H. B. HARTMAN.

REVERSING SWITCH MECHANISM.

APPLICATION FILED AUG. 11, 1911.

1,065,363.

Patented June 24, 1913.

2 SHEETS—SHEET 1.

FIG. 1.

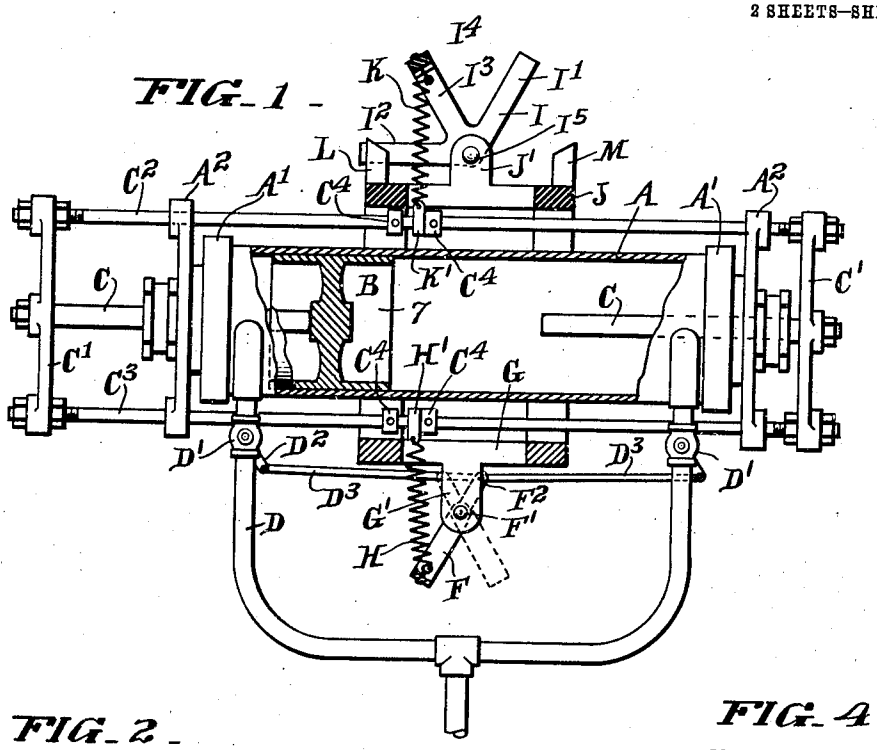


FIG. 2.

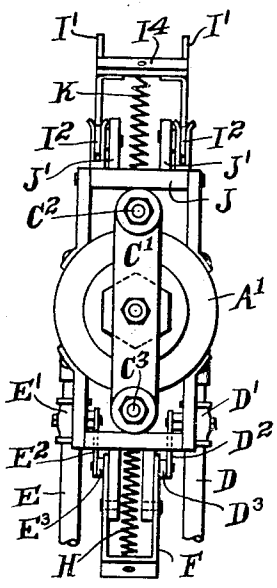
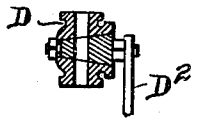


FIG. 4.



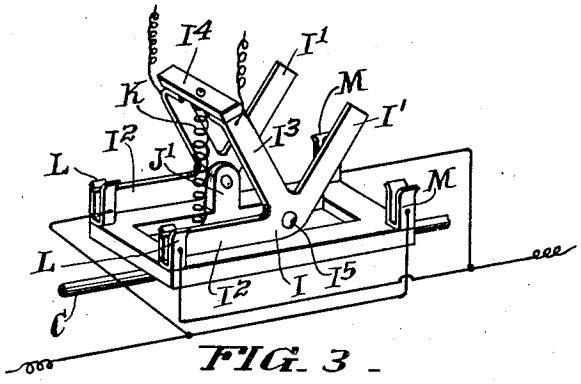


FIG. 3.

WITNESSES

Daniel Webster, Jr.

Stewart

INVENTOR

Harry B. Hartman

BY Francis D. Chamberlin

ATTORNEY

H. B. HARTMAN.

REVERSING SWITCH MECHANISM.

APPLICATION FILED AUG. 11, 1911.

1,065,363.

Patented June 24, 1913.

2 SHEETS—SHEET 2.

FIG. 5.

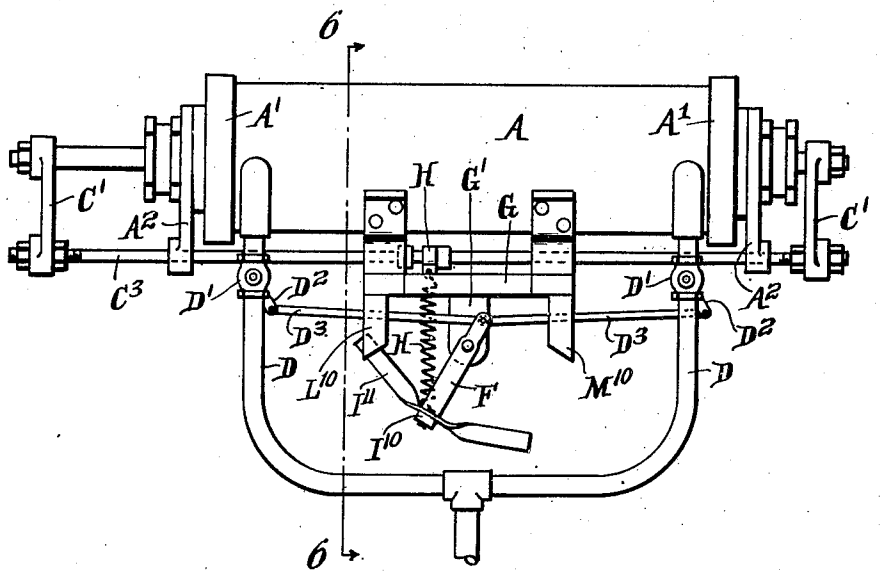
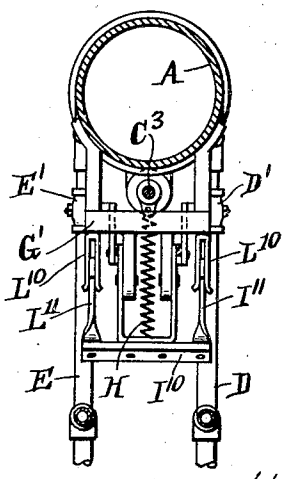


FIG. 6.



WITNESSES

Daniel Webster, Jr.

Stewart

INVENTOR

Harry B. Hartman

BY Francis J. Chamberlain

ATTORNEY

UNITED STATES PATENT OFFICE.

HARRY B. HARTMAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO HIMSELF AND ONE-HALF TO GEORGE A. DUNNING, OF PHILADELPHIA, PENNSYLVANIA.

REVERSING-SWITCH MECHANISM.

1,065,363. Specification of Letters Patent. Patented June 24, 1913.

Application filed August 11, 1911. Serial No. 643,476.

To all whom it may concern:

Be it known that I, HARRY B. HARTMAN, a citizen of the United States of America, residing in the city and county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Reversing-Switch Mechanism, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My present invention relates to mechanism for periodically making and breaking electric circuit connections and particularly to apparatus of this kind employing a fluid pressure motor for automatically actuating the switch mechanism proper.

The object of the present invention is to provide a simple, reliable and effective mechanism of the general character specified, particularly adapted for use as a part of a plant for the electrolytic purification of water to periodically reverse the polarity of the electrodes employed for electrolyzing the water treated. Such a use of the apparatus claimed herein is illustrated in my patent application Serial No. 643,473, filed of even date herewith covering a water purification plant devised by me.

The various features of novelty which characterize my present invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however and the advantages possessed by it, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described several forms in which my invention may be embodied.

Of the drawings, Figure 1 is an elevation, partly broken away and in section of one form of apparatus embodying my invention. Fig. 2 is an end elevation of the apparatus shown in Fig. 1. Fig. 3 is a perspective view of the switch mechanism proper of the device shown in Fig. 1. Fig. 4 is a sectional elevation of one of the controlling valves for the switch actuating motor. Fig. 5 is an elevation of a modified form of apparatus, and Fig. 6 is a section on the line 6—6 of Fig. 5.

In the apparatus shown by Figs. 1 and 2 of the drawings, A, represents a cylinder and B a piston working in said cylinder. C, C, represent rods entering the cylinder at its opposite ends through suitable stuffing boxes carried by the end heads A′. The rods C are each connected at its outer end to a corresponding crosshead C′ and the two crossheads C′ are connected by rods C^2 and C^3 which are parallel to the rod C and are guided by ears A^2 projecting from the crosshead A′ and formed with apertures in which the rods C^2 and C^3 slide. The rod C, crosshead C′ and rods C^2 and C^3 form a frame which is reciprocated by the piston B as the latter moves back and forth in the cylinder A. In the preferred construction illustrated, however, the piston B is not directly connected to the rods C and the latter are spaced apart so that during an intermediate portion of the travel of the piston B the latter is out of engagement with the reciprocating frame which then remains stationary. As the piston approaches either end of the cylinder A, however, it engages the corresponding rod C and moves the reciprocating frame a short distance. These provisions for relative movement between the piston and the frame of which the rods C form a part make it possible to have the travel of the piston substantially greater than the travel of the frame. The movement of the piston B determines the frequency of current reversals, and in general needs to be appreciably greater than the movement of the reciprocating frame necessary to enable the latter to perform its proper functions. The elimination of undesirable travel of the frame is in itself desirable and in particular it permits the frame to be made shorter and tends to a desirable compactness of the apparatus. The rate of movement of the piston is obviously a function of the volume of piston displacement and the rate of flow of the motive fluid into the cylinder, which may or may not be regulated by a suitable external throttle valve or valves.

D, D, represent pipes connected to the opposite ends of the cylinder A for supplying the motive fluid which is water in the ordinary use of the apparatus, and E, E, represent exhaust pipes connected to each end of the cylinder. The pipes D, D, are controlled by inlet valves D′, D′ and the pipes E E are controlled by exhaust valves E′, E′. Each of the valves D′, E′ may be in the form of a rotary plug cock having attached to it an operating arm D^2 or E^2.

The valve arms D^2 and E^2 are connected by links D^3 and E^3 at F^2 to the ends of a yoke F pivoted at F′ to ears G′ of a frame member G secured to the cylinder A. The bow of the yoke member F is connected by a spring H to a collar H′ slidingly mounted on the rod C^3 between collars C^4, C^4 adjustably secured to the rod.

In Fig. 1 the apparatus is shown in the condition in which the piston B has completed its movement to the left and is just beginning to move to the right. In this condition of the apparatus the left inlet valve D′ and the right exhaust valve E′ are open and the left exhaust valve E′ and the right hand inlet valve D′ are closed. As the piston thereafter approaches the right hand end of the cylinder it engages the right hand rod C and through it moves the reciprocating frame to the right. As the rod C^3 is thus moved to the right the rod at first slides through the collar H′ until the latter is engaged by the rear collar C^4 and after this the collar H′ is moved to the right with the rod C^3. This shifts the line of action of the spring H from the left to the right of the axis of the pivotal connections F′, F′. As the latter is crossed by the line of action of the spring H, the spring being under tension, exerts a pull on the yoke F which throws it from the position shown in full lines in Fig. 1 to the dotted line position of that figure and closes the left hand inlet valve D′ and the right hand exhaust valve E′ and opens the right hand inlet valve D′ and the left hand exhaust valve E′. This brings about the return movement of the piston to the right.

The switch mechanism proper of the apparatus comprises a rocking frame composed of two three armed elements I pivoted at I^5 to ears J′ carried by a base J of insulating material mounted on the cylinder A. The central arms I^3 of the elements I are mechanically connected by a bridge piece I^4 of insulating material. A spring K is connected at one end to the bridge piece I^4 and at the other end to a collar K′ slidably mounted on the frame rod C^2 and working between adjustable collars C^4. With this arrangement it will be understood without further explanation that the rocking frame formed by the elements I and I^4 is swung first in one direction and then in the other by the movements of the piston B in exactly the same manner as is the rocking frame F. The two arms I′ and I^2 of each element I form switch blades coöperating with stationary contacts L and M mounted on the base member J. When the apparatus is in the position shown in Fig. 1, the switch blades I^2 contact with the stationary switch members L and the switch blades I′ are separated from the switch contacts M and when the switch blades are rocked into their other operative position the blades I′ engage the contacts M and the blades I^2 separate from the contacts L.

With the apparatus described it will be readily understood that the circuit connections including the rocking switch blades and coöperating stationary contacts are made and broken with the desired snap action. Similarly the valves controlling the movements of the piston are positively and rapidly shifted from one operative position to another. This does away with wire drawing and practically eliminates all possibility of the valves sticking in intermediate positions. The device as a whole is simple, durable and not likely to get out of order. By adjusting the collars C^4 the timing of the parts may be regulated and the travel of the piston varied. Similar results may be obtained by varying the effective length of the frame which may be accomplished with the construction illustrated by adjusting the threaded connections between the rods C^2 and C^3 and the crossheads C′.

The mechanism for shifting the valves and making and breaking the circuit connections shown in Fig. 1 may be readily combined with a reduction in the number of parts required, as is shown in Figs. 5 and 6. The construction shown by these figures differs from that first described primarily in the fact that the switch contacts L^{10} and M^{10} corresponding to the contacts L and M, previously described, are mounted on the support G and the yoke has attached to it a crossbar I^{10} of insulating material carrying at each end a double ended switch blade I^{11} which engages the contacts L^{10} and M^{10} alternately, depending upon the position of the yoke F. In this form of the apparatus the rod C^2 and the corresponding guide ears and corresponding portions of the crosshead C′ are dispensed with.

While in accordance with the provisions of the statutes I have illustrated and described the best forms of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention, and that under some conditions it may be of advantage to use certain features of the invention without a corresponding use of the others.

Having now described my invention what I claim as new and desire to secure by Letters Patent is,

1. In a reversing switch mechanism the combination of a fluid pressure motor comprising a cylinder, a piston working therein, and controlling valves for said motor, movable switch members, and mechanism for moving them comprising an element mounted to rock about an axis a spring connected at one end to said rocking element and

means engaging the other end of said spring and actuated by said piston for shifting the line of action of said spring from one side to the other of said pivotal axis as the piston moves back and forth in said cylinder.

2. In a reversing switch mechanism the combination of a fluid pressure motor comprising a cylinder, a piston working therein, and controlling valves for said motor, movable switch members, mechanism for moving the said members and for operating said valves comprising one or more elements mounted to rock about an axis, a spring connected at one end to each such rocking element and means for engaging the other end of said spring and actuated by said piston for shifting the line of action of said spring from one side to the other of said pivotal axis as the piston moves back and forth in said cylinder.

3. In a reversing switch, the combination with movable switch members, of a fluid pressure motor for actuating them, said motor comprising a cylinder, a piston working therein, controlling valves for said motor, and operating mechanism for the latter comprising an element mounted to rock about an axis, a spring connected at one end to said rocking element and means engaging the other end of said spring and actuated by said piston for shifting the line of action of said spring from one side to the other of said pivotal axis, as said piston moves back and forth in said cylinder.

4. In a reversing switch, the combination of a fluid pressure motor comprising a cylinder, a piston working therein, controlling valves for said motor, and a movable frame comprising a rod portion entering each end of said cylinder, each rod being engaged and the frame correspondingly moved on a predetermined movement of the piston toward the corresponding end of the cylinder, and circuit controlling provisions actuated by said frame.

5. In a reversing switch the combination of a fluid pressure motor comprising a cylinder, a piston working therein and controlling valves for said motor, movable switch members, and mechanism for moving them comprising an element mounted to rock about an axis, a spring connected at one end to said rocking element and means engaging the other end of said spring for shifting the line of action of said spring from one side to the other of said pivotal axis as the piston moves back and forth in said cylinder, said means including a member reciprocated by said piston and a slide mounted thereon and having a limited movement with respect thereto in the direction of movement of said piston.

6. In a reversing switch, the combination of a fluid pressure motor comprising a cylinder, a piston working therein, and controlling valves for said motor, a member reciprocated by said piston, a pair of slides mounted on said member and movable with respect thereto in the direction of movement of said piston, stops limiting such relative movements, the stops for the two slides being independently adjustable, a pair of elements each mounted to rock about an axis, a pair of springs, one for and connected at one end to each element, each spring being connected at its opposite end to a corresponding one of said slides and being moved thereby to shift its line of action from one side to the other of the pivotal axis of the element to which it is connected as the piston moves back and forth in said cylinder, operating connections between one of said elements and said valves, and switch members moved by the other element.

7. In a reversing switch the combination of a fluid pressure motor comprising a cylinder, a piston working therein, and controlling valves for said motor, a sliding frame comprising crossheads at each end of the cylinder, stay rods at the sides of the cylinder connecting said crossheads, and rods connected to said cross heads and entering the opposite ends of the cylinder and engaged by the piston as it approaches the ends of its back and forth movements, a pair of elements each mounted on said cylinder to turn about an axis with respect thereto, a pair of sliding collars mounted on said stay rods, stop collars adjustably mounted on said stay rods at the opposite ends of said sliding collars, a pair of springs each connecting one of said sliding collars to one of said rocking elements and being moved to shift its line of action from one side to the other of the pivotal axis of the element to which it is connected as said piston moves back and forth in said cylinder, operating connections between one of said elements and said valves, and switch members connected to the other element.

HARRY B. HARTMAN.

Witnesses:
ARNOLD KATZ,
D. STEWART.