No. 663,781. Patented Dec. 11, 1900.

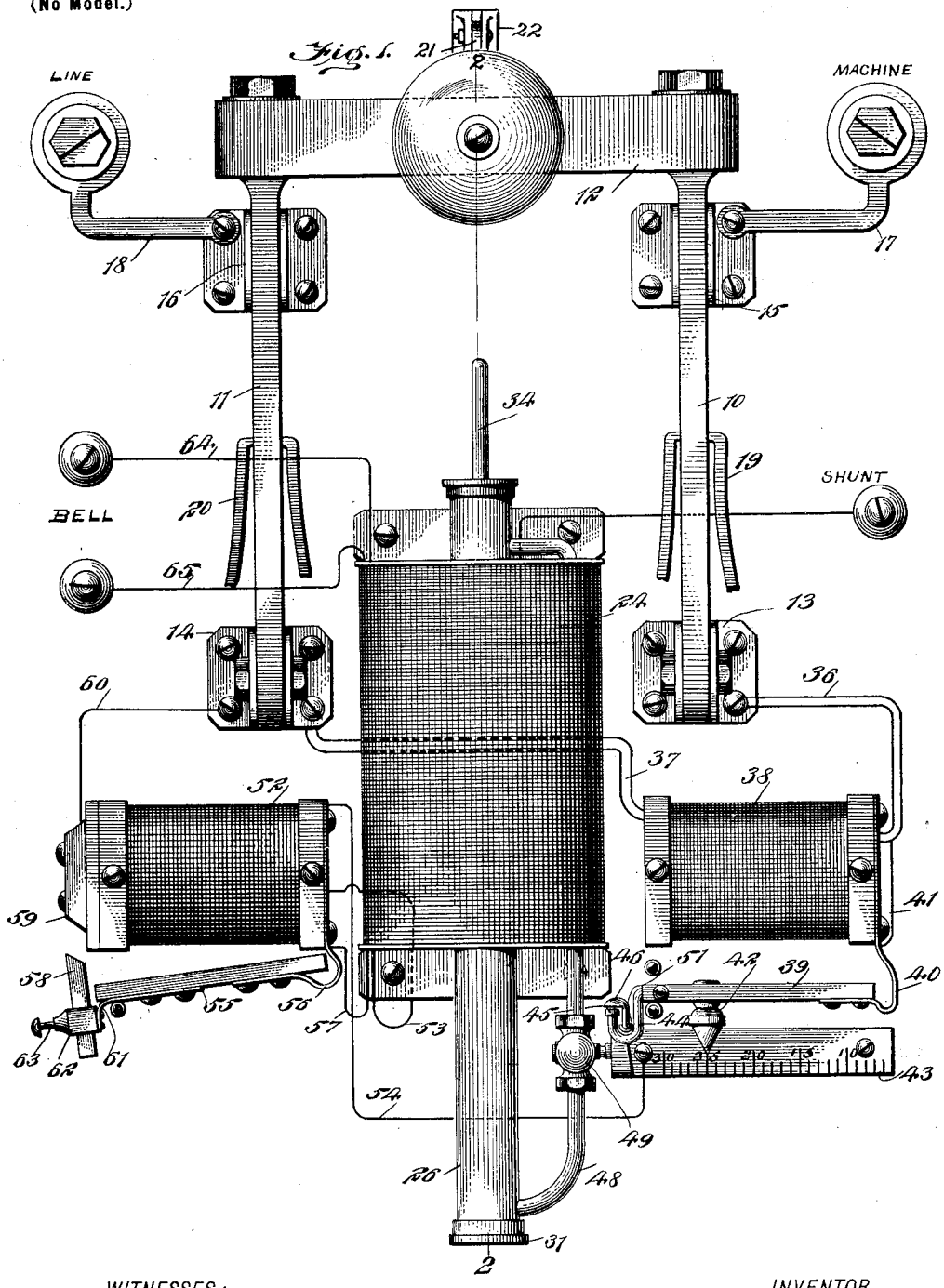
G. W. PARSONS.

CIRCUIT BREAKER.

(Application filed Apr. 6, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



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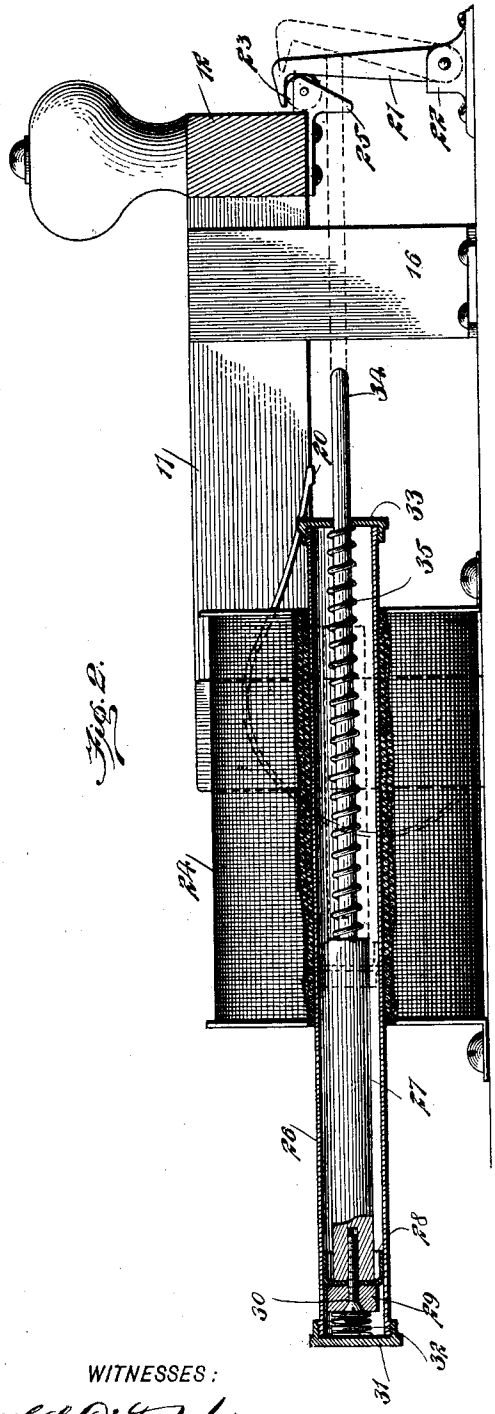


Fig. 2.

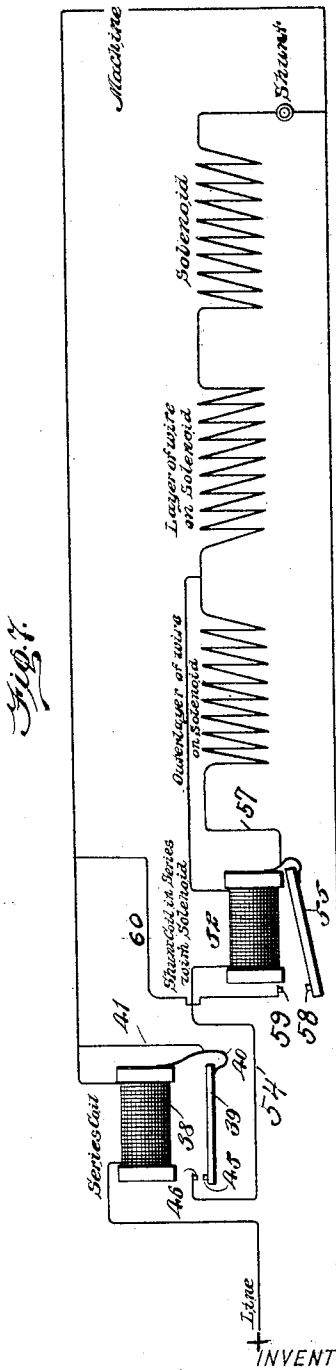


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Fig. 3.

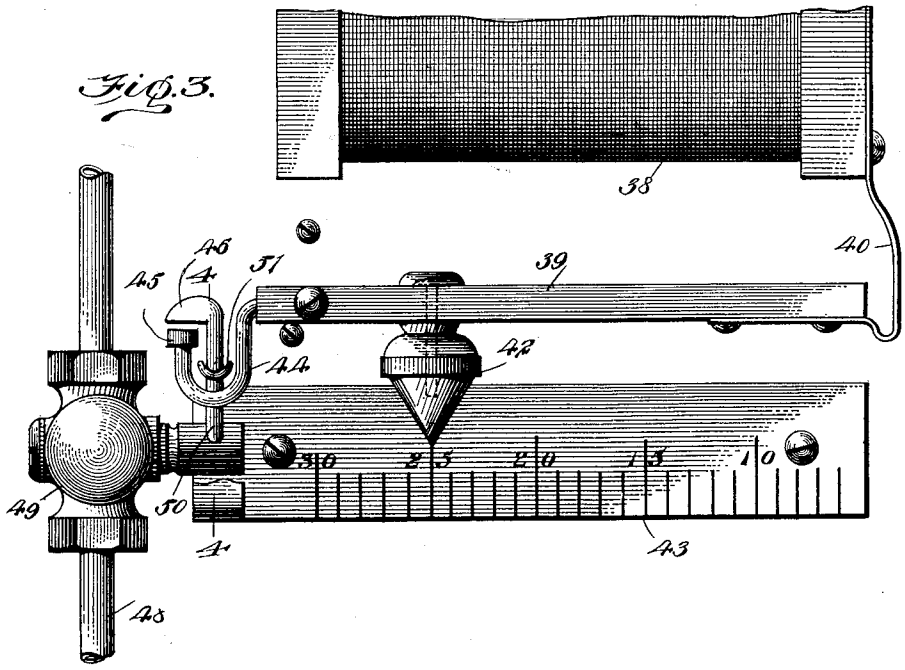


Fig. 4.

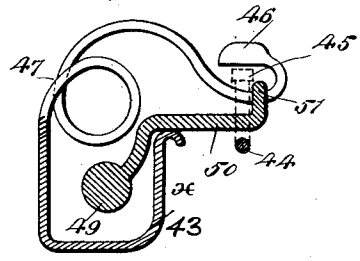


Fig. 5.

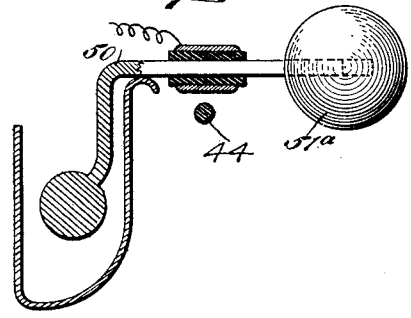
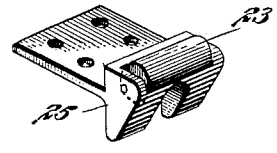


Fig. 6



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UNITED STATES PATENT OFFICE.

GEORGE W. PARSONS, OF LA GRANGE, ILLINOIS.

CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 663,781, dated December 11, 1900.

Application filed April 6, 1900. Serial No. 11,830. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. PARSONS, a citizen of the United States, and a resident of La Grange, in the county of Cook and State of Illinois, have invented a new and Improved Circuit-Breaker, of which the following is a full, clear, and exact description.

This invention relates to improvements in circuit-breakers, and is designed, in addition to being opened and closed manually, to be automatically opened either instantaneously upon excessive overload of current, or when the overload is not immediately dangerous the circuit will be opened only after a lapse of a considerable interval of time, and during said interval of time an alarm is sounded, giving ample warning to reduce this overload before the circuit could be opened by the continuance of the overload to the expiration of the time limit.

I will describe a circuit-breaker embodying my invention and then point out the novel features in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is an elevation of a circuit-breaker embodying my invention. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a detail showing shunt-circuit-closing mechanism and a valve mechanism controlled by an overload in the main-line series coil. Fig. 4 is a section on the line 4 4 of Fig. 3. Fig. 5 shows a modified form of device that may be used instead of that shown in Fig. 4. Fig. 6 is a perspective view of a holding-block on the contact-blades, and Fig. 7 is a diagrammatic view of the windings.

Referring to the drawings, 10 11 designate two contact-blades connected together at their outer ends by a cross-bar 12 of insulating material. These contact-blades are respectively pivoted to plates 13 14, and they are adapted for engagement with contact-plates 15 and 16, which have connections 17 18 with the working line. Springs 19 20 are provided for forcing the contact-blades out of their circuit-closing position when released, as will be hereinafter described. The blades are held in their closed position by means of a swinging hook or latch 21, pivoted to a block 22, attached to the base of the device, the said hook or latch being adapted for engagement with a roller 23, supported in a bracket 25, attached to the cross-bar 12. By employing the roller 23 in conjunction with a hook it is obvious that the frictional resistance between the two parts will be very slight when the hook is moving out of engagement with the roller.

A solenoid 24 is supported between the contact-blades, and extended through this solenoid is a brass tube 26. Movable in this brass tube is the soft-iron core 27, having at one end a cup-shaped flexible valve 28, preferably consisting of leather. This valve is held in place by a block 29, through which a screw 30 passes into the end of the core. The outer end of the tube is provided with a tight closure 31, and on the inner side of this closure 31 is a buffer-spring 32 to receive or, rather, to relieve the shock of the core when moved to its normal position.

Extended from the forward end of the core and through an opening in the head 33 of the brass tube 26 is a striker-rod 34, adapted to engage with the hook or latch 21 to release it upon an overload of current, as will hereinafter appear. A spring 35 is coiled around the brass rod 34 and presses at one end against the head 33 of the tube and at the other end against the forward end of the core 27, as plainly shown in Fig. 2.

The contact-blades 10 and 11 are connected through the lead-wires 36 and 37 with the main-line series coil 38, coacting with which is an armature 39. This armature 39 is supported on the coil by means of a light spring 40, and this spring 40 completes the electrical connection between the lead-wire 36 and the armature through a wire 41. Mounted to slide on the armature 39 is a weight 42, designed to regulate or to change the resistance of the armature, as may be desired. This weight is movable along a graduated plate 43, which will indicate the resistance. On the free end of the armature 39 is a U-shaped bar 44, having a platinum contact-point 45, designed to contact with a platinum point 46, mounted on a curved spring-arm 47, attached to the plate 43.

The tube 26 is designed to contain a lubricating material—such, for instance, as oil—to cause free movements of the core 27 and

also, as will hereinafter appear, serving somewhat as a retarding device. This oil is to have a free circulation in the tube and is to be controlled from the coil 38. A small tube 48 provides communication between the opposite ends of the tube 26, and in this small tube 48 is a valve 49, from the stem of which an arm 50 extends and terminates in a hook portion 51, designed to be engaged by the U-shaped rod 44, carried by the armature 39. This hook end of the arm 50 normally engages with the spring 47, so that the valve is normally held nearly closed; but in this connection instead of the spring 47 for holding the valve nearly closed I may employ a weight 51^a, as indicated in Fig. 5. By changing the tension of the spring 47 or the weight 51^a I regulate the tripping-point for instantaneous opening action.

Arranged adjacent to the solenoid 24 is a shunt-coil 52, which has connections through a wire 53 with a layer of the solenoid 24 and a wire 54 with the plate 43. Coacting with this shunt-coil is an armature 55, which is attached to the coil at one end by a light spring 56, and this spring 56 is in electrical connection through a wire 57 with the solenoid 24. On the free end of the armature 55 is a carbon contact-block 58, adapted for engagement with a contact-block 59, which has electrical connection with the main line through a wire 60. To relieve the shock of the two carbons 58 59 when brought together, the carbon block 58 has a spring yielding connection 61 with the armature 55, the said spring being shown as attached to a lug 62, in which the block 58 is adjustable and is held by a set-screw 63.

A bell or other alarm shunt 64 65 is connected in parallel with one or more layers of the wire constituting the solenoid 24.

In operation, as the solenoid is connected electrically in straight shunt across the two sides or between the two poles or terminals of the main circuit, it is evident that the amount of current flowing through this shunt-circuit is always the same after the second shunt-circuit is closed at 58 and 59 and is independent of the amount of current traversing the main line, providing the voltage of the main line is kept constant. It is to be also understood that the valve 49 is at all times slightly opened, so that there can be a more or less free movement of oil. The amount of opening through the valve 49 is determined by the position of its valve-stem when against its limit-stop x and remains the same for all overloads under the dangerously-excessive-overload point at which the device is set to open instantaneously—that is, when a highly-excessive overload traverses the main line, energizing the series coil 38 and magnetizing its iron core and pole-piece so strongly as to attract the free end of the armature 39 against the continuous resistance of the coiled spring 47 or of the weight 51^a and the weight 42. The movement of this armature 39 at its free end carries or moves with it the valve-stem 50, thereby enlarging the opening through its valve, allowing the free passage of oil through it, thus removing the resistance of forcing the oil to flow through the small opening, and thereby permitting the plunger to rise almost instantaneously and releasing the main-line-circuit locking device. Further, as the current flowing through the solenoid is practically always the same when this circuit is closed at 45 46 by an overload in the main line, so the amount of power or force it exerts upon the plunger to make it rise into its highest position and at which point the plunger-striker will open the main-line circuit is always the same. If the amount of resistance which this plunger must overcome in rising is varied, the rate of movement or time it takes to move a certain fixed distance is also varied. The resistance in this case is in forcing a flow of oil through the very small opening in the by-pass valve 49, and by varying the size of this opening the rising speed of the plunger and the time it takes to move it to a point where its striker 34 opens the main-line circuit by tripping the locking mechanism will be regulated. In other words, a given amount of power will force a given amount of oil through an orifice of a given size in a certain amount or length of time, and if the size of this orifice is varied the length of time required to force the same amount of oil through this orifice and use the same amount of power is varied.

With relation to the electrical shunt connections and their functions, when there is no overload present in the main-line circuit, there is no current flowing through the shunt connections. Suppose an overload traverses the main line, not, however, of an immediately-dangerous volume, the increased magnetic effect due to the increase of current through the series coil 38 will raise its armature 39 and complete or close the shunt-circuit through the contacts 45 and 46. A current now flows through the wire 54, through the windings of the small coil 52, which is insulated from its iron core, then through all the windings of the solenoid, with the exception of the outer layer of wire constituting a part of the windings of this solenoid, to the other side terminal or pole of the main circuit. (See Fig. 7.) When this circuit is first closed, there will be a much greater current flowing through the small coil 52 than immediately afterward, when the magnetic effect of this current attracts the armature 55 to its poles and closes another circuit with the main-line circuit through contacts 58 and 59. This shunt-circuit traverses all the windings of the solenoid and has the effect of putting the windings of the small coil 52 and outer layer of the wire constituting a part of the solenoid in parallel with each other. As the electrical resistance of this small coil 52 is many times greater than that of its parallel circuit, (the outer layer of the solenoid,) so the amount of current travers-

ing its (the small coil 52) windings will be that number of times less. As the total amount of current traversing this shunt-circuit is, with the main-line pressure of one hundred volts, not more than two amperes, it will be seen that by using the above shunting effect there will be a lower current flowing through the coil 52, and this current (while strong enough to energize the coil 52 sufficiently to hold the free end of its armature 55 up in place against its pole of the coil 52 and maintain the second shunt-contact) can be broken or opened with but slight separation of the contact-points at 45 and 46 and with no danger of arcing. The instant, however, that the circuit is opened the coil 52 loses its magnetism and allows the armature 55 to drop to its limiting-stop, opening, of course, at the same time the second shunt-circuit at the carbon points 58 and 59. This opening of the second shunt-circuit cuts off all current through the solenoid, and its plunger falls to the bottom of the brass tube, assisted by the coil-spring 35.

The device is very sensitive in operation, the main-line series-coil armature when at its operating-point responding to small fluctuations in the main-line circuit, thereby enabling the amount of current to be kept normally constant and close up to the limit at which the device is set. It is also obvious that there can be no loss of oil from the tube 26.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A circuit-breaker, comprising a contact-blade, a latch for holding said contact-blade in circuit-closing position, a solenoid adapted to be operated by an overload of current in the main line, a core in said solenoid operating to release the holding-latch, and electrically-controlled means for regulating a lubricating and retarding liquid to said core, substantially as specified.

2. A circuit-breaker, comprising contact-blades, a main series coil having connection with the blades, a solenoid, a tube extended through said solenoid, a core for operating in the tube, a locking device for the contact-blades and adapted to be released by said core, an oil-tube connecting with the opposite ends of the first-named tube, a valve in said oil-tube, and means actuated by the series coil for further opening said valve, substantially as specified.

3. A circuit-breaker, comprising contact-blades, a solenoid, a tube extended through said solenoid, a core operating in the tube, a locking device for the contact-blades and adapted to be released by said core, and means controlled by the electric current of the main line for regulating an oil-supply to the interior of the tube, substantially as specified.

4. A circuit-breaker, comprising contact-blades, a main-line series coil having connection with the blades, an armature for coacting with said coil, a solenoid, a tube extended through said solenoid, a core operating in said tube, a locking device for the contact-blades and adapted to be released by the solenoid-core, an oil-circulating pipe communicating with the opposite ends of the tube, a valve in said pipe operated in one direction by a movement of the armature, a circuit-closer on the armature and the circuit through the solenoid closed by a movement of said armature, substantially as specified.

5. A circuit-breaker, comprising contact-blades, a locking device for the contact-blades, a solenoid, a tube extended through said solenoid, a core for operating in said tube and adapted to release the locking device, a lubricant-circulating pipe communicating with opposite ends of the tube, a valve in said pipe, a main series coil having connection with the contact-blades, an armature operated by said coil for actuating the valve in the pipe and also for closing a circuit through the solenoid, and means for regulating the degree of resistance of the armature, substantially as specified.

6. A circuit-breaker, comprising contact-blades, a solenoid, a core operating in said solenoid, a locking device for the contact-blades and adapted to be released by the engagement of said core, a main-line series coil in circuit with the contact-blades, a circuit-closer operated by said coil, said closer controlling a circuit through the solenoid, and a shunt-coil, the current through which is also controlled by the said series coil, substantially as specified.

7. A circuit-breaker, comprising contact-blades, a series coil having connection with the blades, a solenoid, a core operating in said solenoid, a locking device for the contact-blades and adapted to be released by the core striking against the locking device, an armature coacting with the series coil, a circuit-closer operated by said armature, a shunt-coil, the current through which is controlled by said circuit-closer, and means operated by said shunt-coil for controlling the current through its own coils and the solenoid, substantially as specified.

8. A circuit-breaker, comprising contact-blades, a locking device for the contact-blades, a solenoid, a core operating in said solenoid for releasing the locking device upon an overload of current passing into the solenoid, and a shunt-coil for receiving an overload of current not sufficient to operatively energize the solenoid, substantially as specified.

9. A circuit-breaker, comprising contact-blades, a locking device for the contact-blades, a solenoid, a tube extended through said solenoid, a core operating in said tube and having a flexible valve at one end, a striker-rod extended from the opposite end of said core and adapted to release the lock-

ing device, and means for controlling a circulation of lubricating liquid in said tube, substantially as specified.

10. A circuit-breaker, comprising contact-blades, a locking device therefor, a solenoid operated by an overload of current to release said locking device, an alarm-shunt in parallel with the solenoid, a series coil having connection with the contact-blades, an armature coacting with said coil, a weight adjustable longitudinally on said armature, a circuit-closer operated by said armature for directing an overload of current through the solenoid and means operated by said armature for regulating a supply of oil within the solenoid, substantially as specified.

11. In a circuit-breaker, contact-blades, a locking device for the contact-blades, a solenoid adapted to operate to release the locking device upon an excessive or overload of current, and a shunt-coil having connection with the solenoid and also with the main line and adapted to receive an increase of current not sufficient to operatively energize the solenoid, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE W. PARSONS.

Witnesses:
C. E. FREEMAN,
JOHN E. SNOW.