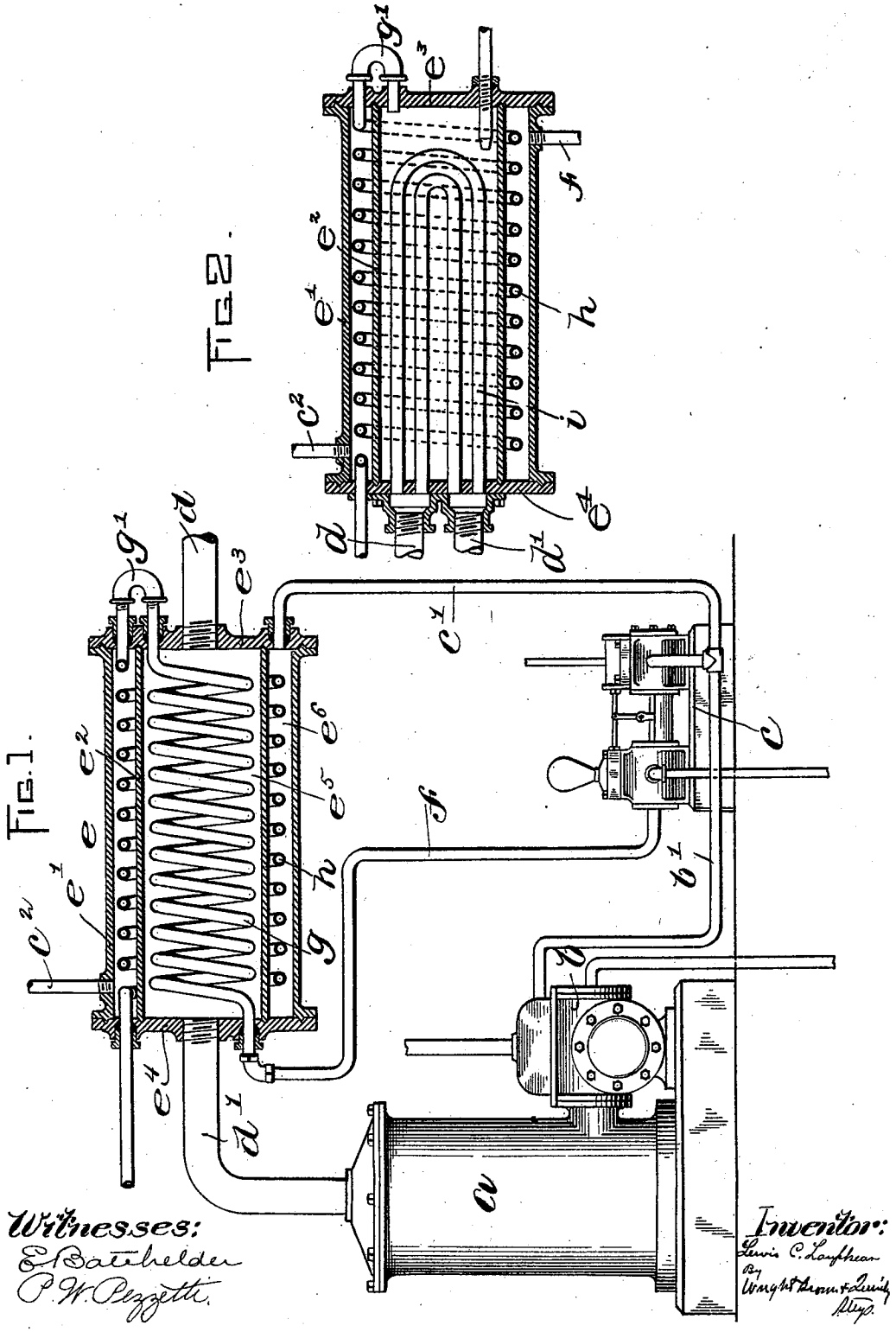
No. 631,426. Patented Aug. 22, 1899.

L. C. LANPHEAR.

FEED WATER HEATER.

(Application filed Sept. 8, 1898.)

(No Model.)



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UNITED STATES PATENT OFFICE.

LEWIS C. LANPHEAR, OF BOSTON, MASSACHUSETTS.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 631,426, dated August 22, 1899.

Application filed September 8, 1898. Serial No. 690,506. (No model.)

To all whom it may concern:

Be it known that I, LEWIS C. LANPHEAR, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

This invention has relation to that class of feed-water heaters in which the exhaust-steam from the engine is utilized in raising the temperature of the water introduced into the boiler.

Ordinarily where the exhaust from the main engine is employed in connection with a condenser it is impossible to raise the temperature of the water to more than 130° Fahrenheit, and consequently a greater consumption of fuel is required or the boiler-pressure is reduced.

The object of the present invention therefore is to provide a heater constructed and arranged to impart a supplemental heating to the water which is initially heated by the exhaust from the engine, whereby the temperature of the water at the time it is delivered to the boiler is 212°, or above, and the desired boiler-pressure can be maintained with a relatively low consumption of fuel.

To these ends the invention consists of a feed-water heater formed with two separate uncommunicating chambers, one within the other, and one of the chambers being heated by the exhaust-steam from one or more engines and the other by the exhaust-steam from other engines or pumps, said heater having conduits for the water, whereby it flows from one chamber to the other before being delivered to the boiler.

The invention further consists of certain other combinations of parts or elements and in certain improvements in the construction and arrangement of parts of a heater, all as I have illustrated upon the drawings and shall now proceed to describe in detail.

Reference is to be had to the accompanying drawings, forming a part of this specification, the same letters designating the same parts or features, as the case may be, wherever they occur.

Of the drawings, Figure 1 represents a diagrammatic view of an engine plant with the heater in section. Fig. 2 represents a longitudinal section through another form of heater.

Referring to the drawings, which show one embodiment of the invention selected for illustration, the condenser *a*, the air-pump *b*, and the feed-pump *c* may all be of any approved style or pattern. The main engine and the boiler are not shown, as their particular construction is immaterial, the exhaust-pipe from the engine being indicated at *d*.

The feed-water heater (shown as a whole at *e*) comprises an outer casing e', an inner casing e^2, and cylinder-heads e^3 e^4, to which said casings are secured in any suitable way to form two concentric chambers e^5 e^6. The exhaust-pipe *d* communicates with the inner chamber e^5, passing from thence through the pipe d' to the condenser *a*, while the pipe b' c' for the exhaust-steam from the air and feed pumps leads into the outer or annular chamber e^6 and exhausts from there into the atmosphere through the pipe c^2. The feed-water passes through a pipe *f* from the pump *c*, through the inner compartment to the outer compartment or chamber, and from thence to the boiler.

It is evident that the arrangement of the tubes or conduits for the steam and water in the heater may be varied as desired, and hence I have shown two different ways of arranging them. In Fig. 1 the feed-water passes through a coil *g* in the inner chamber or compartment and a coil *h* in the outer compartment, there being a coupling g' to connect the two coils. In this case the exhaust-steam from the engine is discharged directly into the inner chamber and that from the pumps into the outer chamber, whereby the coils *g* and *h* are in a steam-bath. In Fig. 2, however, the feed-water is discharged into the inner compartment, while the exhaust-steam passes therethrough in bent tubes *i*, and said water passes through the coupling g' into the outer coil *h*. By this arrangement of the parts of the heater the water is initially heated in the inner chamber and then raised to a high temperature in the outer annular compartment or chamber, whereby it is delivered to the boiler at substantially 212° Fahrenheit. The annular chamber forms a heating-jacket for the inner chamber to prevent the wastage

of heat, and the two chambers operate mutually to sustain the high temperature of each other.

This invention is preferably employed in plants where a condensing, compound, or triple-expansion engine and a condenser are used; but it will be understood that it may be equally well used in other plants where a portion of the live steam is employed as a heating agent.

The invention in utilizing only the exhaust-steam from the engine and the two pumps enables a saving in fuel and the maintenance of a high pressure in the boiler.

Having thus explained the nature of the invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I declare that what I claim is—

1. A feed-water heater having an inner chamber, an outer annular chamber uncommunicating with the said inner chamber, conduits for the feed-water leading from one chamber to the other, means for delivering steam into the inner chamber and exhausting it therefrom, and means for delivering steam into the outer chamber and exhausting it therefrom whereby the water is initially heated in one chamber and receives a supplemental heating in the other chamber.

2. A feed-water heater comprising two casings, one within the other and forming an inner chamber and an outer chamber which are separate and uncommunicating, separate means for introducing steam into and exhausting it from each of said chambers and means for passing water through one of said chambers into the other chamber and delivering it from said last-mentioned chamber.

3. A feed-water heater comprising two casings, one within the other and forming two separate uncommunicating chambers, a pipe extending through each casing, an inlet and an exhaust pipe to introduce steam into and discharge it from each of the chambers, a feed-water inlet extending into one of said chambers, a feed-water outlet extending out from the other of said chambers, and a coupling for conducting the feed-water from one of said chambers to the other whereby exhaust-steam from a main engine may be passed through one chamber to initially heat the water, and exhaust-steam from auxiliary engines or pumps may be passed through the other chamber to increase the temperature of the water.

4. A feed-water heater comprising two tubular casings, one within the other, a plate at each end of the heater for closing the two casings whereby there are formed two separate uncommunicating chambers, a separate steam-inlet for each chamber, and a separate outlet therefor, whereby steam from separate sources may be admitted to said chambers respectively, and conduits for passing feed-water first through one chamber and then through the other chamber whereby the water is initially heated in the first chamber and receives a supplemental heating in the second chamber.

In testimony whereof I have affixed my signature in presence of two witnesses.

LEWIS C. LANPHEAR.

Witnesses:
C. C. STECHER,
E. BATCHELDER.