No. 632,665. Patented Sept. 5, 1899.

W. H. H. WHITING.

ELECTRIC FIRE ENGINE.

(Application filed Jan. 14, 1899.)

(No Model.) 3 Sheets—Sheet 1.

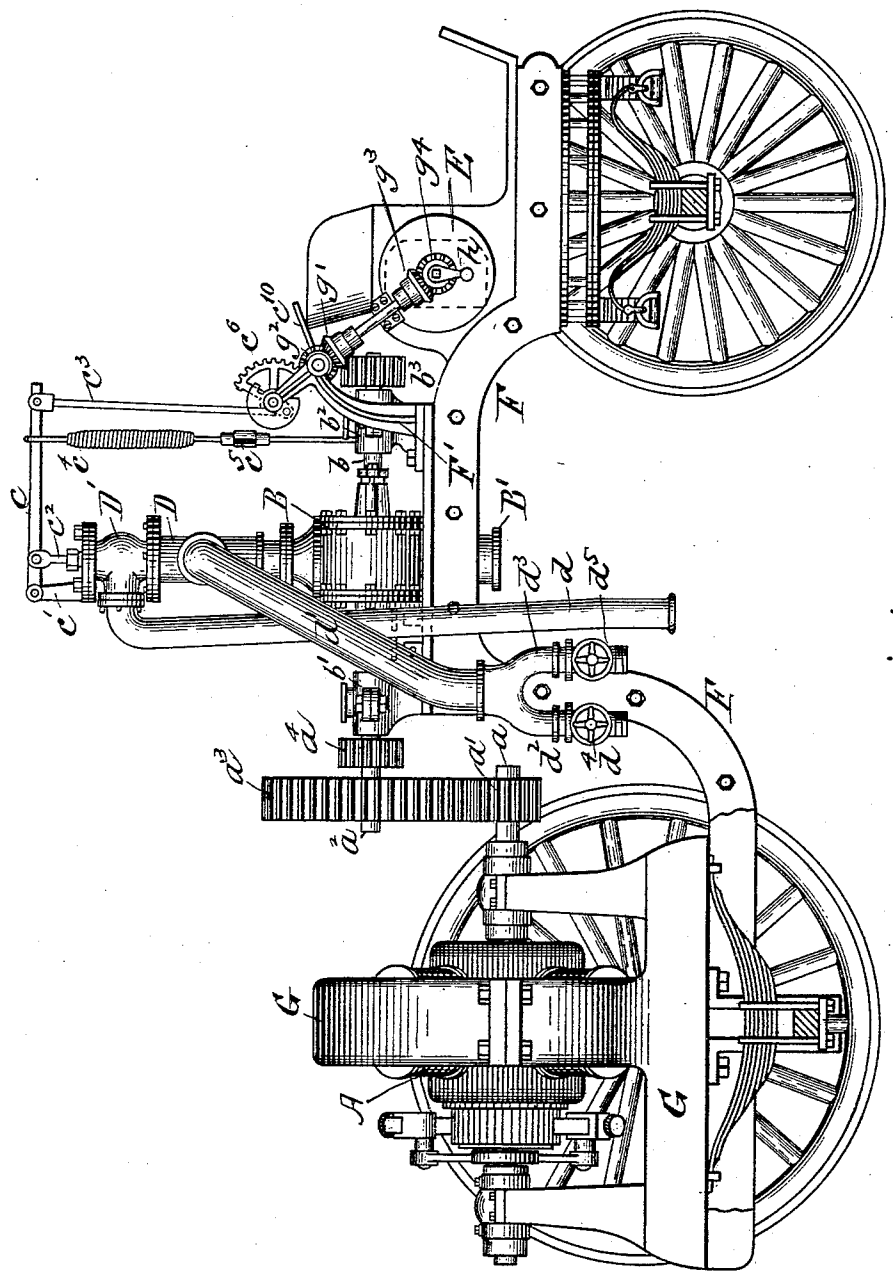


Fig. 1.

WITNESSES

Mary E. Holmes

INVENTOR

William H. H. Whiting.
by Bowdoin S. Parker
his Atty

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 632,665. Patented Sept. 5, 1899.

W. H. H. WHITING.

ELECTRIC FIRE ENGINE.

(Application filed Jan. 14, 1899.)

(No Model.) 3 Sheets—Sheet 2.

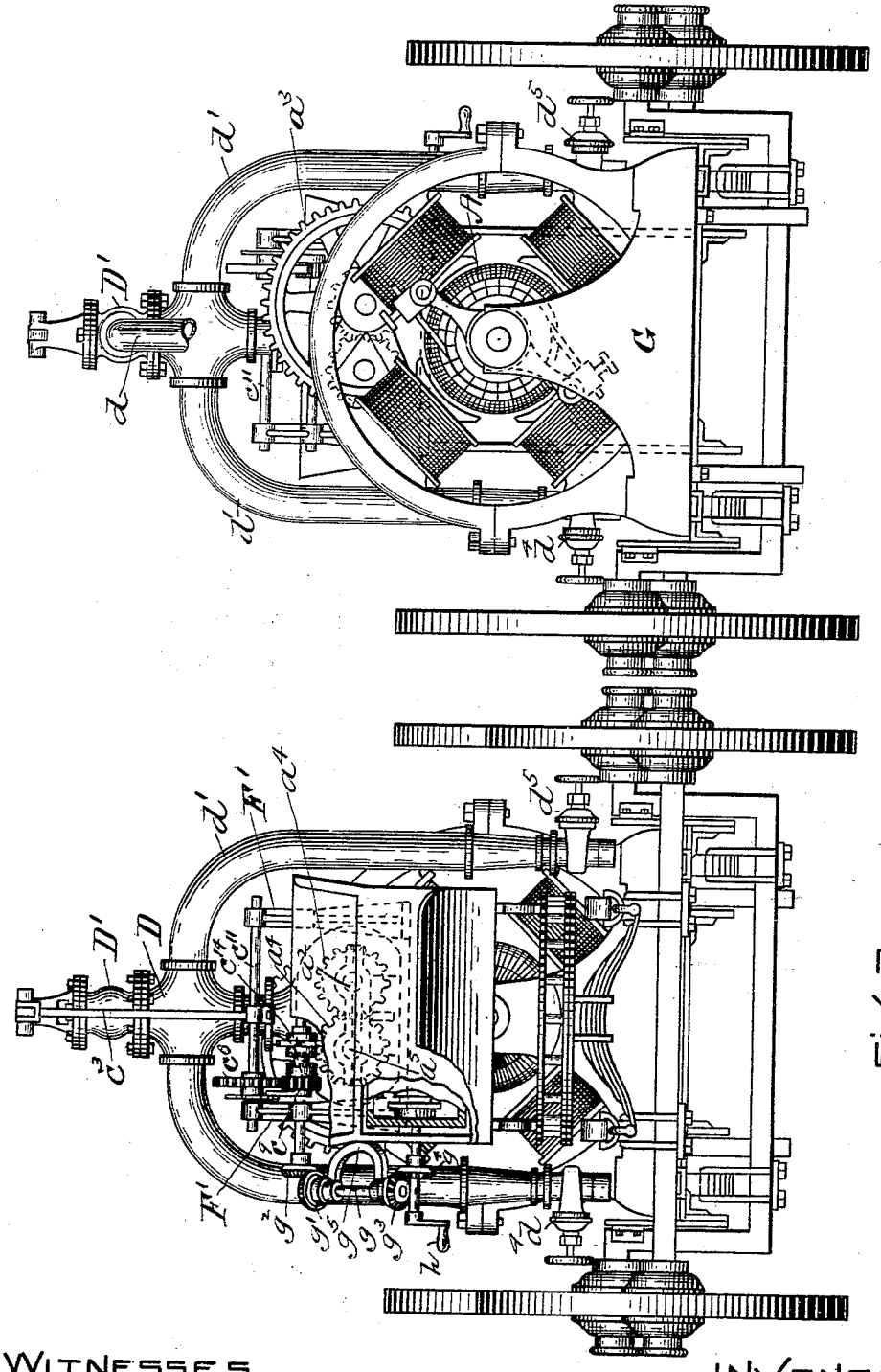


Fig. 1.

Fig. 2.

WITNESSES

Mary E. Holmes

Thos. E. Hall

INVENTOR

William H. H. Whiting.

by Bowdoin S. Parker his Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 632,665. Patented Sept. 5, 1899.

W. H. H. WHITING.

ELECTRIC FIRE ENGINE.

(Application filed Jan. 14, 1899.)

(No Model.) 3 Sheets—Sheet 3.

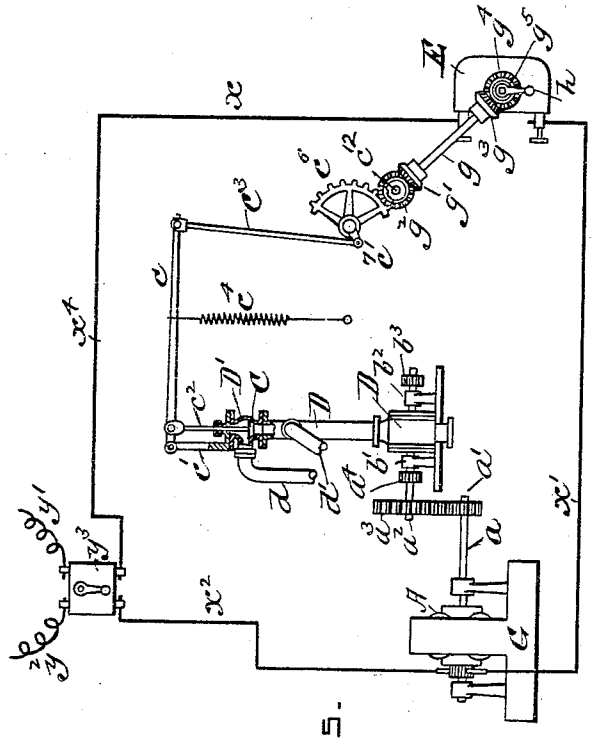


Fig. 5.

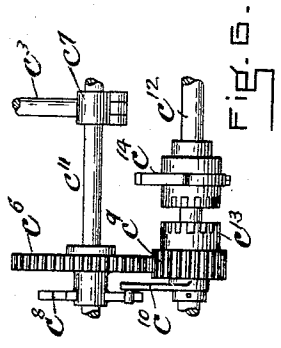


Fig. 6.

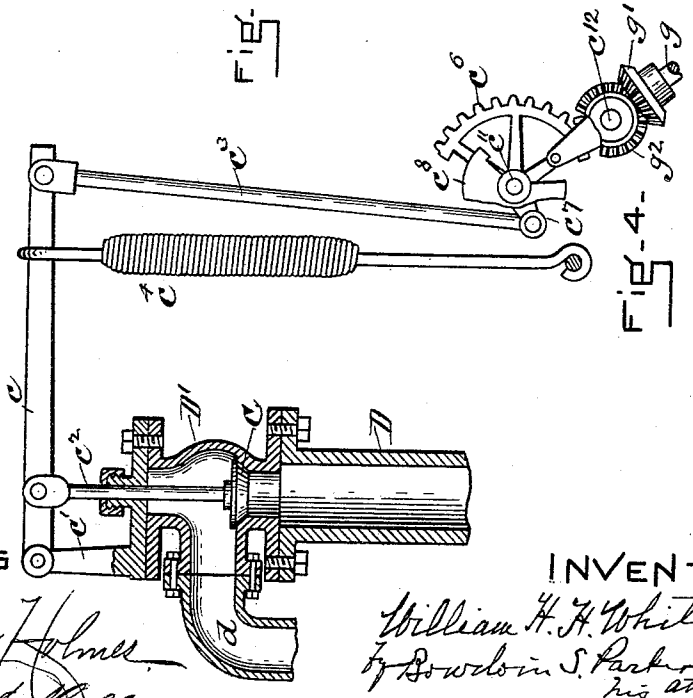


Fig. 4.

WITNESSES

Mary E. Holmes

INVENTOR

William H. H. Whiting.

by Bowdoin S. Parker his atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM H. H. WHITING, OF BEACHMONT, MASSACHUSETTS.

ELECTRIC FIRE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 632,665, dated September 5, 1899.

Application filed January 14, 1899. Serial No. 702,144. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. H. WHITING, of Beachmont, town of Revere, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electric Fire-Engines, of which the following is a specification.

My present invention relates to portable fire-engines used for the extinguishment of fires in cities and towns. The special class of these machines covered by my present invention has for power electricity and may properly be denominated an "electric fire-engine." The principal points are the special combination of motor, a rotary force-pump, controller and safety-valve, and automatic stop-motion, with other parts, which will be understood by the description hereinafter given.

In the drawings like letters of reference indicate corresponding parts.

Figure 1 is a side elevation of the organized machine. Fig. 2 is a front elevation with a part of the seat cut away to show connections of a portion of the stop-motion device, also in dotted lines the pump and double gears that actuate it. Fig. 3 is a rear end elevation of the machine. Fig. 4 is a detail of the relief or safety valve and its connections with the stop-motion for controlling the electric current. Fig. 5 is a detail of the principal parts, illustrating the method of communicating the electricity to the controller and to the motor. Fig. 6 is a detail of the gears and clutch through which the machine is automatically controlled.

F represents the frame of the machine, which rests on springs and wheels in the usual manner of the ordinary steam fire-engine. The only change in the frame is to adapt it to the peculiarities of the new style of machines. The electric motor A rests in the frame G, which is supported on the rear truck and wheels. Between the forward and rear wheels is placed the rotary fire-pump B on the frame F. The pump-arbors b are journaled in the boxes b' b^2. The pump has double arbors and is driven by the gears a^4. (Shown by the dotted lines in Fig. 2.) The induction-pipe B' of the pump is shown in Fig. 1. The discharge-pipe is represented by D, from which lead two pipes, one on each side d', having two branches near the lower or outer ends, with valves, to which the fire-hose is attached. On the upper end of the discharge-pipe D is placed the valve-chest D', in which is placed the valve C, Figs. 4 and 5. To the valve-chest D' is secured the relief-pipe d. To the valve C is secured the valve-rod c^2, the upper end being secured to the bar c. The bar c is pivoted to the rod c', which is secured at its bottom end to the valve chest or box. At the opposite end of bar c the upright rod c^3 is riveted, and on the rod c is secured the spring-rod c^4, to which may be attached the tightener c^5 to take up the stretch of the spring or to make more resistance to the raising of the bar c. The lower end of rod c^3 is secured to the arm c^7, which is fastened to the shaft c^{11}, to which is attached the segmental gear-wheel c^6. Outside of the gear-wheel c^6 is placed the segmental stop c^8. Just below the arbor or shaft c^{11} is placed the shaft c^{12}. On this is keyed or splined the clutch member c^{14} and having a lateral motion on the shaft, so as to interlock with the clutch member c^{13}, the latter journaled loosely on shaft c^{12}. Connected with clutch member c^{13} is the gear-wheel c^9, meshing with the segmental gear-wheel c^6. The lever c^{10} is secured to the hub of clutch c^{13}, so that when the gear c^9 has been nearly revolved the movement will be arrested by the upper end of the lever c^{10} striking the segmental stop c^8. On the end of the shaft c^{12} is placed the bevel-gear g^2, which meshes in bevel-gear g' on the end of shaft g. On the lower end of said shaft g is placed the bevel-gear g^3, which meshes in bevel-gear g^4, the latter secured to the controller-shaft. The shaft g is supported and journaled in the arm or bracket g^5. (Shown in Fig. 2.) The shafts c^{11} and c^{12} are held and journaled in arm or bracket F', which is secured to the main frame of the machine, as shown in Figs. 1 and 2. A removable crank is adapted to fit and be used on the end of the controller-shaft. Said crank is represented by h in Fig. 2.

The pump is actuated by means of the electric motor A, the power being communicated by the shaft a, pinion a', gear-wheel a^3, and shaft a^2, to which is attached the gear-wheel a^4, which meshes with a corresponding one on the shaft that works parallel to the first

in operating the pump. The ends of the two gears a^4 are shown in Fig. 2, where the seat is broken away, in dotted lines. The electricity is taken from any convenient source and is carried by the wire x to the controller, thence to the motor by the wire x', and thence away by the wire x^2. These wires may be placed in any convenient manner and arranged according to circumstances as to source and use of the electricity. A cut-off or switch may be placed in the box, as indicated by y^8, Fig. 5. In this machine I make use of an ordinary powerful electric motor, which may be of any convenient form sufficient to furnish the necessary power to the pump. The pump I employ is the ordinary double-acting rotary pump, such as is known upon the market as the "Holyoke Machine Company's Pump," though I do not restrict myself to this particular make.

In order to use this class of pump for the purposes of a portable fire engine or machine, it is necessary to combine with it some efficient device for relieving the great pressure on the pump and parts as well as the hose that may be attached to the machine in use, and as the pump works positively—that is, does not work against an air-cushion or air-chamber, as in most of the power-pumps in use for general purposes; but the action of the pump in forcing the water therefrom is direct force applied, and therefore if for any reason the pressure of the water were to be increased quickly, as by the shutting off of several lines of hose at the same time, unless the pump was stopped or some suitable relief was afforded immediately there would be great danger of serious accident. To overcome this liability, I provide two devices. These may act independently or together.

The devices arranged for relief consist of, first, the chamber D' and the interior valve C, working against a weight or pressure applied in any convenient manner through the valve-stem c^2. When this valve is raised, the water will be forced into and through the relief-pipe d, which flow will continue as long as the pressure upward on the valve is sufficient to overcome the weight holding down the same. In slight increases of pressure this mode may be all that is required; but when a greater stress is put upon the parts almost instant relief must be had or damage will result.

My second device for the relief of the pump and hose consists of the following parts in connection with the valve C and its stem c^2: To the bar or lever c I secure the valve-stem c^2, and securing one end of the lever c to piece c' and attaching the rod c^3 to the other end I connect the lower end of the rod c^3 to the crank c^7, which is secured to the shaft c^{11}. From shaft c^{11} power is communicated, through gear-segment c^6, gear c^9, clutch-members c^{13} c^{14}, shaft c^{12}, bevel-gears g' g^2 g^3 g^4, and shaft g, to the controller-shaft g^5. The lever c is held down to the required pressure by the spring-rod c^4, the lower end of said rod c^4 being suitably secured to the frame or other part of the machine. A weight without the spring can be used, if preferred, or any other method for securing the requisite pressure on the valve C.

The several relations of the parts of the devices and their combination will be fully understood by the explanation of the operation of the machine.

The power or electricity is connected from any convenient wire, as a trolley-wire or the feed-wire of electric street-lights, or preferably the electric wires may be carried to the vicinity of each hydrant in the city or town, and suitable devices well known to the art may be employed for making the connections with the electric fire-engine. Upon the wires being connected the power will flow to the controller E through the wire x, the clutch part c^{14} will be thrown out, and the operator will turn on the power by turning the hand-lever h, Fig. 2, and the power will pass to the motor A by the wire x'. The motor being started will turn the shaft a, which will transmit power, through the gears, &c., to the pump, revolving the double actions of the pump and operating it in the same way as when other power is applied. The water will be taken in through the induction-pipe B' and discharged through the pipes d', and thence through the hose in the usual manner. Now when the pump has attained the requisite speed the clutch part c^{13} is moved on the shaft c^{12} till it contacts with the clutch part c^{13}. Now when the pressure is increased by the shutting off of any part of the water by the closing of one or more lines of hose, so as to overcome the weight or spring resistance applied to the lever c, the valve C will be lifted and the surplus water, if not too much, will flow off through the relief-pipe d. If, however, as is most probable, the relief discharge-pipe is insufficient to give the necessary relief quickly enough, then the raising of the lever c operates the segmental gear-wheel c^6, which turns the connecting parts and closes, partly or wholly, the electric connection within the controller. If the pressure is very great, the suddenly raising of the lever c will thus instantly shut off the power and the motor will stop. If the relief required is comparatively slight, the speed of the motor will be nicely regulated, as desired. The closing of the valve C, partially or wholly, will of course put on the power as well as take it off. Thus the regulating and safety device described will nicely regulate and control the pressure of the water in the machine and in the hose, and it will fully protect all parts even if all the hose were suddenly closed at the same time. By disconnecting the clutch mechanism c^{13} and c^{14} the machine may be regulated and controlled by the hand of the operator with the crank h.

That the controller-shaft be turned with exactness and not too much, I provide the lever c^{10} and the segmental stop c^8. It will be seen

that when the gear-wheel c^9 has been turned nearly around the lever c^{10} will strike the periphery of the segmental stop c^8, and thus the exact distance the shaft g^5 of the controller E will move will be regulated with exactness. This is a valuable feature of the invention as well as the whole device for regulating the pressure and the power to be applied to the motor.

I am not aware that this class of pump has ever been used as a part of a portable fire-machine. This has resulted from the facts that it requires a very great power to operate and it is impracticable to carry the necessary weight of steam boiler and engine sufficient to furnish proper power. I overcome these difficulties by the use of the electric motor and the several appliances for regulating and controlling the same.

My electric fire-machine has very many advantages over the ordinary steam fire-engines in common use, and among these may be mentioned simplicity; an increase of efficiency, estimated from thirty to forty per cent.; reduction in weight over steam fire-engines of from twenty to thirty per cent.; no expensive fuel required; it requires no skilled engineer to operate it; it is available in every city or town where there is an electric plant or electric power; the power can be quickly attached to the machine and at its full force; there is little or no vibration in operation; it has no high-pressure boiler to explode, and its perfect regulation prevents a large loss in the usual bursting of fire-hose.

I do not claim any novelty in the motor, controller, or pump as such, but I do claim their combination into an organized machine, with the devices and adaptations for the successful working of a practicable working electric fire-engine, substantially as hereinbefore described.

I do not confine myself to the precise form of parts herein shown, as these may be modified without departing from the spirit of my invention.

The invention has been described with reference to its uses as a portable fire engine or machine; but it is obvious that the automatic device herein explained and shown for regulating the electric power communicated to the motor, corresponding with the pressure of the water in the discharge-pipes, is equally applicable to an electric fire-machine of this general class not portable.

In case this device were used in connection with stationary electric motor and rotary pump for fire purposes the motor and pump would be secured to a base or foundation, the power being communicated from the motor to the pump substantially as shown herein, and the automatic devices for regulating the motor and affording relief to the pipes and hose would be adapted to the changed position of parts; but this could be arranged by any good mechanic skilled in the art to which this appertains without departing from my invention. The arranging of a stationary electric machine for putting out fires would be much simpler than to adapt the parts herein described to the necessities of a portable machine.

In so far as my present invention applies to both the stationary and portable forms of electrically-driven rotary fire-pumps they are equally within the meaning and spirit of my invention. In my judgment the automatic device for regulating the power by the water-pressure is equally necessary in both forms, though it would probably oftener come into play in the portable machine. As the electric power acts so quickly and the pumps throws so great a quantity of water by direct force and without an air-chamber, it would be impracticable, if not dangerous, to attempt to use the motor and pump without suitable means of regulation.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The within-described portable electric fire engine or machine combining the following elements, viz; an electric motor suitably mounted on a movable truck; a rotary pump adapted to be driven by said motor; suitable induction, eduction and relief pipes; an electric controller; a regulating device consisting of the arbor c^{11}, gear-wheels c^6, and c^9, loose clutch member c^{13}, arbor c^{12}, having the clutch member c^{14}, movably secured thereto; a stop device consisting of the segmental stop c^8, and the stop-lever adapted to operate in connection therewith and also in connection with said regulating device; the said regulating device adapted to be operated by suitable means by a weighted valve operating against the water-pressure within the eduction-pipe of the machine, and with suitable means for transmitting the power conveyed to said arbor c^{12}, to the controller-shaft g^5, substantially as set forth.

2. The within-described machine for extinguishing fires, consisting of the combination of a suitable electric motor; a direct-action rotary pump, arranged to discharge water directly through the eduction-pipes without the aid of any air-chamber or air-cushion connected with said pump; an electric controller adapted to regulate the electric power communicated to the said motor; and an automatic regulating device for operating the said controller, consisting of a weighted valve acting against the water-pressure within the eduction-pipes, means for communicating the valve movement to the loose clutch member c^{13}, and from thence through the clutch member c^{14}, to the arbor of said controller, substantially as set forth.

3. An organized, portable, electric fire engine or machine, consisting, substantially, of the electric motor A, suitably secured to the frame G, and said frame G being secured to the frame F, on movable trucks; the motor-arbor a, the pinion thereon a', the gear-wheel

a^3, the shafts a^2, and a^5, gears a^4, and b^3, rotary pump B, having suitable induction and eduction pipes, for the introduction and discharge of the water, the valve-chest D′, and waste or relief pipe d, the valve C, valve-stem c^2, pivoted at its upper end to the bar or lever c, said lever secured or fulcrumed at one end and having the rod c^3, pivoted at the other, the spring rod or weight c^4, secured at one end to the lever c, and at the other end to the machine; the arm c^7, arbors c^{11}, c^{12}, segmental gear-wheel c^6, secured to the arbor or shaft c^{11}, stop-segment c^8, secured to the arbor c^{11}, the clutch c^{13}, c^{14}, the member c^{13}, being loose on the arbor or shaft c^{12}, and the clutch member c^{14}, being keyed or movably secured to the arbor c^{12}, the gear-wheel c^9, stop-lever c^{10}, secured to the hub of the clutch; the bevel-gears g^2, g', g^3, g^4, shaft g, controller-shaft g^5, controller E, with suitable wires arranged to conduct the electricity from the source of supply to and from the controller and the motor, and all arranged and combined substantially as and for the purposes set forth.

4. The combination of an electric motor, a rotary pump and a controller; the controller adapted to regulate the electric power to be supplied to the said motor; the said motor adapted to operate the said pump by suitable gear-wheels and arbors or shafts; with the automatic regulating device consisting of a valve adapted to raise a weighted lever by the water-pressure within the eduction-pipe of the pump, the rod c^3, pivotally connected with the long arm of the said weighted lever, the crank c^7, arbor c^{11}, gear-wheel c^6, gear-wheel c^9, loose clutch member c^{13}, arbor c^{12}, having the clutch member c^{14}, movably secured thereto, and with suitable means for transmitting the power conveyed to the said arbor c^{12}, to the controller-shaft g^5, substantially as set forth.

5. In an organized machine for extinguishing fires, having the parts following; an electric motor; an electric controller; a direct-operating rotary pump; suitable induction, and eduction pipes; an automatic regulating device consisting of a valve-chest, having a relief-pipe connected therewith and a direct connection with the main eduction-pipe of the machine, a valve weighted against the water-pressure within the said eduction-pipe and adapted to move within said valve-chest and to thereby permit the water therein to escape through the said relief-pipe; and also adapted so that the movement of said valve shall automatically operate the shaft of the said controller through suitable mechanism connecting said valve with the loose clutch member c^{13}, and from thence to the said arbor by the clutch member c^{14}, secured to the arbor c^{12}, and also having the intermediate stop device consisting of the lever c^{10}, secured to the loose clutch c^{13}, and the segmental stop c^8, all combined substantially as and for the purposes set forth.

6. In a device for regulating the controller to an electric machine for extinguishing fires, in which a rotary pump is actuated by an electric motor, the combination of the gear-wheels c^6 and c^9, the clutch members c^{13} and c^{14}, in combination with the segmental stop c^8 and the stop-lever c^{10}, substantially as and for the purposes set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

WILLIAM H. H. WHITING.

Witnesses:
BOWDOIN S. PARKER,
MARY E. HOLMES.