J. M. F. H. GIL.

MEANS FOR OPERATING COCKS, VALVES, AND THE LIKE FROM A DISTANCE.

APPLICATION FILED MAY 31, 1911.

1,074,428.

Patented Sept. 30, 1913.

3 SHEETS—SHEET 1.

Fig. 1

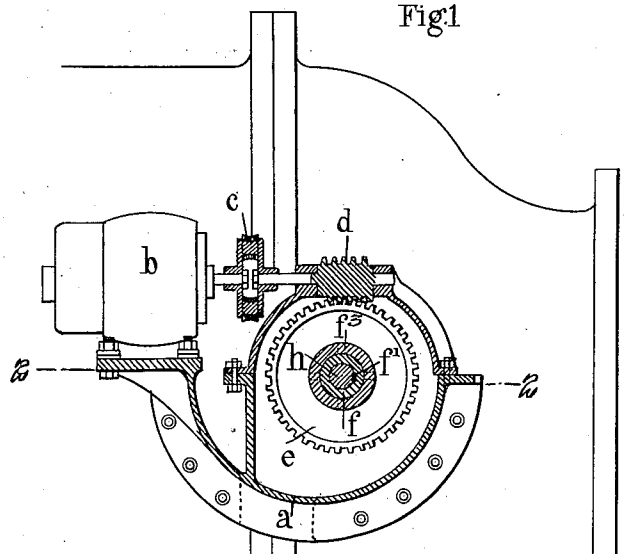
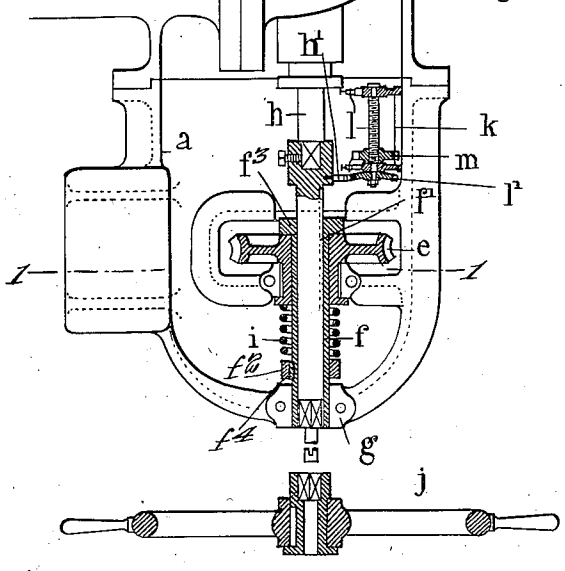


Fig. 2



WITNESSES

Sidney Brooks

J. P. Davis

INVENTOR

Joseph Marie Francois Hubert Gil

BY Munn & Co.

ATTORNEYS

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Fig. 3

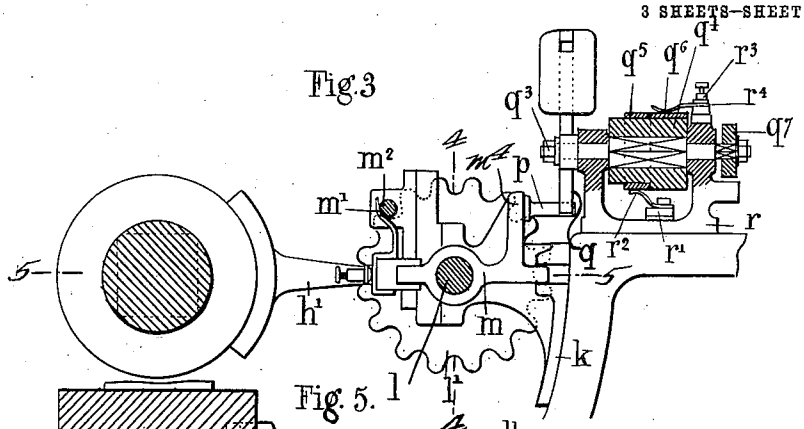


Fig. 5.

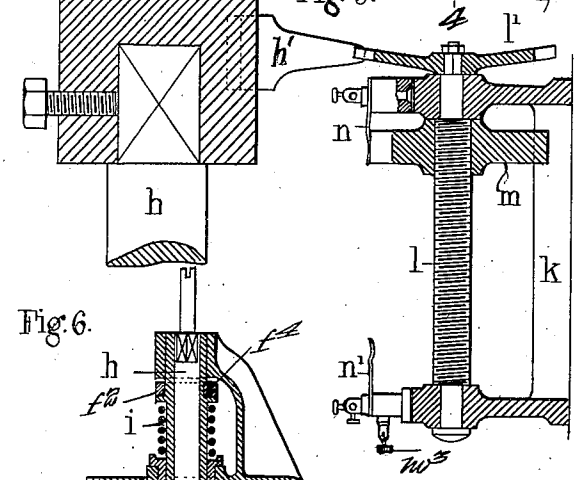
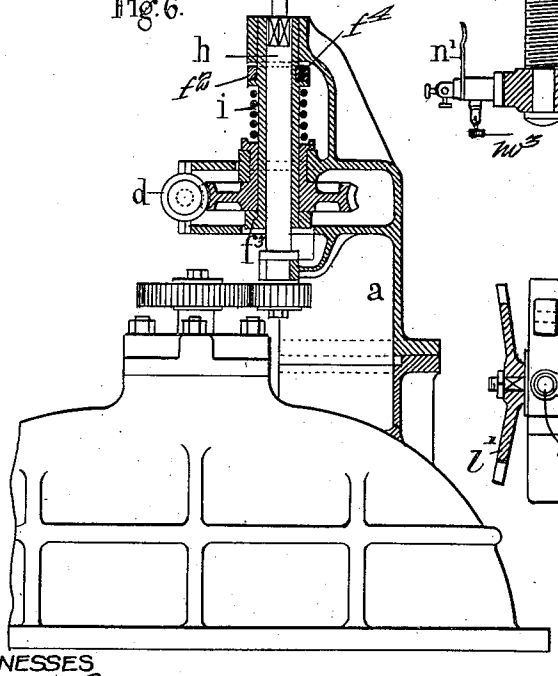


Fig. 6.



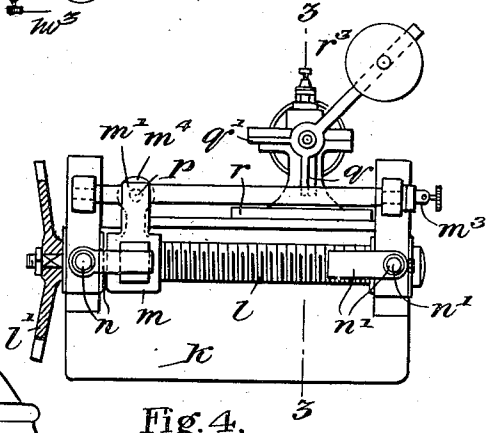


Fig. 4.

WITNESSES

Sidney Brooks

J. P. Davis

INVENTOR

Joseph Marie Francois Hubert Gil

BY Munn & Co

ATTORNEYS

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3 SHEETS—SHEET 3.

Fig:8.

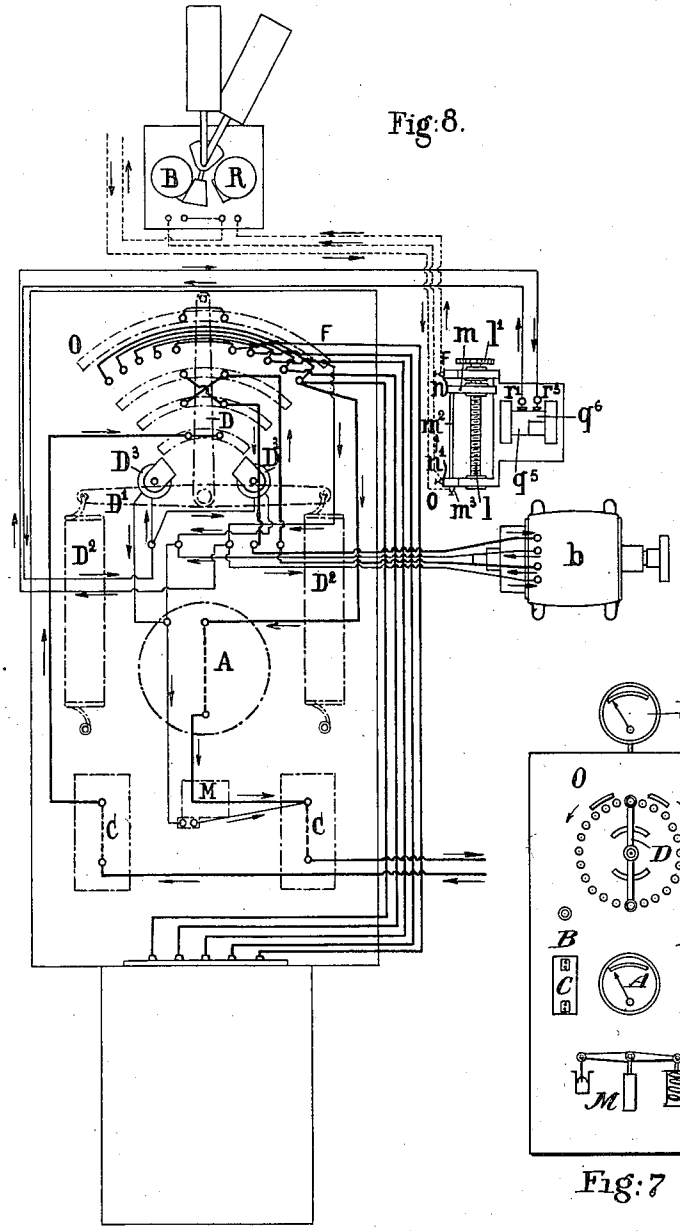


Fig:7

WITNESSES

W. C. Baker.

C. E. Holske

INVENTOR

Joseph Marie Francois Hubert Gil

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

JOSEPH MARIE FRANÇOIS HUBERT GIL, OF PARIS, FRANCE.

MEANS FOR OPERATING COCKS, VALVES, AND THE LIKE FROM A DISTANCE.

1,074,428. Specification of Letters Patent. Patented Sept. 30, 1913.

Application filed May 31, 1911. Serial No. 630,485.

To all whom it may concern:

Be it known that I, JOSEPH MARIE FRANÇOIS HUBERT GIL, a citizen of the Republic of France, and a resident of 26 Rue Boursault, Paris, France, have invented new and useful Improvements in Means for Operating Cocks, Valves, and the like from a Distance, of which the following is a specification.

This invention relates to means for controlling from a distance by electrical transmission cocks, valves and so forth of all kinds and in particular valves fitted to conduits of large cross section. This means comprises operating mechanism for the valve actuated by a motor controlled from a distance by a hand starter which starts it and stops it automatically at the end of the travel for opening the valve by means of a mechanical circuit breaker and at the end of the closing movement by means of a maximum electrical circuit breaker in combination with an automatic device indicating the opening and closing. The operation of the starter cannot in any case cause the motor to run in the opposite direction to the possible required direction of movement of the valve so that all cause of injury to the motor or to the valve in case the said starting device should be incorrectly operated is effectively prevented.

A constructional form of the means forming the object of the present invention is illustrated in the accompanying drawing in which:

Figure 1 is a cross section on line 1—1 of Fig. 2, showing the mounting of the motor upon the conduit and the operating mechanism for the valve. Fig. 2 is a corresponding horizontal section on line 2—2 of Fig. 1. Fig. 3 shows on an enlarged scale a sectional front elevation of the automatic circuit breaker at the end of the opening stroke and of the opening and closing indicator. Fig. 4 is a section on line 4—4 of Fig. 3. Fig. 5 is a section on line 5—5 of Fig. 3. Fig. 6 is a view corresponding to Fig. 1, showing the arrangement of the operating mechanism on an elliptical cock. Fig. 7 is a front view of the switch board of the distant electrical control station. Fig. 8 is a diagrammatic view showing the electrical connections of said switch board.

The operating mechanism for the valve comprises a cast metal frame *a* the form and dimensions of which are adapted to the type of valve that it is to control. A motor *b* is secured to the frame, its power being adequate for producing the operation; by the intermediary of a resilient clutch *c* its armature rotates an endless screw *d* in mesh with a worm wheel *e* carrying upon its hub a claw clutch f^3 with which the corresponding claws of a sleeve *f* are engaged; this sleeve is able to slide upon the hub of the wheel *e* and in the bearing *g*. This sleeve *f* comprises a fixed key *f'* for driving the shaft *h* which covers the operating screw (not shown) and transmits the movement of the motor *b* to this screw. The motor which is reversible is able to rotate in both directions and thus open and close the valve.

The claw clutch of the wheel *e* and that of the sleeve *f* are maintained in engagement by a spring *i* which bears on the one hand upon the hub of the wheel *e* and on the other hand upon the shoulder f^2 upon the sleeve *f*. The shoulder f^2 is rigidly secured to the sleeve *f* by a key f^4. The extension of this sleeve covers a square formed toward the end of the shaft *h* and intended for the reception of the corresponding part of a hand wheel *j* (Fig. 2). This hand wheel comprises a special sleeve which only permits of fitting it in place when the sleeve *f* is pressed back and therefore uncoupled from the worm wheel *e*. A key enables the hand wheel to be held in place and it is therefore readily possible to operate the valve by hand without regard to the automatic control which is thus automatically disengaged by the introduction of the hand wheel while on the other hand the removal of the latter insures the reëngagement of the distance control device.

It is obvious that the frame and its movement may vary in accordance with the type of valve and its position; thus in Fig. 6 a modified means for controlling a vertical elliptical valve has been represented. It is also possible by means of a pinion keyed upon the shaft *h* to actuate a rack or any other device. A tell-tale device is combined with this mechanism for operating the valve for indicating automatically at the central station whether the valve in question is open or closed. This means consists of a frame *k* in which a screw *l* is journaled; this screw is controlled either by a finger *h'* rigid with the shaft *h* and acting upon a star wheel *l'*

or the like keyed upon the end of the screw l or by means of pinions; a mover m forming a nut is displaceable on the screw l and carries a blade m' suitably insulated upon an ebonite fork fixed to the said mover, the said blade sliding in continuous contact with a rod m^2 arranged parallelly with the screw l the rod being insulated upon the frame and carrying a terminal m^3 connected with a source of electrical energy. Upon the respective supports of the two ends of the screw l contact blades n n' are arranged; the nose of the blades m' on the mover comes into contact with one of these contact blades at the end of the closing or opening stroke of the valve, thus closing the circuit upon the line of one of the lamps R B one of which may be red and indicate the closed position and the other white for indicating the open position or any other method of indication by means of vanes, drop indicators or other devices controlled electrically by means of electro-magnets or by the closing of the circuit may be employed.

Upon an arm m^4 on the mover m a finger p is fixed and in its path a double counter-weighted arm q q' is arranged; this arm is mounted at the end of a spindle q^3 journaled at its extremities in a frame r and carrying an ebonite core q^4 provided at its periphery with a brass circle q^5 with tongue q^6. By means of a terminal r' and a rubber r^2 the circle q^5 is permanently in communication with the terminals of the driving motor. The tongue q^6 in the position indicated in Figs. 3 and 4 by the intermediary of a terminal r^3 and of a rubber r^4 places the circle q^5 in communication with the leading-out terminal of the starting rheostat controlling the motor. A plate q^7 is fixed to the other end of the spindle q^3; this plate carries two stops which alternately bear against a boss cast on the frame r and limit the oscillations of the double arm q q' in such a manner that one member of the double arm is always presented perpendicularly to the line of movement of the finger p. It follows from this break device that when the mover m approaches the end of the opening stroke for the valve its finger p encounters the arm q of the double counter-weighted arm and displaces it. At the moment when the mover m reaches the end of the opening stroke for the valve the counterweight passes beyond the vertical and rocks suddenly interrupting the circuit. Each valve so controlled should comprise at the distant central station an electric controlling switch board composed as follows: The motor is started by means of a reversing starter D (Fig. 8). This starter comprises a neutral contact upon the vertical axis. Two engraved plates O F indicate the direction of the movement for obtaining opening and closing respectively. The starter is combined with a minimum automatic releasing device, that is to say a device such that when it is arranged in running order if for any reason the current on the line should be interrupted the starting lever is instantaneously and automatically brought onto the neutral contact. Starting can only be effected by again operating the starter. The automatic unclutching-device operates in both directions of running. The starting lever D can occupy but three positions, in which it is held automatically, the neutral position corresponding to the stopping of the motor, the position O for starting the motor for opening the valve or cock and the position F for starting the motor for closing the valve or cock. The starting lever D is held in the positions O or F, for closing or opening the valve, by two electro-magnets D^3, D^3, see Fig. 8, which are energized during the whole displacement of the valve. The minimum automatic releasing device consists of a double lever D′ to which the starting lever D is connected, two balanced springs D^2 D^2 being attached to the extremities of the double lever D′. These springs act as soon as the current is interrupted in the electro magnet D^3 and return the starting lever to the neutral contact. When the starting lever D is at the opening position O, the lever is retained by the corresponding electro-magnet D^3 which is energized during the whole time the valve is in motion. In this position the springs D^2 tend to recall the starting lever to neutral position, as shown in Fig. 8. When the mover m rocks the ebonite core supporting the circle q^5, the tongue q^6 escapes from the rubber of the terminal r^3 and breaks the circuit on the corresponding electro-magnet d^3, permitting the springs D^2 to return the starting lever to neutral position.

The switch board is completed by an ampere meter A indicating the intensity of the current absorbed by the operation. Two fuses C C are arranged upon the two operating lines of the motor. An automatic maximum circuit breaker M is arranged upon the line corresponding to the closing movement of the valve. A volt meter V indicating the strength of the current.

If a number of valve controls should be arranged upon one and the same switch board a single volt meter would be sufficient. A tell-tale device indicating the opening and closing operations at a distance can also be arranged on the switch-board; this device might be composed as indicated above by two colored lamps, a red lamp R indicating the closed position and a white lamp B the open position. Behind the switchboard all the connections and terminals leading to the motor are arranged as shown in Fig. 8.

The automatic circuit breaker M which is arranged upon the line controlling the closing of the valve is a maximum circuit

breaker that is to say, when the power absorbed by the motor reaches a predetermined limit which can be regulated at will the current is interrupted by the circuit breaker. The stopping of the motor at the end of the closing stroke is automatically assured from the moment that the power absorbed by the motor reaches the predetermined limit. At that moment the current, which works only in the direction of operation for closing the valve, acts on an electro-magnet which releases the circuit breaker M, the latter breaking the circuit of the corresponding electro-magnet D^3 and the starting lever D returns to the neutral position. If on the other hand the current is cut off from this line the electro magnet maintaining the circuit breaker M disengaged no longer acts so that the engagement is reëstablished automatically under the influence of the weight of the lever arm of the circuit breaker. The circuit is then reëstablished for starting.

Before proceeding to describe the operation of this apparatus it is desirable first of all to consider the conditions that it should fulfil. For the opening of the valve the condition is very simple. A considerable interval can be left between the upper part of the valve and the stop defining the end of the movement. The current may be interrupted automatically by any mechanical means which is sufficiently precise and which will limit the movement with an approximation of some millimeters and this maximum movement may always remain the same. The automatic circuit breaker at the end of the opening movement (represented in Figs. 3, 4 and 5) may very well be utilized in this case. It would be possible to regulate its disengagement so that the valve would not strike against the upper part of the cock which would entail serious disturbance of the valve or of the motor. The condition is not the same as regards the closing, however. It is necessary to obtain sufficient power for insuring the binding of the valve; when once this power has been obtained it is necessary to be able to obtain sudden interruption of the current in order to avoid accidents. A mechanical interrupter like that described would not be sufficiently exact. It may happen that as a result of wear the valve descends slightly more than when new so that it would be essential to modify the adjustment of the interrupter as otherwise closing would not be insured. An obstacle of some kind might prevent the complete descent of the valve and in this case the fuses would blow out or the armature coils would be burned. Accordingly the maximum automatic circuit breaker which affords a guarantee against any incorrect operation is provided for cutting off the current at the end of the closing operation. This device presents the further advantage of providing a greater effort on starting than on closing. On closing, the force that the motor is able to produce is limited by the adjustment of the maximum automatic circuit breaker. On starting, on the other hand, there is no limit to this power. As a motor is able to furnish a supplementary effort of 50% of this power the opening movement is always assured. This would not be the case with two mechanical interrupters which would permit of the same power in both directions of running.

The operation of these devices as a whole is as follows: Assuming the valve to be open and the controlling circuit of the motor interrupted the automatic maximum circuit breaker M is disengaged. If the starter D be acted upon and caused to turn in the direction indicated by the arrow F for closing the valve the current passing through the automatic circuit breaker reaches the terminals of the motor *b*, which latter then rotates in the direction for closing the valve, and the screw being driven by the controlling apparatus, closing of the valve takes place. When the valve has become wedged the effort required for the thrust increases rapidly, whereupon the circuit breaker M becomes operative and cuts off the current. At this moment the maximum clutch of the starter becomes operative also and brings the lever D of the starter into the vertical position, thus preventing the motor *b* from restarting in case the automatic maximum circuit breaker M should be accidentally connected. As soon as the starter D returns to the vertical position it interrupts all current upon the opening line. The automatic maximum circuit breaker recloses automatically owing to the fact that the electro-magnet is no longer influenced and the apparatus is ready to effect a fresh operation. During this period the opening indicator actuated by the screw *l* has been operated. At the open position the mechanical interrupter occupied the position in which it breaks the circuit but the finger *p* of the indicator acting upon the lever arm *q'* has again placed the tongue q^6 of the circle q^5 in communication with the terminal r^3 thereby enabling the circuit to be reëstablished. In continuing its travel the opening indicator has closed the circuit toward the terminal *n* and the red lamp R indicating that the valve is closed being switched in is energized. If it be desired to open the valve it is only necessary to turn the handle of the starter D in the direction for opening indicated by the arrow O; as previously stated the mechanical interrupter enables the current to pass over this circuit to the motor which is started and the valve opens; when the finger *p* of the opening indicator reaches the end of its travel it encounters the lever arm *q* which it displaces, the counterweight rocks, the

tongue q^6 is no longer in contact with the terminal r^3, the current is suddenly interrupted and the motor stops. As soon as the current is cut off on the circuit the automatic unclutching device of the starter becomes operative, returns the lever D of the starter to the vertical position thus preventing starting from being produced merely by operating the lever of the automatic interrupter. This lever can only be operated at the moment of opening because it is held by the finger p of the indicator. A fresh closing operation only is therefore possible and the motor can only be re-operated for closing the valve so that no accident arising from an incorrect operation need be feared. Similarly when once the valve is closed it can only be operated in the direction for opening. If by oversight the current should be switched onto the closing circuit the automatic maximum circuit breaker would automatically become operative and the lever of the starter would return to the neutral contact. During the opening movement the indicator is displaced, the circuit to the terminal n is interrupted and when the valve reaches the end of its travel the circuit is closed upon the terminal n' and the white lamp B indicating that the valve is open becomes energized.

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

1. A device for operating valves, cocks, and the like from a distance, by electrical transmission, comprising an electric motor, operating mechanism for the valve actuated by the motor, a hand starter for starting the motor from a distance, the hand starter being adapted to be moved to a position to start the motor to open the valve, or to a position to start the motor to close the valve, electrical means for holding the hand starter in either of said positions, means for automatically returning the said hand starter when released to a position to break the circuit of the motor and stop the latter, a mechanical current breaker for releasing the hand starter at the end of the opening movement of the valve, means actuated by the movement of the valve for controlling said current breaker and a maximum electric circuit breaker for releasing the hand starter at the end of the closing stroke of the valve.

2. In a device for operating valves, cocks and the like from a distance by electrical transmission, a reversible electric motor arranged upon a conduit to which the valve to be operated is fitted, means for controlling the operation of the valve from the motor, the said means comprising a resilient clutch, an endless screw and a worm wheel, a hand starter for starting said motor from a distance to open or close the valve, a mechanical circuit breaker for automatically stopping said motor at the end of the opening movement of the valve, and a maximum electric circuit breaker for stopping said motor at the end of the closing stroke of the valve.

3. In a device for operating valves, cocks and the like, from a distance by electrical transmission and at the same time permitting of direct hand operation, an electric motor, a hand starter for starting the motor from a distance, a shaft controlling the operation of the valve, an operating mechanism driven from the motor and including an endless screw and a worm wheel, and a clutch sleeve for detachably coupling the shaft controlling the operation of the valve with said worm wheel.

4. In an electrical device for operating valves, cocks and the like from a distance, an electric motor, operating mechanism for the valve actuated by the motor, a hand starter for starting the motor from a distance to open or close the valve, a screw controlled by the operation of the valve, a mover moving upon said screw, a finger rigidly connected with said mover, a counterweighted lever adapted to be suddenly rocked by said finger at the end of the opening stroke of the valve, an ebonite core with which said lever is connected, a circle of conducting material on said core, a rubber permanently connecting said circle with the terminals of the motor, the said circle having a tongue, and a rubber connecting said tongue only when the valve is closed, with the leading-out terminal of the starting rheostat controlling the motor.

5. In a device for operating valves, cocks and the like at a distance by means of an electric motor, a starting lever for starting said motor from a distance, the said lever being adapted to be moved from a neutral position corresponding to the stopping of the motor to a position to start the motor to open the valve or to a position to start the motor to close the valve, a screw operated during the movement of the valve, a mover displaced by said screw, an interrupter actuated by said mover at the end of the opening movement of the valve for interrupting the current, and means for automatically returning the starting lever to neutral position on the interruption of the current.

6. In an electrical device for operating valves, cocks and the like from a distance, an electric motor, operating mechanism for the valve actuated by the motor, a hand starter for directly closing the circuit and starting the motor from a distance to open or close the valve, a maximum electric circuit breaker arranged only in the closing line for insuring the closing of the valve without accident to the valve or to the motor, and means for moving the hand starter, when the current is interrupted, to a position to break the circuit of the motor and stop the latter.

7. In an electric device for operating

valves, cocks and the like from a distance, an electric motor, operating mechanism for the valve actuated by the motor, a hand starter for starting the motor from a distance to open or close the valve, a mechanical circuit breaker for automatically stopping the motor at the end of the opening movement of the valve, a maximum electric circuit breaker for automatically stopping the motor at the end of the closing movement of the valve, and indicators for indicating the opening and the closing of the valve and controlled by the movement of the mechanical circuit breaker.

8. In an electrical device for operating valves, cocks and the like from a distance, an electric motor, operating mechanism for the valve actuated by the motor, a hand starter for starting the motor from a distance to open or close the valve, a mover operated by the movement of the valve for interrupting the circuit to stop the motor at the end of the opening movement of the valve, indicators for indicating the opening and the closing of the valve, and electric circuits for said indicators, the said mover at the end of the opening or closing movement, closing the circuit for the corresponding indicator.

9. A device for operating valves, cocks and the like at a distance by means of an electric motor, comprising a starting lever for starting said motor from a distance, the said lever being adapted to be moved from a neutral position to directly close the circuit on the armatures of the motor to a position to start the motor to open the valve, or to a position to directly close the circuit to start the motor to close the valve, an electro-magnet for holding the starting lever in position for opening the valve, a second electro-magnet for holding the starting lever in position for closing the valve, means for automatically returning the starting lever to the neutral position corresponding to the stopping of the motor, each time the valve reaches the end of the opening or closing movement, or is stopped at any point in its closing stroke, and means for indicating at a distance the open or closed position of the valve.

10. A device for operating valves, cocks and the like at a distance by means of an electric motor, comprising a starting lever for starting said motor from a distance, the said lever being adapted to be moved from a neutral position to a position to start the motor to open the valve, or to a position to start the motor to close the valve, electro-magnets for holding the starting lever in the position to open or to close the valve, a mechanical interrupter for interrupting the current in the circuit of one of said electro-magnets at the end of the opening movement of the valve, a maximum circuit breaker for interrupting the current in the circuit of the other electro-magnet at the end of the closing movement or in case the valve should stop in course of closing, and means for automatically returning the starting lever to the neutral position corresponding to the stopping of the motor on the interruption of the current.

11. In a devict for operating valves, cocks and the like from a distance, by electrical transmission, an electric motor, operating mechanism for the valve actuated by the motor, a hand starter for starting the motor from a distance to open or close the valve, the said hand starter being adapted to be moved from a neutral position corresponding to the stopping of the motor to a position to start the motor to open the valve, or to a position to start the motor to close the valve, an electro-magnet for holding the hand starter in position to start the motor to open the valve, a screw controlled by the operation of the valve, a mechanical circuit breaker controlled by said screw for breaking the circuit of said electro-magnet at the end of the opening movement of the valve to release the hand starter, and means for returning the hand starter to neutral position to break the circuit and stop the motor.

12. In an electrical device for operating valves, cocks and the like from a distance, an electric motor, operating mechanism for the valve actuated by the motor, a hand starter for directly closing the circuit and starting the motor from a distance to open or close the valve, electro-magnets for holding the hand starter in the closing or the opening direction of the valve, circuits including said electro-magnets, and a maximum electric circuit breaker for insuring the closing of the valve without accident to the valve or to the motor, the said maximum electric circuit breaker being arranged only in the circuit of the electro-magnet holding the hand starter in position to close the valve.

13. In a device for operating valves, cocks and the like from a distance by electrical transmission, an electric motor, operating mechanism for the valve actuated by the motor, a hand starter for starting the motor from a distance to open or close the valve, the said hand starter being adapted to be moved from a neutral position corresponding to the stopping of the motor to a position to start the motor to open the valve or to a position to start the motor to close the valve, an electro-magnet for holding the hand starter in position to start the motor to close the valve, a maximum electric circuit breaker in the circuit of said electro-magnet, for breaking the circuit of said electro-magnet at the end of the closing stroke of the valve to release the hand starter, and

means for returning the hand starter to neutral position to break the circuit and stop the motor.

14. A device for operating valves, cocks and the like from a distance by electrical transmission, comprising an electric motor, operating mechanism for the valve actuated by the motor, a hand starter for starting the motor from a distance to open or close the valve, the said hand starter being adapted to be moved from a neutral position corresponding to the stopping of the motor, to a position to start the motor to open the valve or to a position to start the motor to close the valve, two electro-magnets, one for holding the hand starter in position to start the motor to open the valve and the other for holding the hand starter in position to start the motor to close the valve, a mechanical circuit breaker controlled by the movement of the valve for breaking the circuit of the first electro-magnet at the end of the opening movement of the valve, a maximum electric circuit breaker in the circuit of the second electro-magnet for breaking the circuit of said magnet, and means for automatically returning the hand starter to the neutral position, to break the circuit and stop the motor, on the interruption of the current in either of said electro-magnets.

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

JOSEPH MARIE FRANÇOIS HUBERT GIL.

Witnesses:
GEORGE GARNINON,
CHARLES DONN.