(No Model.) 3 Sheets—Sheet 1.

E. MARSHALL.

ELECTRICALLY OPERATED HYDRAULIC ELEVATOR.

No. 502,981. Patented Aug. 8, 1893.

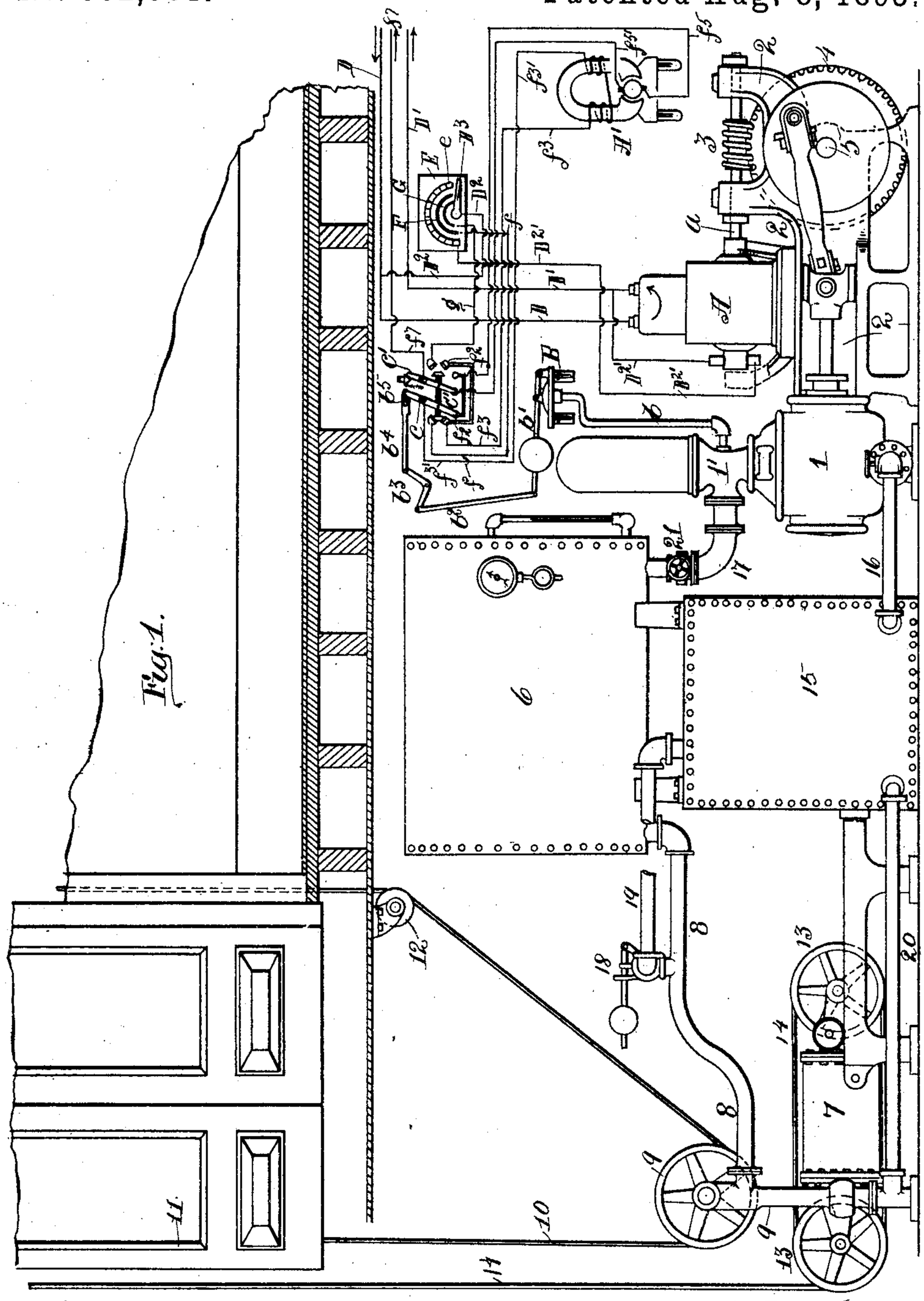

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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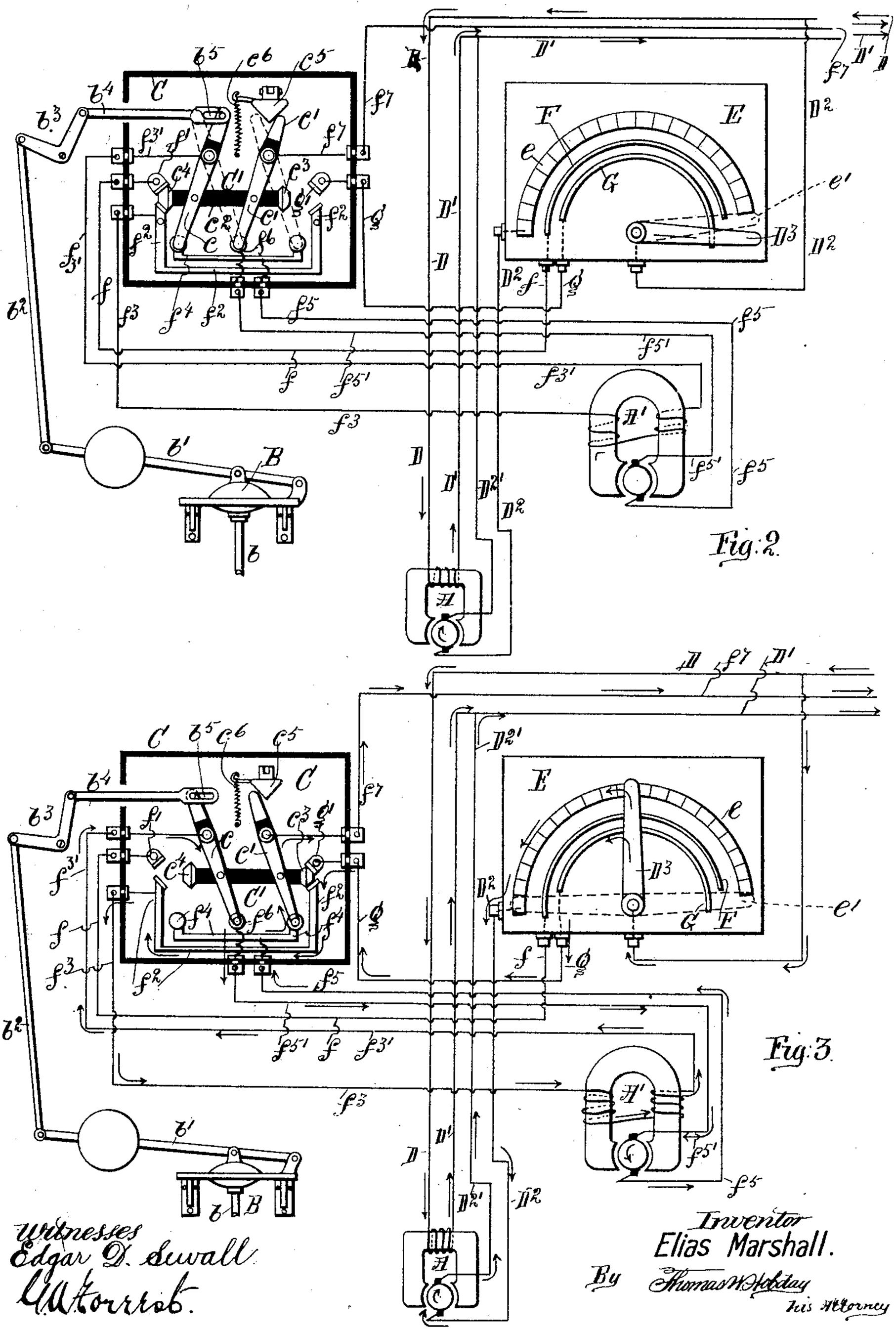

Fig. 2.

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

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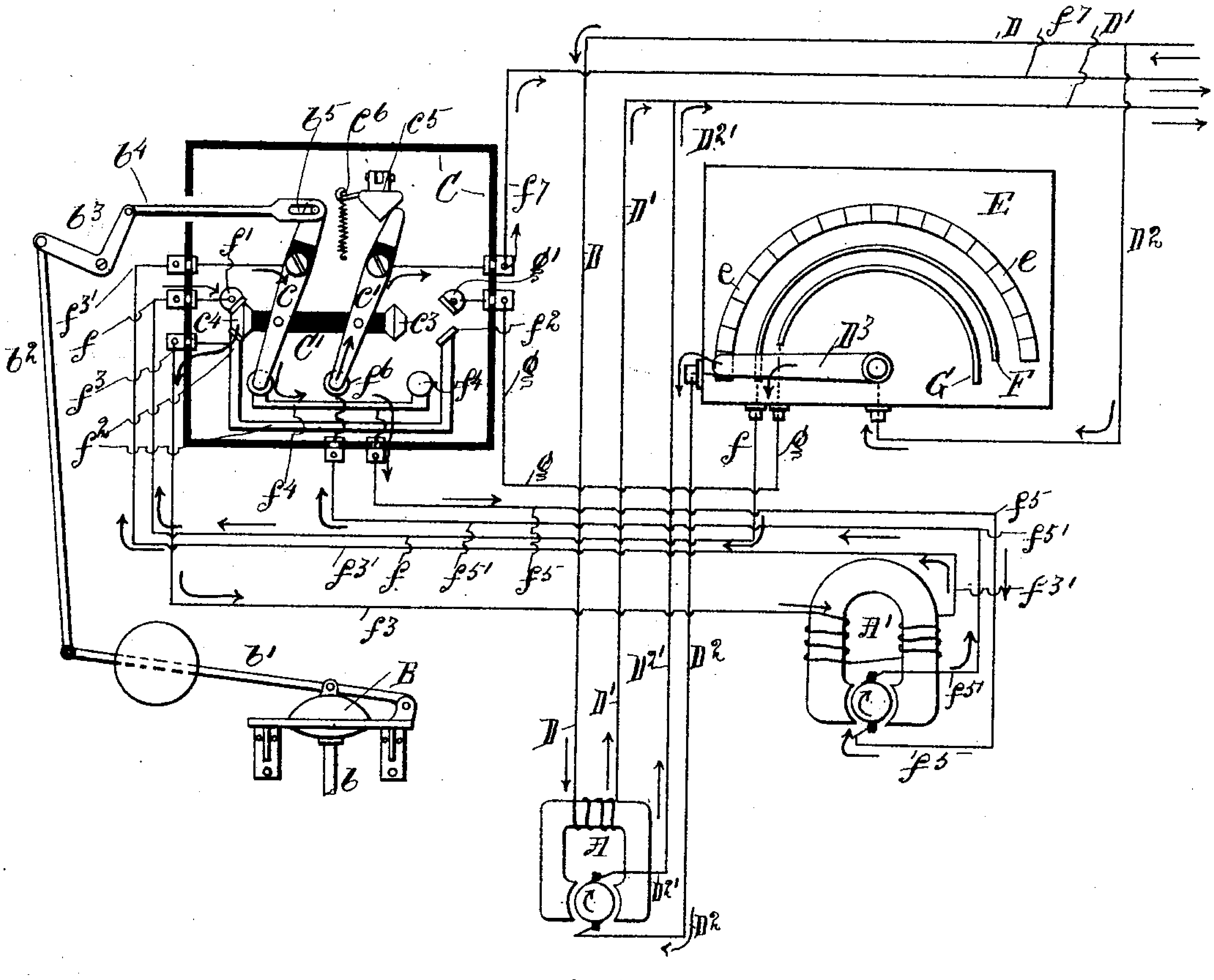

Fig 4.

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UNITED STATES PATENT OFFICE.

ELIAS MARSHALL, OF BOSTON, MASSACHUSETTS.

ELECTRICALLY-OPERATED HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 502,981, dated August 8, 1893.

Application filed November 19, 1892. Serial No. 452,590. (No model.)

To all whom it may concern:

Be it known that I, ELIAS MARSHALL, of Boston, in the county of Suffolk, State of Massachusetts, have invented certain new and useful Improvements in Automatic Electric Pressure-Retaining Means, of which the following is a specification.

This invention consists essentially in the application of a pressure diaphragm to the pressure receptacle of a hydraulic elevator system pump, and in and to the combination therewith of a suitable electric three point switch device, rheostat and two electric motors, and in and to the arrangement of parts respectively in circuit with each other, whereby the elevator mechanism may be so actuated as to fulfill the requirements as attained by steam and its machinery and this invention consists essentially in the application of one of the two electric motors as a means whereby the rheostat as presently described, through the combination of a pressure diaphragm and of a suitable three point switch therewith, and the manner in which their several parts are in circuit with each other and with the two electric motors; is caused to so work through its charged finger as to first cause through suitable conducting segments provided thereon, the said motor to receive action by a complete circuit, and such to give movement to the rheostat finger whereby the other moter receives impetus to work the hydraulic elevator system pump; by the same closing its circuit, and then to break its own circuit by causing the said finger to move in a certain direction while the circuit of the machinery driving motor remains closed, and to cause the said finger to return from whence it came at a certain pressure of water and again break its own circuit together with that of the machinery driving motor circuit thus causing all things to be at rest until the water pressure is depreciated, and to again repeat.

In the drawings Figure 1 illustrates my invention in conjunction with a hydraulic elevator system. Figs. 2, 3, and 4, are views involving my invention.

Fig. 1 represents the entire hydraulic elevator mechanism together with my combined mechanism to be at rest.

(A) represents the main driving motor, secured to the upper part of the pump frame-work (2), with its armature shaft (*a*) engaged with the worm-wheel (4) through the worm (3) on the armature shaft. The worm-wheel is secured to the crank shaft (5) of the pump (1); thus transmitting movement from the said motor to the pump. This mode of transmission is not of my invention, but described and shown to merely demonstrate a method for such purpose. This pump is in water circuit with the various parts of a hydraulic elevator mechanism, and in order that my invention may be clearly understood in its various conditions I will briefly describe the method of utilizing the same water over and over again in a hydraulic elevator system as shown in Fig. 1, but which I do not claim as of my invention.

(6) represents the pressure tank, that communicates with the hydraulic engine (7), through the discharge pipe (8) and hydraulic valve (9). This valve is actuated by the manipulation of the shipping cable (10), that passes through the car (11) and returns on the other side thereof as shown by the inclination of said cable guided by the idler (12). When the water is allowed by the hydraulic valve to enter the hydraulic engine, the car is raised by the engine drawing apart the sheaves (13) over which the hoisting cables (14) are wound; in which case the pressure in the pressure tank becomes reduced by the water receiving further space; and, in order to efficiently keep this pressure normal to attain a satisfactory result with the car, it is quite necessary to use a pump and provide such, with a means whereby the said pump may be so actuated as to keep normal the pressure within the pressure chamber (6). The pump draws the water from the open tank (15) through the pipe (16) and discharges it through the pipe (17) into the pressure tank.

(18) and (19) denote a pressure valve, and pressure discharge pipe, which is to discharge the water over a certain pressure in the pressure chamber into the open tank (15). When the car is caused to return to its primary position as shown by Fig. 1, through the hydraulic valve, the weight of the car discharges the water out of the hydraulic engine into the tank (15) through the pipe (20).

Fig. 1 as before stated represents the en-

tire machinery therein shown to be at rest, and I now will proceed to describe the operation of such. When the hydraulic valve has been so actuated by the manipulation of the shipping cable, and the water from the pressure tank permitted to enter the hydraulic engine, such water immediately becomes depreciated in its pressure, and the pressure receptacle (1′) of the pump being in communication with the pressure tank, the pressure in such receptacle is varied by the same cause as with the pressure in the tank (6), and by communicating a tube (*b*) from the receptacle (1′) of the pump to the diaphragm (B) it will cause its arm (*b*′) to move up and down in a straight line according to the pressure therein which will equal that within the receptacle (1′) and the tank (6).

My object in causing the diaphragm (B) to be in communication with the pressure receptacle of the pump and not with the pressure tank, is for two reasons; first if the discharge pipe valve (21) of the pump should be closed for certain reasons, the car could be used but for a certain time, and then stop, without causing the pump to work; second, if it should be closed, and the car started it would not affect the pump, (*i. e.*) the pressure in the pressure tank (6). To the arm of the diaphragm, I connect the rod (b^2) and such to the right angled lever (b^3), and to such the connecting rod (b^4); this rod has an elongated hole (b^5) through its opposite end, for the arm of the fulcrumed lever (*c*) to be engaged therewith; this lever is insulated above its fulcrum as denoted by the black surface between its fulcrum and the connecting rod (b^4); this is to prevent a current that passes through the lower arm of said lever from charging the mechanism used to operate such. The lever (*c*′) is fulcrumed and insulated as with its adjacent lever, and both suitably sustain a horizontal circuit connector and breaker (C′); this horizontal circuit connector and breaker, consists of a nonconductible body as denoted by the black surface thereof in the drawings, provided with suitable conductors or connection points (c^3) and (c^4) secured to its ends. The upper arm of the lever (*c*′) engages with the V shaped snapping device (c^5) hinged as shown, and provided with a spring (c^6) to depress the V shaped hinged arm, held by the insulated switch cabinet (C). By engaging the above parts as shown and described, the levers (*c*) and (*c*′) when brought to a certain vertical position, are snapped by the above snapping device, the remainder of their travel without the assistance of the diaphragm (B); through the elongated hole being in the rod (b^4); thus breaking and connecting circuits, as and for the purpose hereinafter described.

The driving motor (A) being engaged with the pump for the purpose, and as described, I charge its fields permanently, through the main supply wire (D); (D′) represents its return wire. This circuit is shown to be complete, having no circuit connector or breaking device engaged therewith, and can be supplied with a current from any desirable source. From the main wire (D) runs the armature supply wire (D^2) in circuit therewith and with the finger (D^3) of the rheostat (E). To the left hand extremity of the rheostat segment (*e*) is connected and in circuit therewith, and with the lower brush of the armature of the driving motor (A), the remainder of the armature supply wire (D^2) which transmits the current through the said armature, and the upper brush thereof and along the return wire ($D^{2\prime}$) and out by the main field return wire (D′). The rheostat finger (D^3) curving farther than the rheostat segment, and these two parts being in circuit with the main supply wire of the armature of the driving motor, and out of contact with each other, as shown by Figs. 1 and 2, this motor together with the pump is dormant.

The circuit conductor segment (F), is in circuit with the wire (*f*) and such with the contact point (*f*′) that would transmit the current through the contact points (c^4) and (f^2); the former is secured to the horizontal circuit connector and breaker (C′) which is in its primary position or the position that equals a certain pressure, as beforementioned; and the latter to the insulated switch cabinet (C). The wire (f^3) being in circuit with the conductor point (f^2) and such with no other wire, the current then would flow through the said wire and charge the fields of the governor motor (A′) and return by the wire ($f^{3\prime}$) passing down the lower arm of the lever (*c*) through the double contact piece (f^4) then through or on its only circuit wire (f^5), to the under brush of the armature of the governor motor (A′) up through the armature and the upper brush, along the wire ($f^{5\prime}$) thereof to the intermediate conductor point (f^6), through that and up the lower arm of the lever (*c*′) out at its fulcrum along the intermed or exit wire (f^7), but, it will be observe said Figs. 1 and 2 do not show this segment (F) on the rheostat to be in contact with the rheostat finger. Thus this circuit is quite broken and the aforesaid wires and contacts dead, but, there is another conductor segment (G) on the rheostat, and as shown by said views, it is in contact with the rheostat finger while the other two segments are not, the object of such will presently appear; and, by following the current as it would flow through this segment (G), along its wire (*g*) the circuit thereof, it will be found, is broken at the contact point (*g*′) on account of the horizontal circuit connector and breaker (C′) being disengaged therefrom, and from the contact point (f^2), and such from the connecting point (c^3) of the horizontal circuit connector and breaker (C′); hence it will be seen, that the driving motor and the regulator motor together with the entire machinery, are at rest and the pressure normal.

Fig. 3 represents, that the hydraulic valve has been opened to permit water from the

pressure tank to enter the hydraulic engine, thus reducing the pressure within the same and the parts in communication therewith, including the diaphragm, and causing the arm (b') thereof to recede, and such to ship the two levers (c) and (c'), and such the horizontal circuit connector and breaker (C') to their opposite connections. Having thus described the meaning of this view, the subject matter following will relate the current courses, connections, and the effects attained by such. The fields of the driving motor being always charged; and its armature circuit broken as before described, it remains broken until connected by the movement of the rheostat finger, the finger (D^3) of the rheostat being only engaged with the segment (G) when the above occurrence happened with the switch and pressure. The charged finger of the rheostat sends a current over the segment (G) while in the position as shown by Fig. 2 through the wire (g) over the contact points (g'), (c^3) and (f^2) respectively, around the double point piece (f^2) over its wire (f^3) through the fields of the governor motor (A') charging such in the same manner as described with reference to Figs. 1 and 2; back again over the return wire ($f^{3'}$), through the lower arm of the lever (c) and the contact point (f^6) over its wire ($f^{5'}$) through the upper brush and the armature of the governor motor, returning through the lower brush thereof and over its wire (f^5), through the double contact piece (f^4) and up the lower arm of the lever (c'), out by its fulcrum and over the intermediate or exit wire (f^7); thus causing the armature of the governor motor to rotate in the direction as denoted by the arrow thereon, before the driving motor receives action, which occurs by the motor (A') causing the finger of the rheostat to move to the left thereof, and by such coming in contact with the rheostat segment (e) through the action of the governor motor. The dotted fingers (e') of the rheostat, represent the finger thereof coming in contact with the rheostat segment and the segment (F), when the governor motor receives its impetus in the manner as just described. The current arrows on the drawings denote complete circuits, and where not placed the wires are dead. The governor motor being set in action, the rheostat finger travels quickly to the left thereof, connecting the armature circuit of the driving motor as denoted by the arrows. The finger is shown to be midway in full lines breaking the resistance of the rheostat, and at its left hand stopping point by dotted lines, with such resistance broken, in which position the finger stays until the pressure in the diaphragm has reached its standard, and the parts of the switch have been shipped by the diaphragm to their primary position as shown by Fig. 4. The dotted finger of the rheostat to the left thereof as shown in Fig. 3 also represents that the finger when it reaches this point, has broken that circuit of the governor motor which caused the said motor to give this movement to itself the said finger; by leaving the segment (G); thus stopping further action of said governor motor, while the driving motor continues to work, and thus work until checked in the manner described with reference to Fig. 4.

Fig. 4 represents that the required or standard pressure has just been attained, and that the diaphragm has shipped the switch parts to their primary position while the driving motor continues to work the pump, and that the switch mechanism has broken the contacts therein, that caused the governor motor to swing the finger of the rheostat from its primary position as shown in Figs. 1 and 2 to its secondary position as shown in Fig. 4; such being the case, the current now flows from the rheostat finger, through the segment (F), and its wire (f), to the contact point (f'), through such and the contacts (c^4) and (f^2) respectively along the wire (f^3), through the fields of the governor motor in the same direction as previously described, out on the return wire ($f^{3'}$), down the lower arm of the lever (c), through the double contact piece (f^4), over its wire (f^5), through the under brush and armature and upper brush of the regulator motor, and along the upper brush wire ($f^{5'}$), to the intermediate contact point (f^6), up the lower arm of the lever (c'), and out by the intermediate or exit wire (f^7); thus causing the finger of the rheostat to move in the rotary direction of the governor motor as denoted by the arrow on its armature, and quickly break the armature circuit of the driving motor and its own circuits simultaneously as represented by Figs. 1 and 2. When the finger is caused to move toward its primary position, it again comes in contact with the segment (G), but, before this occurrence, its circuit has been broken by the switch mechanism as represented by Fig. 4. Thus the finger may travel over this segment and not cause confusion of circuits as it remains dead until the pressure as before described becomes reduced, which will again cause the finger to return to its secondary position until made normal, and then swing back to its primary position. This occurrence can happen at any point between its travel, as the rheostat finger has not got to be at either one point of the extremity of its movement. Thus it will be observed that my method of utilizing electric force to drive a motor, and to stop such according to a limited pressure, is applicable to more than a hydraulic elevator system and thus I do not wish to limit myself to such; furthermore it will also be seen that my invention can be caused to work, and such to work other bodies, through a very small reduction of power, and cause such to be retained. The rheostat finger on arriving at the position as shown by the drawings Fig. 2, has left the two segments (e) and (F) thus causing the two motors to be at rest, as the moving parts of the switch mechanism do not change their

contacts through the rheostat finger returning, but through the pressure in the diaphragm, and the diaphragm. Hence the finger on arriving at its primary position, while out of contact with the two above segments is yet in contact with the segment (G), and the other parts being in their first position according to a certain pressure, they await a reduced power, as represented by the drawings Figs. 1 and 2, to occur to repeat that as hereinbefore described and shown by the drawings. This rheostat finger can be provided with any suitable snapping device to throw it at the end of its travels to the extremity thereof in case it should lag.

Having described my invention, I claim—

1. In an electrical means for the purpose as described, a driving motor engaged with a pump through suitable mechanical means, so as to efficiently actuate such; having its fields permanently charged and its armature in circuit with a rheostat segment as described, and with the finger thereof, such finger being charged with the armature supply wire of the driving motor, and from the main supply wire, and engaged with the rheostat segment and with two other segments on the rheostat, arranged as shown and described; such segments being insulated from each other and the intermediate one being in circuit with the contact point (f'), and the inner segment with the contact point (g'), and such being conductors and engaged with the rheostat finger as described; a double contact piece (f^2) arranged as shown, in circuit with the fields of a motor to actuate the rheostat finger as described; a lever (c) as described being in circuit with the return wire of said motor, and acting as a means to supply and reverse the current through the armature of said motor in conjunction with the points (f^4) and (f^6); a double contact piece (f^4) arranged as shown, and in circuit with the under brush of said motor; the intermediate contact point (f^6) arranged as shown, and in circuit with the upper brush of said motor, and such with the armature and lower brush thereof; the lever (c') as described, such acting as a return circuit connector for the armature of the last mentioned motor, in conjunction with the points (f^4) and (f^6); the horizontal circuit connector and breaker (C') as described, such being suitably sustained by the levers (c) and (c') and engaging with such contacts as described; the lever (c') or the lever (c) being engaged with a suitable snapping device, or actuated by such for the purpose as described; the lever (c) being engaged with a suitable rod as described, and such being engaged with suitable levers for the purpose as described; and the lever of a suitable diaphragm being engaged with said levers, and the diaphragm being in communication with the pressure receptacle of a pump, and said pump with said diaphragm, substantially as set forth.

2. The combination with a hydraulic elevator system, its pump, and suitable machinery to actuate said pump in conjunction with an electric motor, of an electric motor being engaged by such with the pump, and so actuated by a pressure diaphragm engaged as described, three point snap switch, rheostat and governor motor as described; as to automatically keep a certain pressure in the pressure tank of said system, through the pressure in the pressure receptacle of the pump, substantially as described.

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