No. 859,327. PATENTED JULY 9, 1907.

C. P. McMULLEN.

GOVERNOR FOR PUMPING ENGINES.

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Fig. 1.

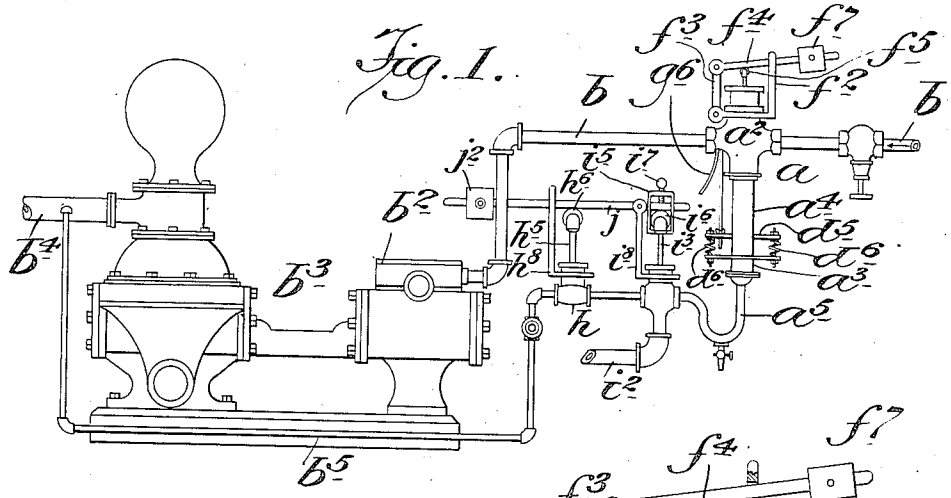
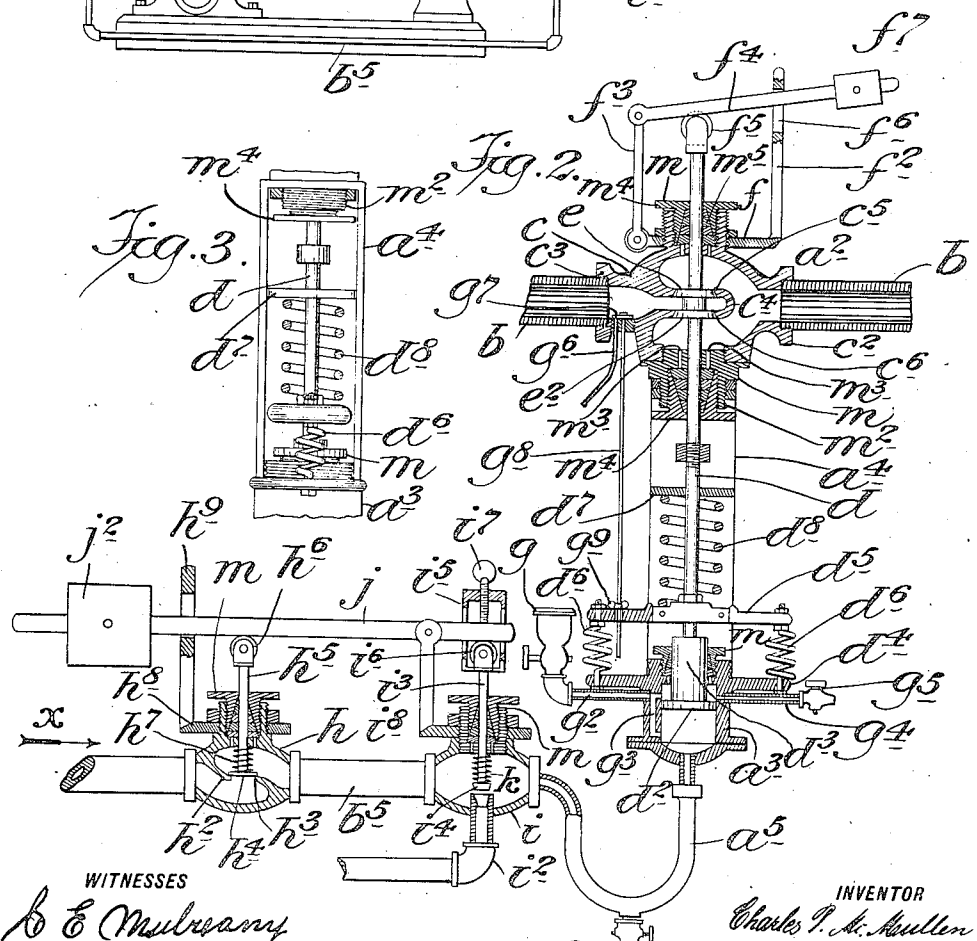


Fig. 3.

Fig. 2.



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GOVERNOR FOR PUMPING-ENGINES.

No. 859,327. Specification of Letters Patent. Patented July 9, 1907.

Application filed November 20, 1906. Serial No. 344,189.

To all whom it may concern:

Be it known that I, CHARLES P. McMULLEN, a citizen of the United States, and residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Governors for Pumping-Engines, of which the following is a specification, such as will enable those skilled in the art to which it appertains to make and use the same.

This invention relates to governors for pumping engines of the class described and claimed in United States Letters Patent No. 774,266 granted to me November 8, 1904 and reissued January 10, 1905, No. 12,302; and United States Letters Patent No. 810,666 granted to me January 23, 1906.

The governors described and claimed in the said patents consists of a device or apparatus adapted to be connected with the steam supply pipe and with the water delivery pipe of the pump and comprising a cylinder, a piston movable therein and adapted to control the supply of steam to the pump, said piston being operated in one direction to close a valve in the pipe which supplies steam to the pump by pressure in the water delivery pipe of the pump, and in the opposite direction by devices which hold said valve normally open; and means for supplying oil to the cylinder and especially to the end thereof with which the water delivery pipe of the pump is connected; and the object of this invention is to provide an auxiliary or supplemental pressure controller or automatic cut-off which is connected with the water delivery pipe of the pump, between said pump and the cylinder of the governor, and which operates as an automatic cut-off to cause the governor to be much more sensitive and to open and shut with much less fluctuation in the pressure required to operate it than is possible with the main governor constructed and operated as described and claimed in said patents; a further object being to provide an auxiliary or supplemental pressure controller or regulator for governors of the class described, whereby it will be possible to operate and open a discharge valve in the water delivery pipe and thus break the pressure on the main governor, whereby said oil is always retained either in a trap with which said cylinder is usually provided or in the end of the cylinder with which the water delivery pipe of the pump is connected; and with these and other objects in view the invention consists in the construction, combination and arrangement of parts hereinafter described and claimed.

The invention is fully disclosed in the following specification, of which the accompanying drawing forms a part, in which the separate parts of my improvement are designated by suitable reference characters in each of the views, and in which;—

Figure 1 is a side view of a pumping engine provided with my improved governor and automatic supplemental governor or pressure controller or regulator; Fig. 2 a sectional side view of the governor and supplemental controller or regulator shown in Fig. 1; and, Fig. 3 a sectional side view of the central portion of the governor at right angles to Fig. 2.

In controlling devices of the class described for steam pumps which are used for continuous runs, it becomes essential to provide an automatic device which will respond quickly to any variation in the pressure on the water end of water delivery pipe of the pump, and if used for the intermittent runs it is very essential to have all moving parts in the governor mechanism in good working order and to prevent corroding of the cylinder which forms a part of the governor and its connected parts; and for this purpose, I provide a governor a which is of the same general form, construction and operation as that described and claimed in an application for Letters Patent of the United States filed by me December 7, 1905, Serial No. 290,676, with the exception of the details of construction of the steam valve which forms part of the governor and other details pertaining to the packing of the cylinder and valve rod or rods or the parts through which said rod or rods pass.

The governor a is inserted into and connected with the steam pipe b which supplies steam to the steam chest b^2 of the pump b^3, and said pump is provided with the usual delivery pipe b^4 with which is connected a water pipe b^5 which connects with the governor as hereinafter described.

The governor a comprises a throttle valve device a^2, a hydraulic cylinder a^3 connected with the valve device a^2 by a link-shaped frame a^4, and the general construction and operation of said governor is substantially the same as that described and claimed in application for Letters Patent No. 290,676 hereinbefore referred to with the following exceptions. The valve device a^2 comprises a valve casing c having an inlet end c^2 and an outlet end c^3, and said valve casing is provided at its outlet end with an inwardly directed partition member c^4 which is U-shaped in vertical longitudinal section and composed of top and bottom plates provided respectively with ports or passages c^5 and c^6, and passing vertically through the governor is a valve rod d which is connected with a piston d^2 in the hydraulic cylinder a^3 and provided with an enlarged piston rod d^3 with which the rod d is connected. The hydraulic cylinder a^3 is provided at its opposite sides with laterally directed arms d^4, and mounted in the link-shaped frame a^4 is a vertically movable cross head d^5 the opposite ends of which are connected with the laterally directed arms d^4 by adjustable tension springs d^6, and the link-shaped frame a^4 is provided with a transverse partition d^7, in the form of construction shown, between which and the cross head d^5 is placed a spiral spring d^8.

The rod d passes vertically through the valve casing c and is provided with two valves e and e^2, and the up-

per valve e is adapted to close the port or passage c^5 in the valve casing c while the lower valve e^2 is adapted to close the port or passage c^6 in said valve casing. The ports or passages c^5 and c^6 are beveled downwardly and outwardly and the valves e and e^2 are correspondingly beveled, and the form and dimensions of the port or passages c^5 and c^6 and the valves e and e^2 may be regulated as desired.

Mounted on the top of the valve casing c is a frame comprising a transverse bottom member f provided at one side with an upright member f^2 and at the opposite sides with a pivoted link f^3 to the upper end of which is pivoted a lever f^4 which bears on a roller f^5 in the upper end of the rod d, and said arm passes through a vertically arranged slot f^6 in the member f^2 and is provided with an adjustable weight f^7; and the object of the lever f^4, the spring d^8 and the springs d^6 is to normally hold the valves e and e^2 open and to hold said valves in a balanced position, it being understood that the said valves are closed as shown in Fig. 2 by pressure of water in the hydraulic cylinder a^3.

The hydraulic cylinder a^3 is provided with an oil or other lubricant supply device g which connects with the top portion thereof by means of a pipe g^2, and said cylinder is provided with a by-pass g^3 which communicates with said pipe g^2 and with the cylinder at the top and bottom portions thereof, and the said cylinder is also provided at the top thereof with a vent pipe g^4 having a valve g^5 by which it may be opened or closed as desired.

The throttle valve casing c is provided in the bottom part of the outlet end thereof with a drain pipe g^6 which is closed by a valve g^7 located in said end of the valve casing, and connected with said valve g^7 is a vertically movable rod g^8 which passes through the cross head d^5 and is provided with a set nut g^9, and by means of this construction any vertical movement of the cross head d^5 will open the drain pipe g^6 and thus cause the discharge of any water of condensation in the discharge end of said valve casing c.

Connected with the bottom of the hydraulic cylinder a^3, in the form of construction shown, is a trap a^5 designed to contain at all times a body of oil or other lubricating material for the purpose of lubricating the cylinder a^3 and the piston a^2 placed therein, and the water pipe b^5 is connected with the water delivery pipe b^4 of the pump and also with one side or leg of the trap a^5.

My auxiliary or supplemental pressure controller and governor regulator which forms, in effect, an automatic cut-off, is connected with the pipe b^5 adjacent to the trap a^5 and involves the following construction: Two valve casings h and i are placed in the pipe b^5 at a predetermined distance apart, the valve casing i being adjacent to the trap a^5. The valve casing h is provided with a partition h^2 which ranges horizontally and longitudinally therein and is provided with a port or passage h^3 controlled by a valve h^4 provided with a valve stem h^5 which passes upwardly through said valve casing and is provided at its upper end with a roller h^6, and mounted on the valve stem h^5 between the valve h^4 and the top of the valve casing is a spring h^7 which normally holds said valve in a closed position as shown in Fig. 2.

The valve casing i is provided in the bottom thereof with a drain pipe i^2, and passing vertically through the top of said valve casing is a valve stem i^3 provided at its lower end and within the valve casing with a valve i^4 adapted to close the inlet of the drain pipe i^2 within the valve casing i, and said valve stem is provided at its upper end with a frame or yoke device i^5 in the bottom portion of which is mounted a roller i^6, and in the top portion of which is mounted a vertically arranged set screw i^7.

Connected with the top portion of the valve casing i is a horizontal support i^8 having an upright member i^9 to which is pivoted a lever j, the shorter arm of which passes through the yoke or frame device i^5 and is vertically movable therein and adapted to bear on the roller i^6 in the top of the valve stem i^3; and the object of the set screw i^7, the lower end of which bears on the shorter arm of the lever j, is to regulate the movement of said arm and to hold it in contact with the roller i^6, if desired. Connected with the top portion of the valve casing h is a horizontal support h^8 provided with an upright member h^9, and the longer arm of the lever i passes through a vertical slot in the upright member h^9 and is provided with an adjustable weight j^2.

In the operation of the governor a, any increase in the pressure of water in the pipe b^5 beyond the normal, or the pressure at which it is desired to operate the pump, raises the piston d^2, and in this operation the valves e and e^2 are closed and the supply of steam to the pump is cut-off. This operation, of course, reduces the pressure in the pipe b^5, and the lever f^4, the spring d^8, and the springs d^6 reopen the valves e and e^2, depressing the piston d^2, and the supply of steam to the pump is renewed.

The object of the automatic cut-off and auxiliary regulator or controller consisting of the valve devices h and i is to cause the governor to be much more sensitive and to open and shut with much less fluctuation in the pressure than would be possible with the governor operating alone; a further object being to break or release the pressure on the main governor instantly when necessary in the operation of said governor, by opening the valve i^4 and discharging the water in the pipe b^5 through the pipe i^2, said operation being automatic, and without losing or discharging the oil in the trap a^5 whereby said oil is always retained in position to lubricate the hydraulic cylinder a^3 and piston cylinder d^2.

It will be understood that under normal conditions, the water passes through the pipe b^5 in the direction of the arrow x Fig. 2, and the valve h^4 is normally opened and the valve i^4 normally closed when the pump and governor are in operation. The oil in the trap a^5 is thus forced up into the cylinder a^3, and if the pressure is increased beyond the normal, or the pressure at which the apparatus is set to work, the valves e and e^2 will be closed until a change of pressure takes place in the pump which results in a decrease of pressure on the piston d^2 and also on the bottom of the valve h^4, and when the pressure on the bottom of the valve h^4 is less than is necessary to raise the weighted lever j and the valve i^4, which is depressed by a spring k, the weighted lever j descends closing the valve h^4 and opening the valve i^4, thus discharging the water in the pipe b^5 through the pipe i^2 and decreasing the pressure in said pipe b^5, thus causing an instantaneous reverse movement of the pis-

ton d^2 and the reopening of the valves e and e^2 at which time the steam is again free to pass to the pump. The yoke or frame device i^5 with set screw i^7 is designed as a means for regulating the operation of the valve i^4 and to facilitate the operation of the lever j.

I have found by experiment that where the governor a is used alone, a drop of pressure between the time of closing off the steam throttle valve and bringing the pump to a full stop, and the time of opening the throttle valve to start the pump, is about twenty pounds, but with the use of my improved auxiliary cut-off or regulator this pressure has been reduced to between two and five pounds which is quite an object in the operation of hydraulic apparatus of this class.

The throttle valve casing c is provided both at the top and bottom with a packing box m of novel construction and through which the rod d passes, and the hydraulic cylinder a^3 is provided at the top thereof with a similar packing box as are also the valve casings h and i, and the packing box m at the bottom of the valve casing i, serves as means for connecting the yoke-shaped frame a^4 with said valve casing, and said packing box at the top of the valve casings h and i also serve as means for connecting the horizontal supports i^8 and h^8 with said valve casings. Each of the packing boxes m comprises a thimble-shaped base portion m^2 provided with ports or passages m^3 which communicate in the case of the valve casings c, h and i with the interior of said valve casings and in the case of the cylinder a^3 with the interior of said cylinder and gland members m^4 are employed in connection with the thimble-shaped base portions, the interior of said gland members being conical in shape; and placed in the packing boxes thus formed are separate layers m^5 of packing material which form a conical packing, and the pressure in the valve casings c, h and i and in the cylinder a^4 operating through the ports or passages m^3 serve to compress the packing m^5 and make the packing boxes more tight and secure. The packing boxes m, however, or the method of constructing the same is not claimed in this case but made the subject of a separate application of equal date herewith.

Although I have shown and described specific means for operating the valves h and i of the automatic auxiliary controller and cut-off, it will be apparent that various changes in and modifications of this construction may be made without departing from the spirit of my invention or sacrificing its advantages, and I reserve the right to make all such alterations therein as fairly come within the scope of my invention.

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

1. In a governor for steam pumps, a throttle valve device placed in the steam pipe, a hydraulic cylinder provided with a piston in operative connection with the valve of the throttle valve device, a pipe connecting the delivery end of the pump with the hydraulic cylinder by means of a supplemental water pipe, and an automatic pressure regulator and water discharge device connected with the supplemental water pipe adjacent to the hydraulic cylinder and comprising two valve casings having valves, the valve in the valve casing adjacent to the hydraulic cylinder being adapted to open and close a discharge pipe connected with said valve casing, and mechanical devices operating in connection with the pressure in the supplemental water pipe for automatically operating the valves in said casings.

2. A governor for steam pumps comprising a throttle valve device placed in the steam supply pipe of the pump and a hydraulic cylinder connected with the water delivery pipe of the pump by means of a supplemental water pipe, said hydraulic cylinder being provided with a piston having a rod which passes through and operates the valve of the throttle valve device, said piston being operated in one direction by water pressure in the supplemental water pipe, means for operating said piston in the other direction to open said throttle valve device and an automatic pressure regulator and water discharge device connected with the supplemental water pipe adjacent to the hydraulic cylinder, and comprising two valve casings having valves, the valve in the valve casing adjacent to the hydraulic cylinder being adapted to open and close a discharge pipe connected with said valve casing and means for automatically operating said valves, substantially as shown and described.

3. A governor for steam pumps, comprising a throttle valve device connected with the steam supply pipe of the pump and a hydraulic cylinder connected with the water delivery pipe of the pump by means of the supplemental water pipe, said hydraulic cylinder being provided with a piston operated in one direction by pressure in the cylinder to close the throttle valve, means for operating said piston in the other direction to open said throttle valve, a trap one leg of which is connected with the hydraulic cylinder and the other with the supplemental water pipe, and an automatic regulator connected with the supplemental water pipe adjacent to said trap.

4. A governor for steam pumps, comprising a throttle valve device connected with the steam supply pipe of the pump and a hydraulic cylinder connected with the water delivery pipe of the pump by means of the supplemental water pipe, said hydraulic cylinder being provided with a piston operated in one direction by pressure in the cylinder to close the throttle valve, means for operating said piston in the other direction to open said throttle valve, a trap one leg of which is connected with the hydraulic cylinder and the other with the supplemental water pipe, and an automatic regulator connected with the supplemental water pipe adjacent to said trap, said regulator being provided with means for discharging the water from said pipe.

5. A governor for steam pumps, comprising a throttle valve device placed in the steam supply pipe of the pump, and a hydraulic cylinder connected with the water delivery end of the pump by means of a supplemental water pipe, said hydraulic cylinder and said valve device being also rigidly connected in the same vertical line, said hydraulic cylinder being provided with a piston having a rod which passes through the valve device and operates the valve thereof, said piston being operated in one direction by a supplemental water pipe, and means for operating said piston in the other direction to open said throttle valve device, and an automatic pressure regulator and water discharge device connected with the supplemental water pipe adjacent to the hydraulic cylinder and comprising two valve casings having valves, the valve in the valve casing adjacent to the hydraulic cylinder being adapted to open and close a discharge pipe connected with said valve casing, and mechanical devices operating in connection with the pressure in the supplemental pipe for automatically operating the valves in said casings.

In testimony that I claim the foregoing as my invention I have signed my name in presence of the subscribing witnesses this 19th day of November 1906.

CHARLES P. McMULLEN.

Witnesses:
C. E. MULREANY,
PAUL BARTELS.