(No Model.) 2 Sheets—Sheet 1.

J. H. CLARK.

ELECTRIC ELEVATOR.

No. 477,100. Patented June 14, 1892.

Fig. 3.

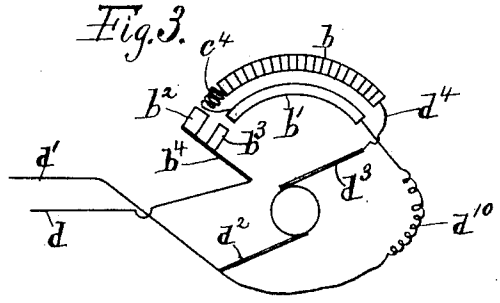

Fig. 1.

WITNESSES
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By Jas. H. Churchill
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(No Model.) 2 Sheets—Sheet 2.

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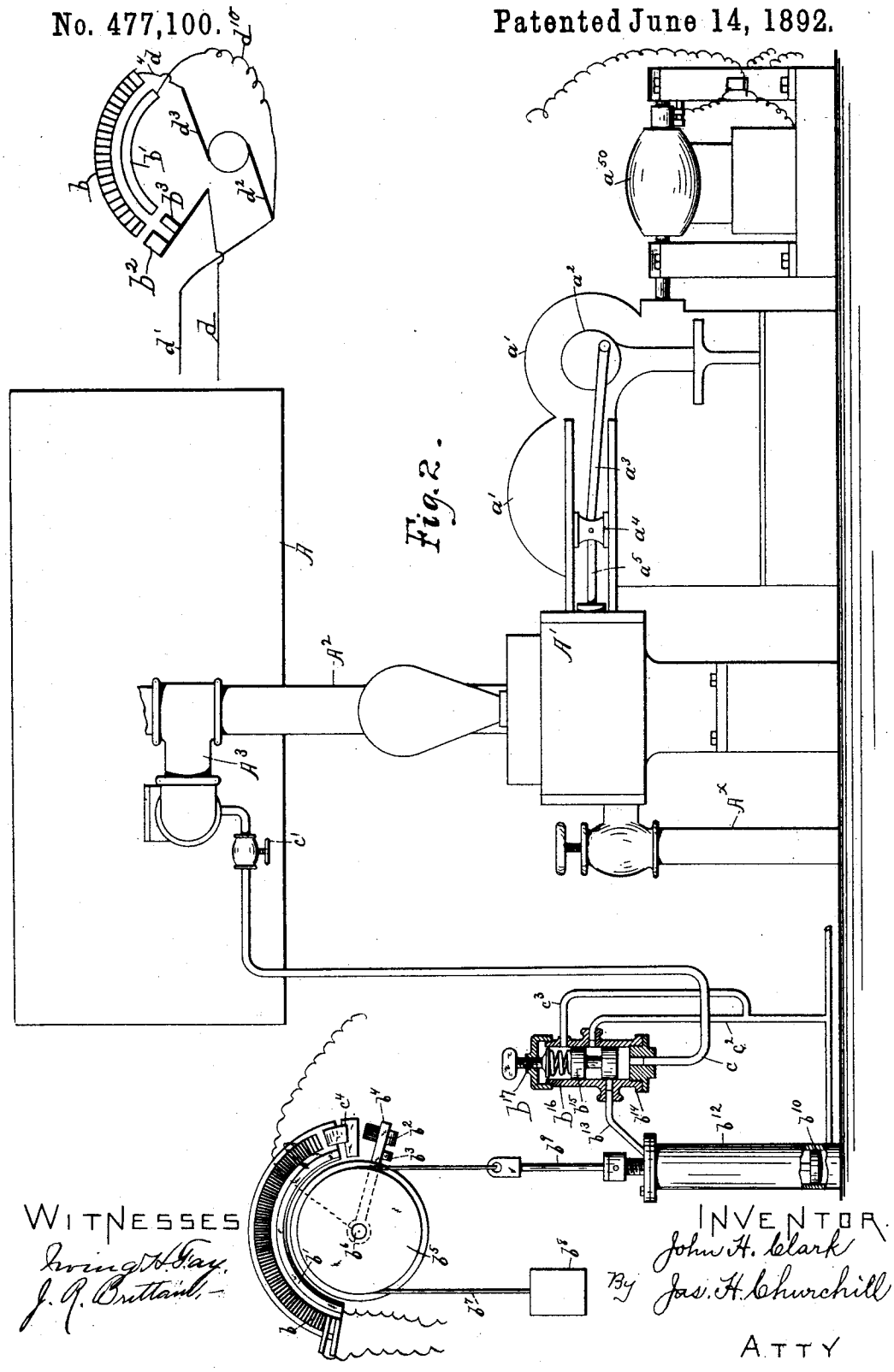

Fig. 2.

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UNITED STATES PATENT OFFICE.

JOHN H. CLARK, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE WHITTIER MACHINE COMPANY, OF SAME PLACE.

ELECTRIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 477,100, dated June 14, 1892.

Application filed June 5, 1891. Serial No. 395,272. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. CLARK, of Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Electric-Elevator Mechanism, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to elevator mechanism of that class in which the elevator is actuated by a fluid preferably contained in a tank under pressure.

Prior to my invention I am aware that the fluid employed to actuate the elevator has been forced into the tank or vessel by a pump driven by an electric motor.

My present invention has for its object to provide a novel mechanism, as will be described, whereby the electric motor and the pump operated by it may be rendered inoperative when the volume of fluid in the tank or vessel has reached a predetermined point or amount, and whereby they are maintained inoperative until the volume of fluid in the tank is reduced by actual use of the elevator.

Another feature of my invention consists in providing a novel construction of switch for use in connection with a shunt-wound electric motor, the said switch being operated by the mechanism actuated by the fluid in the tank.

My invention therefore consists in the combination of the following instrumentalities, viz: a tank or vessel to contain fluid to actuate the elevator, a pump to supply the fluid to the tank, an electric motor to operate said pump, a switch to control the circuit of the motor, a cylinder, a piston located therein operatively connected to the said switch, a valve-casing provided with a port connected to the said tank, a second port connected to the said cylinder, and an outlet-port for the fluid discharged from the cylinder, and a valve in said valve-casing to control said ports, whereby the fluid is confined in the cylinder when the fluid in the tank is at a predetermined point and the motor thereby maintained inoperative by the fluid confined in the cylinder, substantially as will be described.

Other features of my invention will be pointed out in the claims at the end of this specification.

Figure 1 represents a sufficient portion of a building provided with an elevator mechanism embodying my invention. Fig. 2 in elevation and section represents a sufficient portion of the elevator-operating mechanism shown in Fig. 1, on an enlarged scale; and Fig. 3, a diagram of circuits to more clearly show the operation of the switch.

B represents a building or structure provided with a hoistway B′, in which is located an elevator-car B^2, suspended by hoisting-ropes B^3, passed about pulleys or sheaves B^4 and about sheaves B^5 B^6 of the hoisting-engine B^7, located, as herein shown, in the basement B^8 of the building. The hoisting-engine B^7 is supplied with fluid contained in a tank or vessel A.

The tank or vessel A is preferably made air-tight to contain the fluid in it under pressure. The fluid is supplied to the tank A by a pump A′ of any usual or well-known construction, it having its outlet-pipe A^2 connected, as herein shown, by a branch pipe A^3 to the said tank, the inlet-pipe $A^\times$ of the said pump being connected to the source of supply. The pump A′ is driven by an electric motor a^{50}, which may be of any usual or well-known type of motor; but I prefer to employ what is known as a "shunt-wound motor."

The pump A′, as herein represented, is driven by worm-gears, (not shown, but which are inclosed within a case a',) the shaft of one of the gears having mounted on it crank wheels or disks a^2, only one of which is shown, joined by connecting-rods a^3 to cross-heads a^4, secured to the piston-rods a^5 of the pump. The worm-gears referred to are on a shaft secured to or forming part of the armature-shaft of the motor and driven by worms not herein shown, but which may be substantially such as shown and described in United States Patent No. 442,344, dated December 9, 1890.

The current to the electric motor a^{50} is controlled by a switch preferably of the form herein shown, it consisting of a resistance b, arranged in the arc of a circle, and a conducting-strip b', with which co-operate two contact-brushes b^2 b^3 on an arm b^4, herein repre-

sented as fastened to a shaft b^6, having mounted upon it a pulley b^5, the resistance b and conducting strip or section b' constituting one form of stationary member of switch and the arm b^4 and contact-brushes b^2 b^3 constituting one form of movable member of said switch. The pulley b^5, as herein shown, has passed about it a rope or other flexible connection b^7, having at one end a suitable weight b^8 and having its other end connected to the piston-rod b^9 of a piston b^{10}, located within a cylinder b^{12}, connected by a pipe or port b^{13} to a valve casing or cylinder b^{14}, preferably containing a piston-valve b^{15}, which is moved in one direction by the volume of fluid in the tank A and in the other direction, as herein shown, by a spring b^{16}, located within the valve-casing and acted upon by an adjustable rod b^{17}, extended through the end of the valve-casing and by means of which the pressure upon the valve to be overcome by the pressure of fluid upon the said valve may be regulated. The valve-casing b^{14}, as herein shown, has its lower end or bottom connected by the pipe c to the inlet-pipe A^3 for the tank, and, if desired, the pipe c may be provided, as shown, with a cock or valve c'. The valve casing or fitting b^{14} is provided with an outlet-pipe c^2 and preferably with an overflow-pipe c^3, joined to the said outlet-pipe. The switch herein shown is provided with a supplemental coil c^4, arranged at the end of the resistance b, so that the current will flow through the coil substantially at right angles to the arc, which may be formed when the contact-brush or arm b^3 leaves the resistance b, and whereby the said arc may be broken or reduced to a minimum. The circuit of the electric motor is controlled by the position of the movable member or arm b^4 of the switch, the said movable arm or member being brought in contact with its co-operating stationary member or members when the volume of fluid in the tank A has fallen below a predetermined point or amount, and at such time current is supplied to the electric motor and the pump is put in operation to renew the volume of fluid in the tank. When the volume of fluid in the tank has reached the predetermined or desired point, the back-pressure from the tank acts through the pipe c upon the valve b^{15} and raises the said valve so as to connect the pipe b^{13} with the valve-casing b^{14}, thus permitting the fluid from the tank to flow into the cylinder b^{12} and force the piston b^{14} in a direction to move the arm or movable member b^4 of the switch out of contact with the stationary member or members, and thus break the circuit of the electric motor and stop the rotation of its armature. The outlet for the fluid in the tank A and for the fluid in the cylinder b^{12} is closed, while the volume of fluid in the tank remains at the predetermined point, and the said volume of fluid is maintained at the predetermined point until it is reduced by the starting of the elevator. When the elevator is put in operation, the volume of fluid in the tank falls below the predetermined point, and the pressure acting upon the valve in the casing b^{14} is reduced, and the counterbalancing-pressure of the spring, or it may be a weight, predominates and forces the valve into its normal position, thereby cutting off communication between pipe c and pipe b^{13} and establishing communication between the pipe b^{13} and the pipe c^2, and at such time the weight b^8 acts upon the pulley b^5 and moves the piston b^{10} in its cylinder b^{12} so as to force the fluid in the cylinder out through the pipe b^{13}, the valve b^{15}, and into the pipe c^2, from whence it may be permitted to run to waste; or the pipe c^2 may be connected to the inlet-pipe for the pump.

I prefer to employ a switch constructed substantially as herein shown when the electric motor used is a shunt-wound motor, for with this form of switch the resistance b may be interposed in the armature-circuit when the current is first supplied to the motor, while at the same time a direct path for the current is afforded through the field-coils of the motor, which being of less resistance than the armature-circuit at the beginning of the rotation of the armature substantially all the current will pass through the field-coils of the motor and substantially little current will pass through the armature, thus preventing the armature from being burned out by an excessive current when the motor is first started. This may be readily comprehended by referring to Fig. 2, wherein the manner of connecting the motor in circuit is represented in diagram.

Referring to Fig. 2, it will be seen that one line-wire d is connected to the movable arm or member of the switch, the other line d' to one commutator-brush d^2, and the other commutator-brush d^3 is joined by wire d^1 to the resistance, while one end of the field-magnet coil d^{10} is connected to the conducting-strip and its other end to the brush d^2.

When the contact-brushes are first brought in contact with the resistance and with the conducting-strip, the circuit through the fields is of less resistance than the armature-circuit, and consequently the maximum part of the current will pass through the fields, thus avoiding danger of burning out of the armature by an excess of current; but as the resistance is gradually cut off the armature-circuit the amount of current passing through the armature is gradually increased until the resistance has been entirely cut out, and at such time a maximum current passes through the armature and the motor is working at its full capacity.

I do not desire to limit my invention to the particular construction shown, as any desired form of weight to move the valve b^{15} in a direction opposite to that in which it is moved by the fluid may be used.

With the apparatus herein shown it will be noticed that the motor remains inoperative as long as the fluid is confined in the cylin-

der, and the fluid remains confined in the cylinder as long as the volume of fluid in the tank remains at the predetermined point, and inasmuch as the volume of fluid is only diminished by actual use of the elevator the electric motor is employed only to replace the fluid used in the elevator-service, and consequently the electrical part of the apparatus is run at a minimum expense.

I claim—

1. In a hydraulic-elevator system, the combination of the following instrumentalities, viz: an elevator, a tank or vessel to contain fluid to actuate the elevator, a pump to supply the fluid to the tank, an electric motor to operate said pump, a switch to control the circuit of the motor, a cylinder, a piston located therein and operatively connected to the said switch, a valve-casing provided with a port connected to the said tank, a second port connected to the said cylinder, and an outlet-port for the fluid discharged from the cylinder, and a valve in said valve-casing to control said ports, whereby the fluid is confined in the cylinder when the fluid in the tank is at a predetermined point, and the motor thereby maintained inoperative, substantially as described.

2. In a hydraulic system, the combination of the following instrumentalities, viz: an elevator, a tank or vessel to contain fluid to actuate the elevator, a pump to supply the fluid to the tank, a shunt-wound electric motor to operate said pump, a switch comprising a resistance included in the armature-circuit of the motor, a conducting strip or section included in circuit with the field-coils of the motor, a supplemental coil c^4, connected to the resistance and to the conducting-strip, a movable member of the said switch connected to the line-circuit, and mechanism, substantially as described, actuated by the volume of fluid in the tank to operate the said movable member of the switch, substantially as specified.

3. In a hydraulic-elevator system, the combination of the following instrumentalities, viz: an elevator, a tank or vessel to contain fluid to actuate the elevator, a pump to supply the fluid to the tank, an electric motor, and intermediate gearing to connect the pump with the armature-shaft of the said motor, a switch to control the circuit of the motor, a cylinder, a piston located therein and operatively connected to said switch, a valve-casing provided with a port connected to the said tank, a second port connected to the said cylinder, and an outlet-port for the fluid discharged from the cylinder, and a valve in said valve-casing to control said ports, whereby the fluid is confined in the cylinder when the fluid in the tank is at a predetermined point, and the motor thereby maintained inoperative by the fluid confined in the cylinder, substantially as described.

4. In a hydraulic-elevator system, the combination of the following instrumentalities, viz: a tank or vessel to contain fluid to actuate the elevator, a pump to supply the fluid to the tank, a shunt-wound electric motor to operate said pump, a switch comprising a resistance included in the armature-circuit of the motor, a conducting-strip included in circuit with the field-coils of the motor, and a movable member connected to the line-circuit, a pulley to which said movable member is secured to move therewith, a cylinder, a piston therein, a weight, a connection joined to the said piston and to the said weight, a valve to control the movement of the said piston, a valve-casing connected to the tank, and means to act on said valve in opposition to the fluid, substantially as described.

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

JOHN H. CLARK.

Witnesses:
JAS. H. CHURCHILL,
L. A. WASHBURNE.