R. F. HALLIWELL.

FEED PUMP REGULATOR.

APPLICATION FILED NOV. 10, 1916.

1,250,863. Patented Dec. 18, 1917.

Fig. 1.

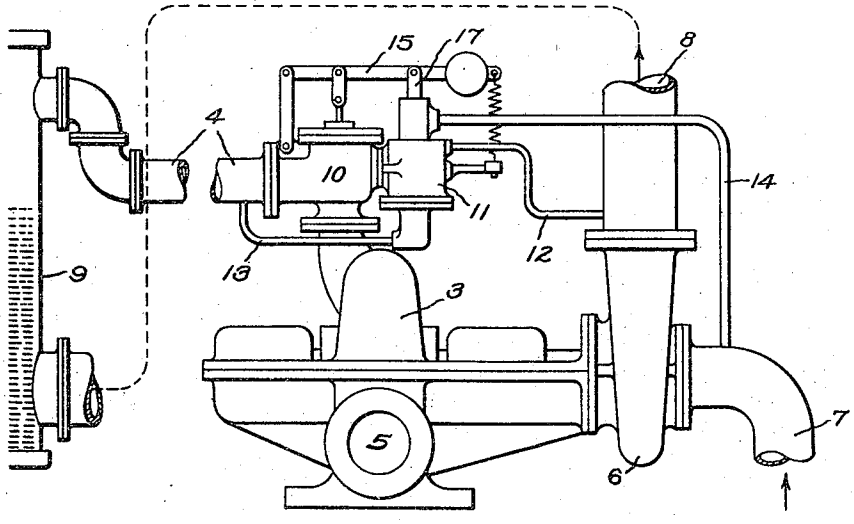
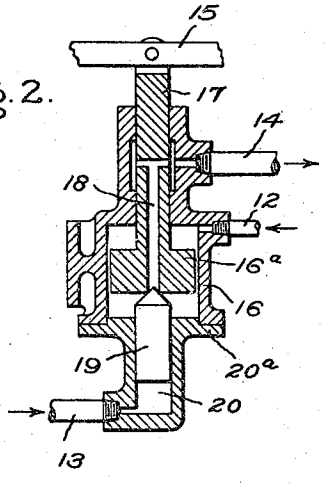


Fig. 2.



Inventor:
Reginald. F. Halliwell,
by Albert G. Davis
His Attorney.

UNITED STATES PATENT OFFICE.

REGINALD FRANCIS HALLIWELL, OF RUGBY, ENGLAND, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

FEED-PUMP REGULATOR.

1,250,863. Specification of Letters Patent. Patented Dec. 18, 1917.

Application filed November 10, 1916. Serial No. 130,663.

To all whom it may concern:

Be it known that I, REGINALD FRANCIS HALLIWELL, a subject of the King of Great Britain, residing at Rugby, in the county of Warwickshire, England, have invented certain new and useful Improvements in Feed-Pump Regulators, of which the following is a specification.

The present invention relates to regulators for controlling the amount of water or other fluid delivered to a boiler or the like by a pump driven by a prime mover, such, for example, as an elastic-fluid turbine. In such installations it is customary to regulate the apparatus by regulating the elastic fluid delivered to the prime mover so that it will drive the pump at a speed to maintain the desired fluid pressure on the delivery side of the pump, and the object of the present invention is to provide an improved regulator for this purpose. In the following specification I have described my invention as applied to a pump supplying water to a steam boiler but it will be understood that it is not necessarily limited thereto.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying specification and the claims appended thereto.

In the drawing, Figure 1 is a diagrammatic view of a turbine driven pump provided with my improved regulator, and Fig. 2 is an enlarged sectional elevation of the regulator.

Referring to the drawing, 3 indicates an elastic-fluid turbine supplied with motive fluid, as steam, from a pipe 4, the motive fluid exhausting through an outlet 5. Mounted on the end of the turbine shaft is a centrifugal pump 6 which draws water through a suction pipe 7 and delivers it into a delivery main 8. 9 indicates a steam boiler to which main 8 leads, and to which it delivers water against the pressure therein. The pipe 4 may supply elastic fluid to the turbine from any suitable source. In the present instance it is shown as taking steam directly from the boiler 9. The admission of steam from the boiler 9 to the turbine is governed by a throttle valve 10 which is preferably a double seated equilibrium valve, but may be a piston valve or other valve of the balanced type. This valve is actuated by an operating motor 11, connection being made to the water pressure in the delivery main through the pipe 12 and to the steam pressure in the steam supply main: *i. e.*, in the boiler through the pipe 13. Waste water from the operating cylinder is led through the pipe 14 and may be connected to the suction side of the pump or other convenient place providing a free outlet. In Fig. 1 the operating motor is shown actuating the throttle valve through the lever 15, but the form of mechanism is immaterial to this invention. It will be seen from Fig. 2 that the operating motor consists of a cylinder 16 fitted with a piston 16^a having an extension forming a piston rod 17 connected to the gear actuating the throttle valve. Extending for some distance up the center of the piston rod is a passage 18 which is in communication with the waste water outlet 14. The lower end of this passage can be closed by a valve formed on the end of a plunger 19 sliding in a cylindrical portion 20 of the cover 20^a. As shown clearly in Fig. 2, the piston 16^a fits loosely in the operating cylinder so that there is a constant small leakage of water past it. Water under the delivery main pressure is admitted through the pipe 12 into the annular space above the piston surrounding the piston 16^a. The space below the plunger 19 is in communication with the steam pressure through the pipe 13. It will be seen that in order to obtain equilibrium, the pressure above the piston 16^a must be to some extent higher than the pressure beneath the piston, depending on the area of the piston rod 17: also it will be seen that the pressure beneath the piston 16^a must be approximately the same as the steam pressure to maintain the plunger 19 in equilibrium. Since there is a constant leakage past the piston 16^a, it will be seen that the valve on the plunger 19 must be a certain small distance off its seat if equilibrium is to be maintained. Assuming that the pressure in the delivery main rises, the piston 16^a will be forced downward, thus closing the passage 18. This causes the pressure beneath the piston to build up, with the effect that the plunger 19 is pressed downward so as to restore the opening to passage 18 to the amount necessary to reëstablish equilibrium. The movement downward of the piston 16^a will close the steam valve 10, thus reducing the speed of the turbine sufficiently to restore the pressure in the delivery

main 8 to the proper amount. This action is continuous and similar over the whole stroke of the operating piston, as, whatever the position of the piston 16ª may be, it will always tend to move downward and shut off steam if the pressure in the delivery main is greater than the desired proportionate amount above the steam pressure. It will be seen that the action of the gear is similar when moving in an opposite direction if the water pressure is reduced. In this case, if the piston 16ª rises following a reduction in water pressure, the pressure in the space beneath the piston 16ª would tend to fall, causing the plunger 19 to rise and again throttle the passage 18 to the amount necessary to pass the leakage.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. The combination of a pump, a prime mover for driving it, a receptacle to which the pump delivers fluid, a valve mechanism for regulating the supply of operating fluid to the prime mover, and means for controlling the valve mechanism comprising a movable abutment subjected to the pressure of the fluid delivered by the pump, means forming an escape opening through which fluid may escape from said abutment, and a valve mechanism in said escape opening which is controlled by the pressure in the receptacle.

2. The combination of a pump, a prime mover for driving it, a boiler to which the pump delivers fluid, a valve mechanism for regulating the supply of operating fluid to the prime mover, and means for controlling the valve mechanism, comprising a cylinder, a piston therein, a stem on the piston connected to the valve mechanism, a pipe for supplying fluid under pressure from the delivery side of the pump to the cylinder, said piston having a passage through which such fluid may escape, a valve controlling the passage, and means subjected to the pressure in the boiler for regulating said valve.

3. In an apparatus of the character described, the combination of a cylinder having a piston therein, said cylinder having an admission opening on one side of the piston, and said piston having an escape passage, and a plunger having a valve head for regulating the escape passage, said piston and plunger being each movable relative to the other.

4. The combination with a boiler, a pump for supplying fluid thereto, a prime mover for driving the pump, and a valve gear for regulating the admission of motive fluid to the prime mover, of a pressure regulator for the valve gear comprising a cylinder having a piston therein, said cylinder having an admission opening connected with the delivery side of the pump and said piston having an escape opening therein, a second cylinder connected with the first, a plunger therein having a valve head which regulates the flow of fluid through said escape opening, and a pipe connecting the second cylinder to the boiler so that the plunger is subjected to the pressure therein.

5. The combination with a boiler, a pump for supplying fluid thereto, a prime mover for driving the pump, and a valve mechanism for regulating the admission of motive fluid to the prime mover, of a pressure regulator for the valve mechanism comprising a cylinder having a piston loosely fitted therein, said cylinder having an admission opening on one side of the piston connected with the delivery side of the pump, and said piston having an escape opening through which the cylinder on the other side of the piston is connected to a region of lower pressure, a second cylinder adjacent the first, a plunger therein having a valve head which regulates the flow of fluid through the passage in the piston, and a pipe connecting the second cylinder to the boiler so that the plunger is subjected to the pressure therein.

6. The combination of a pump, a prime mover for driving it, a receptacle to which the pump delivers fluid, a valve mechanism for regulating the supply of operating fluid to the prime mover, and means for controlling said valve mechanism comprising a movable abutment subjected to the pressure of the fluid delivered by the pump, means forming an escape opening through which fluid may escape from said abutment, and a valve mechanism comprising relatively movable valve and seat members for regulating the area of said escape opening, one of which is moved in accordance with the delivery pressure of the pump and the other in accordance with the pressure in the receptacle.

7. The combination of a pump, a prime mover for driving it, a boiler to which the pump delivers fluid, a valve mechanism for regulating the supply of operating fluid to the prime mover, and means for controlling the valve mechanism, comprising a cylinder, a piston therein, a stem on the piston connected to the valve mechanism, there being a passage of restricted area connecting the two ends of the cylinder on opposite sides of the piston, a

pipe for supplying fluid under pressure from the delivery side of the pump to the cylinder on one side of the piston from which it may escape to the other side thereof through said passage of restricted area, a discharge conduit communicating with the cylinder on such other side of the piston, and valve mechanism controlled by the pressure in said boiler and by the delivery pressure of the pump for regulating the area of said discharge conduit.

In witness whereof, I have hereunto set my hand this thirteenth day of October, 1916.

REGINALD FRANCIS HALLIWELL.

Witnesses:

CHARLES H. FULLER,

JOHN HALFORD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."