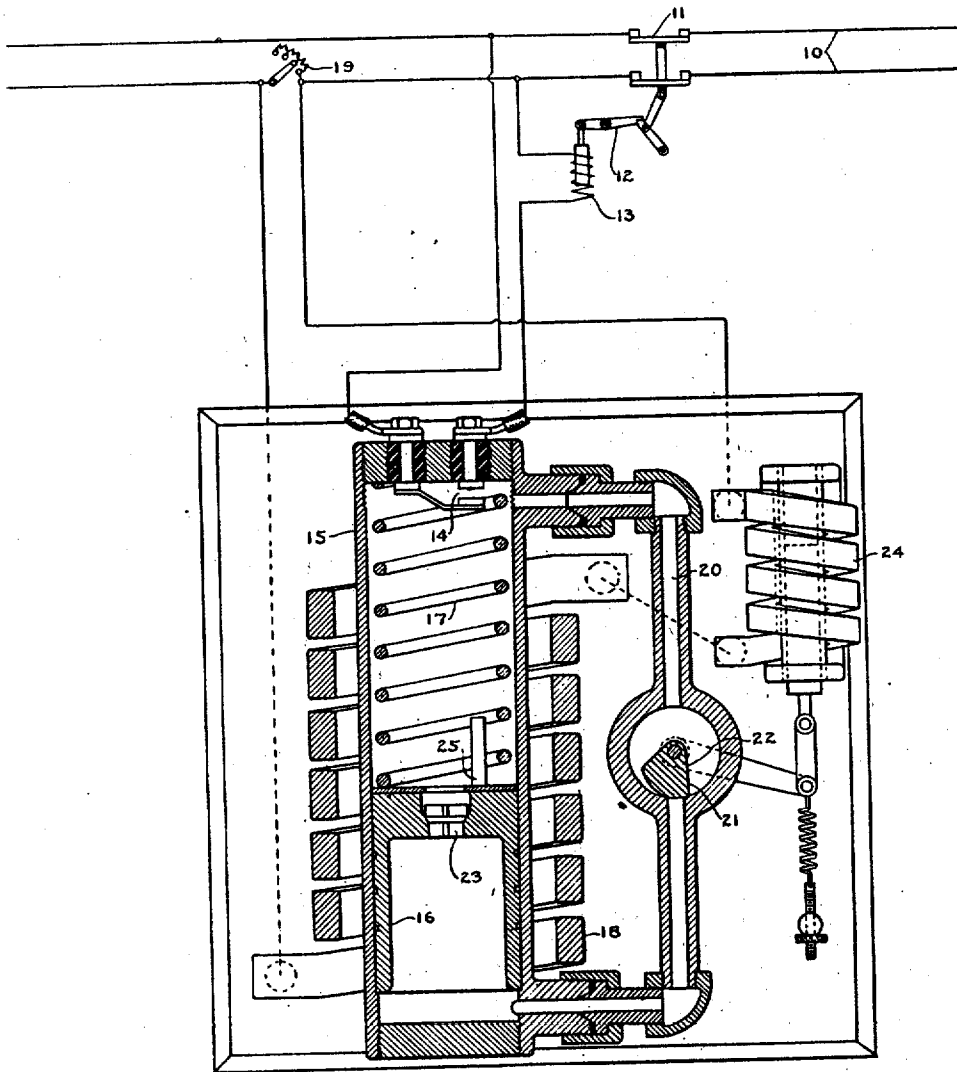


J. L. JOHNSON.  
TIME ELEMENT DEVICE.  
APPLICATION FILED JUNE 12, 1911.

1,288,017.

Patented Dec. 17, 1918.



Witnesses-

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# UNITED STATES PATENT OFFICE.

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TO ALLIS-CHALMERS MANUFACTURING COMPANY, A CORPORATION OF DELAWARE.

## TIME-ELEMENT DEVICE.

1,288,017.

Specification of Letters Patent.

Patented Dec. 17, 1918.

Application filed June 12, 1911. Serial No. 632,532.

*To all whom it may concern:*

Be it known that I, JOHN L. JOHNSON, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Time-Element Devices, of which the following is a full, clear, and exact specification.

My invention relates to time-element devices.

In some devices it is often desirable that the abnormal condition be permitted to exist for a limited time, but if it persists longer than that time that proper protective steps be taken. Thus overload circuit-breakers are sometimes arranged so that the overload does not cause the tripping of the circuit-breaker until it has lasted for a predetermined time.

It is an object of my invention to make the time element of the time-element device vary inversely as the abnormality of the controlling condition; for instance, in a time-element overload circuit-breaker, to make the time element an inverse function of the overload current for values of the latter up to a predetermined point.

This is accomplished by obtaining the time element by the flow of a fluid through an orifice, and varying the size of the orifice in accordance with the extent of the controlling abnormal condition.

The above mentioned and other novel features of the invention will appear from the description and drawings, and will be particularly pointed out in the claims.

The figure shows my invention embodied in a time-element device for overload circuit-breakers.

In the mains 10 is located a circuit-breaker 11. This circuit-breaker is held in closed position by a latch 12, which may be released by a coil 13 when the latter is energized. This coil is normally deenergized, its circuit including a normally open switch 14 mounted in the upper part of a fluid containing tube 15 in which is an iron piston 16 biased to the bottom of the tube by gravity or a spring 17 or both. The fluid in the tube 15 may be gaseous or liquid, and is preferably oil. The piston 16 is also the core of a coil 18, which is connected in series with the mains 10, preferably in shunt to a rheostat 19 provided for adjustment purposes. The spaces in the

tube 15 above and below the piston 16 are connected by a by-pass 20 in which is a valve 21 of any suitable type. As shown, the movable member 22 of this valve 21 is slightly eccentric, so that its movements vary the size of the orifice through which the fluid in the tube must pass in going from one side of the piston 16 to the other side thereof. A valve 23 in the piston 16 permits the fluid to pass from the space below the piston to the space above it without going through the by-pass. The valve member 22 is movable by a coil 24, connected in series with the coil 18 in the shunt around the rheostat 19.

The pull of the coils 18 and 24 on their cores varies with the current in the mains 10. When such current exceeds a predetermined value, the coil 18 begins to lift the core 16 upward, forcing the fluid above the core 16 through the by-pass 20 into the space below the core. The upward movement of the core 16 is limited by the speed at which the fluid can pass through the by-pass. The heavier the overload, the farther the coil 24 moves the valve-member 22 in a counter-clockwise direction and the wider the orifice in the by-pass 20 is opened, so that the rate at which the fluid can pass through the by-pass, and consequently the rate at which the core 16 moves upward, is a direct function of the strength of the current.

Thus the amount of retardation caused by the fluid varies, dependent on the extent of opening of the valve-member 22, and decreases until no further decrease is possible, that is, when the valve is opened to its maximum extent. When that occurs, as when the core of coil 24 is pulled up as high as it will go into the coil, the passage of fluid from the upper to the lower part of the dash-pot is still restricted as is obvious; in other words the piston 16 can never rise instantaneously from its lowest to its highest position. When the coil 18 has moved the core 16 to the upper limit of its movement, a projection 25 on the core 16 engages the switch 14 and closes it, thus completing the circuit of the coil 13 and tripping the circuit-breaker 11. The tripping of this circuit-breaker deenergizes all the circuits shown, and the core 16 immediately drops back to the bottom of the tube 15. The dropping of

the core 16 is comparatively rapid because the valve 23 opens at this time to allow the passage of the fluid directly through the core.

5 Many modifications may be made in the precise arrangement shown and described, and all such which do not involve a departure from the spirit and scope of my invention I aim to cover in the following claims:

10 What I claim as new is:

1. In a time-element device, the combination of a device which is movable in response to controlling conditions, a member having an orifice, a fluid which such movement tends to force through said orifice, and means for varying the size of the orifice in response to the same controlling conditions.

2. In a time-element device, a dash-pot, means tending to move the piston of said dash-pot in response to controlling conditions, a member having an orifice, a fluid on the compression side of said piston which the movement of said piston tends to force out through said orifice, and means for varying the size of said orifice in response to the same controlling conditions.

3. In a time-element device, a dash-pot, means responsive to controlling conditions for moving the piston of said dash-pot in one direction, the dash-pot being provided with an orifice through which there is a tendency to draw a fluid into the dash-pot on the rarefaction side of the piston, and means responsive to the same controlling conditions for varying the size of said orifice.

4. In a time-element device, a dash-pot having relative moving parts and an orifice, means responsive to controlling conditions for causing a relative movement between said parts, and means responsive to the same controlling conditions for varying the size of said orifice.

5. In a time-element device, a dash-pot, means responsive to abnormal conditions for moving the piston of said dash-pot in one direction, the dash-pot being provided with an orifice through which there is a tendency to draw a fluid into the dash-pot on the rarefaction side of the piston, and means responsive to the same abnormal conditions for varying the size of said orifice.

6. In a time element device, the combination of a dash-pot having a piston and an orifice, means responsive to controlling conditions for causing a relative movement of the dash-pot and piston, and means for varying the size of said orifice in response to said controlling conditions.

7. In combination, an electrical circuit, a movable member, means responsive to abnormal conditions in said circuit for causing movement of said member, means for retarding the movement of said member, and means responsive to said abnormal conditions for causing the rate of retardation of

said member to vary inversely as the intensity of said abnormal conditions up to a certain point and for insuring a desired effective retardation of said member under all abnormal conditions.

8. In a time element device, the combination of a dash-pot, a by-pass connecting said dash-pot on the two sides of the piston thereof, said by-pass being provided with an orifice of variable size, means responsive to predetermined controlling conditions for causing relative movement of said dash-pot and piston, and means also responsive to said controlling conditions for varying the size of said orifice.

9. A selective time-limit controlling-device for electric-switches including in combination operating-means for the switch, means to actuate said operating-means, a retarding-device connected with the operating-means to retard its operation, and means responsive to an overload current to variably adjust the speed of motion of said retarding-device according to the strength of the overload, substantially as described.

10. A selective time-limit controlling-device for electric-switches including in combination operating-means for the switch, means to actuate said operating-means, a retarding-device connected with the operating-means to retard its operation, and means responsive to an overload current to variably adjust the speed of motion of said retarding-device according to the strength of the overload, said retarding-device having means permitting of its quick recovery upon cessation of the overload, substantially as described.

11. A selective time-limit controlling-device for electric-switches including in combination operating-means for the switch, means controlled by an overload current to actuate said operating-means, a retarding-device to retard movement of said operating-means, and means also controlled by the overload current to vary the speed of motion of said retarding-device according to the strength of the overload, substantially as described.

12. A selective time-limit controlling-device for electric-switches including in combination operating-means for the switch, means operated by an overload current to actuate said operating-means, a retarding-device to control the movement of said operating-means, and means controlled by the overload current to increase the speed of motion of said retarding-device according to the strength of the overload, to thereby reduce the time required for the operating-means to operate the switch according to the strength of the overload, substantially as described.

13. A selective time-limit controlling-device for electric-switches including in combination

nation a controlling-magnet responsive to an overload current, operating-means for the switch actuated thereby, a retarding device for said operating-means, and means responsive to an overload current to regulate the speed of motion of said retarding-device, substantially as described.

14. A selective time-limit controlling-device for electric-switches including in combination a switch-controller, an operating-device for said switch-controller, a retarding-device for said operating-device, means to actuate said operating-device, and means responsive to an overload current to variably adjust the speed of motion of said retarding-device, substantially as described.

15. A selective time-limit controlling-device for electric-switches including in combination a switch-controller, an operating-device for said switch-controller, a retarding-device for said operating-device, means operated by the overload current to actuate said operating-device, and means responsive to an overload current to regulate the speed of motion of said retarding-device, substantially as described.

16. A selective time-limit controlling-device for electric-switches including in combination a switch-controller, an operating-device for said switch-controller, a retarding-device for said operating-device, means controlled by an overload current to actuate said operating-device, and means responsive to an overload current to regulate the speed of motion of said retarding-device, substantially as described.

17. A selective time-limit controlling-device for electric-switches including a controlling-magnet responsive to an overload current, operating-means for the switch actuated thereby, a retarding-device for said operating-means, and means responsive to an overload current to reduce the resistance of said retarding-device according to the strength of the overload, substantially as described.

18. A selective time-limit controlling-device for electric-switches including a solenoid responsive to an overload current, operating-means for the switch actuated thereby, a fluid-controller timing-device to regulate the speed of motion, a regulating-valve for said timing-device, and means controlled by the overload current to automatically adjust said valve according to the strength of the overload, substantially as described.

19. A selective time-limit controlling-device for electric switches comprising oper-

ating-means for the switch, a timing-device for retarding its speed of motion, a valve to control the speed of motion of said retarding-device, and means responsive to an overload current to variably adjust said valve according to the strength of the overload, substantially as described.

20. A selective time-limit controlling-device for electric-switches comprising a movable element, a timing-device to regulate its speed of motion, means controlled by the overload current to adjust said timing-device, and means for varying the thrust on the movable element according to said strength of the overload, substantially as described.

21. A selective time-limit controlling-device for electric-switches comprising a movable element, a controlling-magnet for said movable element arranged to be operated by an overload current, a timing-device for said movable element, and means controlled by the overload current for adjusting said timing-device, substantially as described.

22. In a time element device, a dash-pot, means responsive to controlling conditions for moving the piston of said dash-pot, the dash-pot being provided with an orifice through which fluid may move, and a valve for said orifice controlled by the same controlling conditions providing for a minimum and maximum opening.

23. In a time element device, a retarding device including two parts, namely, a dash-pot and a piston, means responsive to controlling conditions for moving said parts relatively to each other, an orifice in one of said parts through which fluid may move, and a valve for said orifice controlled by the same controlling conditions providing for a minimum and maximum opening.

24. In a time element device, a retarding device including two parts, means adapted to be responsive to electrical conditions in a circuit for moving said parts relatively to each other, an orifice in one of said parts through which fluid may move, and a valve for said orifice controlled by the same electrical conditions providing for a minimum and maximum opening.

Milwaukee, Wis., June 6, 1911.

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

JOHN L. JOHNSON.

Witnesses:

CHAS. L. BYRON,  
ROB. E. STOLL.