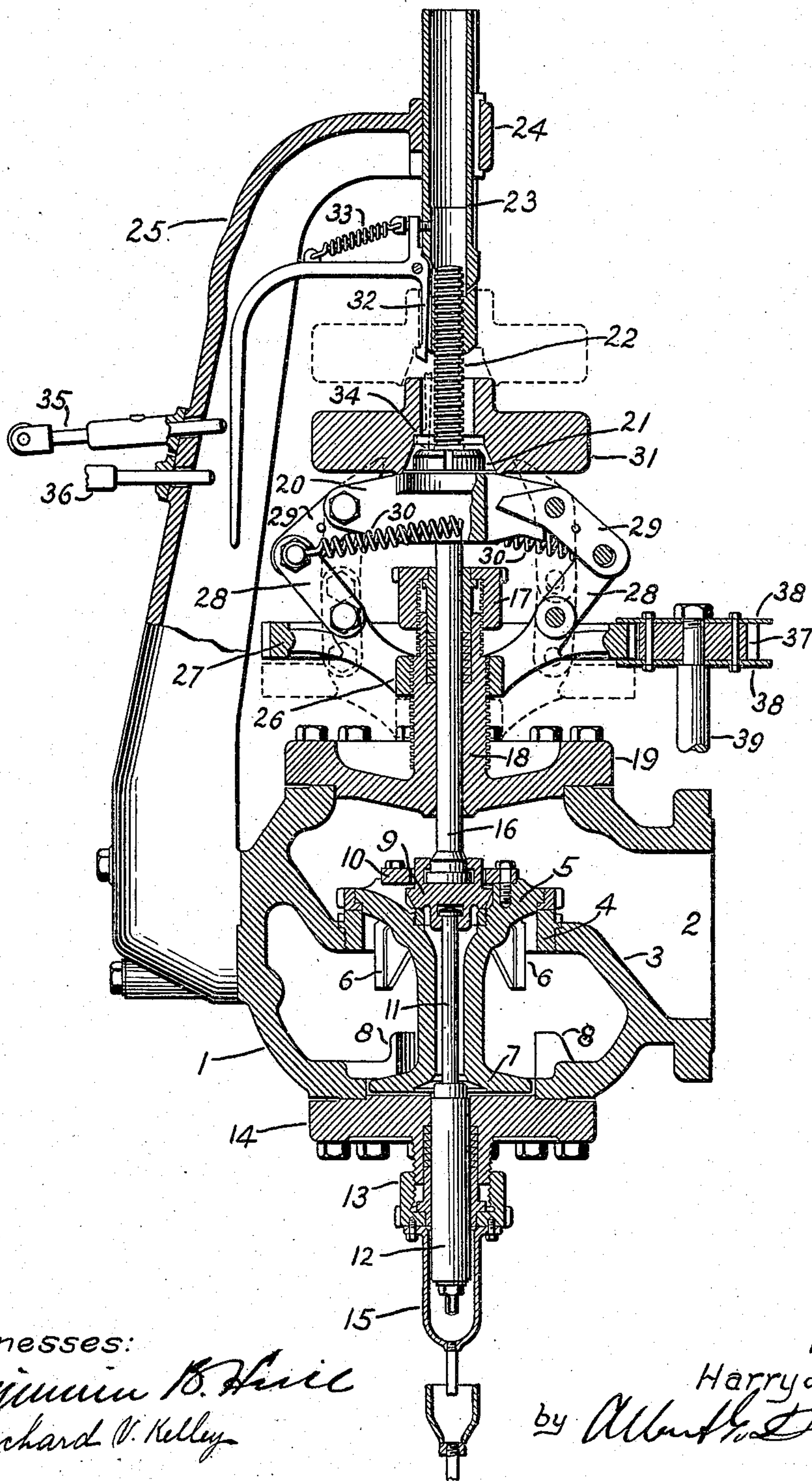


H. A. DOLLEY.
EMERGENCY VALVE.
APPLICATION FILED OCT. 21, 1905.

930,847.

Patented Aug. 10, 1909.



Witnesses:

Benjamin B. Hill
Burchard V. Kelley

Inventor:

Harry A. Dolley
by *Albert H. Davis*
Atty.

UNITED STATES PATENT OFFICE.

HARRY A. DOLLEY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

EMERGENCY-VALVE.

No. 930,847.

Specification of Letters Patent.

Patented Aug. 10, 1909.

Application filed October 21, 1905. Serial No. 283,778.

To all whom it may concern:

Be it known that I, HARRY A. DOLLEY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Emergency-Valves, of which the following is a specification.

This invention relates to valves for controlling the admission of elastic fluid to a prime mover, and its object is to provide a valve which can be opened and closed slowly in order to regulate the flow of fluid under normal conditions, and also can be suddenly closed in response to abnormal or emergency conditions.

The broader aspects of the invention are covered by the pending application of Richard H. Rice, Serial Number 200,885, which issued as Patent No. 838,455 on Dec. 11, 1906, and discloses a throttle valve having an upright stem slidable through a stuffing box and carrying a transverse yoke whose ends are connected by toggles with a handwheel having a screw-threaded hub adapted to ride up and down on a screw-threaded neck rising from the top of the valve casing concentric with the valve stem. When the toggles have been straightened out or locked, the turning of the wheel causes the valve to open or close slowly to meet normal conditions of regulation. A heavy weight slides freely on an upward extension of the valve stem and is normally held inoperative by a catch. Under abnormal or emergency conditions this weight is automatically released and drops on projecting arms of the toggles, causing said toggles to buckle or flex and permitting the valve stem to be driven downward by the weight, thereby suddenly closing the valve. To reset the device, the weight is lifted by hand until the catch engages with it, and the handwheel is screwed down until the toggles straighten and lock; the parts being then in condition to open the valve as before by turning the handwheel in the opposite direction. This device works well with small mains, but when built of a size capable of controlling a large conduit, such for instance as a 14 inch main for a 5000 kw. steam turbo-generator, the actuating weight is so heavy that it cannot be manually handled, since it weighs some 400 pounds.

The present invention therefore consists in the combination with a valve of the class

above described, of means for automatically resetting the weight. The handwheel is preferably replaced by a gear wheel, which meshes with a pinion driven by power. The weight is normally supported by a latch pivoted on a sleeve which can be slid up and down in a guide. The valve stem is extended upward and is screw-threaded to mesh with screw-threads in said sleeve. The stem is also keyed to the yoke, so that it will rotate when the gear wheel is rotated, and will thus cause the sleeve to rise or fall in its guide. The pitch of the thread on the stem is greater than that on the neck with which the hub of the gear wheel engages, so that the vertical travel of the sleeve will be greater than that of the gear wheel, for a given number of revolutions. The result is that when the yoke is raised by the gear wheel, the sleeve and the weight will rise a greater distance, owing to the differential screw action, so that the weight will be carried far enough above the yoke to give it an effective drop when released from the latch. It thus appears that the operation of opening the valve also raises the weight to its operative position.

The accompanying drawing is a sectional elevation of a valve embodying my invention.

The valve casing 1 has an inlet 2, the outlet not being shown for the reason that it is located in the part that is sectioned away. The casing has the usual septum 3 containing the part which is provided with a removable valve-seat 4. The main valve 5 is tubular and has wings 6 which engage the cylindrical interior surface of the seat and guide the valve in its vertical movements in opening and closing. The lower end of the valve has a head 7 working in guide-ribs 8 on the casing, and of sufficient area nearly to balance the valve.

Seated on top of the main valve, and controlling the tubular passage through it, is the relay valve 9, which is allowed a limited vertical play by a guard 10 located above the relay valve and secured to the main valve. A tail rod 11 is swiveled in the under side of the relay valve and passes down through the main valve to a plunger 12 which slides through a stuffing-box 13 on the bottom plate 14 of the casing and is received in a dash-pot 15 supported by said plate; preferably being secured to the gland

of the stuffing-box. The valve stem 16 is swiveled in the top of the relay valve and passes up through a stuffing-box 17 at the upper end of a neck 18 rising from the cap 19 of the casing. A yoke 20 is keyed to the stem above the stuffing-box 17 and is prevented from longitudinal movement on said stem by a nut 21. The portion 22 of the stem above said nut is screw-threaded, and meshes with internal screw-threads in the lower end of a sleeve 23, which is splined in a stationary guide 24 at the end of a standard 25 bolted to the valve casing. When the stem is rotated, the sleeve will slide up or down in its guide without revolving. The neck 18 is cylindrical, and is screw-threaded on the outside. Meshing with these threads is a nut 26 which forms the hub of a gear wheel 27. Links 28 are pivoted to opposite sides of said wheel, and are also pivoted to the longer arms of toggle levers 29 which are fulcrumed in the outer ends of the yoke 20. The short arms of said levers project above the yoke when the toggles are straightened out. Strong tension springs 30 are connected to the yoke and to the toggle joints, and tend to straighten the toggles and to cause the pivots to pass over the dead center into the locked position.

The weight 31 surrounds the stem 16 and is preferably a circular disk having a central bore to fit the sleeve 23, and a counter-bore to let the weight rest on the yoke without bearing on the nut 21. A latch 32 is pivoted on the sleeve 23, and a spring 33 urges the latch outward to insure its engaging with an internal shoulder 34 in the central bore of the weight. The tail of the latch is curved downwardly and is of considerable length so that it can be engaged in any position to which it may be carried up or down, by tripping devices, such as the push-rods 35, 36, mounted in the standard 25. One rod may be connected to automatic tripping mechanism controlled by the apparatus receiving elastic fluid through the main valve, and the other rod may be arranged for tripping the latch by hand.

A driving pinion 37 meshes with the gear wheel 27 and is provided with shrouds 38 to keep it in engagement therewith. The shaft 39 on which the pinion is secured is capable of longitudinal movement in its bearings, so that the pinion can rise or fall with the gear. The shaft can be driven by any suitable power, such as belting, gearing, or an electric or hydraulic motor.

The operation of the device is as follows: The drawing shows the weight dropped, and the valve closed. In order to open the valve and reset the weight, the shaft 39 is rotated, which turns the gear, yoke and valve stem. The nut 26 runs down the neck 18 to the dotted line position, gradually straightening out the toggles. As the links and the

levers approach alinement, the short arms of the levers engage with and slightly lift the weight, being assisted by the springs 30 which urge the toggle joints past the dead centers, where they lock. Meanwhile, the rotation of the screw 22 has drawn down the sleeve 23, so that the latch 32 has passed down into the bore of the weight until it finally snaps under the shoulder 34. The parts are now in position to open the valve and reset the weight. On rotating the pinion in the opposite direction, the gear wheel begins to ride up the neck 18, lifting the yoke by means of the straightened toggles. The lifting of the yoke at first opens the relay valve, permitting the elastic fluid to pass through the tubular main valve and exert a counterbalancing pressure on the head 7. The continued upward movement of the valve stem then begins to open the main valve. The rotation of the stem forces the sleeve upward also away from the yoke, because the pitch of the screw 22 is greater than that on the neck 18. The sleeve being latched to the weight, the latter is lifted off the yoke and carried up toward the dotted line position. The wider the main valve is opened, the greater will be the amount of separation between the weight and the yoke. When the main valve has been opened sufficiently to meet the conditions of service, the driving shaft is stopped. Under normal circumstances, the valve can be regulated at will simply by turning the wheel in one direction or the other. But this movement of the valve is slow, and if an emergency arises calling for a quick closing of the valve, one of the push-rods can be forced inwardly, tripping the latch and letting the weight drop. It strikes on the upwardly projecting short arms of the toggle levers, collapses or breaks down the toggles and comes with full force on the yoke, which, being no longer supported by the toggles, is forced downward, carrying with it the valve stem and closing the valve; the dash-pot preventing any shock. The parts then occupy the positions shown in the drawing, and the above-described operation of resetting may then be repeated.

It is evident that the mechanism above described is applicable to valves having a hand-wheel instead of a gear wheel, since the differential screw mechanism for raising the weight enables the operator to lift a much heavier weight by hand than is possible in the previous device hereinbefore mentioned. The word "wheel" in the following claims is therefore not limited to a power-driven gear wheel, but covers a hand operated wheel as well.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider

to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In a valve of the character described, the combination of a casing, a valve, an actuating means located exterior to the casing for opening and closing the valve under normal conditions, a connection between the valve and said means also exterior to the casing, which normally unites them in working relation, a motor for rendering the connection inoperative and closing the valve suddenly, and means cooperating with the actuating means for automatically resetting said motor when the valve is opened again by said means.

2. In a valve of the character described, the combination of a casing, a valve, a stem for the valve which projects through the casing, stem actuating mechanism including a toggle and connected with the projecting portion of said stem, a device responsive to abnormal conditions for collapsing the toggle and closing the valve, and means cooperating with said actuating mechanism for automatically resetting said device when the valve is opened again.

3. In a valve of the character described, the combination with a casing, of a valve therein, means for moving the valve slowly under normal conditions, one or more collapsible devices which unite the valve and said means, a weight for collapsing said devices and closing the valve suddenly, and means cooperating with said valve-moving means for raising said weight automatically when the valve is opened again.

4. In a valve of the character described, the combination with a casing, of a valve therein, a stem for the valve, a wheel for operating the valve under normal conditions, collapsible devices connecting the wheel and the stem, a weight for collapsing said devices and closing the valve suddenly, and means operated by the turning of said wheel for raising said weight to its operative position when the valve is opened again.

5. In a valve of the character described, the combination with a casing, of a valve therein, a rotatable stem for said valve, a wheel for raising and lowering and rotating said stem, collapsible connections between said wheel and stem, a weight for collapsing said connections and closing the valve suddenly, and means cooperating with the stem whereby upon the rotation of said stem in opening the valve again the weight is raised to its operative position.

6. In a valve of the character described, the combination with a casing, of a valve therein, a rotatable stem for said valve, a

wheel for raising and lowering and rotating said stem, a yoke attached to said stem, toggles connecting said wheel and yoke, a weight for collapsing said toggles, and means actuated by the rotation of said stem for resetting the weight.

7. In a valve of the character described, the combination with a casing, of a valve therein, means for operating the valve slowly under normal conditions, a weight for closing it suddenly under abnormal conditions, and means cooperating with said operating means for lifting said weight to operative position faster than the valve is raised when said valve is opened again.

8. In a valve of the character described, the combination with a casing, of a valve therein, a stem for the valve having a portion of it screw-threaded, a stem-actuating wheel, a weight for closing said valve suddenly, and a weight-lifting device engaging with the screw-threads on the stem which raises the weight to operative position when the stem is rotated by the wheel to open the valve again after it has been closed by said weight.

9. In a valve of the character described, the combination with a casing, of a valve therein, means for operating it under normal conditions, a weight for closing it suddenly under abnormal conditions, and differential screw mechanism cooperating with said means for opening the valve and raising said weight to operative position.

10. In a valve of the character described, the combination with a casing, of a valve therein, a screw-threaded wheel for operating said valve under normal conditions, a threaded member on the casing with which the wheel engages, a weight for suddenly closing said valve under abnormal conditions, and a screw cooperating with the wheel for raising said weight, the pitch of said screw being greater than that of the threaded portion of the wheel.

11. In a valve of the character described, the combination with a casing, of a valve therein, a rotatable and slidable stem for the valve, a yoke secured to said stem, means for rotating and lifting and lowering said yoke, screw-threads on the stem above said yoke, a sleeve having threads engaging those on the stem, a guide on the casing for the sleeve, a weight concentric with said stem, and means for detachably connecting the weight and the sleeve.

12. In a valve of the character described, the combination with a casing, of a valve therein, a stem for the valve having screw-threads on its upper portion, a sleeve having internal threads meshing with those on the stem, a guide on the casing in which the sleeve is mounted for longitudinal movement, a weight surrounding said stem, a latch on said sleeve for engaging with said weight,

means for rotating said stem and a device for disengaging the latch and weight under certain conditions.

13. In a valve of the character described, the combination with a casing, of a valve therein, a stem for the valve having screw-threads on its upper portion, a sleeve having internal threads meshing with those on the stem, a guide on the casing in which the sleeve is mounted for longitudinal movement, a weight surrounding said stem, a latch for suspending the weight which is pivoted on said sleeve and has a depending tail, means for rotating and lifting and lowering said stem, and a device which engages said tail under certain conditions to release the weight from the latch.

14. In a valve of the character described, the combination with a casing, of a valve therein, a stem for the valve, a yoke on said stem, a wheel having a screw-threaded hub, a threaded neck on the casing with which the hub engages, toggles connecting said wheel and yoke, a stationary guide, a sleeve splined therein and inclosing the upper end of said stem, intermeshing screw-threads on said stem and sleeve which are of different pitch from those of the hub, a latch on said sleeve, and a weight surrounding said stem and engageable by said latch.

15. In a valve of the character described, the combination with a casing, of a valve therein, a stem for the valve, a yoke secured to said stem, a wheel having a screw-threaded hub, a threaded member on the casing with which said hub engages, toggles connecting said wheel and yoke, springs acting to straighten said toggles, a weight arranged to drop on said yoke and suddenly close said valve, and means for raising said weight automatically when the valve is opened by turning the wheel.

16. In a valve of the character described, the combination of a casing, a valve therein, an actuator for opening and closing the valve slowly under normal conditions which includes a breakdown connection, a device responsive to abnormal conditions for breaking down the connection and closing the valve suddenly, and means coöperating with the actuator for automatically resetting said device when the valve is opened again by said actuator.

17. In a valve of the character described, the combination of a casing, a valve therein,

an actuator for opening and closing said valve under normal conditions, a device released in response to abnormal conditions which closes the valve suddenly, and means coöperating with the actuator for automatically resetting the device when the valve is opened again by said actuator.

18. In a valve of the character described, the combination of a casing, a valve therein, means for opening and closing the valve under normal conditions, a suspended weight which is released under abnormal conditions to close the valve suddenly, and means for automatically resetting the weight when the valve is opened again.

19. In combination, a casing, a valve located therein, a wheel and stem for opening and closing the valve, a lock for holding the valve in any position to which it may be moved by the wheel, a motor for operating the valve under certain conditions which first releases the lock and thereafter moves the valve, and differentially-acting means coöperating with the wheel for restoring the motor and the lock to their respective positions.

20. In combination, a casing, a valve located therein, a stem connected to the valve, a hand-wheel connected to the stem for opening and closing the valve under normal conditions, a suspended weight for closing the valve suddenly, a device for releasing the weight under abnormal conditions to close the valve, and means also actuated by the wheel for restoring the weight to its operative position.

21. In combination, a casing, a valve therein, a stem for the valve, a wheel operatively connected with the stem for opening and closing the valve under normal conditions, a weight which coöperates with the stem to close the valve suddenly under abnormal conditions, a device for suspending the weight so it can move vertically under the influence of gravitation when it is released, mechanism for disengaging the weight and the device under abnormal conditions, and means actuated by the wheel for resetting the weight.

In witness whereof, I have hereunto set my hand this 20th day of October, 1905.

HARRY A. DOLLEY.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.