

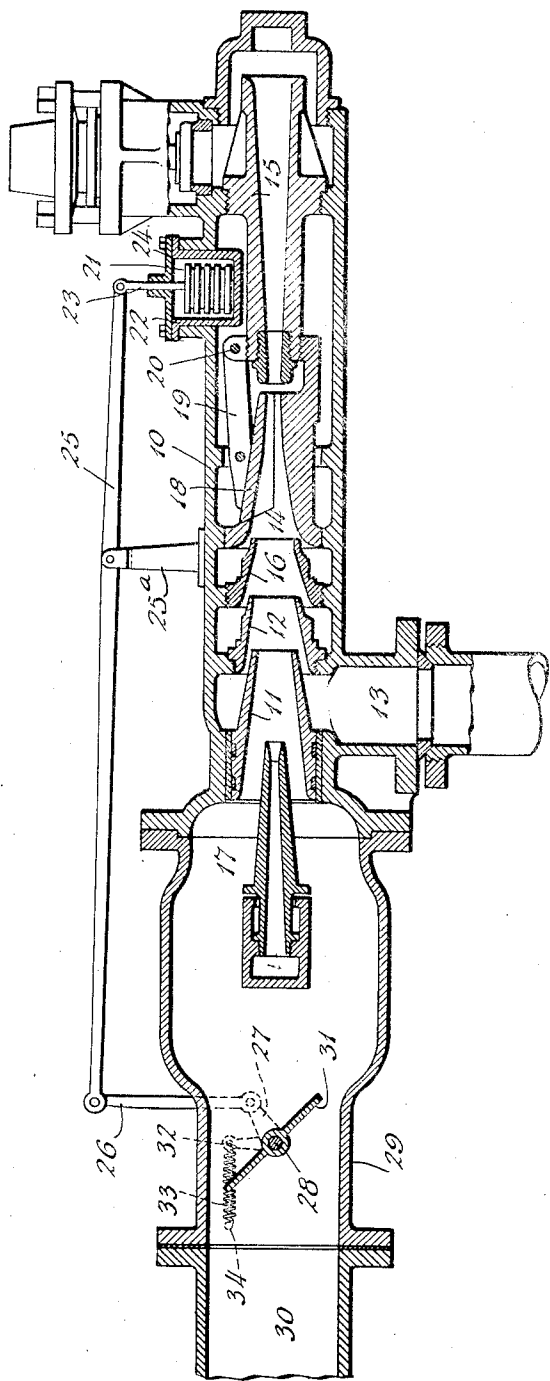
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R. M. OSTERMANN

INJECTOR

Filed March 5, 1925



INVENTOR

RUDOLF M. OSTERMANN

BY

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UNITED STATES PATENT OFFICE.

RUDOLF M. OSTERMANN, OF EVANSTON, ILLINOIS, ASSIGNOR TO THE SUPERHEATER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

INJECTOR.

Application filed March 5, 1925. Serial No. 13,106.

To all whom it may concern:

Be it known that I, RUDOLF M. OSTERMANN, a citizen of the United States, and resident of Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Injectors, of which the following is a specification.

This invention relates to steam injectors and particularly to the type thereof that are operated by exhaust steam from an engine. This type of injectors is usually provided with nozzles of fixed cross sectional areas through which the steam and water are passed, and as the amount of water required to be delivered to the boiler as well as the amount and quality of the steam, or in other words, the pressure and temperature of the steam available varies considerably from time to time, difficulty is experienced in keeping the injector operating continuously, that is to say, without frequent interruptions in the continuity of the jet. Each interruption of the continuity of the jet or "breaking of the injector," as it is termed, necessitates a manipulation of the various controls at times when the duties of the engine man require his attention to the operation of the many other controlling devices provided for other parts of the engine.

The principal object of this invention is to provide automatically operated controlling means for regulating the amount of exhaust steam passing through the injector in accordance with the temperature of the combined steam and water jet issuing from the injector. Other objects of the invention will appear more fully from the following description and by reference to the accompanying drawing forming a part hereof and wherein the figure of the drawing is a central longitudinal section through an injector embodying the principles of my invention.

For the purpose of illustration, I have shown the invention combined with an exhaust steam injector of the type disclosed in United States Patent No. 1,342,128, granted to J. Metcalf et al. As shown in the drawing the numeral 10 indicates the main casing of the injector, which contains in accordance with the disclosure of said patent, a main exhaust steam nozzle 11, and a water cone or preliminary mixing nozzle 12, into which the water from the water supply conduit 13 issues and combines with the ex-

haust steam from the said main exhaust steam nozzle. The structure also includes a combining nozzle 14, a delivery nozzle 15, and a further preliminary mixing nozzle 16 located between the water cone 12 and the combining nozzle 14. A supplementary live steam nozzle 17 is also provided in this type of injector for assisting or supplementing the action of the exhaust steam whenever necessary or desirable. A portion of the upper half of the combining nozzle 14 is separate from and movable with respect to the main portion of said nozzle to form a flap 18, mounted upon an arm 19, which arm is pivotally secured as at 20 to any suitable stationary portion of the injector. Whenever the pressure or quantity of steam and water passing from the combining nozzle 14 is greater than the jet which the delivery nozzle 15 is capable of handling, the flap 18 is caused to be opened by the pressure built up within said combining nozzle 14 and the excess fluid is ejected into an overflow chamber which surrounds the combining nozzle 14 and delivery nozzle 15 and thence through a discharge pipe (not shown). When this occurs, the jet of the injector is broken and therefore the jet must be again reestablished before the injector is again operative to perform its functions.

With this type of injector the amount of water delivered thereto is regulated by adjusting the main exhaust steam nozzle 11, longitudinally of the injector so as to vary the annular space between such nozzle and the water cone 12, and in the ordinary operation of the injector said main exhaust steam nozzle 11 is set to secure a definite water delivery. When the pressure of the jet within the combining nozzle reaches an amount sufficient to open the flap 18, such excessive pressure is usually caused by the delivery to the injector of an amount of exhaust steam too great for the definite water delivery above mentioned, or because the temperature of the exhaust steam has increased appreciably. As these injectors are used mostly for locomotives, the above variations in the pressure and quality of the exhaust steam occur frequently. It is obvious that an increase in the quantity of the exhaust steam or an increase in the temperature thereof will cause the temperature of the combined jet of steam and water issuing

from the injector to be also increased. Therefore, the conditions which cause the objectionable break of the continuity of the jet are largely, if not entirely, governed by temperature conditions within the injector. Consequently, I propose to control the delivery of exhaust steam to the injector automatically in response to variations in such temperature conditions. A satisfactory example of a construction capable of so controlling the admission of exhaust steam is illustrated in the drawings, and as shown, comprises a thermostat 21 of any approved type or construction, such thermostat being mounted closely adjacent to the delivery nozzle 15 so as to be in heat exchanging relation therewith. For the purpose of illustration, I have shown a thermostat of the so called "dry" type mounted within a chamber 22, provided within the main casing 10. The thermostat comprises an expansion element or elements filled with an expanding gas or liquid, and said thermostat has secured thereto a rod 23 which passes through a cover 24 suitably secured to the chamber 22. The upper or outer end of the rod is pivotally secured to one end of a lever arm 25, pivotally supported between its ends in a bracket 25^a, secured to the injector casing 10. The other end of the lever arm 25 has pivotally secured thereto the upper end of a connecting link 26, the lower end of which link is connected to a crank arm 27, fixed upon a shaft 28. The shaft 28 extends transversely through and is rotatably mounted in the auxiliary casing 29 of the injector; said auxiliary casing having its one end secured to the main casing 10, and its other end bolted to the exhaust steam conduit 30 which leads to the exhaust steam line of the engine. A butterfly valve 31 is fixed upon the shaft 28 and is adapted to throttle or regulate the amount of exhaust steam passing to the injector. The shaft 28 also has secured thereto a second crank arm 32, to the outer end of which is connected one end of a spring 33, the other end of said spring being anchored, as at 34, to the auxiliary casing 29 and tending to hold the valve 28 in its full opened position.

The operation of the device will be readily understood. If the temperature rises beyond a predetermined amount the expansion of the thermostat will cause the lever 25 to be rotated upon its pivot in a counter-clockwise direction, thereby causing the shaft 28 and butterfly valve to be rotated in a clockwise direction against the action of the spring 33 and throttling the passage for the exhaust steam. As the temperature of the injector in the neighborhood of the thermostat decreases, the reverse movement of the parts will occur.

It will be understood that the construction herein disclosed is merely illustrative

and that many changes, variations and modifications may be resorted to without departing from the spirit of my invention.

I claim:

1. The combination with an exhaust steam injector of a thermostatically controlled valve for regulating the quantity of exhaust steam delivered to the injector in accordance with the temperature conditions prevailing adjacent to the delivery nozzle of the injector.

2. The combination with an exhaust steam injector, having a delivery nozzle, a conduit connected therewith for supplying exhaust steam to said injector and a valve controlling the said conduit, of a thermostat located adjacent to said delivery nozzle and connected with said valve to cause said valve to be actuated in accordance with variations in the temperature conditions within said injector adjacent to said delivery nozzle.

3. The combination with an exhaust steam injector, having a delivery nozzle, a conduit connected therewith for supplying exhaust steam to said injector and a valve controlling said conduit, means for normally holding said valve in its opened condition, a thermostat mounted within said injector adjacent to said delivery nozzle, and connections from said thermostat to said valve to cause said valve to be moved towards closed position by temperature increases within said injector adjacent to said delivery nozzle.

4. The combination with an exhaust steam injector having a plurality of nozzles therein of fixed area through which a combined jet of steam and water is delivered from the injector, a conduit for supplying exhaust steam to said injector and a valve for closing said conduit, of a thermostat mounted within said injector adjacent to one of said nozzles, and a lever operated by said thermostat and connected with said valve for causing said valve to be actuated in accordance with variations in the temperature conditions prevailing in said injector.

5. In an exhaust steam injector, a plurality of nozzles through which steam and water is passed through said injector, including a delivery nozzle of fixed cross-sectional area, conduits for supplying water and auxiliary steam to said injector, a valve mounted adjacent to the delivery end of the exhaust steam conduit, a thermostat mounted adjacent to said delivery nozzle, and connections from said valve to said thermostat to cause said valve to be operated by variations in the temperature conditions within said injector.

6. In an exhaust steam injector, a plurality of nozzles through which steam and water is passed through said injector, in-

cluding a delivery nozzle of fixed cross-sectional area, conduits for supplying water and exhaust steam to said injector, a butterfly valve mounted adjacent to the exhaust steam conduit, a thermostat mounted adjacent to said delivery nozzle and connections from said butterfly valve to said thermostat to cause said butterfly valve to be operated by variations in the temperature conditions within said injector.

7. In an exhaust steam injector, a plurality of nozzles through which steam and water is passed through said injector, including a delivery nozzle of fixed cross-sectional area, conduits for supplying water and exhaust steam to said injector, a butterfly valve mounted adjacent to the exhaust steam conduit, a thermostat mounted adjacent to said delivery nozzle, connections from said butterfly valve to said thermostat to cause said butterfly valve to be operated

by variations in the temperature conditions within said injector, and a spring to normally hold said valve in open condition.

8. In an exhaust steam injector, having a plurality of nozzles mounted therein, through which the steam and water passes in its passage through the injector, an overflow chamber, and means adapted to be automatically opened to said overflow chamber by pressure within said nozzles; a conduit for supplying steam to said injector, a valve mounted adjacent to the delivery end of said conduit and a thermostat mounted within said overflow chamber and connected with said valve to cause said valve to be actuated automatically in accordance with temperature variations within said overflow chamber.

In testimony whereof I have hereunto set my hand.

RUDOLF M. OSTERMANN.