

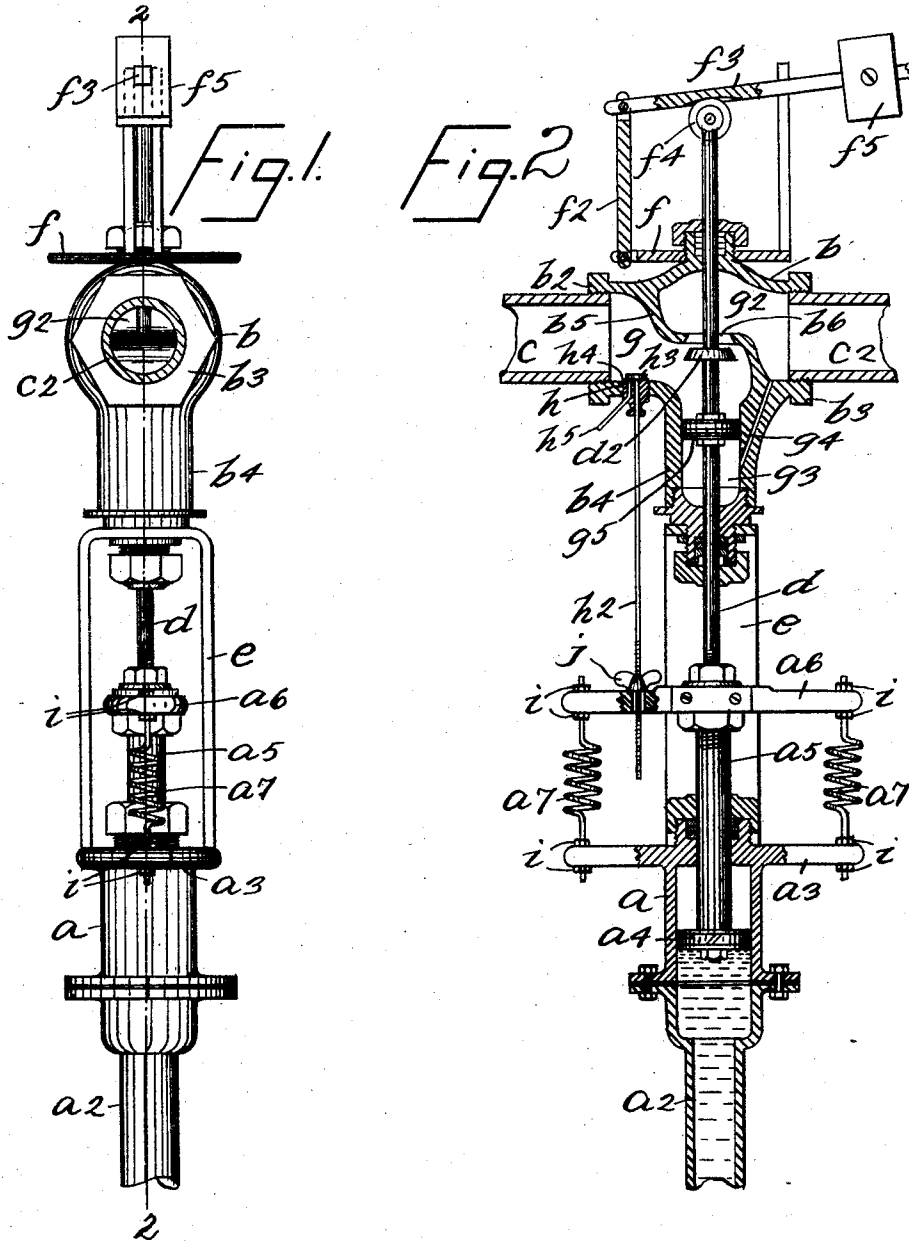
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C. P. McMULLEN.

PRESSURE REGULATOR FOR STEAM OPERATED APPARATUS.

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WITNESSES

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PRESSURE-REGULATOR FOR STEAM-OPERATED APPARATUS.

No. 859,407.

Specification of Letters Patent.

Patented July 9, 1907.

Application filed December 7, 1905. Serial No. 290,676.

To all whom it may concern:

Be it known that I, CHARLES P. McMULLEN, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Pressure-Regulators for Steam-Operated Apparatus, 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 of steam actuated pumps, and the object thereof is to provide an automatic governing mechanism which will control the admission of steam from the boiler to the steam pump by means of automatic variable cut-off devices.

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 part of a governor of a steam pump and showing my improved pressure regulating device; and Fig. 2 a partial section on the line 2—2 of Fig. 1.

In controlling devices for steam pumps which are used for continuous runs it becomes essential to provide an automatic cut-off device which will respond quickly to any variation in the pressure on the water end of the same, and if used for intermittent runs it is very essential to have all moving parts of the governing mechanism in good working order and to prevent corroding in any of the mechanical parts which enter into its construction. Also for the purpose of preventing destruction of the governor and other parts by means of water hammer induced by means of an accumulation of condensed water in the steam pipe leading to the governor, it is essential to provide in devices of this kind an automatic condensed water drain off mechanism which will keep the live steam pipe clear, of condensed water during the time that the governor has entirely shut off any steam supply thereto. For this purpose I employ my governor which is inserted into the steam supply pipe leading to the steam chest of a pumping engine. This governor has a vertically movable throttle valve d^2 which will permit the passage of steam from the boiler by means of the pipe c to the steam chest when in the position shown in Fig. 2 of the drawing and will cut off such supply when the valve d^2 becomes seated by a vertical upward motion imparted thereto by means of a valve rod d which latter extends downwardly into a separate piston cylinder a by means of the piston rod a^4 and is provided with a piston a^4 . The valve casing b is connected with the piston cylinder a by means of a link-shaped frame e , and the valve rod d also extends upwardly through the casing b and terminates

in a roller f^4 upon which the weighted lever f^3 with adjustable weight f^5 bears and thereby maintains under normal conditions an open position of the throttle valve d^2 .

The weighted lever f^3 with weight f^5 is pivoted to the vertical link f^2 which in turn is pivoted to the disk f screwed into the top of the valve casing b . The valve rod d is further provided with a cross head a^6 which is movable with the same, and interposed between said cross head a^6 , and the extended lugs a^3 of the piston cylinder a are located two tensional springs a^7 , their tension being regulated by means of the set nuts i . These tension springs a^7 as well as the weighted lever f^3 are designed to counter-act any upward pressure which might be brought to bear against the piston a^4 of the cylinder a , the object being to regulate by means of the weight and springs a counter-force against the piston a^4 which may be communicated thereto by means of the pressure pipe a^2 which connects with the delivery pipe of the steam pump.

A lubricating device with oil trap, not shown in the drawing, is usually interposed in the pressure pipe a^2 which serves to lubricate the cylinder a and piston a^4 and insures free movement to the latter and prevents corroding and clogging of these parts, such a device being described and claimed in Reissue U. S. Letters Patent No. 12,302, granted to me on the 10th day of January 1905.

The steam throttle valve d^2 has an ancillary piston g^5 attached to the valve rod d and of a diameter equal to that of the valve d^2 and its valve seat b^6 . This piston g^5 reciprocates within its cylinder b^4 forming part of the valve casing b and steam is supplied to the bottom side thereof by means of a duct g^4 after the steam taken from the boiler through the pipe c has passed through the throttle b^6 , thereby insuring a perfect balanced position of the latter, the extent of the throttle opening being subject to the tension of the springs a^7 and to the length of the weighted lever f^3 , or to a combination of both of these devices, it being understood that the counter-acting forces of these devices against any predetermined back pressure is regulated in keeping the throttle open for the admission of a certain predetermined quantity of steam. It is obvious that when such pressure exceeds the counter-force of the springs then the piston a^4 will be forced forwardly and the throttle valve d^2 will be closed and the pump ceases to operate until the back pressure communicated to the piston a^4 by means of the pressure pipe a^2 falls below this point whereupon the steam valve d^2 will automatically be opened and steam will again be admitted for the resumption of the work.

The steam flows through the valve b^6 in the direction from pipe c to pipe c^2 and when the valve d^2 is closed the ancillary piston g^5 is not supplied with steam on its

under side through the duct g^4 thereby facilitating the releasing action of the springs a^7 and weighted lever f^3 for opening the valve d^2 .

In order to prevent water hammer liable through the accumulation of condensed water in the admission steam pipe c between the boiler and valve d^2 , a drain pipe h^5 is attached at h^4 to the body part of the valve casing b and is normally closed by the disk valve h^3 . A valve stem h^2 adjustably connected by means of thumb screw j to one of the lugs of the movable cross head a^6 opens the drain valve h^3 by the upward motion of the main valve rod d and drain valve rod h^2 and permits of the discharge of the accumulation of condensed water during the time of the closure of the throttle valve d^2 .

It will thus be seen that the compulsory lubrication of the cylinder a from the interposed lubricating device by means of the pressure pipe a^2 prevents all possibility of corrosion of these parts and that the variable cut-off governing action is effected reliably and efficiently by direct pressure action of the water end of any steam pump to which my governor has been applied, and whereby an accumulation of condensed water in the live steam pipe leading to the governor is effectively obviated.

I am aware that springs and weights actuated governing devices have hereinbefore been employed to obtain a variable cut-off of the steam supply, but by means of my device a greater effect is obtained by balancing the steam supply valve in placing the steam duct g^4 in such a manner so as to admit steam against the under side of the ancillary steam piston g^5 only after the valve d^2 has been opened. This becomes apparent in the event that when back pressure from the water end of the steam pump and directed against the water piston a^4 has closed the valve d^2 against its seat b^6 , in which position steam through the duct g^4 is cut off and the live steam from the boiler entering at c exerts its force equally against the under side of the valve d^2 and the upper side of the ancillary piston g^5 . As soon as the back pressure against the piston a^4 has been partially or totally relieved, the springs and weight forces overcome the direct pressure of the live steam, the valve d^2 opens by means of said springs and weights and steam now also enters again by means of the duct g^4 into the cylinder g^3 , thereby insuring a live steam pressure against both sides of the ancillary piston g^5 .

I am also aware that valves for condensed water drain pipes have heretofore been used, but such drains have always been operated at will in the nature of hand operated pet-cocks, but in my device I employ an automatically operated valve opened and closed by means of the governing device, made adjustable to this moving mechanism and operated automatically by the latter, thereby insuring at all times when the steam valve is closed an open position of the drain valve for the admission of condensed water in the live steam pipe and vice versa.

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

1. In an automatic variable cut-off governor for steam pumps adapted to be connected to the water end of a pump and to the steam supply pipe of the same, a hydraulic cylinder and piston with one end of which the water delivery

pipe is connected, a throttle valve for the steam supply pipe provided with an ancillary piston movable in a cylinder forming part of the steam valve casing, springs and weights for holding the steam and hydraulic piston in one position with the steam valve normally open, said piston being operated in one direction so as to close the steam valve by pressure in the water delivery pipe and in the opposite direction by springs and weights, and an automatically operated condensed water drain valve placed in the steam supply pipe whereby said drain valve is held normally open when the governor closes the steam supply pipe, substantially as shown and described.

2. In an automatic cut-off governor for steam pumps, the combination with the hydraulic cylinder and a steam valve casing provided on its lower side with a steam cylinder and having a steam valve and piston therein located in the same vertical plane, of a link-shaped frame connected to the top of the said hydraulic cylinder and to the bottom of the said steam cylinder, a hydraulic piston, a piston rod connected therewith, a rod serving as a piston rod and valve stem for the steam piston and steam valve connected with the rod of the hydraulic piston, said steam valve rod extending above the valve casing and a weight applied to the upper end of said rod to depress the valve, steam piston, and hydraulic piston, substantially as described.

3. In an automatic cut-off governor for steam pumps, the combination with the hydraulic cylinder, laterally extending projections on opposite sides of the same and a steam valve casing provided on its lower side with a steam cylinder and having therein a steam valve and piston located in the same vertical plane, of a link-shaped frame connecting the upper part of the hydraulic cylinder between said lateral projections and the said steam cylinder, a piston in the hydraulic cylinder and rods for said hydraulic and steam pistons and for said valve united to form one continuous piece, said rod having a cross head secured thereto between the two parts of the link-shaped frame, springs connecting said cross head and the lugs or projections of the hydraulic cylinder and a weight applied to said rod above the valve, substantially as described.

4. In an automatic variable cut-off governor for steam pumps adapted to be connected with the water end of a pump and with the steam supply pipe thereof, a hydraulic cylinder connected with the water delivery pipe of the pump and provided with a piston, a valve casing arranged over said cylinder and connected therewith and provided with oppositely arranged inlet and outlet ports, a steam pipe adapted to connect the inlet port with a steam supply, a steam pipe adapted to connect the outlet port with the pump, said valve casing being also provided with a horizontally ranging partition having a central port or passage and with a downwardly extending cylinder, the outlet end of the valve casing and the bottom of the downwardly extending cylinder being placed in communication by a duct or passage, a rod passing vertically through the valve casing and through the cylinder at the bottom thereof and connected with the piston in the hydraulic cylinder, said rod being also provided below the partition in the valve casing with a valve adapted to close the port or passage in said partition and below said valve with a piston movable in the cylinder at the bottom of said valve casing, and automatic devices in operative connection with said rod for holding the same in a depressed position and holding said valve open, said devices consisting of springs connected with the hydraulic cylinder or the support thereof and with said rod, and the inlet end of said valve casing being also provided with a drain port or passage and a device operated by the hydraulic piston and by said springs for opening and closing said port or passage.

In testimony that I claim the foregoing as my invention I have signed my name in presence of the subscribing witnesses this 5th day of December 1905.

CHARLES P. McMULLEN.

Witnesses:

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C. E. MULREANY.