W. M. SCOTT.

SHOCKPROOF CIRCUIT BREAKER STRUCTURE.

APPLICATION FILED MAY 8, 1918.

1,340,564. **Patented May 18, 1920.**

Fig. 1

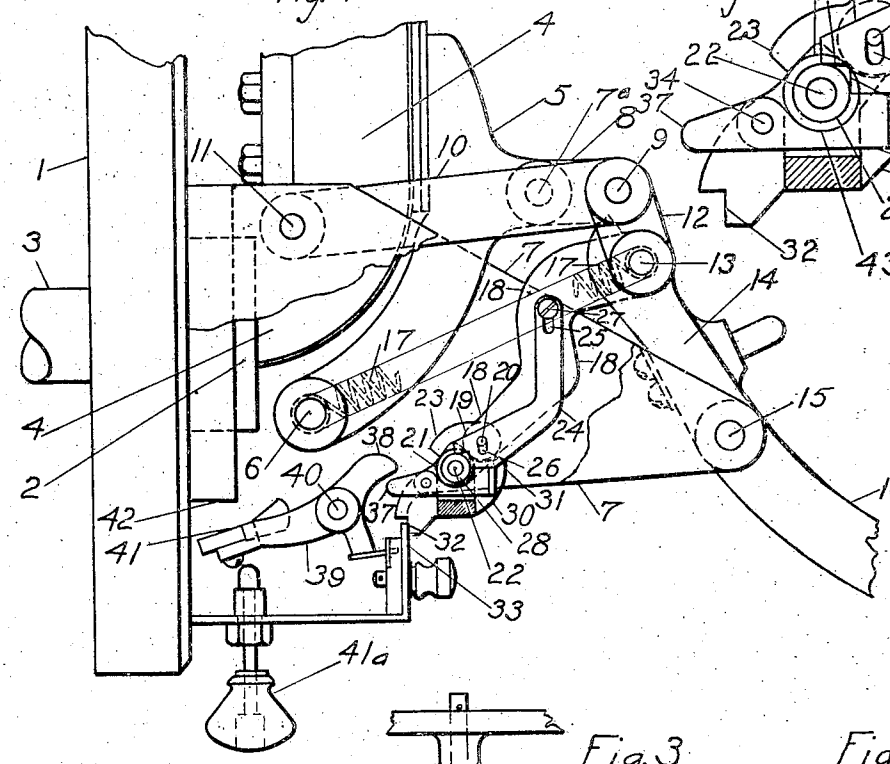


Fig. 2

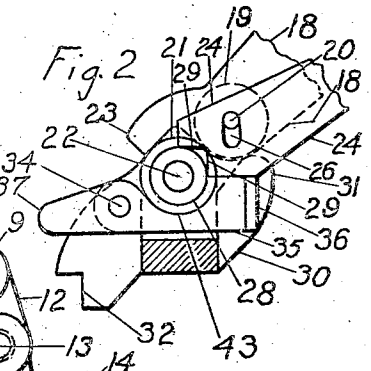


Fig. 3

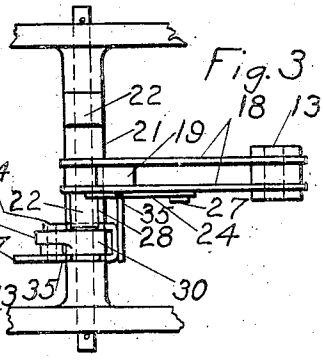


Fig. 4

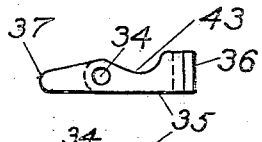


Fig. 5

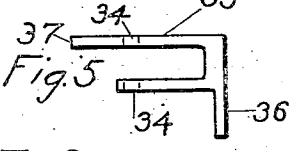


Fig. 6

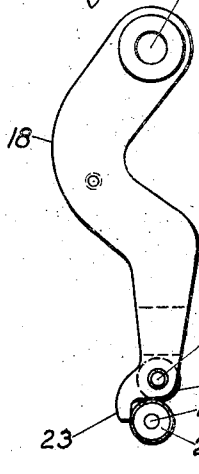


Fig. 7

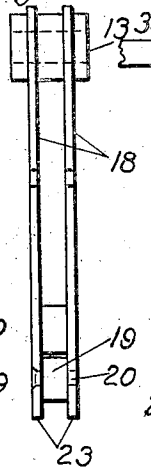


Fig. 8

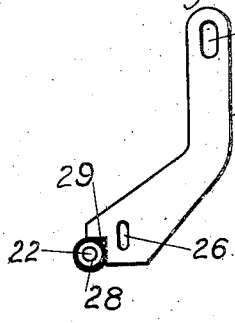
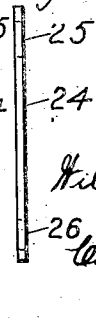


Fig. 9



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SHOCKPROOF CIRCUIT-BREAKER STRUCTURE.

1,340,564. Specification of Letters Patent. Patented May 18, 1920.

Application filed May 8, 1918. Serial No. 233,201.

To all whom it may concern:

Be it known that I, WILLIAM M. SCOTT, a citizen of the United States, residing at Tredyffrin township, in the county of Chester and State of Pennsylvania, have invented a new and useful Shockproof Circuit-Breaker Structure, of which the following is a specification.

My invention relates to a switch or circuit breaker restrained in normal position by locking mechanism which may be actuated manually or automatically to release the switch or circuit breaker to allow it to move to another position.

It is the object of my invention to provide switch or circuit breaker apparatus which shall withstand shock, and particularly successive shocks, without response of the locking mechanism and consequent untimely or improper tripping of the switch or circuit breaker, but which shall nevertheless promptly respond to proper automatic or manual actuation or control.

My invention resides in switch or circuit breaker apparatus comprising a movable contact structure, locking means, as a latch, for restraining it in normal position, and auxiliary latching or locking means for preventing response of the first named locking means to shock, together with tripping mechanism for actuating or releasing the locking means in succession.

In a specific form of my invention I provide locking mechanism which is biased toward full locking position or which has a tendency to restore itself to full locking position after shock; and with such locking mechanism I associate a safety device which restricts the movement of the locking mechanism under influence of shock from its full locking position within a limit or range within which the bias or restoring tendency of the locking mechanism is operative to cause it to return to full locking position. By such structure the effect of successive shocks on the locking mechanism does not become cumulative, that is, the successive shocks do not move the locking mechanism through successive small ranges eventually sufficient to cause release of the switch or circuit breaker.

My invention resides in structure of the character hereinafter described and claimed.

For an illustration of one of various forms my invention may take, reference is to be had to the accompanying drawing, in which:

Figure 1 is a partial side elevational view of an automatic circuit breaker embodying my invention.

Fig. 2 is a fragmentary side elevation, partly in section, and on larger scale, of parts shown in Fig. 1.

Fig. 3 is a plan view of parts shown in Fig. 1.

Fig. 4 is a side elevational view of a part shown in Fig. 1.

Fig. 5 is a plan view of the structure shown in Fig. 4.

Fig. 6 is an elevational view, on enlarged scale, of the latch or locking member.

Fig. 7 is an edge view of the structure shown in Fig. 6.

Fig. 8 is a side elevational view of the safety device.

Fig. 9 is an edge view of the same.

Referring to the drawing, 1 is a base, as a switchboard of insulating material, generally mounted in a vertical position. Upon this base plate is mounted a terminal block 2, connected to the stud 3. Engaging the terminal 2, and a similar terminal above the same, not shown, is the movable contact member 4, carried by the arm 5 pivoted at 6 to the bracket or housing 7, the latter secured upon base 1. Pivoted to the arm 5 at 7^a is the short link 8 pivoted at 9 to the long link 10, which is in turn pivoted at 11 to the housing 7. With the contact member 4 in the circuit closing position illustrated, the links 8 and 10, constituting a toggle, are in extended position, the center of the pivot 7^a being slightly above the imaginary line joining the centers of pivots 9 and 11. At 9 is also pivoted the short toggle link 12 pivoted at 13 to the toggle link 14 pivoted at 15 to the housing 7 and having the extension 16 forming a lever or handle. With the parts in the circuit closing position shown, the toggle 12, 14 is extended and slightly undertraveled because the center of the pivot 13 is slightly to the left of the imaginary line joining the centers of pivots 9 and 15. A spring 17 is connected at its one end to the pivot 13 and at its other end to the pivot 6, the spring

with the parts in circuit closing position shown being under tension and tending to pull the pivot 13 toward the left. To lock the mechanism in the position shown, there is provided a latch or dog 18 pivoted at 13 and carrying near its other end the roller 19 pivoted to the member 18 at 20. The roller 19 bears against the roller 21 horizontally pivoted at 22 in the frame or housing 7. The latch 18 terminates in the laterally disposed hook or lug 23 pressing against the roller 21, the point of contact between the rollers 19 and 21 lying slightly below and to the right of the imaginary line joining the center of the roller 22 and the center of the pivot 13, as viewed in Fig. 1, the roller 19 being therefore slightly overtraveled, and the lug or hook 23 prevents further counterclockwise movement of the latch 18 on its pivot 13, as viewed in Fig. 1.

The safety device comprises the plate or member 24 having the vertically extending slots 25 and 26, through the former of which extends the pin or screw 27 carried by the latch 18, and through the other of which extends the pivot pin 20 carried by the latch 18, whereby the plate or member 24 is carried by the latch or dog 18 and is capable of vertical movement thereon. Pivoted concentrically with the roller 21 on the pin 22 is the roller 28 of smaller diameter than roller 21. The plate 24 has a rectangular notch 29 at its end which closely approaches or lightly bears upon the roller 28.

Pivoted on the pin 22 is the latch actuator 30 having the lug 31 adapted to engage the roller 19 and having at its other end the lug 32 engaging the plate 33 carried by the housing 7 to limit clockwise movement of the member 30, as viewed in Fig. 1.

Pivoted at 34 on the member 30 is the second actuator member 35 having the transversely extending lug 36 adapted to engage the under side of the plate or member 24 and having at its other end the tail or lug 37 disposed in the path of travel of the tail 38 of the armature lever 39, pivoted to the housing 7 at 40 and carrying the armature 41 coöperating with the poles 42 of an inverted U-shaped member of iron embracing the stud 3 and magnetized by the current passing through said stud and the contact member 4.

The operation is as follows:

With the parts in normal position as illustrated in Fig. 1, actuation of the armature lever 39 in a clockwise direction, either manually by member 41^a or due to attraction of armature 41 by the poles 42 upon predetermined current flow through the movable contact member 4, causes the tail 38 to engage the upper side of the tail or lug 37 of the member 35, rotating the latter in counterclockwise direction upon its pivot 34 upon the member 30, causing the lug 36 to lift the safety plate 24, which moves vertically upon the latch or dog 18 until the portion 43 of the member 35 engages the roller 28, whereupon the member 35 and the member 30 continue to rotate as a unit about the pivot pin 22 until the lug or nose 31 of the member 30 pushes the roller 19 on latch 18 upwardly sufficiently for it to move across the dead center. Thereafter the roller 19 passes over the roller 21, due to the bias of the pivot 13 toward the left under the influence of the spring 17 and the resiliency of the contact member 4, the toggles collapsing and the arm 5 rotating in a clockwise direction upon its pivot 6 to carry the contact member 4 away from the main terminals and thereby interrupt the circuit.

Assuming the apparatus in circuit closing position as illustrated, if the base 1 or the support carrying the same, as the deck or framework of a ship, particularly a warship, subject to shock, is subjected to a shock or blow in a horizontal direction or having a substantially horizontal component, the effect, without the safety device, would often be sufficient to cause the latch 18 to disengage from roller 21 and cause premature or undesired opening of the switch. However, with the safety device present, a blow or shock of the character referred to will cause the notched end 29 of the plate 24 firmly to engage the roller 28 and prevent the roller 19 from disengaging from roller 21; and when the shock or blow is past, the plate 24 will be freed from roller 28 and leave the apparatus in its previous condition ready to respond to proper actuation of latch 18.

This action is due to the fact that when the latch 18 starts to move under the influence of external blow or shock, it carries the lower notched end 29 of plate 24 slightly to the left and into engagement with roller 28, thereby limiting the movement of the latch 18 and preventing latch 18 from passing beyond its over-center position, that is, the center of the pin 20 is kept to the right of the imaginary line joining the centers of pins 13 and 22. In this over-center position the pressure of the latch 18 through its roller 19 on the roller 21 has a component causing it to move in a counter-clockwise direction until the lug 23 comes again into engagement with the roller 21, thus restoring the latch 18 to the position occupied by it before the occurrence of the blow or shock. While the safety plate 24 is movable on or with respect to the dog or latch 18, it is so movable only in a predetermined direction, as vertically, and unless moved in that direction will prevent release of the latch 18 under the influence of blow or shock. Since such external blow or shock as would otherwise cause the unlocking of

the latch 18 does not produce such predetermined or vertical movement of the plate 24, plate 24 so limits the movement of the latch 18 that the self-restoring forces are effective in returning it to its full locked position.

By the hereinbefore described structure the locking mechanism is biased, due to its over-center position, toward its full locked position to which it will always return if it is never moved beyond the dead center or over-center position; the safety plate 24 limits the movement of the locking mechanism to prevent its movement under influence of shock to a distance from which the self-restoring force cannot return it to fully locked position. Accordingly the locking mechanism cannot be released or unlocked either by a single shock or by the cumulative effect of successive shocks.

What I claim is:

1. The combination with the movable contact member of a switch, of means for locking said contact member, said locking means having a bias toward full locking position, and means limiting the movement of said locking means upon the occurrence of shock to position in which said locking means retain said bias, whereby said locking means returns to full locking position.

2. The combination with the movable contact member of a switch, of a latch for locking said contact member, said latch having a dead center position to one side of which said latch is in fully locked position, and a safety device preventing movement of said latch upon occurrence of shock to the other side of said dead center position.

3. The combination with the movable contact member of a switch, of a latch for locking said contact member, said latch having a bias toward full locked position, and a safety member carried by and movable in predetermined direction only with respect to said latch, said safety member limiting the movement of said latch upon occurrence of shock to position in which said latch retains said bias and returns to full locked position, and means for moving said safety member upon said latch to allow actuation of said latch to free said contact member.

4. The combination with the movable contact member of a switch, of means for locking said contact member, said means movable only in predetermined direction for releasing the same, and a safety device preventing actuation of said locking means in response to shock.

5. The combination with the movable contact member of a switch, of means for locking said contact member and movable in predetermined direction only for releasing the same, and a safety device preventing actuation of said locking means in response to shock comprising auxiliary locking means restraining said contact member and movable only in a direction different from that of the movement of said first named locking means.

6. The combination with the movable contact member of a switch, of means for locking said contact member and movable in predetermined direction only for releasing the same, and a safety device preventing actuation of said locking means in response to shock comprising auxiliary locking means carried by and movable with respect to said first named locking means in a direction different from the direction of movement of said first named locking means.

7. The combination with the movable contact member of a switch, of means for locking said contact member and movable in predetermined direction only for releasing the same, and a safety device preventing actuation of said locking means in response to shock comprising a member having lost motion with respect to said locking means in a direction unaffected by shock and immovable with respect to said locking means in the direction of movement of said locking means.

8. The combination with the movable contact member of a switch, of means for locking the same comprising a latch and a member engaged thereby, and a safety device preventing dislodgment of said latch in response to shock comprising an auxiliary latch and a member engaged thereby during shock to prevent release of said contact member, and means allowing movement of said auxiliary latch in a direction other than the direction of movement of said first named latch.

9. The combination with the movable contact member of a switch, of means for locking the same comprising a latch and a member engaged thereby, and a safety device preventing dislodgment of said latch in response to shock comprising an auxiliary latch carried by said latch, a member engaged by said auxiliary latch to prevent release of said contact member during shock, and means allowing movement of said auxiliary latch with respect to said latch in a direction differing from the direction of movement of said latch when releasing said contact member.

10. The combination with the movable contact member of a switch, of means for locking the same comprising an abutment, a latch thrusting against said abutment, and an auxiliary latch carried by said latch thrusting against said abutment and restraining said contact member during shock.

11. The combination with the movable contact member of a switch, of means for locking the same comprising an abutment, a latch thrusting against said abutment, an auxiliary latch carried by said latch thrusting against said abutment and restraining

said contact member during shock, and means allowing movement of said auxiliary latch with respect to said latch in a direction to free said auxiliary latch from its abutment.

12. The combination with the movable contact member of a switch, of means for locking the same comprising an abutment and a latch thrusting against said abutment, an auxiliary latch carried by and movable with respect to said latch and engaging said abutment to restrain said contact member during shock, and means for releasing said auxiliary latch and said latch in succession.

13. The combination with the movable contact member of a switch, of means for locking the same comprising an abutment and a latch thrusting against said abutment, said latch having a movement having a horizontal component for releasing said contact member, and an auxiliary latch carried by and movable vertically on said latch engaging said abutment for restraining said contact member during shock.

14. The combination with the movable contact member of a switch, of means for locking the same comprising an abutment and a latch thrusting against said abutment, said latch having a movement having a horizontal component for releasing said contact member, an auxiliary latch carried by and movable vertically on said latch engaging said abutment for restraining said contact member during shock, and means for actuating said auxiliary latch and said latch in succession.

15. The combination with the movable contact member of a switch, of a roller abutment, a latch, a movable pivot on which said latch is pivoted, and a roller on said latch engaging said roller abutment.

16. The combination with the movable contact member of a switch, of a roller abutment, a latch, a movable pivot on which said latch is pivoted, a roller on said latch engaging said roller abutment, said roller on said latch overtraveling with respect to said roller abutment, and means for limiting the overtravel of said roller.

17. The combination with the movable contact member of a switch, of means for locking the same comprising an abutment and a latch engaging said abutment, an auxiliary latch carried by and movable with respect to said latch and coöperating with said abutment, a latch actuator for actuating said latch to release said contact member, and a second latch actuator pivoted to said first latch actuator for releasing said auxiliary latch.

18. The combination with the movable contact member of a switch, of means for locking the same comprising an abutment and a latch engaging said abutment, an auxiliary latch carried by and movable with respect to said latch and coöperating with said abutment, a latch actuator for actuating said latch to release said contact member, and a second latch actuator pivoted to said first named latch actuator for releasing said auxiliary latch in advance of the release of said latch by said first named latch actuator.

19. The combination with the movable contact member of a switch, of locking means for restraining the same in normal position, auxiliary means preventing release of said contact member from said locking means, and tripping mechanism for actuating said auxiliary means and said locking means.

20. The combination with the movable contact member of a switch, of pivoted locking means for restraining the same in normal position, auxiliary means carried by and partaking of straight line motion with respect to said locking means preventing actuation of said locking means, and tripping means for first actuating said auxiliary means and thereafter said locking means.

21. The combination with the movable contact member of a switch, of locking means for restraining the same in normal position, auxiliary means preventing actuation of said locking means in response to shock, and tripping means for first actuating said auxiliary means and thereafter said locking means.

22. The combination with the movable contact member of a switch, of means overtraveling beyond a predetermined position for restraining said contact member in normal position, and auxiliary means carried by and slidable upon said first named means preventing operation of said first named means.

23. The combination with the movable contact member of a switch, of means overtraveling beyond a predetermined position for restraining said contact member in normal position, and auxiliary means carried by and movable with respect to said first named means preventing operation of said first named means.

24. The combination with the movable contact member of a switch, of means overtraveling beyond a predetermined position for restraining said contact member in normal position, auxiliary means preventing operation of said first named means, and tripping mechanism for actuating first said auxiliary means and thereafter said first named means.

25. The combination with the movable contact member of a switch, of means overtraveling beyond a predetermined position for restraining said contact member in normal position, auxiliary means carried by and movable with respect to said first named means preventing operation of said first

named means, and tripping mechanism for actuating first said auxiliary means and thereafter said first named means.

26. The combination with the movable contact member of an electric switch, of a latch for restraining the same in normal position, and an auxiliary latch preventing operation of said latch.

27. The combination with the movable contact member of an electric switch, of a latch for restraining the same in normal position, and an auxiliary latch carried by and movable with respect to said first named latch preventing operation of said latch.

28. The combination with the movable contact member of an electric switch, of a pivoted latch for restraining the same in normal position, an auxiliary latch carried by and movable on said latch preventing operation of said latch, and tripping mechanism for actuating said auxiliary latch and thereafter said first named latch.

29. The combination with the movable contact member of an electric switch, of a latch for restraining the same in normal position, an auxiliary latch carried by and movable with respect to said first named latch preventing operation of said latch, and tripping mechanism for actuating said auxiliary latch and thereafter said first named latch.

30. The combination with a base, of a movable contact member of an electric switch, a latch movable with said contact member and engaging said base for locking said contact member in normal position, and an auxiliary latch carried by said latch and engaging said base for holding said first named latch in locking position.

31. The combination with the movable contact member of an electric switch, of a latch for locking the same in normal position, and an auxiliary latch carried by and movable with respect to said latch holding said first named latch in locking position.

32. The combination with the movable contact member of an electric switch, of a pivoted latch for locking the same in normal position, an auxiliary latch carried by and having sliding connection with said first named latch holding said first named latch in locking position, and tripping mechanism for releasing said auxiliary latch and thereafter said first named latch.

33. The combination with the movable contact member of an electric switch, of a latch for locking the same in normal position, an auxiliary latch carried by and movable with respect to said latch holding said first named latch in locking position, and tripping mechanism for releasing said auxiliary latch and thereafter said first named latch.

34. The combination with the movable contact member of a switch, of a latch for restraining the same in normal position, an auxiliary latch carried by and movable with respect to said latch, latch actuators for said latches, and a connection between said actuators whereby one of them first actuates said auxiliary latch and thereafter actuates the actuator of said first named latch.

35. The combination with the movable contact member of an electric switch, of a latch for restraining the same, an auxiliary latch carried by and sliding on said latch restraining said latch to prevent response thereof to shock, and means for actuating said auxiliary latch and thereafter said first named latch to free said contact member.

36. The combination with the movable contact member of an electric switch, of means movable with said contact member for locking the same in normal position, and auxiliary means for holding said locking means in locking position.

37. The combination with the movable member of an electric switch, of a locking member movable therewith for locking the same in normal position, and a latch for holding said locking member in locking position.

38. The combination with the movable contact member of an electric switch, of means movable with said contact member for locking the same in normal position, auxiliary means for holding said locking means in locking position, and means for actuating said auxiliary means and said locking means in succession.

39. The combination with the movable contact member of an electric switch, of means for locking the same in normal position comprising a member having a dead center position to one side of which said member lies for locking said contact member, and means for holding said locking means in locking position.

40. The combination with the movable contact member of a switch, of a latching member traveling beyond a dead center position to lock said contact member, and an auxiliary latch holding said latch member against return through dead center position.

41. The combination with the movable contact member of a switch, of a latch member traveling beyond a dead center position to lock said contact member, an auxiliary latch holding said latch member against return through dead center position, and means for first actuating said auxiliary latch and thereafter said latch member.

42. The combination with the movable contact member of an electric switch, of operating means therefor, locking means movable with said contact member and operating means for locking said contact member in normal position, said means comprising a

member traveling through dead center position to lock said contact member, and auxiliary means for locking said locking means in locking position.

43. The combination with a base, of a switch contact movable thereon, operating means for said contact, means for locking said contact in normal position pivoted to said operating means and comprising a member traveling through dead center position to lock said contact member, and auxiliary means carried by and movable with respect to said base independently of said operating means for locking said locking means in locking position.

In testimony whereof I have hereunto affixed my signature this 6″ day of May, 1918.

WILLIAM M. SCOTT.