W. S. MAYER.

CIRCUIT BREAKER.

APPLICATION FILED SEPT. 30, 1915.

1,244,225.

Patented Oct. 23, 1917.

2 SHEETS—SHEET 1.

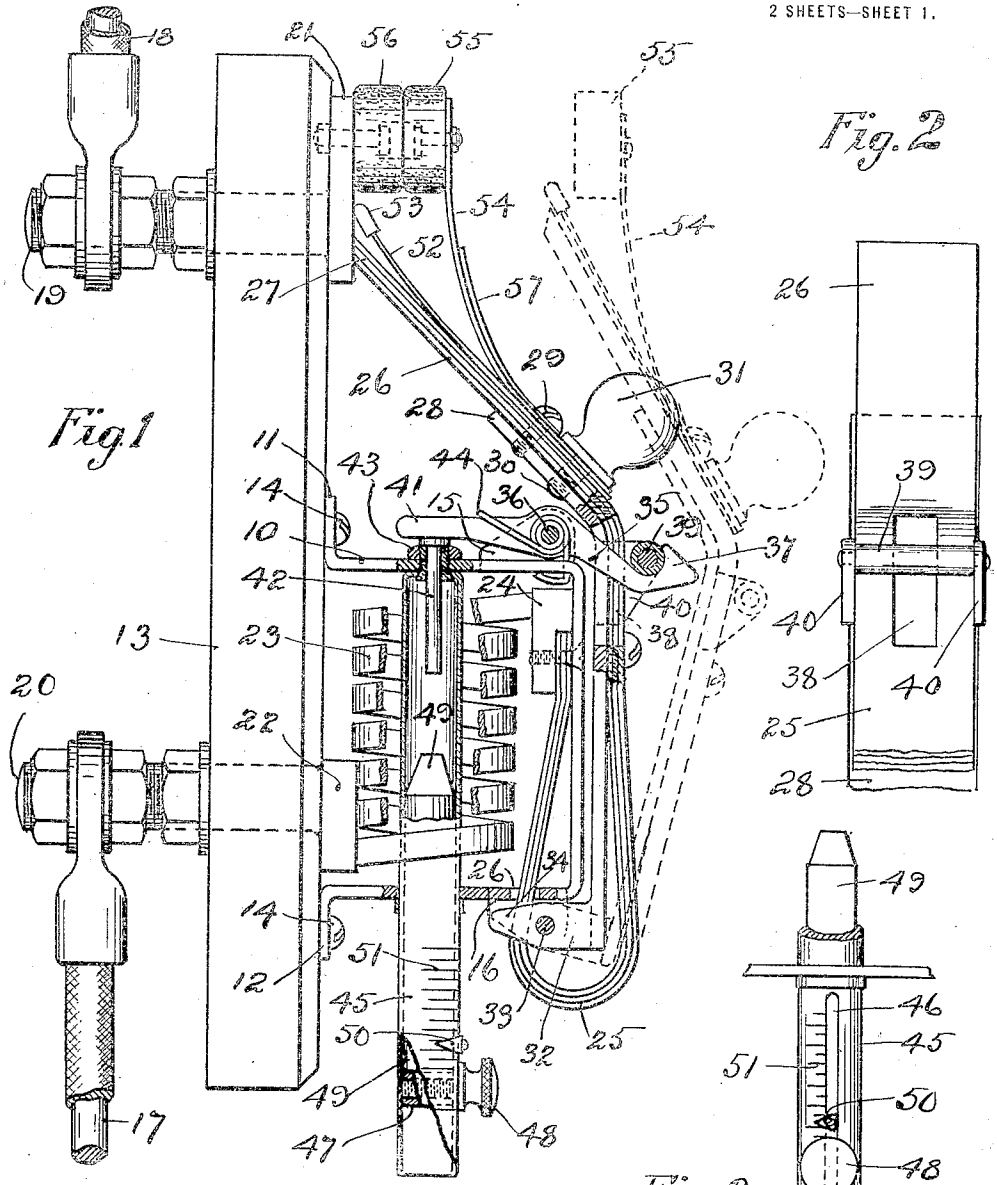


Fig. 1

Fig. 2

Fig. 3

Witnesses

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A. F. Maready

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2 SHEETS—SHEET 2.

Fig. 4

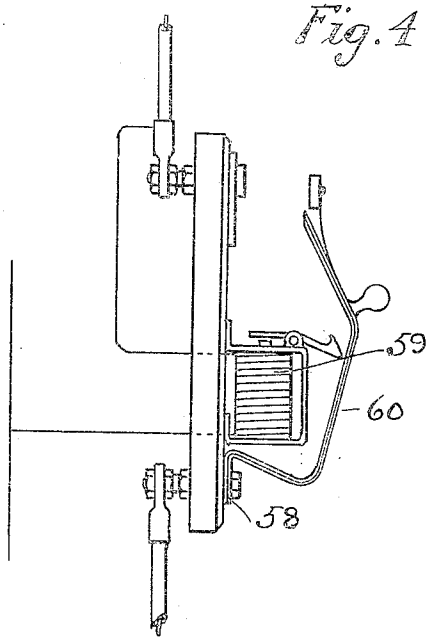


Fig. 5

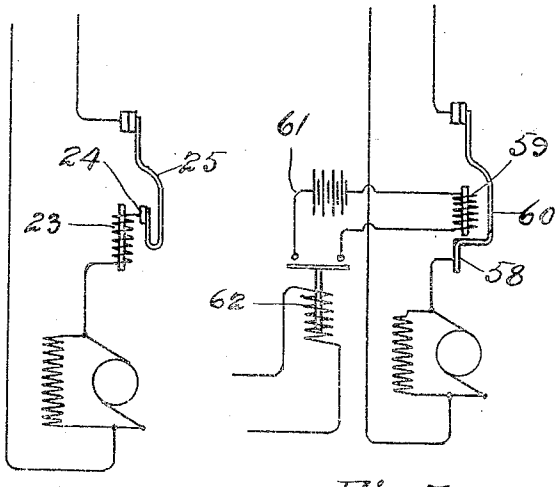


Fig. 7

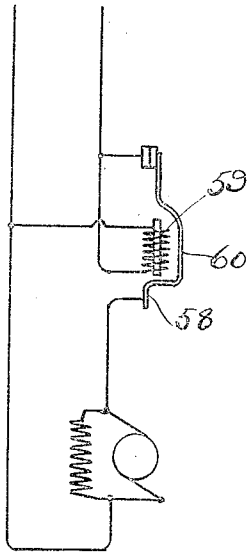


Fig. 6

Witnesses:

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UNITED STATES PATENT OFFICE.

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CIRCUIT-BREAKER.

1,244,225. Specification of Letters Patent. **Patented Oct. 23, 1917.**

Application filed September 30, 1915. Serial No. 53,364.

To all whom it may concern:

Be it known that I, WALTER S. MAYER, a citizen of the United States, and resident of the city of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Circuit-Breakers, of which the following is a specification.

This invention relates to circuit breakers of the class adapted to be operated to break the electric circuit by the action of an electromagnet operated when an over-load or other abnormal condition occurs on the line, and the object of this invention is to provide such a circuit breaker of relatively small dimensions that is compact and self-contained, also one that is exceptionally simple in construction yet rigid and durable, is positive in its action and will break the circuit without injury to the main contacts.

A further object of the invention is to provide means whereby a quick action and a wide break is obtained.

A further object of the invention is to provide an electromagnet having an armature arranged to trip the bridge arm and open the circuit when abnormal conditions occur on the line.

A still further object of the invention is to provide means whereby the armature may be adjusted relative to the electromagnet so that the amount of current required to move the armature may be varied.

The invention further consists in the provision of means for indicating the different amounts of current which are required to operate the armature from different adjusted positions.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described, and particularly pointed out in the appended claim.

In the accompanying drawings:

Figure 1— is a side elevation, partly in section, of my improved circuit breaker.

Fig. 2— is a top view showing a portion of the bridge arm and backing plate illustrating the opening through them through which the latch projects to engage the lock bar and lock the bridge arm closed.

Fig. 3— is a front elevation of the plunger tube showing the graduations thereon.

Fig. 4— is a modified form of my improved circuit breaker which is arranged to be tripped by a shunt instead of a series coil.

Fig. 5— is a diagrammatic view illustrating the circuit breaker as connected in series with the main line to be operated by an excess current.

Fig. 6— is a diagrammatic view of my circuit breaker illustrating a modified form of shunt coil connections arranged to operate the switch by an excess voltage.

Fig. 7— is a diagrammatic view illustrating the solenoid in my modified form of circuit breaker as connected to be operated through a separate circuit which is controlled by other mechanism.

Referring to the drawings 10 designates the frame on which the operating mechanism is supported, the same being formed of a strip of sheet metal bent into substantially a U shape having three sides with its ends 11 and 12 turned outward and secured to the base 13 by screws 14, and is provided on its upper side with a pair of integral pivot ears 15 and on its lower side with a second pair of similar pivot ears 16 both sets being bent up from its opposite edges for the purpose presently described.

The structure illustrated in Fig. 1 shows my improved device as connected in series, in which arrangement the main line wires 17 and 18 are connected through the binding posts 19 and 20 to their respective contact plates 21 and 22. To the contact plate 22 is connected one end of the solenoid coil 23 having its opposite end connected to the terminal block 24. It will be noted that this solenoid is so located between the arms of the frame, that the latter serves as a portion of the magnetic circuit. In order to bridge this block 24 and the opposite terminal 21, I have provided a bridge arm 25. This arm is connected to the terminal block 24 by suitable screws and extends downwardly through the opening 26 in the frame and is bent in a loop form, it then extends upwardly along the back of the frame, then inwardly at an angle as at 26ª so that its upper end 27 is adapted to rest squarely upon and make a perfect contact with the terminal block 21. This bridge arm is preferably of a laminated construction being formed of a multiplicity of superimposed thin strips of flat spring copper, which by being bent in this loop form shown, the inherent spring in the copper serves to lift the arm when re-

leased into the open position illustrated by dotted lines in Fig. 1.

A backing plate 28 serves to reinforce or support the leaves of the bridge arm which are secured thereto by screws 29 and the threaded portion 30 of the operating handle 31. The lower end of this backing plate is provided with a pair of inwardly turned ears 32 which are pivoted on the pin 33 in the ears 16 of the frame, whereby the backing plate is adapted to swing with the bridge arm as it moves to and from closed position. The ears 32 are arranged to project beyond the pivoting point as at 34 and are suitably shaped to contact with the underside of the frame and so limit the opening motion of the bridge arm. Owing to the fact that this bridge arm is normally carried to open position by its inherent spring, it is necessary to provide means for locking the arm in order to hold it in closed position. To accomplish this, I have provided a latch member 35 to act directly upon the arm to hold it closed. This latch is pivoted at 36 to the frame ears 15 and its outer end 37 is made in a hook form and is arranged to extend outwardly through an opening 38 through both the backing plate and bridge arm, to engage a roller catch bar 39 mounted in ears 40 on the back plate. The opposite end 41 of this latch extends back over a striking pin 42 which latter extends downwardly through the plug 43 into the center of the coil 23. This end of the latch is normally pressed downwardly onto this pin, by means of the coil spring 44.

A plunger guide tube extends through the center of the solenoid, its upper end being turned inward to grip the flaring end of the plug 43 and its lower portion is provided with a vertically arranged slot 46, see Fig. 3, in which is movably mounted a plug 47 which is adapted to be adjusted vertically relative to the coil and held in the desired position in the tube by means of a thumb screw 48 which is threaded into the same through this vertically disposed slot.

A plunger 49 of soft iron is mounted to move vertically in this guide tube 45, when an excessive amount of current passes through the solenoid, to engage the striking pin, trip the latch and permit the bridge arm to swing to open position and break the circuit. The lower end of this plunger is provided with a pointer 50 which is arranged to coöperate with the graduations 51 on the tube at the edge of the slot to indicate the amount of current required to attract and raise the plunger when set in different positions.

In order to prevent excessive arcing and destroying the contact surface of the bridge arm, I have provided a contact spring leaf 52 with an arc tip 53 and I have also provided a contact spring plate 54 carrying a carbon contact 55, to register with the corresponding fixed carbon contact 56, both of these carbons are in disk form and each is preferably retained in position by a single central screw whereby they may be very readily removed and replaced when worn, which feature is quite essential from a practical standpoint as the contacts deteriorate very rapidly requiring frequent renewals. This particular construction of bridge performs a double function; first, its spring leaves serve to carry a portion of the current, and second, they act upon the bridge arm to assist in accelerating its outward swing when released, to insure a quick final break between the carbons as this bridge arm moves to open position. These readily replaceable carbon disks serve to receive the effect of the final arc and so protect the contacting end of the bridge arm.

A feature in the practical construction of my improved circuit breaker is that the U shaped portion 10 in addition to acting as a support for the working parts also serves as a portion of the magnetic circuit to render more effective the action of the magnet.

By my improved construction, it will be noted that the manual closing of the bridge arm 25 may be effected by direct action upon the arm itself and without a multiplicity of intervening parts such as cams or levers or the like. In other words the operator may engage the handle 31 of the bridge member and by a direct action upon the bridge arm quickly slam the same closed.

In some cases when it is desired to operate the switch by excessive voltage, the bridge arm 60 instead of being connected to the coil terminal 24, is insulated therefrom and connected direct to the main terminal 58 as illustrated in Fig. 4, and a shunt coil 59 is employed instead of a series coil and connected in the circuit in any suitable way whereby an excess voltage will energize the coil to raise the plunger and break the circuit. Again if desired this shunt coil 59 may be energized through an auxiliary circuit 61 as illustrated in Fig. 7 which circuit may be controlled by a relay switch 62 of any suitable type or other suitable means may be provided for energizing this solenoid to operate the mechanism under predetermined conditions to open the main circuit.

I have shown and described two forms of circuit breakers similarly arranged to be affected by abnormal conditions in the main line, but I do not wish to be restricted to any particular form or arrangement of parts of this device as various modifications may be made without departing from the spirit and scope of my invention.

I claim:

A circuit breaker of the character described comprising a base provided with

separated contacts, a laminated metal bridge member bent into loop form, one arm thereof being immovably held in circuit with one of said contacts, the other arm being movable under the resiliency of the metal of which constructed, and having an offset end positioned to engage the other contact, the last mentioned arm having a slot therein, a catch bar attached to said arm opposite said opening, a detent positioned to extend through said opening to engage said catch bar, and means for automatically disengaging said detent from said catch bar.

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

WALTER S. MAYER.

Witnesses:
WILLIAM C. HEYDE,
WILLIAM C. RAYNOR.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."