

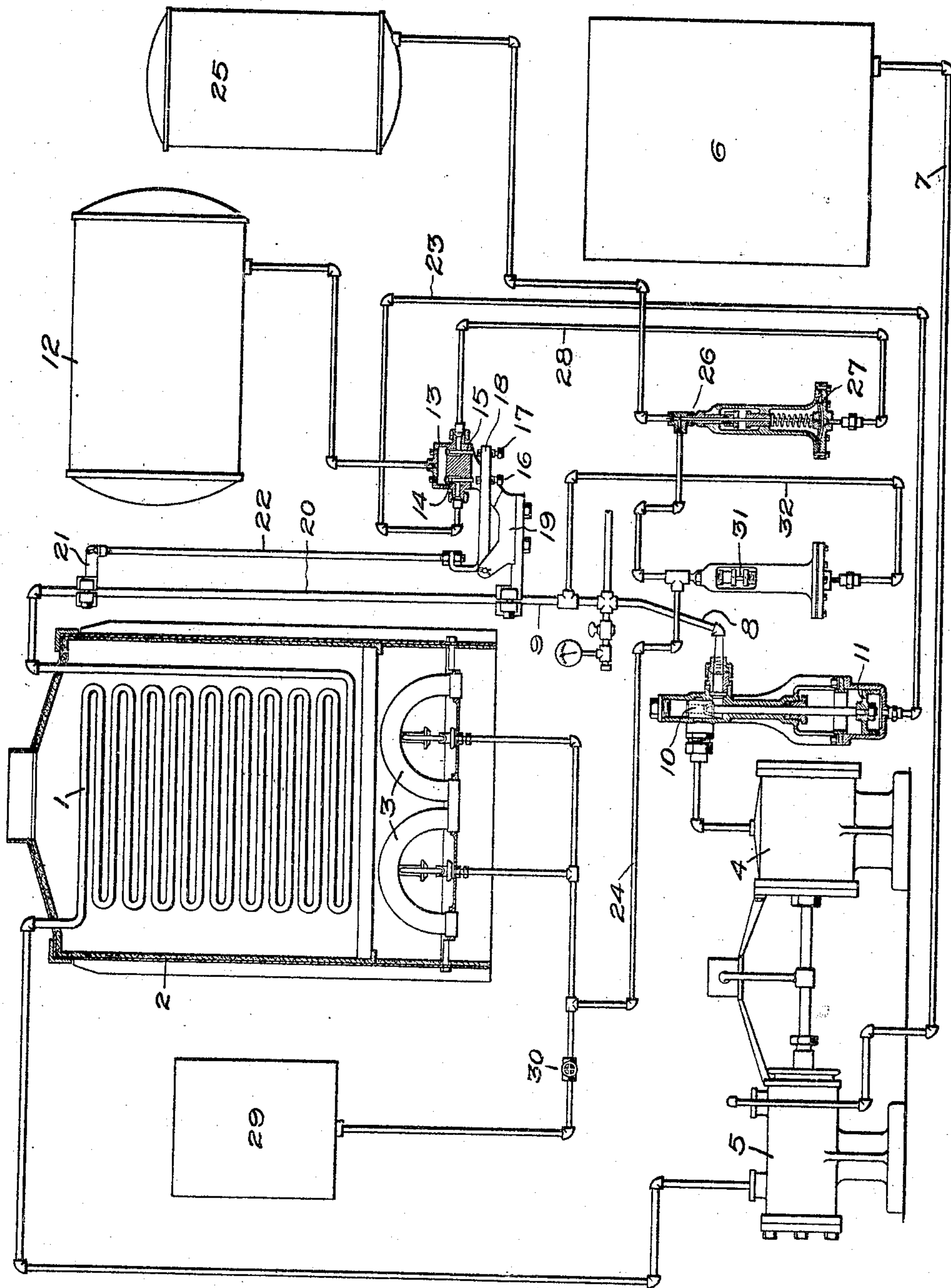
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FUEL AND WATER SUPPLY SYSTEM FOR BOILERS.

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994,939.

Patented June 13, 1911.



Witnesses:

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UNITED STATES PATENT OFFICE.

HERMANN LEMP, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

FUEL AND WATER SUPPLY SYSTEM FOR BOILERS.

994,939.

Specification of Letters Patent. Patented June 13, 1911.

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To all whom it may concern:

Be it known that I, HERMANN LEMP, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Fuel and Water Supply Systems for Boilers, of which the following is a specification.

This invention relates to that class of steam generators known as semi-flash boilers, and its object is to regulate automatically the supply of fuel and water in order that the steam pressure may be kept at or near a constant value.

The fuel ordinarily used is a liquid hydrocarbon, which is forced to the burners by a pump or by pneumatic pressure. The water is generally fed by a steam pump. It is necessary to use great care in regulating the supplies of fuel and water to prevent overheating on the one hand and excessive cooling on the other, in order to maintain a normal steam pressure and meet the varying demands upon the boiler. There are two factors which are customarily depended on to effect an automatic control of the fuel and water. These are the pressure and the temperature of the steam. In the present case, I use both, the fuel supply being controlled by both and the water supply by the temperature only. Briefly stated, the oil or other liquid fuel can feed by gravity to the burners, but the main fuel supply is forced from a reservoir by pneumatic pressure. The flow is governed by a pressure regulator actuated by elastic fluid pressure, preferably compressed air, which is controlled by a thermostatic valve responsive to changes in the temperature of the steam, whereby the flow of fuel is shut off when the temperature exceeds a given value. Another pressure regulator, adjusted to yield under excessive boiler pressure, is interposed in the fuel pipe in series with the other regulator. A third pressure regulator, connected with the thermostatic valve and actuated by the compressed air operates to control the flow of steam to a steam pump which supplies the boiler with water until the temperature of the steam drops below a given value. The thermostatic valve is located in proximity to the boiler, so that all of the steam drawn therefrom either by the engine or other utilizing device, or

by the steam pump, acts upon the thermostat.

The accompanying drawing is a diagram of parts and connections illustrating my invention.

The boiler is conventionally represented as a zigzag coil of pipe 1, inclosed in a casing 2 lined with heat-resisting and insulating material. The casing extends below the coil to form a fire-chamber in which are burners 3 adapted to vaporize and burn the liquid fuel. The steam pump for supplying water to the upper end of the boiler comprises a steam cylinder 4 and a water cylinder 5, the latter drawing water from a tank 6, through a pipe 7. The steam end of the pump receives steam through a branch main 8 connected to the main 9 at a point between the boiler and the main shut-off valve (not shown). Interposed in the branch main 8 is a throttle valve 10 attached to a movable abutment 11 which can be subjected to elastic fluid pressure, preferably compressed air drawn from the tank 12. The casing 13 of the air relay valve contains two valves, 14, 15, adapted to be actuated by adjustable screws 16, 17 in the end of a lever 18 pivoted to a bracket 19 on which said casing is mounted. The bracket is supported on the lower end of a section 20 of the steam main, preferably made of copper, or some other metal having a large coefficient of expansion. Near the upper end of this section is an arm 21 from which depends a rod 22 whose lower end is pivoted to the lever 18. The rod is made of nickel-steel, or some other material having a small coefficient of expansion. These parts form a thermostat which operates the valves 14, 15, opening them when the temperature rises, and allowing them to be closed by the air pressure in the tank 12 when said temperature falls.

The screw 16 is so adjusted that it will open the valve 14 when the steam attains a temperature of say 490 degrees F. This admits air through pipe 23 to the abutment 11 of the steam throttle valve 10, opening said valve and thereby causing the pump to start.

Fuel is fed to the burners 3 through a pipe 24 leading from a tank 25, in which the oil is subjected to an air pressure of about eighty pounds to the square inch. Inter-

posed in the pipe 24 is a shut-off valve 26 connected to a movable abutment 27, to which air can be admitted from the tank 12, through a pipe 28, controlled by the valve 15. The screw 17 which opens this valve is adjusted to operate only when the temperature of the boiler reaches say 510 degrees F. At this temperature, then, the oil supply is cut off by the closing of the valve 26, and as the steam pump continues to operate, the temperature will soon drop. This causes the thermostat to withdraw the lever and permit the valve 15 to close, whereupon the air trapped between this valve and the abutment of the oil shut-off valve will begin to leak out and the oil supply will soon be turned on again. During the time that the supply from tank 25 is shut off, a pilot-light is kept burning by a gravity flow of oil from the tank 29 through a check-valve 30. Should the temperature fall to, say, 490 degrees F. the valve 14 will close. The unbalanced steam pressure on the upper end of the throttle valve 10 will then close it and stop the pump until the temperature of the steam again reaches 490 degrees. There is thus a zone of twenty degrees temperature, between 490 and 510, during which both water and fuel are supplied to the boiler and burners, while above this zone the fuel is cut off and below it the water supply is stopped. The result is a tendency to maintain the temperature of the steam at about 500 degrees F., which represents some 80 degrees of superheat if the working pressure is 300 pounds. As an additional safeguard, I provide a second shut-off valve for the oil, operated by an excessive steam pressure. This valve 31 is similar in construction to the valve 26 with which it is connected in series. Its movable abutment is exposed to the boiler pressure by means of a branch steam main 32 connected with the main 9 below the thermostatic section 20.

It is assumed that the burners will consume sufficient fuel under normal conditions to evaporate all the water the pump can furnish when the boiler is producing its maximum output.

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 with a boiler, of a burner for heating the boiler, a source of liquid fuel supply, a pump for supplying water to the boiler, a source of elastic fluid

under pressure, devices responsive to elastic fluid pressure for controlling the fuel and water supplies, means for causing elastic fluid from said source to actuate one of the devices to prevent a supply of fuel above a predetermined steam temperature, and means causing elastic fluid from said source to actuate another of the devices to shut off the water supply at another lower predetermined steam temperature.

2. The combination with a boiler, of a burner therefor, a source of liquid fuel supply, a steam pump for supplying water, a source of elastic fluid under pressure, valves responsive to elastic fluid pressure for controlling the fuel and water supplies, and means for automatically admitting fluid pressure from said source to said valves at predetermined and different temperatures of the steam.

3. The combination with a boiler, of a burner therefor, a source of liquid fuel supply, a steam pump for supplying water, a source of elastic fluid pressure, devices responsive to elastic fluid pressure for controlling the fuel and water supplies, valves admitting elastic fluid pressure from said source to said devices, and a thermostat responsive to changes in steam temperature and adapted to actuate said valves.

4. The combination with a boiler, of a burner therefor, a source of liquid fuel supply, a steam pump for supplying water, a source of elastic fluid pressure, devices responsive to elastic fluid pressure for controlling the fuel and water supplies, valves admitting elastic fluid pressure from said source to said devices, and a thermostat responsive to changes in steam temperature and adapted to actuate said valves at predetermined and different degrees of temperature respectively.

5. The combination with a boiler, of a burner therefor, a source of liquid fuel supply, a steam pump for supplying water, devices responsive to elastic fluid pressure for controlling the fuel and water supplies, a source of elastic fluid pressure, a valve casing communicating with said source of elastic fluid pressure, valves therein controlling the admission of pressure to said devices, a movable valve-actuating element, adjustable valve-operating screws carried by said element, and a thermostat responsive to changes in the temperature of the steam and arranged to move said element.

6. The combination with a boiler, of a burner therefor, a steam pump for supplying water, a self-closing throttle for said pump, a source of elastic fluid pressure, means for opening said throttle by elastic fluid pressure, and a thermostat responsive to changes in the temperature of the steam and controlling the admission of pressure from said source to open said throttle.

7. In apparatus of the character described, the combination of a generator; heating means coöperative therewith; means for regulating the supply of liquid to said generator and of fuel to said heating means, respectively; fluid-pressure actuated means for operating each of said regulating means; and means, operating automatically according to the demand for power upon said generator, for controlling the supply of pressure-fluid to said fluid-pressure actuated means.

8. In apparatus of the class described, the combination of a generator; heating means coöperative therewith; means for regulating the supply of liquid to said generator and of fuel to said heating means, respectively; fluid-pressure actuated means for operating each of said regulating means; a source of fluid-pressure supply independent of said generator; and means, operating automatically according to the demand for power upon said generator, for controlling the supply of pressure fluid to said fluid-pressure actuated means.

9. In apparatus of the class described, the combination of a generator; heating means coöperative therewith; means for regulating the supply of liquid to said generator and of fuel to said heating means, respectively; fluid-pressure actuated means for operating each of said regulating means; a source of fluid-pressure supply independent of said

generator; and means, controlled by a condition in the generator, for controlling the supply of pressure fluid to said fluid-pressure actuated means.

10. In apparatus of the class described, the combination of a generator; heating means coöperative therewith; means for regulating the supply of liquid to said generator and of fuel to said heating means, respectively; fluid-pressure actuated means for operating each of said regulating means; a source of fluid-pressure supply independent of said generator; and thermostatic means in connection with said generator for controlling the supply of pressure fluid to said fluid-pressure actuated means.

11. The combination with a boiler heated by liquid fuel, of a thermostat comprising a section of steam pipe and a rod having different co-efficients of expansion, a pressure actuated regulator controlling the supply of liquid fuel, a source of elastic fluid under pressure, and means operated by the thermostat for admitting said fluid pressure to the regulator.

In witness whereof, I have hereunto set my hand this fourteenth day of August, 1907.

HERMANN LEMP.

Witnesses:

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