No. 754,505. PATENTED MAR. 15, 1904.

W. M. SCOTT.

AUTOMATIC CIRCUIT BREAKER.

APPLICATION FILED JUNE 18, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

FIG 1

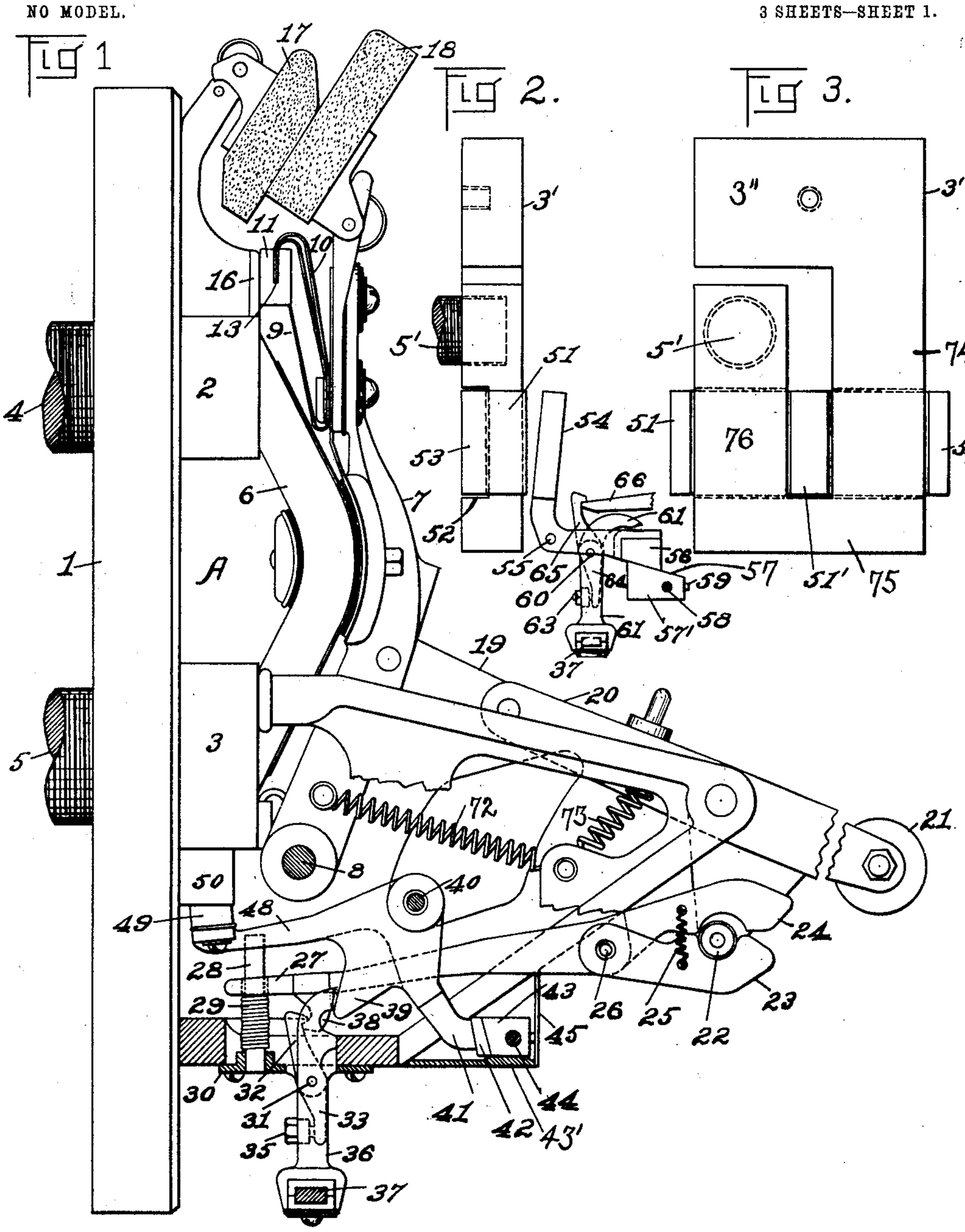

FIG 2.

FIG 3.

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James M. Sawyer

INVENTOR.

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BY Munn & Co

ATTORNEY.

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 5.

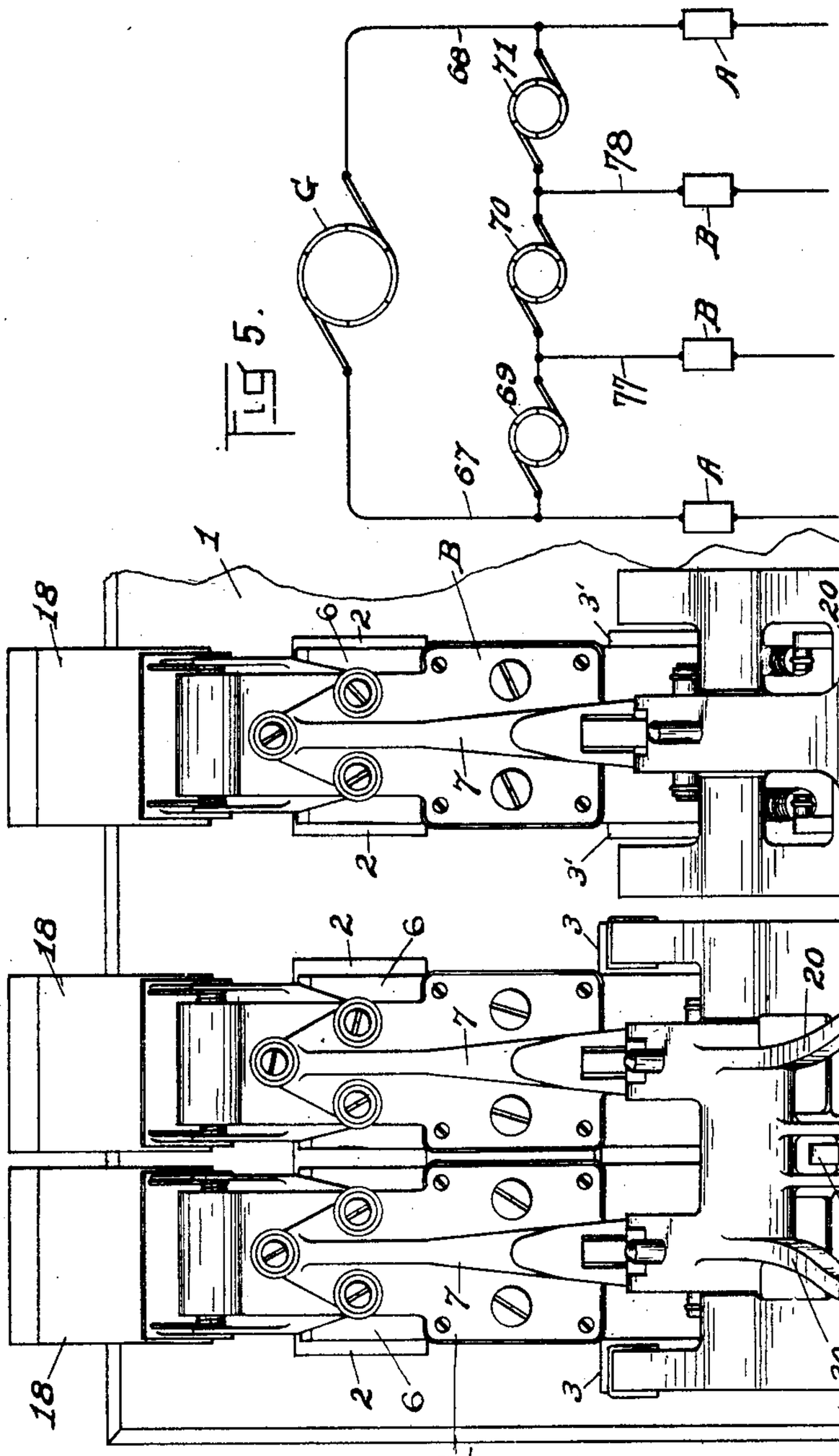

Fig. 4.

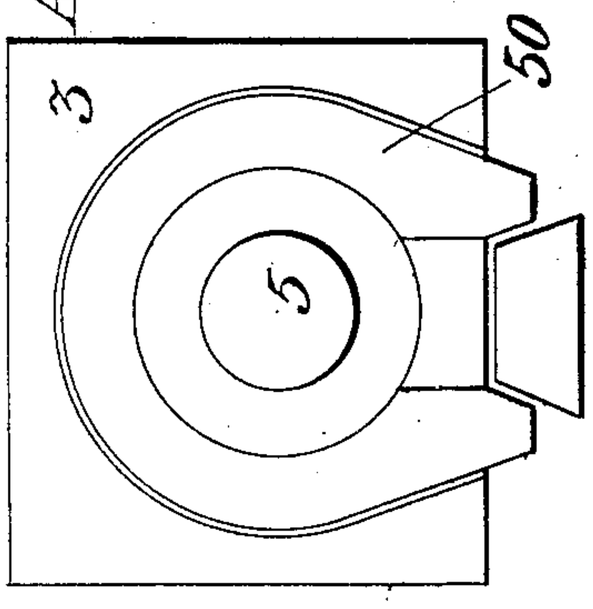

Fig. 5.

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NO MODEL. 3 SHEETS—SHEET 3.

Fig 9

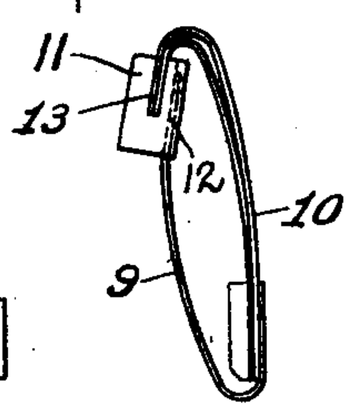


Fig 8.

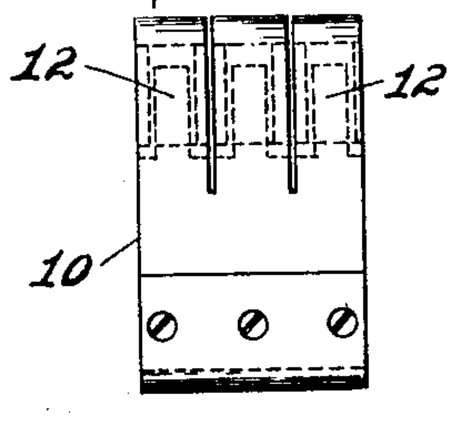


Fig 7.

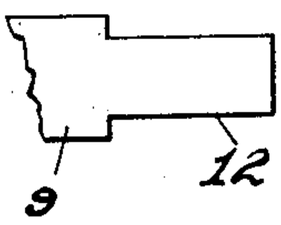


Fig 6.

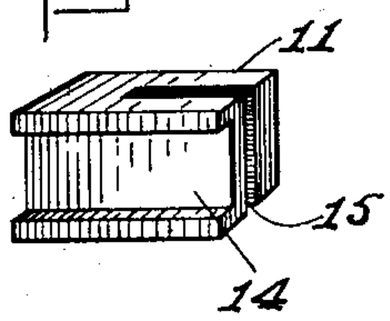


Fig 11

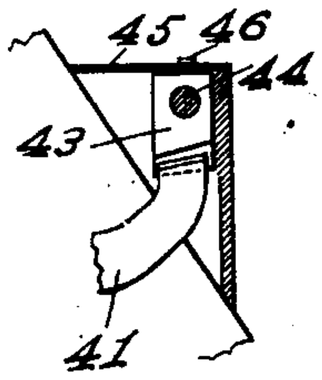


Fig 10.

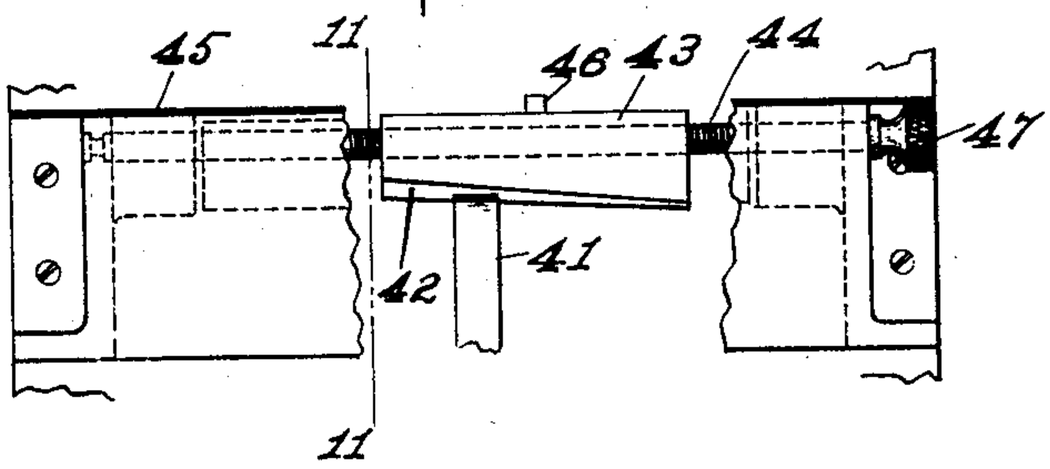


Fig 12.

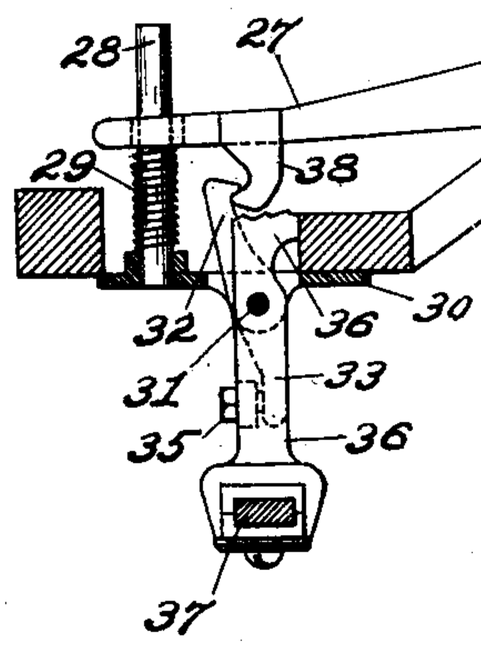


Fig. 14.

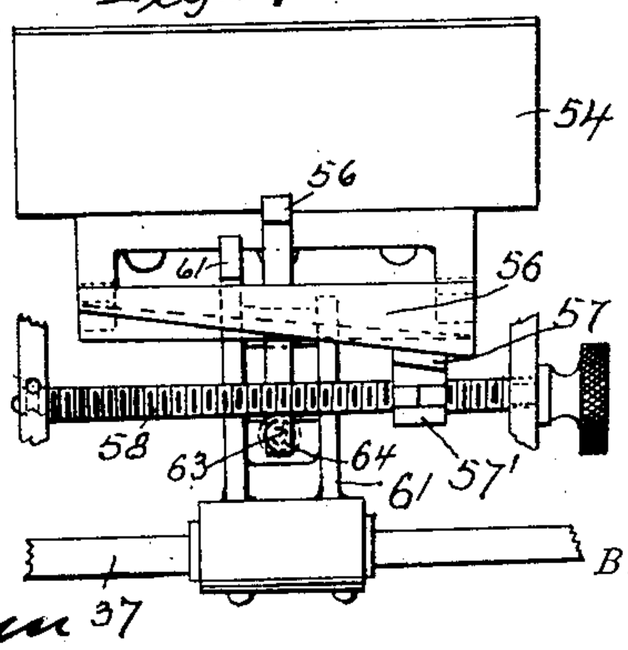
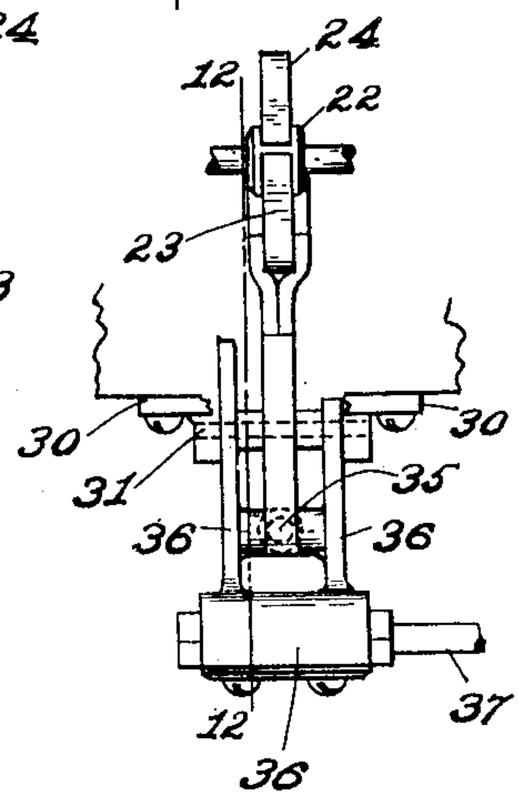


Fig 13.



WITNESSES:

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ATTORNEY.

No. 754,505. Patented March 15, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM M. SCOTT, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO CUTTER ELECTRICAL AND MANUFACTURING COMPANY, A CORPORATION OF NEW JERSEY.

AUTOMATIC CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 754,505, dated March 15, 1904.

Application filed June 18, 1903. Serial No. 161,985. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. SCOTT, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new Automatic Circuit-Breaker, of which the following is a specification.

My invention relates to automatic magnetic circuit-breakers whose function is to interrupt an electric circuit when any abnormal or undesired conditions obtain in a circuit. These undesirable conditions may be abnormal current-flow, reversed current-flow, underload, low voltage, excessive voltage change, or any other abnormal conditions likely to arise in an electric circuit.

My invention relates particularly to improvements whereby the shunt-contact piece may be quickly and securely replaced without resource to screws, riveting, soldering, or the like.

It relates also to an improved form of electromagnetic tripping device in which the magnet is so combined with the terminal block that a maximum effect shall be obtained with the simplest structure.

My invention consists, further, in improvements in the tripping mechanism of an automatic circuit-breaker whereby automatic circuit-breakers of different capacities having tripping mechanism of different dimensions or types may be used to coöperate with each other as multicircuit circuit-controllers, in which the tripping mechanisms of the different controllers are so interconnected mechanically that when one circuit-breaker is tripped by its magnet all the others will be simultaneously tripped in virtue of the mechanical connection aforementioned.

My invention consists, further, in connection with the armature of the tripping-magnet, of means for adjusting with nicety the relative position of the armature with respect to the pole-pieces, such means having for its essential feature a warped surface upon which rests a projection from the armature member and between which projection and warped surface there is a relative movement in passing from one adjustment to another.

In multivoltage systems it is often desirable to employ circuit-breakers of different capacities, and hence of different dimensions, mounted in juxtaposition upon a base or panel, such circuit-breakers being required to open simultaneously upon the occurrence of any abnormal condition in any one of the multivoltage circuits. It is to meet such requirements that the devices aforementioned are particularly adapted.

Reference is to be had to the accompanying drawings, in which—

Figure 1 represents in side elevation an automatic circuit-breaker for controlling currents reaching values as high as many thousands of amperes. Fig. 2 is an end view of an electromagnetic tripping mechanism employed in a circuit-breaker of the same general type as that shown in Fig. 1, but which is designed for the control of relatively smaller currents than in the case of the switch shown in Fig. 1. Fig. 3 is a front view of the electromagnet shown in Fig. 2. Fig. 4 is a view of two circuit-breakers of different capacities mounted upon the same panel having dissimilar tripping mechanism mechanically interconnected, so that when one circuit-breaker operates the other shall operate simultaneously. Fig. 5 is a diagrammatic view of a multivoltage circuit including circuit-breakers as shown in Fig. 4. Fig. 6 is a perspective view of a metalic shunt-contact piece capable of ready insertion and removal. Fig. 7 is a view of an end of a spring aiding in the support of the metallic shunt-contact shown in Fig. 6. Fig. 8 is a view showing a plurality of shunt-contacts of the kind shown in Fig. 6 supported by leaf-springs. Fig. 9 is a side view showing the metallic shunt-contact of Fig. 6 secured in position. Fig. 10 is a front view of an armature-adjusting device. Fig. 11 is a transverse view of Fig. 10, taken at the line 11 11. Fig. 12 is an enlarged view of the tripping mechanism shown in Fig. 1. Fig. 13 is an end view of the mechanism shown in Fig. 12, Fig.

12 being taken as a view at the line 12 12. Fig. 14 is a front view of the tripping mechanism shown in end view in Fig. 2. Fig. 15 is a view in elevation looking at the rear of main contact-block 3 and having the magnet 50 embedded therein.

Referring to Fig. 1, A represents an automatic magnetic circuit-breaker adapted to control relatively great currents. 1 represents a base of insulating material, such as a switchboard, to which are secured the massive copper terminal blocks 2 and 3, secured to the switchboard or base by means of the screw-threaded studs 4 and 5, which serve also as electrical connections with said terminal block. 6 represents a laminated bridging member supported by and insulated from the pivoted arm 7, having its pivotal connection with the base of the instrument at 8. Secured to and insulated from an upper extension of the arm 7 are the metallic springs 9 and 10 for supporting the metallic shunt-contact piece 11, which engages the stationary metallic shunt-contact 16. At 18 is shown a movable shunt carbon contact pivoted with respect to the arm 7, insulated therefrom, but in electrical communication with the contact 11. At 17 is shown the stationary shunt-carbon, which coöperates in the well-known manner with the carbon 18. When the circuit-breaker opens, circuit is first broken between the laminated bridge 6 and the main terminal blocks 2 and 3. Later the shunt metallic contacts 11 and 16 separate, and circuit is finally broken at carbons 17 and 18, between which the final arc occurs. These shunt-contacts remove the arcing from the engaging faces of the terminal blocks 2 and 3 and the bridging member 6. The metallic shunt-contact 11 is best understood by an inspection of Fig. 6, where it is shown in perspective. Extending for a considerable portion of its length is a slot 15, and in its one face, the face opposite its contact-face, is the groove or channel 14. On the upper end of the metallic spring 9 and integral therewith is a tongue 12, adapted for insertion and fit into and within the channel 14. The upper ends of the springs 10, which are bent in a downward direction, as shown in Fig. 9, fit into and engage in the slot 15. The downward pressure exerted by the ends of the springs 10 force the block 14 along the tongue 12 until the shoulders between the tongue 12 and the spring 9 engage the lower end of the block 14. When this relation exists, the block 14 is securely held from play or motion in any direction and is easily and quickly detachable, though forming good electrical connection with the springs 9 and 10. It is in virtue of this construction that a damaged shunt metallic contact may be quickly removed and replaced in the shortest interval of time, because it is not necessary to resort to unscrewing, unriveting, or unsoldering. The laminated bridging member 6 is cramped in circuit-closing position, as shown in Fig. 1, by means of the toggle 19 20. The toggle-link 20 extends toward the right of its pivot and terminates in the operator's handle 21. To maintain the circuit-breaker in the closed position, there is supplied in an extension from the member 20 a roller or pin 22, which is embraced by the latch 23, pivoted at 26 to the frame of the instrument. 24 is a latch-operating member resiliently connected with the latch 23 by means of the spiral spring 25. The member 24 is also pivoted at 26 and has an extension 27, which embraces the vertical rod 28, secured at its lower end in the plate 30, secured to the frame of the instrument. The actuation of the member 24 serves at once to disengage the latch 23 from the roller 22 and also to impart to said roller 22 a blow which aids in opening the switch. Surrounding the rod 28 is the spiral spring 29. (Shown compressed by the extension 27 in Fig. 1.) Secured to the extension 27 is the hook or latch member 38, which is engaged by the detent 32, pivoted at 31 in the plate 30. As shown in Fig. 1, this detent 32 holds the extension 27 in such position as to compress the spring 29. The detent 32 extends downwardly below its pivot 31 by a portion, as indicated at 33. 36 is a vertically-extending member, also pivoted at 31, and engages with its upper extremity with the extension 39, forming a portion of the armature-support 48, pivoted at 40 to the frame of the instrument. The armature 49, supported by member 48, coöperates with the pole-pieces 50 of an electro-magnet comprising a U-shaped mass of iron embedded in the main terminal block 3 and located between said terminal block and the switchboard or base. In the lower portion of the member 36 is a screw 35, adapted to engage the portion 33 at the lower end of the detent 32. 37 is a bar or rod clamped to the member 36 and insulated therefrom, if of metal, and extends to the tripping mechanisms of other circuit-breakers which it is desired shall open simultaneously with the circuit-breaker shown at A. The operation of the device is as follows: When the current passing through the circuit-breaker attains a predetermined value, the armature 49 is drawn upwardly, which results in the member 39 revolving about its pivot 40 to a slight extent and in a clockwise direction. In consequence the upper extremity of the member 36 revolves to a slight extent in a counter-clockwise direction about its pivot 31 and the screw 35 engages the extension 33 of the latch 32, causing the same to rotate to a slight extent in a counter-clockwise direction about its pivot 31, thus releasing the hook or latch member 38. At such release spring 29 expands quickly and forcibly, causing the member 24 to rotate in a clockwise direction about its pivot 26 and to deliver a blow to the latch 23, causing it to rotate in a clockwise direction about its pivot

26 and release the roller or pin 32. Instantly the toggle 19 and 20 collapses under the combined influences of gravity and the springs 72 and 73, attached to the frame and to arm 7 and link 20, respectively, causing the member 7 to rotate in a clockwise direction about its pivot 8, and thus carrying the bridging member 6 away from the terminal blocks 2 and 3, later the contact 11 from its associate 16, and finally carbon 18 from its associate 17, thus completely rupturing the circuit. The tripping device is therefore in the nature of a hair-trigger, comprising the members 32 and 38, which control the power-spring 29. By this arrangement it is found that the circuit-breaker may be tripped most satisfactorily and positively, the electric magnet of any circuit-breaker supplying the energy or power for tilting, through the agency of the bar 37, all the members 36 or similar members of the several circuit-breakers, thus simply unlatching the almost frictionless trigger comprising the members 32 and 38 or similar arrangements in the several circuit-breakers, the power for actually tripping each circuit-breaker being derived from a spring or other device in each circuit-breaker. In other words, a hair-trigger is employed to control the power or energy which actually trips the circuit-breaker, and the delicate hair-trigger, is actuated by the electromagnetic device in each circuit-breaker.

Between the end of the magnet 50 and its coöperating armature 49 a very nice adjustment of the armature is necessary if the circuit-breaker is to be calibrated for current strengths differing by reasonable amounts from each other. To this end is provided block 43, which rests on one of its long flat faces upon a machined or smoothed surface on the upper side of the plate 43′. To move this block backwardly and forwardly is supplied a screw 44, engaging within the block 43 such screw having a convenient thumb-screw 47. In general the shape of the block 43 is that of a wedge and has a surface 42, which is a warped surface, on which bears the extremity of the armature member 41. The end of this armature member 41 is of considerable extent, and in order that it may bear over its entire extent upon the adjusting-block 43 for every angular position of member 41 and for every corresponding position of block 43 the surface 42 is necessarily a warped one—that is, one generated by a straight line whose ends have for loci two other straight lines which are not parallel to each other. By turning the thumb-screw 44 the block 43 is moved from right to left, or vice versa, either lifting or permitting the fall of the armature 49, thus adjusting it with respect to the pole-pieces 50. It is upon the position of the block 43 that the operation of the circuit-breaker depends. With the block 43 toward the right, Fig. 10, the armature 49 will be at a relatively great distance from the pole-pieces 50, and it will therefore require a greater current passing through the circuit to trip the circuit-breaker. With the block 43 toward the left, Fig. 10, the armature 49 is relatively close to the pole-pieces 50, and the circuit-breaker will therefore open on a much less current.

46 is a pointer or projection from the block 43, which extends through a slot in the plate 45, and upon this plate 45, extending across the front of the circuit-breaker and hiding the block 43 and appurtenances, are the graduations of the current. By turning thumb-screw 47 until the pointer 46 comes opposite any calibration-mark the armature 49 is in such position that with the current of the magnitude indicated by the pointer 46 on the plate 45 the circuit-breaker will open. The adoption of the warped surface adjustment assures a great nicety and smoothness in adjustment, making the behavior of the circuit-breaker so satisfactory that it becomes in fact an instrument of precision.

In Fig. 2, 3′ represents the lower main terminal block of a switch of the same general type as that shown at A. The switch, however, is of a lower capacity than that shown at A, and in order to economize space and material and still obtain a sufficiently great magneto-motive force to open the circuit-breaker it is necessary to arrange the magnet with respect to the terminal so that a maximum magnetic flux will be obtained. To this end the main terminal block 3′ has a portion of 3″ which is engaged by a laminated bridging member similar to 6. 3′ has a downwardly-extending portion 74. It is then turned toward the left in a horizontal portion 75 and terminates in a reascending portion 76. It is into the rear of this portion 76 that the leading-in terminal or stud 5′ is connected. The path of the current is then through the stud 5′ and vertical portion 76, horizontal portion 75, vertical portion 74, and main portion 3″, and next to the laminated bridging member and then to the upper main terminal block. In the terminal members 74 and 76 and in the rear of them next to the switch-board are cut the channels 52. 53 is a body of magnetic material whose thickness is approximately equal to the depth of these channels 52. This magnetic mass is placed within these channels and extends from one of them to the other. Extending toward the front of the switch-board or the flat surface of the main terminal block 3′ are the pole-pieces 51, 51′, and 51. These pole-pieces are integral with the mass 53 and extend slightly above the surface of the main terminal 3′. By this arrangement of the iron and the terminal the effect is that of two turns of the conductor around the magnetic mass, or it may be viewed as two parallel magnetic circuits around which the terminal makes a single turn. The pole-piece 51′ is just twice the

width of either pole-piece 51, and the path of the magnetic lines is, as viewed in Fig. 3, from the pole-piece 51′ through the main portion 53 to the left-hand pole-piece 51 and similarly from the pole-piece 51′ through the right-hand portion of the mass 53 to the right-hand pole-piece 51. Mounted in front of these pole-pieces is armature 54, pivoted at 55 and having a horizontal extension 56, which rides or rests upon a warped surface 57 of the block 57′, which is engaged by the thumb-screw 58 and carries the indicating pointer or stud 59. The operation is similar to that described in connection with the circuit-breaker A. At 60 is a pivot upon which is mounted the latch 65, engaging the member 66, which operates the main latch of the circuit-breaker in a manner similar to that of the element 27 of the circuit-breaker A. The latch or hair-trigger 65 has a downwardly-extension portion 64, which is engaged by the set-screw 63, mounted in the vertical member 61, which is also pivoted at 60. The upper portion of this member 61 bears upon the top surface of the extension 56 of the armature 54. In the lower part of end 61 is secured the rod 37, which is the same rod appearing in the circuit-breaker A. It is by this rod that the tripping mechanisms of the two or more types or sizes of circuit-breakers are connected together. The operation is as follows: When a sufficiently large current—that is, a current corresponding with that marked at the groove opposite the pointer 59—passes through the terminal block 3′, the armature 54 is attracted, and thus presses forwardly upon the upper extremity of the member 61, rotating such member in a counterclockwise direction about its pivot 60. The set-screw 63 then tilts the hair-trigger 65 in a counterclockwise direction about the same pivot 60, releasing the member 66, to which power is applied, as in the case of the circuit-breaker A, and the circuit-breaker tripped. This electromagnet and tripping mechanism, as disclosed in Figs. 2 and 3, is, as aforestated, employed upon a circuit-breaker of a lower capacity than that shown at A, which circuit-breaker is represented at B in Figs. 4 and 5 and is adapted to coöperate with the circuit-breaker A under certain conditions.

In Fig. 4 the two types of circuit-breakers A and B are mounted upon the same base 1. Though only two circuit-breakers are shown to be so mounted, it is to be understood that any number of circuit-breakers of different types or having tripping mechanisms of different types are to be so mounted. At 37 is clearly shown the rod which joins the members in each circuit-breaker which are acted upon by the armatures of the tripping-magnets. 62 is a convenient handle by means of which all the circuit-breakers may be tripped by hand at any desired moment and before the current in any one circuit has obtained its critical value. As seen in Fig. 4, the circuit-breakers A and B are not of exactly the same dimensions and their tripping mechanisms are differently disposed, as heretofore described. The circuit-breaker A is of the larger capacity, while the circuit-breaker B has a relatively smaller capacity, and yet it is desirable under certain circumstances that all the circuit-breakers open at once, even though it is one of the lower-capacity circuit-breakers that is electrically tripped.

In Fig. 5 is shown a multivoltage system or circuit, including the main generator G, from which extend the main leads 67 and 68. Joined in series with each other and connected between the leads 67 and 68 are the subsidiary generators 69, 70, and 71. From these generators extend the additional conductors 77 and 78. This forms the well-known multivoltage circuit between whose different conductors different potentials may be obtained. The large-capacity circuit-breakers A are connected in series in the conductors 67 and 68, while the low-capacity circuit-breakers B are connected in series in the conductors 77 and 78. Now in case the translating device supplied by the conductors 77 or conductor 78 consumes too great an amount of current either one of the circuit-breakers B will be electrically tripped, and in virtue of the connection 37 all of the circuit-breakers on the panel will be tripped. Similarly, if any one of the circuit-breakers is electrically tripped all the others will also be positively tripped. It is for the protection of the multivoltage system that the herein-described invention is adapted. The current taken off of the conductors 77 or 78 is in general less than that taken off of the outer conductors 67 and 68, and in consequence it would be unnecessarily expensive and costly for the conductors 77 and 78 to be supplied with circuit breakers of a capacity equal to the capacity of the greatest circuit-breaker necessary, such as A. By my arrangement I may use circuit-breakers of smaller capacity for the subsidiary conductors of a multivoltage system, which shall coöperate with the circuit-breakers in the main conductors and having a greater capacity. By adopting the delicate tripping mechanism, as herein described, all the tripping mechanisms of the different circuit-breakers may be connected together, as by a bar 37, which is impossible with the arrangement in former types. The tripping devices of the circuit-breakers A and B are generically the same, but differ in details of arrangement because of the different types of electromagnets used. In virtue of my invention circuit-breakers of no matter how different capacities may be mounted upon the same panel and made to coöperate in the manner heretofore described.

It is within the scope of my invention to employ instead of the overload tripping devices those devices representing an underload,

low voltage, &c., in which an armature is released instead of attracted, for it is obvious that the armature by being released may fall, and thereby actuate the member or tripping mechanism similarly to the member 36 in circuit-breaker A, and thereby cause the circuit-breaker to be tripped. It is also within the scope of my invention to employ circuit-breakers of different capacities, as herein described, coöperating with each other, but included in circuits other than multivoltage circuits or in absolutely independent circuits. It is also within the scope of my invention to vary the details of the construction of the parts and also of the tripping mechanism, it being the feature of my invention to employ a hair-trigger in connection with a tripping-magnet, which hair-trigger releases means for positively actuating the main trip of the circuit-breaker. It is to be understood, furthermore, that in place of the hook-latches which I have herein shown and described any other restraining means may be employed.

What I claim is—

1. In an automatic circuit-breaker, separable coöperative contacts, a latch for restraining said contacts in normal position, means actuated by locally-stored energy for operating said latch, a trigger restraining said latch-operating means, a member pivoted concentrically with said trigger for operating said trigger, and electromagnetic means for tilting said trigger-operating means.

2. In an automatic circuit-breaker, separable coöperative contacts, means for restraining said contacts in normal position, an electromagnet, an armature therefor for controlling said restraining means, and adjusting means for said armature engaged by said armature upon a warped surface.

3. In an automatic circuit-breaker, separable coöperative contacts, a latch for restraining said contacts in normal position, an electromagnet, an armature therefor for controlling said latch, and means for adjusting said armature comprising a wedge-shaped block whose engaging face is a warped surface.

4. In an automatic circuit-breaker, separable coöperative contacts, a latch for restraining said contacts in normal position, an electromagnet, an armature therefor, a member supporting said armature and controlling said latch, a means for adjusting said armature comprising a wedge-shaped member, having a warped surface, and engaged on said surface by said armature-supporting member.

5. In an electric switch, a contact comprising a mass of conducting material having a recess therein, means engaging loosely in said recess, and a member loosely engaging said mass and coöperating with said means to lock said mass in position.

6. In an electric switch, a contact comprising a conducting mass having a plurality of recesses therein, means engaging loosely in a recess, and a member loosely engaging in another recess, whereby said mass is locked in position.

7. In an electric switch, a shunt-contact, comprising a conducting mass, a slot in said mass, a supporting-spring engaging in said slot, a groove in said mass, and a spring engaging in said groove.

8. In combination, a plurality of switches of different capacities, and having dissimilar tripping mechanisms, and a connection between the tripping mechanisms of all the switches, whereby the operation of any one switch causes the operation of all the switches.

9. In combination, a plurality of switches of different capacities and having dissimilar tripping mechanisms, and a mechanical connection between the tripping mechanisms of all the switches whereby all switches are tripped when any one switch is tripped.

10. In combination, a plurality of switches, having dissimilar tripping mechanisms, each tripping mechanism comprising a trigger-controlled member actuated by locally-stored energy, a trigger-operating member, and a mechanical connection between the trigger-operating members of all the switches.

11. In combination, a plurality of electrical switches of different capacities, each switch having a tripping mechanism comprising a trigger-controlled member actuated by locally-stored energy, a pivoted trigger-actuating member, and means for causing the simultaneous action of the trigger-operating members of all the switches.

12. In combination, a plurality of automatic circuit-breakers of different capacities, each switch having a tripping mechanism comprising a trigger-controlled member actuated by locally-stored energy, a trigger-actuating member, and electroresponsive means for actuating said trigger-actuating means, and means for causing the simultaneous action of the trigger-actuating means of all the circuit-breakers.

13. In combination, a plurality of automatic circuit-breakers of different capacities, each having a tripping mechanism comprising a tripping-lever, actuated by locally-stored energy, a hair-trigger restraining said lever, a trigger-actuating member, an electroresponsive means controlling said trigger-actuating member, and a mechanical connection between the trigger-actuating members of all the circuit-breakers.

14. In an electric switch, separable coöperative contacts, means for restraining said contacts in normal position, means for imparting a blow to said restraining means, resilient means connecting said restraining means and blow-imparting means, and a trigger controlling said blow-imparting means.

15. In an electric switch, separable coöperative contacts, means for restraining said contacts in normal position, means for actuating

said restraining means by locally-stored energy, a resilient connection between said restraining means and its actuating means, and means controlling said actuating means.

16. In an electric switch, separable coöperative contacts, means for restraining said contacts in normal position, means for actuating said restraining means by locally-stored energy a trigger controlling said actuating means and means for operating said trigger said trigger and its operating means being concentrically pivoted.

17. In an electric switch, separable coöperative contacts, means for restraining said contacts in normal position, a member for actuating said restraining means, a resilient connection between said restraining means and said actuating member, a spring compressed by said actuating member, and a trigger for restraining said spring.

18. In an electric switch, fixed contacts, a movable switch member adapted to coöperate therewith, means for restraining said movable switch member in normal position, means for actuating said restraining means and for delivering a blow to the movable switch member, a local source of energy for operating said actuating means, and a trigger controlling said source of energy.

19. In an electric switch, fixed contacts, a movable switch member adapted to coöperate therewith, a latch for restraining said movable switch member in normal position, a member actuated by locally-stored energy to operate said latch and to impart a blow to the movable switch member, and a trigger controlling said member.

20. In an electric switch, fixed terminals, a movable switch member coöperating therewith, a latch for restraining said movable member in normal position, a pivoted lever for actuating said latch, a spring held compressed by said lever, a trigger controlling said lever, and means for operating said trigger pivoted concentrically with said trigger.

21. In an electric switch, a base, fixed contacts, a movable switch member coöperating therewith, a latch for restraining said movable switch member in normal position, a member for actuating said latch by locally-stored energy, and a trigger pivoted to the base for controlling said member.

22. In an electric switch, a base, contacts secured thereto, a movable switch member coöperating with said contacts, a latch for restraining said switch member in normal position, a member for actuating said latch by locally-stored energy, a trigger pivoted to said base for controlling said member, and means pivoted to said base for actuating said trigger.

23. In an electric switch, a base, fixed contacts, a movable switch member adapted to cooperate therewith, a latch for restraining said movable switch member in normal position, a member for actuating said latch, a spring for operating said member, and a trigger pivoted to the base for controlling said spring.

24. In an electric switch, a base, fixed contacts, a movable switch member coöperating therewith, a latch for restraining said movable switch member in normal position, a member for actuating said latch, a trigger for controlling said member, and a trigger-actuating member, said trigger and its actuating member being pivoted to the base concentrically with each other.

25. In an electric switch, a base, terminal blocks secured thereto, a laminated bridging member adapted to coöperate with said terminal blocks, a latch for restraining said laminated member in normal position, a member for actuating said latch by locally-stored energy, and a trigger pivoted to the base for controlling said actuating member.

26. In an electric switch, a base, terminal blocks secured thereto, a laminated bridging member adapted to coöperate with said terminal blocks, a latch for restraining said laminated member in normal position, a member for actuating said latch by locally-stored energy, a trigger pivoted to said base for controlling said member, and means pivoted to said base for actuating said trigger.

27. In an electric switch, a base, terminal blocks secured thereto, a movable laminated member adapted to bridge said blocks, a latch for restraining said laminated member in normal position, a member for actuating said latch, a spring for operating said member, and a trigger pivoted to the base for controlling said spring.

28. In an electric switch, a base, terminal blocks secured thereto, a movable laminated member adapted to bridge said blocks, a latch for restraining said laminated member in normal position, a member for actuating said latch, a trigger for controlling said actuating member, and a trigger-actuating member, said trigger and its actuating member, being pivoted to the base concentrically with each other.

29. In an automatic circuit-breaker, fixed contacts, a base supporting the same, a movable switch member coöperating with said contacts, a latch for restraining said movable switch member in normal position, a member for actuating said latch by locally-stored energy, a trigger pivoted to said base for controlling said member, and electroresponsive means for controlling said trigger.

30. In an automatic circuit-breaker, a base, fixed contacts mounted thereon, a movable switch member coöperating with said contacts, a latch for restraining said movable switch member in normal position, a latch-actuating member operated by locally-stored energy, a trigger for controlling said actuating member, and electroresponsive means secured to said base for controlling said trigger.

31. In an automatic circuit-breaker, a base, fixed contacts, a movable switch member co-

operating with said contacts, a latch for restraining said movable switch member in normal position, a latch-actuating member operated by locally-stored energy, a trigger pivoted to the base for controlling said actuating member, and electroresponsive means for controlling said trigger.

32. In an automatic circuit-breaker, a base, contacts secured thereto, a movable switch member coöperating with said contacts, a latch for restraining said switch member in normal position, a member for actuating said latch by locally-stored energy, a trigger pivoted to said base for controlling said member, means pivoted to said base for actuating said trigger, and electroresponsive means for actuating said trigger-actuating means.

33. In an automatic circuit-breaker, a base, fixed contacts mounted thereon, a movable switch member adapted to coöperate with said contacts, a latch for restraining said movable switch member in normal position, a member for actuating said latch, a spring for operating said member a trigger pivoted to said base for controlling said spring, and electroresponsive means for controlling said trigger.

34. In an automatic circuit-breaker, a base, fixed contacts mounted thereon, a movable switch member adapted to coöperate with said contacts, a latch for restraining said movable switch member in normal position, a member for actuating said latch, a spring for operating said member, a trigger pivoted to the base for controlling said spring, means pivoted to the base for actuating said trigger, and electroresponsive means for controlling said trigger-actuating means.

35. In an automatic circuit-breaker, a base, fixed contacts mounted thereon, a movable switch member coöperating with said contacts, a latch for restraining said movable switch member in normal position, a member for actuating said latch, a trigger for controlling said member, a trigger-actuating member, said trigger and its actuating member being pivoted to the base concentrically with each other, and electroresponsive means for controlling said trigger-actuating member.

36. In an automatic circuit-breaker a base, contact-blocks fixed thereon, a movable laminated member adapted to bridge said blocks, a latch for restraining said laminated member in normal position, a member for actuating said latch, a spring for operating said latch-actuating member, a trigger pivoted to said base for controlling said spring, and electroresponsive means for controlling said trigger.

37. In an automatic circuit-breaker, a base, contact-blocks fixed thereto, a laminated member adapted to bridge said contact-blocks, a latch for restraining said laminated member in normal position, a member for actuating said latch, a spring for operating said member, a trigger pivoted to the base for controlling said spring, means for operating said trigger, and electroresponsive means for controlling said trigger-operating means.

38. In an automatic circuit-breaker, a base, contact-blocks fixed thereon, a movable laminated member adapted to bridge said blocks, a latch for restraining said laminated member in normal position, said latch being pivoted to said base, a member for actuating said latch, a trigger pivoted to the base for controlling said latch-actuating member and electroresponsive means for controlling said trigger.

39. In an automatic circuit-breaker, a base, contact-blocks fixed thereon, a movable laminated member adapted to bridge said blocks, a latch for restraining said laminated member in normal position, a member for actuating said latch, a trigger for controlling said member, a trigger-actuating member, said trigger and its actuating member being pivoted to the base concentrically with each other, and electroresponsive means for controlling said trigger-actuating member.

40. In a tripping mechanism for electric switches, an adjusting means comprising relatively movable members, one of said members having a warped surface and engaged thereon by another of said members.

41. In a tripping mechanism for electric switches, an adjusting means comprising relatively movable members, one of said members being of a general wedge shape and having a warped surface engaged by another of said members.

42. In a tripping mechanism an electromagnet, an armature therefor, and means for adjusting the position of said armature with respect to said electromagnet comprising a member having a warped surface and a second member engaging said warped surface.

43. In a tripping mechanism, an electromagnet, an armature therefor, a pivotal support for said armature, a movable wedge-shaped member having a warped surface, and an extension from said armature-support engaging said warped surface.

44. In a tripping mechanism, an electromagnet whose conductor has great current-carrying capacity, an armature for said magnet, means for adjusting the position of said armature with respect to said magnet comprising a member having a warped surface and a second member engaging upon said warped surface, said members being relatively movable.

45. In an electric switch, a shunt-contact comprising a conducting mass, a recess therein, means engaging loosely in said recess, and a shouldered member loosely engaging said mass.

46. In an electric switch, a shunt-contact comprising a conducting mass, resilient means

engaging in a slot therein, and a resilient shouldered means engaging said mass.

47. In an electric switch a shunt-contact comprising a recessed conducting mass, and a member supporting said mass by a locking tongue-and-slot engagement.

48. In an electric switch, a shunt-contact comprising a conducting mass, resilient means engaging in a recess therein, and a resilient tongued means engaging in a recess therein.

WM. M. SCOTT.

Witnesses:
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