May 12, 1931. W. DOBLE 1,804,751

BOILER FEED WATER CONTROL DEVICE

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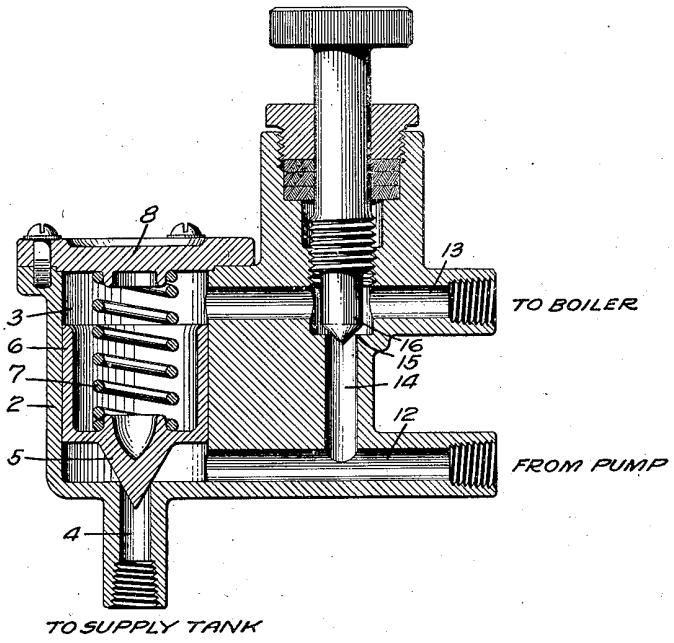

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UNITED STATES PATENT OFFICE

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BOILER FEED WATER CONTROL DEVICE

Application filed October 6, 1924. Serial No. 742,036.

The invention relates to a device for controlling the rate at which water is introduced into a steam boiler.

An object of the invention is to provide a device that will cause water to be introduced into a steam boiler at a substantially constant rate, substantially regardless of the rate at which water is supplied by the feed water pump.

Another object of the invention is to provide a device that will cause the introduction of water into a steam boiler at a substantially constant rate, by causing excess water pumped by the boiler feed pump to be by-passed back to the water supply tank.

Another object of the invention is to provide an apparatus for controlling the rate of introduction of water into a steam boiler, which is adjustable so that the substantially constant rate may be taken at that value which comes nearest to satisfying the water in-put requirements of the boiler.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description, wherein I shall outline in full that form of my invention which I have selected for illustration in the drawing accompanying and forming part of the present specification. In said drawing I have shown one form of apparatus embodying my invention, but it is to be understood that I do not limit myself to such form, since the invention, as set forth in the claim, may be embodied in a plurality of forms.

The drawing is a vertical section through the device of my invention.

The device of my invention is particularly applicable for use in connection with the steam generating plant of a steam automobile or other vehicle. The device of my invention is interposed between the feed water pump and the steam generator and operates to cause the introduction of water into the steam generator at a substantially constant rate, regardless of variations in the speed of the feed water pump. I have found it desirable to maintain the rate at which feed water is introduced into the boiler, substantially constant. The feed water pump is preferably directly connected to the steam engine, which derives steam from the boiler and propels the vehicle, so that the pump is in operation when the vehicle is in motion but can be independently driven in any manner desirable. Since the amount of steam used in the engine is not necessarily proportionate to the speed of the engine, due to the fact that the vehicle travels over varying grades, it is not feasible to pass all of the water discharged by the pump into the boiler, since the engine, when the vehicle is travelling at a good speed on a level highway, might consume far less steam than when the vehicle is climbing a grade at a lower speed. The capacity of the pump is greater than the feed water requirements of the boiler, so that there is always available sufficient feed water under pressure to meet the requirements of the boiler under varying loads and I have made the feed water pump of such capacity that when the vehicle is climbing a steep grade at a low speed, it will pump ample water to meet the requirements of the boiler.

The function of the device of my invention is to maintain the rate at which water is introduced into the boiler substantially constant, regardless of the speed of the pump. This is accomplished by by-passing various proportions of the water pumped, the amount of water by-passed being determined in part by the speed of the pump.

The device of my invention comprises a casing 2 having a cylindrical chamber or cylinder 3 therein. The cylinder is provided with an outlet passage 4 which is preferably connected to the water supply tank and the discharge of water through the passage 4 is controlled by the valve 5 which is preferably formed integral with or secured to a piston 6 disposed in the cylinder 3. The valve 5 is normally held to its seat, closing the outlet passage 4, by a spring 7 interposed between the piston 6 and the cylinder head 8. The casing 2 is provided with a passage 12 opening into the cylinder below the piston and being adapted to be connected at its other end to the feed water pump, so that the water discharged from the pump enters the passage 12. The casing is also provided with a passage

13 which opens at one end into the cylinder 3 above the piston and which at its other end is adapted to be connected to the steam boiler, so that the water discharging from the passage 13 is introduced into the boiler. The passages 12 and 13 are connected by a passage 14 through which the water passes from the passage 12 to the passage 13 and the passage 14 is provided with means for controlling the rate of the passage of water therethrough. The passage 14 is enlarged at its junction with the passage 13, to form a valve seat 15, and an adjustable valve 16 cooperates with the valve seat to provide an orifice or restricted passage for the water. Due to the presence of the restricted passage or orifice, the pressure in the passage 14 will be greater than the pressure in the passage 13 and, these two pressures are exerted respectively on opposite sides of the piston 6. The size of the orifice and the difference between these two pressures, determines the rate at which water passes the orifice and, by adjusting the position of the valve 16, the rate at which water flows to the boiler may be varied.

When the speed of the feed water pump is increased to a magnitude at which an excess of water is being pumped, the difference in pressure on opposite sides of the orifice is increased and consequently the differential pressure on opposite sides of the piston is increased, causing the piston to be raised thus lifting the valve 5 from its seat, thereby permitting water to by-pass through the outlet passage 4 to the supply tank. The difference in pressure is thereby maintained substantially constant, so that the rate at which feed water is introduced into the boiler remains substantially constant. The speed of the pump may be increased indefinitely without materially increasing the rate at which water is introduced into the boiler, since an increase in speed of the pump will result in the discharge of an increased amount of water by the pump, which will in turn result in a further lifting of the valve 5, permitting a greater amount of water to by-pass to the supply tank.

I have found this device to be quite accurate. I have found that as the rate of discharge of water from the feed pump increases, there is a very slight and relatively immaterial increase in the rate at which feed water is introduced into the boiler, due to the increase of pressure in the passage 14, necessary to lift the piston 6 further against the action of the spring 7. This slight increase in pressure causes a slight increase in the rate of flow of water past the valve 16, but this slight increase has substantially no effect upon the practicability and efficiency of the device.

I claim:

The combination with a body having therein a cylinder, a pair of conduits communicating with said cylinder adjacent opposite ends thereof, a duct joining said conduits, and an outlet from said cylinder; of a cylinder head closing one end of said cylinder, a cup-shaped piston reciprocable in said cylinder, a spring within said cup-shaped piston and abutting said cylinder head for biasing said piston toward said outlet, a conical valve on said piston adapted when seated in said body to close said outlet, and an adjustable needle valve for changing the area of said duct for regulating pressures communicated to opposite sides of said piston through said conduits.

In testimony whereof, I have hereunto set my hand.

WARREN DOBLE.