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EXHAUST STEAM INJECTOR

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Fig. 1

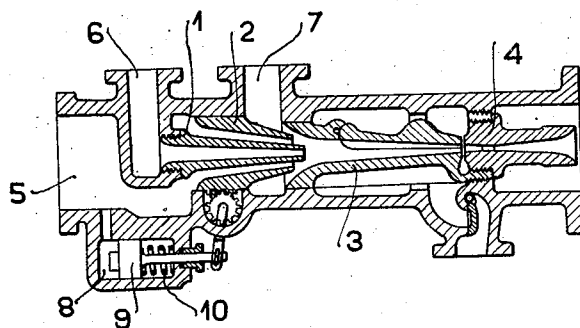
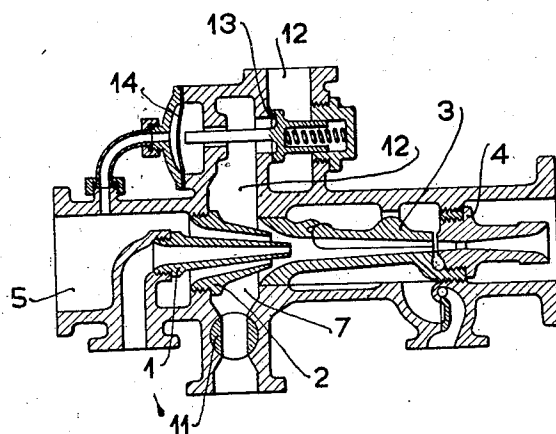


Fig. 2



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EXHAUST-STEAM INJECTOR.

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It is well known that injectors working with exhaust steam act most efficiently when the quantity of water flowing to the injector nozzles is as small as possible, since, as the cross section of the exhaust steam nozzle does not vary, there is always the same quantity of exhaust steam flowing, assuming its pressure to be constant, and, therefore, the more heat is absorbed from the exhaust steam in a given volume of water, the smaller is the quantity of water delivered.

If the pressure of the exhaust steam rises, without the cross section of the water flowing to the injector being increased, the injector fails, because the exhaust steam is no longer fully condensed in the water supplied and, in the formerly known devices, as the pressure of the exhaust steam increased, the rate of flow of the water must also be increased by hand regulation. Since the exhaust steam pressure during the working of the steam engine, particularly with locomotives, often changes and usually fluctuates between 0.1 atm. and 0.5 atm., and with temporary greater demands on the engine, for example when traversing ascents, may be as high as 1 atm., in the formerly known devices the water flow to the exhaust steam injector had to be frequently regulated by hand. This drawback is obviated by the invention.

It consists essentially in arrangements by which a member controlling the water flow to the injector nozzles is displaced or otherwise actuated under the pressure of the exhaust steam, so that, as this pressure rises, the cross section of the passage for the flow of water to the injector nozzles is increased, while if the pressure of the exhaust steam falls, the controlling member is moved towards its original position by a spring or weight.

The accompanying drawing shows two examples of constructions according to the invention.

In Fig. 1, 1 denotes the live steam nozzle, 2 the exhaust steam nozzle, 3 the combining cone, 4 the delivery nozzle of the injector, 5 the inlet for the exhaust steam, 6 the inlet for the auxiliary live steam, 7 the water inlet. The space 5 is connected with a cylinder 8 in which there is a piston 9, the movement of which is transmitted to the exhaust steam nozzle 2, by the displacement of

which the cross section of the passage for the water flowing to the combining cone 3 is varied. A spring 10 moves the piston 9 into its rearmost position, if the pressure does not exceed atmospheric, the exhaust steam nozzle being then adjusted to supply the minimum quantity of water. If the exhaust steam pressure rises and the pressure in the space 5 exceeds atmospheric pressure the piston 9 is moved forwards by this pressure and transmits its movement to the nozzle 2, and the water inlet is correspondingly increased. The piston 9 might be replaced by a membrane exposed to the pressure of the exhaust steam.

Fig. 2 shows a modification in which the increase in the quantity of water flowing to the combining cone is effected by opening a second passage 12 for the water.

In this figure, 7 denotes a passage for the water which can be throttled or closed by a cock or valve 11, 12 is a second water passage which can be closed by a closing member 13. This member is lifted from its seat by a membrane 14 exposed to the pressure of the exhaust steam, or a piston can be employed, the movement of which is transmitted to the member 13.

In each form of the device as above described, it will be noted that the chamber containing the steam pressure operated means which is connected with the exhaust steam chamber 5 is contiguous to the latter chamber and formed in the body of the injector so that the pressure of the exhaust steam acting against the mechanical actuating means for the water regulating valve is practically identical with the pressure existing in the chamber 5 and the exhaust steam nozzle 2 and that there will be little or no reduction in such pressure due to condensation. Further, it will be observed that the live steam nozzle 1 extends through the exhaust steam nozzle and beyond the same and has its outlet end positioned within the ingress end of the combining nozzle 13. This diminution of the live steam pressure by reason of its impingement against the wall of the exhaust steam nozzle prior to delivery into the combining nozzle is obviated.

What I claim is:

1. In an injector utilizing steam, a steam inlet, a water inlet, cones forming a water passage connected to the water inlet, and fluid pressure controlled mechanism for posi-

15 tively varying the cross-section of the water passage in response to variation of steam pressure.

2. In an injector utilizing steam, a steam
5 inlet, a water inlet, cones forming a water passage connected to the water inlet, and mechanism controlled by the pressure of the steam for positively varying the cross-section of the water passage.

10 3. An exhaust steam injector comprising in combination a chamber into which the exhaust steam is admitted, an exhaust steam nozzle in communication with said chamber,
15 a water inlet surrounding said exhaust steam nozzle, a combining cone, a delivery nozzle, a second chamber, in communication with the first-mentioned chamber, a piston displaceable in said second chamber in dependence on the pressure of said exhaust steam,
20 and means by which the movement of said piston effects a corresponding axial movement of said exhaust steam nozzle and thereby controls the cross section of said water inlet.

25 4. An exhaust steam injector comprising in combination a chamber into which the exhaust steam is admitted, an exhaust steam nozzle in communication with said chamber, a water inlet surrounding said exhaust steam
30 nozzle, a combining cone, a delivery nozzle, a

second chamber, in communication with the first-mentioned chamber, a piston displaceable in said second chamber in dependence on the pressure of said exhaust steam, a
35 spring acting on said piston in opposition to said steam pressure and means by which the movement of said piston effects a corresponding axial movement of said exhaust steam nozzle and thereby controls the cross section of said water inlet.

40 5. An exhaust steam injector comprising in combination a chamber into which the exhaust steam is admitted, an exhaust steam nozzle in communication with said chamber, a water inlet surrounding said exhaust steam
45 nozzle, a combining cone, a delivery nozzle, a second chamber, in communication with the first-mentioned chamber, a piston displaceable in said second chamber in dependence on the pressure of said exhaust steam,
50 a spring acting on said piston in opposition to said steam pressure, teeth on said exhaust steam nozzle, a pinion engaging with said teeth, a piston rod secured to said piston and a bar connected at one end to said pinion
55 and at the other end loosely connected to said piston rod.

In testimony whereof I have signed my name to this specification.

LOUIS FRIEDMANN.