March 17, 1931. R. R. WATERMAN 1,797,109

STEAM FLASH BOILER

Filed May 3, 1926

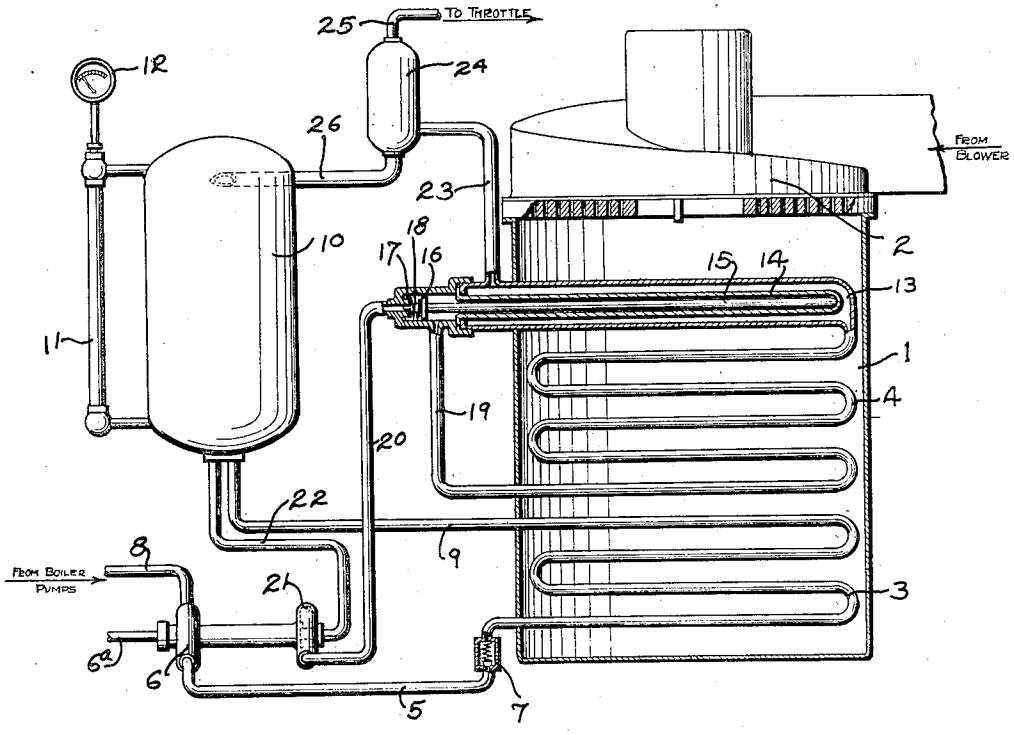


FIG. 1

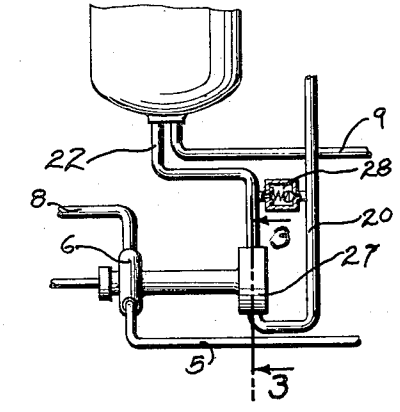


FIG. 2

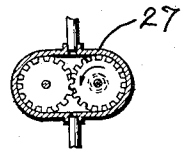


FIG. 3

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UNITED STATES PATENT OFFICE

RUSSELL R. WATERMAN, OF LONG BEACH, CALIFORNIA, ASSIGNOR TO FARMERS' NATIONAL BANK OF GREENVILLE, OHIO, OF GREENVILLE, OHIO, A CORPORATION OF OHIO, TRUSTEE

STEAM FLASH BOILER

Application filed May 3, 1926. Serial No. 106,360.

My invention relates to steam boilers, more particularly to steam boilers adapted to supply steam for automotive vehicles.

The objects of my invention are: first, to provide two-zone steam boiler having an evaporator section and a preheater, or economizer section, the former being adapted to be connected with a steam throttle; second, to provide a novel balanced water pressure producing means intermediate the ends of the coil means of the boiler for supplying water to the evaporator section of the coil means; third, to provide a thermostat in connection with a steam chamber at the one end of the evaporator section of the boiler, which thermostat is operatively connected with a feed water control valve for regulating the flow of feed water to the opposite end of the evaporator section; fourth, to provide a hot water storage drum in connection with the evaporator and preheater sections of a boiler of this class in which the water, supplied from the preheater section, is maintained at the desired working pressure and temperature when the boiler is in normal operation, and which provides a reserve steam supply for the throttle; fifth, to provide a junction drum in connection with a boiler of this class which serves to separate the steam and water from the steam end of the evaporator section for supplying dry steam through the throttle of the engine, the water separated from the steam being returned to the system and adapted to be conducted to the opposite end of the evaporator section of the boiler; sixth, to provide a compact boiler of this class in which the steam and water are maintained at the desired and at balanced pressures; seventh, to provide as a whole a novelly constructed boiler of this class and one which is simple and economical of construction proportionate to its functions, durable, efficient, automatic in its action, and which will not readily deteriorate or get out of order.

With these and other objects in view, as will appear hereinafter, my invention consists of certain novel features of construction, combination and arrangement of parts and portions, as will be hereinafter described in detail and particularly set forth in the appended claims, reference being had to the accompanying drawings and to the characters of reference thereon, which form a part of this application, in which:

Figure 1 is a diagrammatic view of my two-zone boiler in its preferred form of construction, showing certain parts and portions broken away and in section to facilitate the illustration; Fig. 2 is a diagrammatic view of a fragmentary portion of my boiler system in a slightly modified form of construction, showing a different type of pump for supplying water to the evaporator section and a bypass pressure control valve in connection therewith, and Fig. 3 is a sectional view of the pump, taken on line 3—3 of Fig. 2.

Like characters of reference refer to similar parts and portions throughout the several views of the drawings.

The boiler casing 1, burner 2, preheater coil 3, evaporator coil 4, conductor 5, cooling gland 6, boiler check valve 7, water supply conductor 8, hot water conductor 9, hot water storage drum 10, water gage column 11, pressure gage 12, steam chamber 13, thermostat casing 14, thermostat member 15, valve member 16, valve casing 17, spring 18, conductors 19 and 20, centrifugal pump 21, conductors 22 and 23, steam and water separator or junction point 24, and the conductors 25 and 26, constitute the principal parts and portions of my steam boiler in its preferred form of construction.

The boiler casing 1 may be of any desired shape and construction and is provided at its upper end with a burner 2 which directs the flame and heat downwardly into the boiler casing. Within the boiler casing are positioned the preheater sections 3 and evaporator section 4, which are made in the form of coils with the latter positioned nearer the burner.

The one normally cold end of the preheater coil 3 is connected, by means of a conductor 5, gland cooling jacket 6, and conductor 8, with the outlet of a suitable pump not shown. In the conductor 5 is a boiler check valve 7 to prevent return of the water from the preheater coil.

At the upper or steam end of the evapora-

tor coil 4 is provided a steam chamber 13, in which is placed a longitudinally expansible thermostat casing 14 in which is reciprocally mounted a thermostat member or rod 15 of a smaller coefficient of expansion than its enclosing casing. One end of the steam chamber 13 extends preferably beyond the boiler casing 1, as shown. Against the extended end of the steam chamber is positioned the outer flanged end of the thermostat casing 14, which is secured in position against the extended end of the steam chamber by means of the feed water control valve casing 17, the outer end of which is ported and connected, by means of a conductor 20, with the outlet end of the centrifugal pump 21. At the end of the thermostat member or rod 15 extending beyond the thermostat casing 14 is provided a valve member 16, which is adapted to seat against and seal the ported portion of the valve casing 17, previously mentioned. Intermediate the inner end of the casing 17 and the valve member 16 is positioned a compression spring 18, which normally holds said valve member from its seat. The side of the valve casing 17 is connected, by means of a conductor 19, with the lower or water end of the evaporator coil 4.

The centrifugal pump 21, is driven at a constant speed by means of the shaft 6*a*. The pump 21 is connected at its suction end, by means of the conductor 22, with the lower end of the hot water storage drum 10. This drum is provided with a water lever indicator column 11 and also with an indicator gage 12, the latter being preferably connected at the upper end of the former.

The steam chamber 13 is connected by means of the conductor 23 with a junction drum 24, which also serves as a water and steam separator. The conductor 23 connects with the side of the drum 24. The lower end of the drum 24 is connected with the water drum 10, by means of a conductor 26. From the upper end of the drum 24, the conductor 25 leads to the throttle of the engine adapted to be operated by the steam from the boiler.

The operation of the boiler is as follows: the water pump 21, being driven at a constant speed, provides a constant, predetermined pressure of the water conducted to the feed water control valve, which being controlled entirely by the temperature of the steam in the steam chamber 13, opens and permits the water to flow under pressure to the water end of the evaporator coil 4, however only when the steam in the chamber 13 is at its normal running temperature, at which temperature the flow will be exactly in proportion to the amount of steam used. If the temperature of the steam increases, thermostat opens the valve and permits more water to be pumped into the evaporator coil 4. If the temperature of the steam drops, the thermostat closes the feed water control valve, thus permitting no water to flow to the evaporator coil 4; the temperature of the steam will then be permitted to quickly rise to normal, assuming, of course, that the fire is on at all times.

It will be here noted that this structure operates in connection with a storage drum where the whole system is operated on a practically balanced pressure and thus differs from the conventional flash type boiler.

In Figs. 2 and 3 of the drawings, a positive gear pump 27 is used for creating pressure in the water feed line. When a positive pump is used, as shown, a bypass valve 28 becomes necessary between the conductors 20 and 22, or between the outlet and inlet of the pump, in order to maintain a constant predetermined pressure in the line. This bypass valve 28 may be in the form of a check valve, as shown, or in the form of a loaded valve.

Though I have shown and described a particular construction, combination and arrangement of parts and portions and a certain modification thereof, I do not wish to be limited to this particular construction, combination and arrangement, but desire to include in the scope of my invention, the construction, combination and arrangement substantially as set forth in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a flash boiler of the class described, an evaporator coil, a hot water storage drum connected directly with one end of said coil, a constant pressure producing means in the direct connection between said coil and said drum, and an automatic feed water control valve means in said connection between said constant pressure producing means and said coil, said means being controlled by the temperature of the resultant steam from said coil, the other end of said evaporator coil being connected with the upper portion of said hot water storage drum and provided with an outlet adapted to be connected with a throttle.

2. In a flash boiler of the class described, an evaporator coil, a hot water storage drum connected with one end of said coil, a constant pressure producing means in the connection between said coil and said drum, a feed water control valve means in said connection between said constant pressure producing means and said coil, and a steam and water separating drum connected with the opposite end of said evaporator coil, and at its lower end with the upper end of said storage drum, said separating drum being provided with an outlet adapted to be connected with a throttle.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 21st day of April, 1926.

RUSSELL R. WATERMAN.