

No. 725,772.

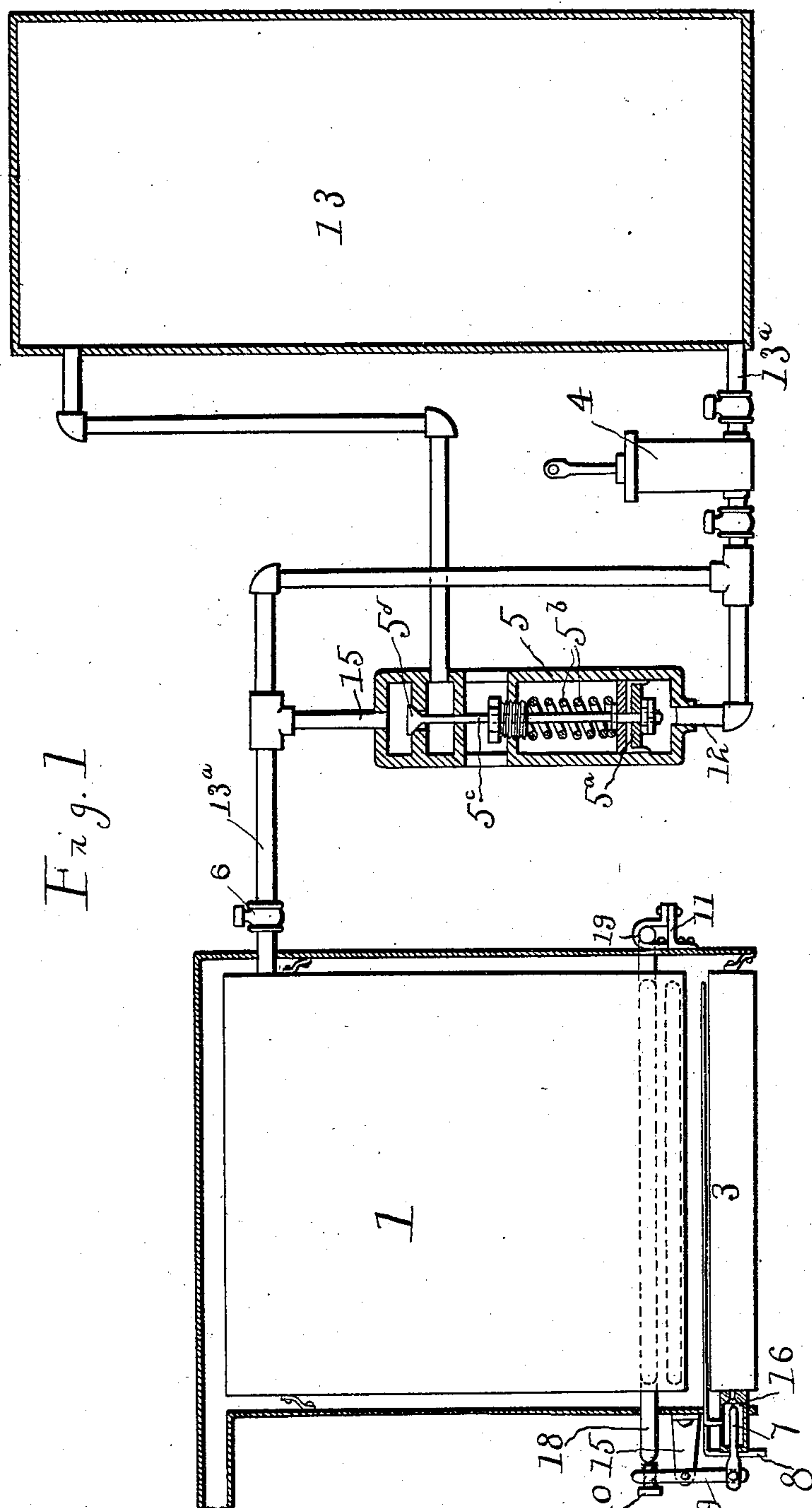
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# STEAM BOILER.

APPLICATION FILED DEC. 1, 1902.

NO MODEL.



Witnesses:

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Inventors:

# UNITED STATES PATENT OFFICE.

CHARLES M. RAYMOND AND LOUIS E. HOFFMAN, OF CLEVELAND, OHIO.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 725,772, dated April 21, 1903.

Application filed December 1, 1902. Serial No. 133,470. (No model.)

*To all whom it may concern:*

Be it known that we, CHARLES M. RAYMOND and LOUIS E. HOFFMAN, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Steam-Boilers; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to the figures of reference marked thereon, which forms a part of this specification.

This invention relates to automatic regulators for steam-boilers in which the steam is generated by the combustion of a hydrocarbon gas; and it is the object of the invention to form an improved device whereby the supply of water will be regulated by the pressure in the boiler and the supply of gas by the temperature of the boiler-coils.

The invention is particularly applicable to the engines of automobiles and is illustrated as so applied in the accompanying drawing, in which is shown a side elevation, partly in section, of the boiler and connected parts.

Referring specifically to the drawing, 1 indicates a boiler of the continuous-coil type, in which water is fed into an upper coil and steam drawn from a lower coil adjacent to the fire.

3 indicates a hydrocarbon-burner receiving gas from a nipple 16, controlled by a needle-valve 7. The fuel-supply pipe 8 is connected to a fuel-tank (not shown) and extends over the burner for purpose of vaporization before reaching the gas-nipple 16.

The thermostatic regulator controlling the movement of the valve 7 comprises a lever 9, pivoted to a bracket 15, and one arm of the lever is connected to the valve-needle and the other is adjacent to the end of a pipe 18, forming one of the lowest of the boiler-pipes. The contact between the lever and the pipe 18 is adjustable by the use of a thumb-screw 10 at the end of the lever. The other end of the tube 18 is anchored at 19 to the supporting-frame 11 of the boiler, which is not exposed to the heat of the boiler, and therefore free from appreciable variation. Longitudinal ex-

pansion of the tube 18 produces a corresponding closure of the orifice in the nipple 16, and thereby varies the fire. Contraction of the pipe produces the opposite effect.

The water-supply tank is indicated at 13 and the feed-pipe at 13<sup>a</sup>, connected to an upper coil of the boiler and having a check-valve 6. The feed-water pump is indicated at 4 and is driven by suitable connection with a moving part of the engine. The water-regulator 5 comprises a casing having therein a piston 5<sup>a</sup>, one side of which receives the pump-pressure through a pipe 12 and the other side of which receives the opposing pressure of a spring 5<sup>b</sup>. The piston is connected by a rod 5<sup>c</sup> to the valve 5<sup>d</sup> in the by-pass 15, which taps the feed-pipe between the pump and the check-valve and leads back to the tank.

When the pressure in the feed-pipe due to the pump and the resistance of the boiler-pressure on the check-valve rises beyond a point determined by the strength of the spring 5<sup>b</sup>, the piston is forced up, opening the valve 5<sup>d</sup>, so that no water is fed to the boiler; but it returns to the tank through the by-pass. When the steam-pressure is less than that of the spring, the check-valve opens under the pump-pressure and water is fed to the boiler.

It will be seen that the fuel-supply is dependent on the temperature of the boiler-pipes, and should the water-supply fail or any other condition arise tending to overheating of the boiler the fuel-supply will be decreased or stopped. The water and fire regulators work together to effect the common result of automatically controlling the generation of steam, and the invention is particularly useful in connection with automobile or other engines where skilled attendance is lacking to prevent overheating the boiler, excessive generation of steam, and waste of fuel.

What is claimed as new, and desired to be secured by Letters Patent, is—

1. The combination with a boiler, of a regulator for the fuel-supply governed by the expansion and contraction of a boiler-tube, and a regulator for the water-supply governed by the steam-pressure in the boiler.

2. The combination with a water-tube boiler, of a regulating-valve for the fuel-supply connected to and controlled by the ex-



pansion and contraction of one of the boiler-tubes, and a regulator for the water-supply governed by the steam-pressure in the boiler.

3. The combination with a boiler and a  
5 thermostatic regulator for the fuel-supply, of a water-tank, a feed-pipe therefrom to the boiler having a check-valve, a feed-pump in the pipe between the tank and the valve, and a by-pass joined to the feed-pipe between the  
10 pump and the check-valve, having a regulating-valve governed by the steam-pressure in the boiler and actuated by the pump-pressure.

4. The combination with a tubular boiler and its burner, of a fuel-supply valve con-  
15 nected to a boiler-tube and operated by the

expansion thereof, a water-tank and a feed-pipe connecting the same to the boiler, said pipe having a check-valve, a pump in the pipe between the tank and check-valve, a by-pass in the pipe between the pump and the boiler, and a regulating-valve controlled by the boiler-pressure and actuated by the pump-pressure, governing said by-pass.

In testimony whereof we affix our signatures in presence of two witnesses.

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LOUIS E. HOFFMAN.

Witnesses:

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