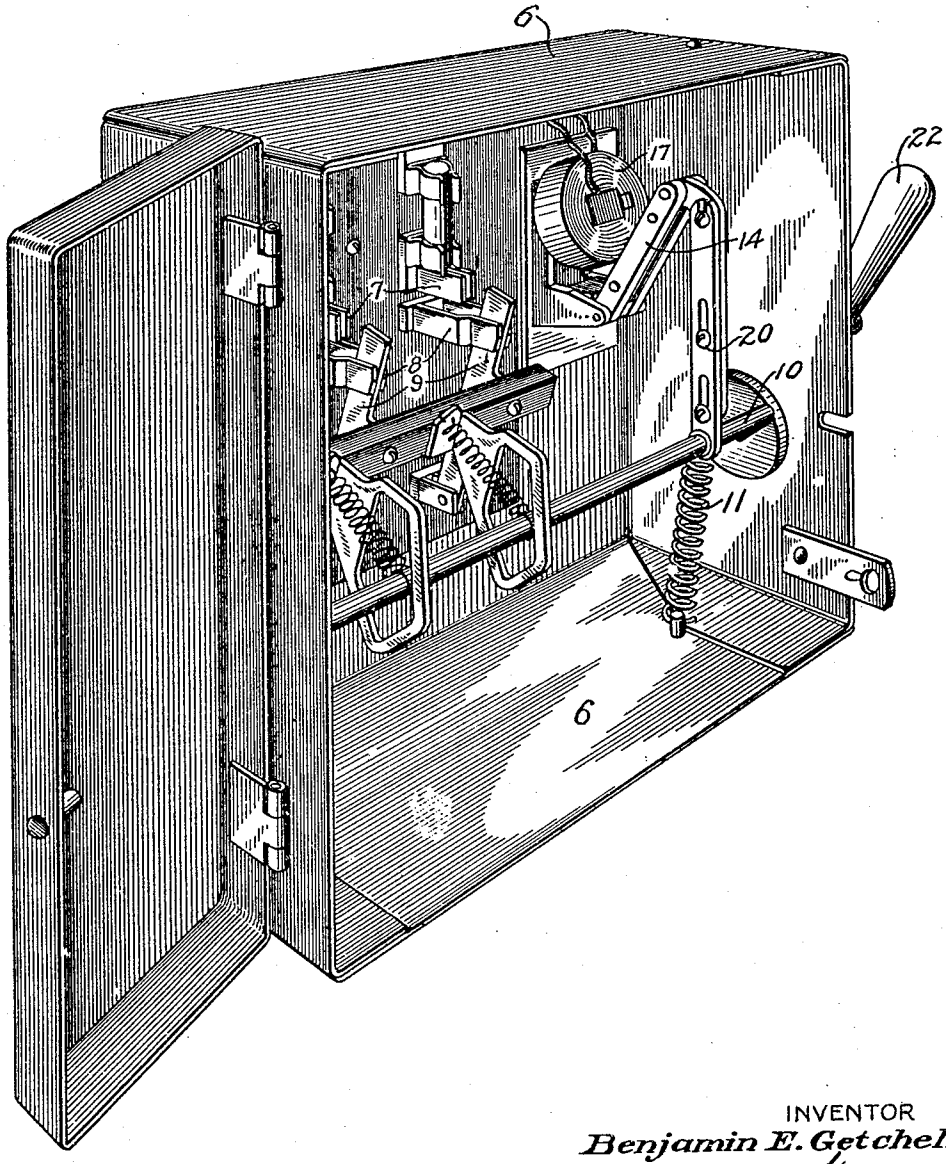
Jan. 9, 1923. 1,441,796.

B. E. GETCHELL.

NO VOLTAGE RELEASE SWITCH.

FILED JAN. 18, 1922. 2 SHEETS—SHEET 1.

Fig. 1.




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Jan. 9, 1923. 1,441,796.

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NO VOLTAGE RELEASE SWITCH.

FILED JAN. 18, 1922. 2 SHEETS—SHEET 2.

Fig. 2.

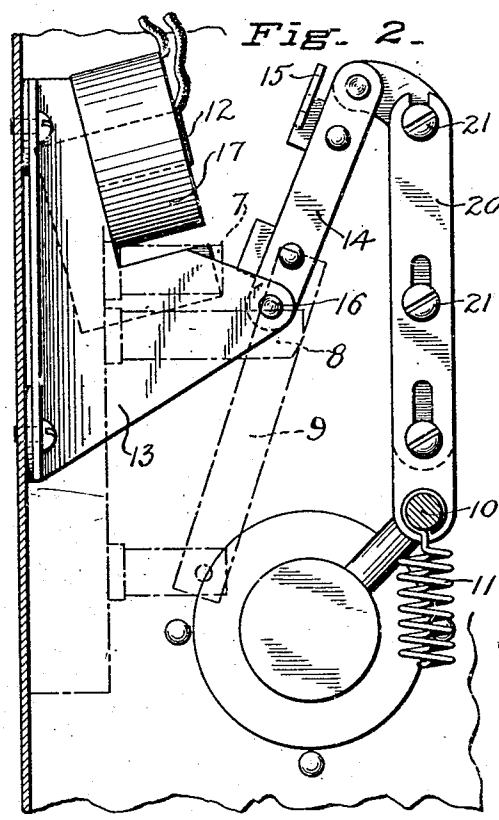



Fig. 3.

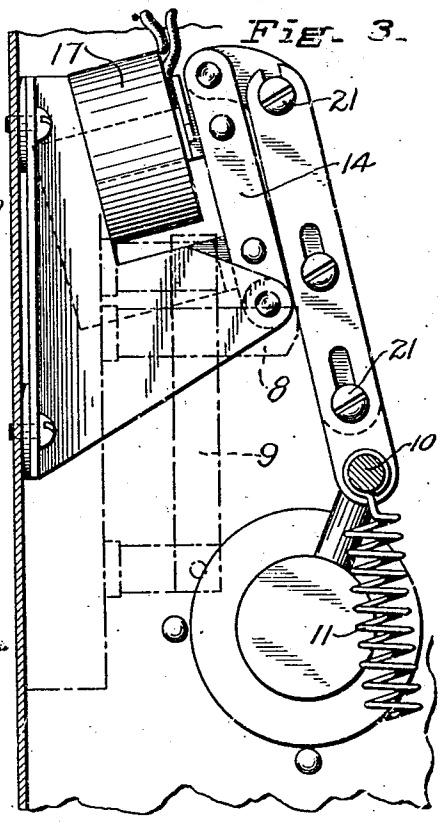



Fig. 5.

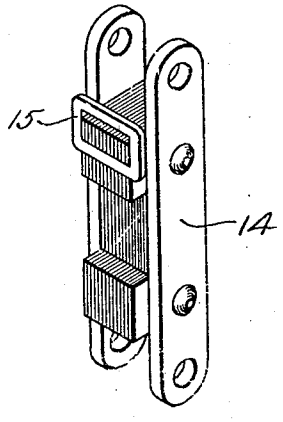
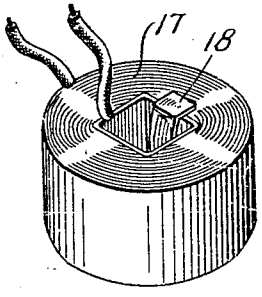



Fig. 4.




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Patented Jan. 9, 1923. BEST AVAILABLE COP 1,441,796

# UNITED STATES PATENT OFFICE.

BENJAMIN E. GETCHELL, OF PLAINVILLE, CONNECTICUT, ASSIGNOR TO THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, OF PLAINVILLE, CONNECTICUT, A CORPORATION OF CONNECTICUT.

## NO-VOLTAGE RELEASE SWITCH.

Application filed January 18, 1922. Serial No. 530,053.

*To all whom it may concern:*

Be it known that I, BENJAMIN E. GETCHELL, a citizen of the United States of America, residing at Plainville, Connecticut, have invented a new and useful No-Voltage Release Switch, of which the following is a specification.

My invention relates to an electric switch, and particularly to the type known as a no-voltage release switch, wherein the switch is automatically opened upon a total failure of voltage or a reduction of voltage below a predetermined point.

It is an object of my invention to provide novel means for holding an electric switch in closed circuit position under normal voltage conditions in the circuit and for opening the switch upon a total or partial failure of voltage in the circuit.

Another object of my invention is to provide mechanical means for adjustment of the releasing means independent of the coil.

Another object is to provide electro-magnetic means for holding the switch in closed position without the use of springs or latches.

My invention in its preferred form includes any suitable type of electric switch, including fixed and movable contacts. The one or more movable contacts may be actuated in the usual or any desired manner. An electro-magnetic core and coil is provided, and an armature is preferably pivoted adjacent thereto and coacts therewith. A suitable connection is provided between the armature and the switch operating means so that when the switch is closed and so long as the voltage is normal, the armature will be held to the core and the switch will be held in closed circuit position. If for any reason the voltage in the circuit should totally fail or be reduced below a predermined point, the force attracting the armature and core will be lessened, and suitable means such as a spring will then throw the switch to open circuit position or the switch may be opened by hand if so desired, without first breaking the circuit of the coil.

I have chosen to disclose an illustrative embodiment of my invention in connection with a commercial type of motor starting switch.

In the drawings:

Fig. 1 is a perspective view of an enclosed motor starting switch and embodying features of my invention.

Fig. 2 is a view partly in section and disclosing parts of the no-voltage release mechanism, the switch parts being diagrammatically shown in the motor starting position.

Fig. 3 is a view similar to Fig. 2, but disclosing the switch in the full closed or motor running position.

Fig. 4 is a perspective view of a removable coil used in connection with my invention.

Fig. 5 is a perspective view of an armature forming a part of my invention.

In the illustrative embodiment shown, 6 indicates a switch box of any desired or approved form. Within the box are located fixed contacts 7—7 which are connected with the fuses shown. 8—8 indicate fixed contacts which are connected to the motor circuit and are not connected with the fuses. Movable contacts such as blades 9—9 are pivoted in the switch box and in their various positions coact at different times with the contacts 7—7 and 8—8. The number of sets of contacts and blades may be varied but in the usual form of motor switch three sets are provided, only two of which are visible in the present disclosure. An operating crank 10 is journaled in the switch box and is operatively connected with the switch blades 9 for moving the latter. The parts thus far described are parts of a well known type of motor starting switch and detailed description thereof is therefore thought to be unnecessary.

A spring 11 is connected, in the present disclosure, to the operating crank 10 and constantly urges the crank in a direction to throw the switch to the open circuit position. Means are provided for holding the switch blades in the closed circuit position under normal voltage conditions and permitting the switch to be opened upon a partial or total failure of current. In the present disclosure an electro-magnetic core 12 preferably U-shaped in form, is secured within the switch box. This core may be laminated as shown and may be secured to the box wall by means of the brackets or

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side plates 13. An armature 14 is pivoted adjacent the core and is adapted to coact therewith for holding the switch closed under normal voltage conditions. The armature is likewise preferably laminated and the usual copper ring 15 may be provided, if desired. In the present disclosure the armature is pivoted at 16 to the side plates 13. About one leg of the core is positioned a coil 17, the opening in the coil being preferably shaped to correspond with the shape of the core and is removably held thereon. In the form shown, I have disclosed a simple spring clip 18 which may be used, if desired, to cause the coil to more firmly grip the leg of the core to prevent accidental disengagement. The coil is connected in the circuit on the load side of the switch so that when the switch is open no current will be consumed by the coil. It is obvious that with removable coils, such as I have disclosed, it is possible to easily and quickly substitute a coil of a greater or lesser number of turns to vary the force exerted on the armature.

In the present disclosure, a link 20 pivotally connects the armature 14 and the operating crank 10. One of these elements, preferably the link 20, is made adjustable in length to suit varying conditions and to permit a slight adjustment of the point at which the electro-magnet will release the armature. The link 20 is preferably made up of two strips secured together by slotted connections and screws 21—21.

The switch may be operated by the handle 22 on the outside of the box and connected to the operating crank 10. For the type of motor starting switch disclosed, the connection between the handle 22 and crank 10 may be of the form shown in patents to Ahlstrom #1,231,229 or Knudsen #1,364,384, to which reference is made for a fuller disclosure. With a connection as shown in the above patents the handle 22 may be moved initially only far enough to connect the blades 9—9 with the contacts 8—8 as shown in Figs. 1 and 2. This is the motor starting position of the switch. To completely close the switch and connect the blades to the contacts 7—7 as diagrammatically shown in Fig. 3 the handle must be drawn back slightly after which it may be again pushed forwardly to move the blades to the contacts 7—7 or motor running position.

The operation is as follows: Assuming the switch to be in open circuit position, and it is desired to close the same, the handle is moved so as to cause the switch blades 9 to engage the fixed contacts 8. This is the motor starting position of the switch. When the motor has attained the proper speed, the handle is further actuated to disconnect the blades from the contacts 8 and to connect the blades to the contacts 7, which in turn conduct the current through the fuses during the operation of the motor. When the switch is closed, the spring 11 will be under stress and the armature will be in contact with the core, as disclosed in Fig. 3. So long as the voltage remains normal, the armature will be held to the core with normal force and the spring is not able to overcome this force so as to open the switch. Should the current in the coil circuit, however, entirely fail or fall below a predetermined point, the force holding the armature is lessened and the spring immediately draws the armature away from the core and opens the switch with a snap action.

It will be seen that various adjustments are possible so as to cause the switch to be opened upon various different drops in the voltage. For example, if the link 20 be lengthened (with the proportions shown), the spring will pull with a greater leverage and therefore the armature would be withdrawn upon a smaller drop in the voltage. Conversely, a shortening of the link 20 (with the proportions shown) would cause the spring to pull with a less advantageous leverage and permit the switch to stay closed during a greater drop in voltage. Obviously the point at which the operating crank is pivoted and the position of the crank will likewise influence the point at which the switch opens and the adjustment of the spring is also a factor. Coils of varying numbers of turns may be interchangeably placed on the core and adjustment of the point at which the switch opens may be thus obtained.

While I have described one specific embodiment of my invention and have disclosed the same in connection with a commercial type of motor starting switch, I wish it understood that many changes may be made within the scope of the appended claims, and that the invention may be used in connection with switches of various kinds.

I claim:

1. In an electric switch, fixed and movable contacts, means for operating said movable contact, a spring for urging said movable contact to open circuit position, an electro-magnetic means including an armature, a link permanently connecting said armature with said operating means, said electro-magnetic means serving to hold said armature in one position and the movable contact in closed circuit position when the magnet is energized, said spring serving to throw the movable contact to open circuit position upon the reduction of voltage in said electro-magnetic means below a predetermined point.

2. In an enclosed switch, a switch box, stationary contacts therein, pivoted switch blades for cooperation with said fixed contacts, a switch operating crank journaled in

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said box, an electro-magnet having a pivoted armature in said box, a link permanently connecting said armature and said operating crank, said electro-magnet serving to hold said switch blades in closed circuit position under normal voltage conditions, and a spring for separating the armature from the core of the magnet and opening the switch upon a reduction of voltage below a predetermined point.

3. In an electric switch, fixed and movable contacts, means for operating the latter, an electro-magnetic core, a coil thereon, an armature pivoted adjacent said core, a link permanently connecting said armature and said contact operating means, said armature serving to hold the movable contact in closed circuit position under normal voltage conditions in the coil, and a spring connected to one of the movable parts for throwing the movable contact to open circuit position upon a reduction of voltage in the circuit below a predetermined point.

4. In an electric switch, fixed and movable contacts, means for moving the movable contact, electro-magnetic means including an armature, a link connecting said armature and said movable contact operating means, a spring for moving said movable contact to open circuit position with a snap action upon a failure of voltage in the circuit, said link being adjustable in length for the purpose described.

5. In an enclosed switch, a switch box, a fixed contact therein, a pivoted switch blade in said box for coaction with said fixed contact, an operating crank for the switch blade, an electro-magnetic core and coil mounted in said box, a pivoted armature for coaction with said core, means permanently connecting said crank and armature, said armature serving to hold said switch blade in closed circuit position under normal voltage conditions, and a spring connected to one of said movable parts for throwing the switch blade to open circuit position upon a reduction of voltage in the circuit below a predetermined point.

6. In an enclosed switch, a switch box, stationary contacts therein, pivoted switch blades for cooperation with said stationary contacts, a crank journaled in said box having operable connection with said switch blades, a spring connected with said crank adapted to throw the switch to Off position and pivoted link means cooperating with said spring and said crank whereby the spring is fully tensioned when the switch is in On position and whereby the switch opening power of said spring is reduced when the switch is in said On position.

7. In an enclosed switch, a switch box having stationary contacts mounted therein, a switch blade for cooperation with said stationary contacts, a crank within said box having operable connection with said switch blade, a spring connected with said crank adapted to throw the switch to Off position, said spring being connected with the crank at one side and a link means connected with the crank at the opposite side, said link means constituting a means whereby the spring is fully tensioned when the switch is in the On position with the switch-throwing power of said spring modified when switch is in said On position.

8. In an enclosed switch, a switch box, stationary contacts mounted therein, pivoted switch blades for cooperation with said stationary contacts, a crank within the box having operable connection with said switch blades, a spring connected with said crank and adapted to throw the switch to Off position, a link pivoted within the box, a second link connected with said crank and a third link connecting said first and second mentioned links, the said spring being adapted to be fully tensioned when the switch is in On position and said links constituting means whereby the switch opening power of said spring is reduced when the switch is in the fully On position.

9. In an enclosed switch, a casing, stationary contacts mounted within said casing, movable switch blades for cooperation with said stationary contacts, a switch crank within the casing having operable connection with said switch blades, a spring connected at one side of the crank adapted to move the switch to Off position, links connected with said crank at the side opposite from the spring and a stop for said links when the switch is in the On position, said spring being adapted to be at full tension when switch is in On position and said links being adapted to reduce the switch opening power of said spring when the switch is in the On position.

10. In an enclosed switch, a switch box, stationary contacts mounted therein, pivoted switch blades for cooperation with said stationary contacts, a crank journaled in said box and having operable connection with said switch blades, a spring connected with said crank adapted to move the switch to Off position, a link pivoted within said box, a second link connected with said crank, a third link connecting said first and second mentioned links and a stop to limit the movement of said links, the said spring being adapted to pull approximately against the pivotal centers of said first and second mentioned links and to be fully tensioned when the switch is in On position.

11. In an enclosed switch, a switch casing, a switch within said casing including appurtenant stationary contacts and pivoted switch blades, a switch crank pivoted in operable engagement with said switch blades, a spring connected with said crank

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adapted to throw the switch to Off position, a link pivoted within said casing, a second link connected with said crank, a third link connecting said first and second mentioned links and a stop for the first mentioned link, the said spring being adapted to be fully tensioned and to pull approximately in the same direction as the pivotal center lines of said first and second mentioned links when the switch is in the On position.

12. In an enclosed switch, a switch casing, a switch within said casing including appurtenant stationary contacts and movable blades therefor, a crank journaled in operable engagement with said movable switch blades, a spring connected with said crank and adapted to move the switch blades to Off position, a link pivoted within the casing, a second link connected with the crank, a third link connecting with said first and second links and a stop for said first mentioned link, the said spring being adapted to exert its force in a direction approximately in line with the pivotal centers of said first and second mentioned link members and said link members constituting means whereby the switch opening force of said spring is reduced when the switch is in the On position.

13. In an enclosed switch, a switch box, a switch within the box including appurtenant stationary contacts and pivoted blades for cooperation therewith, a journaled crank having operable engagement with said switch blades, a spring adapted to throw the switch to the Off position, a link pivoted within the casing, a second link connected with said crank, a third link connecting said first and second links and a stop for said first mentioned link, the said spring being adapted to be fully tensioned and to exert its force approximately in the same direction as the pivot centers of the said first and second link members when the switch is in the On position.

14. In an enclosed switch, a switch box, a switch within the box including appurtenant stationary contacts and pivoted blades for cooperation therewith, a journaled crank having operable engagement with said switch blades, a spring adapted to throw the switch to the Off position, a link pivoted within the casing, a second link connected with said crank, a third link connecting said first and second links and a stop for said first mentioned link, the said spring being adapted to be fully tensioned and to exert its force approximately in the same direction as the pivot centers of the said first and second members when the switch is in the On position, and means for holding said first mentioned link against said stop when the switch is in On position.

15. In an enclosed switch, a switch box, stationary contacts therein, pivoted switch blades for cooperation with said stationary contacts, a crank journaled in said box having operable connection with said switch blades, a spring connected with said crank and adapted to throw the switch to Off position and pivoted link means cooperating with said spring and said crank whereby the spring is fully tensioned when the switch is in On position and whereby the switch opening power of said spring is reduced when the switch is in said On position and electro-magnetic means for holding the link means when the switch is in the On position.

16. In an enclosed switch, a switch box, stationary contacts therein, pivoted switch blades for cooperation with said stationary contacts, a crank journaled in said box having operable connection with said switch blades, a spring connected with said crank and adapted to throw the switch to Off position and pivoted link means cooperating with said spring and said crank whereby the spring is fully tensioned when the switch is in On position and whereby the switch opening power of said spring is reduced when the switch is in said On position, an armature carried by one of the said link members and electro-magnetic means for holding said armature when the switch is in On position.

BENJAMIN E. GETCHELL.