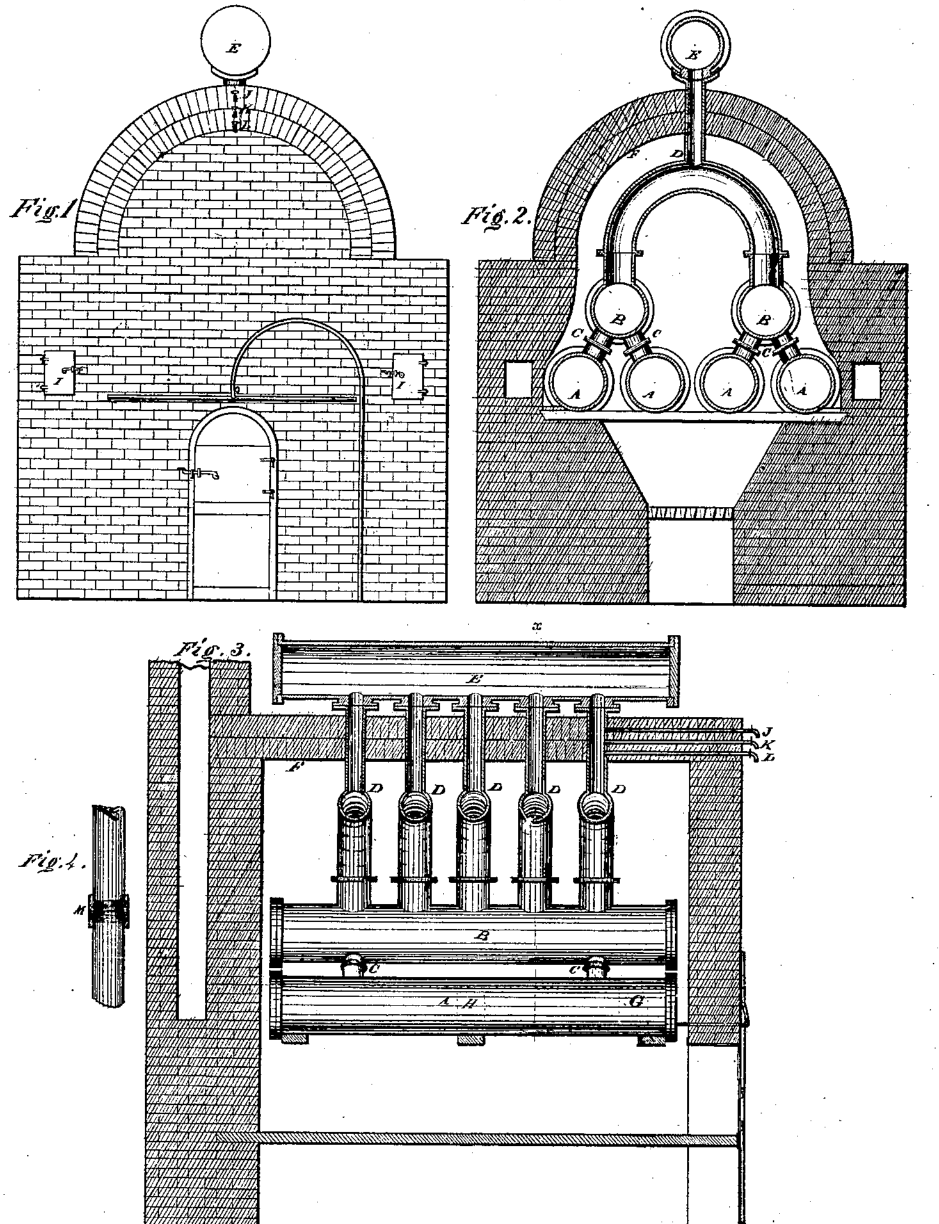
L. R. CORNELL.

STEAM GENERATOR.

No. 109,807. Patented Dec. 6, 1870.



Witnesses: Lucius W. Howe
J. H. Howe

Leffert R. Cornell
By Thos. S. Howe
Atty

United States Patent Office.

LEFFERT RYERSON CORNELL, OF FLATBUSH, NEW YORK.

Letters Patent No. 109,807, dated December 6, 1870.

IMPROVEMENT IN STEAM-GENERATORS.

The Schedule referred to in these Letters Patent and making part of the same.

I, LEFFERT RYERSON CORNELL, of Flatbush, in the county of Kings and State of New York, have invented certain Improvements in Steam-Generators, of which the following is a specification.

Nature and Objects of the Invention.

This invention is adapted to the production of a steam-generator capable of economizing heat in the production of steam without the aid of flues or tubes inside of the boiler, thereby avoiding the leakage liable to result from the use of flues and tubes, and also rendering it practicable to construct a safe and economical steam-boiler from cast-iron, thus very materially cheapening the construction while at the same time the highest efficiency is secured.

My invention consists in the arrangement, in combination with each other, of two or more boilers connected by arched pipes, a reverberatory furnace, and a steam-chamber outside of the said furnace, the arched pipes connecting the said boilers being arranged within the furnace, substantially as hereinbefore set forth.

Description of the Accompanying Drawing.

Figure 1 is an end view, showing the front end of the furnace, and also showing the supply-pipe for furnishing the boilers with water.

Figure 2 is a vertical transverse section taken through the line *x x*, fig. 3, and showing a boiler and furnace constructed according to my invention.

Figure 3 is a vertical longitudinal section of the same.

Figure 4 is a detail view, showing a device which may be used in connecting the pipes and boilers together.

General Description.

A A A A are two pairs of boilers, each of which pairs is connected to a third boiler, B, which is placed above them, as shown in the drawing, and connected to them by pipes C C, as shown.

I prefer to make all these boilers of cast-iron, partly on account of cheapness in construction, and partly on account of their being better in some respects, when constructed according to this invention, than wrought-iron boilers.

D D are pipes which connect the boilers B B to each other and to the steam-drum E.

These pipes I also prefer to make of cast-iron, and in the form represented in the drawing, though it is obvious that that form may be somewhat modified without essential change in their operation so long as each one of them forms a connection from one to the other of the boilers B B, and also connects each of the boilers B B to the steam-drum. These pipes, being principally contained within the reverberatory furnace, also afford heating-surface, and aid in the generation of steam.

It will also be observed that the whole of that portion of these pipes D D which connects the boilers B B to each other is entirely inclosed within the furnace F.

I prefer also to make the steam-drum E of cast-iron.

F is a reverberatory furnace, which incloses the boilers A A and B, the pipes C, and the principal portion of the pipes D around their entire circumference, so as to expose their whole circumference to the action of the heat; and may also inclose boilers at their ends, as represented in the drawing, though this is less important.

This furnace is provided with the necessary ash-pit, and with a fire-box which opens flaringly upward, as represented, so as to throw the fire more directly upon the boilers, the boilers A A being supported upon proper masonry at the ends, and by a bridge of masonry in the middle, or by bars of iron, as shown in the drawing.

The gases of combustion are discharged from the oven or reverberatory furnace, through openings G H, into two horizontal flues which are formed in the masonry alongside of the furnace, and which lead to the chimney.

These flues are provided with doors I at the front end, for the convenience of cleaning them.

Each of the pipes D D extend upward through the top of the furnace to connect with the steam-drum E, which is placed above the furnace, so as not to be exposed to the action of the fire.

J K L are gauge-cocks, connected to one or more of the pipes D D, to ascertain the height of the water, and to furnish a guide for regulating the supply.

These gauge-cocks should all be placed above the inside crown of the furnace, or, in other words, above the highest fire-surface, so that the water shall never fall below the highest point acted upon by the fire, or receiving the radiation of the heat of the furnace.

It will be obvious that any other device for showing the height of the water or regulating the supply may be substituted in the combination for gauge-cocks, it being essential, however, that the arrangement shall be such as to bring the water-line above the heating-surface.

The pipes are represented as being connected by flanges bolted together in the ordinary way, and this is sufficient for ordinary purposes, these bolts being so short that the difference between the expansion of cast and wrought-iron is not seriously felt, and will seldom produce even the slightest leak; but to render the perfection of these joints absolute, and avoid any possible difference of expansion and contraction, these

pipes may be connected by a right-and-left-hand screw-coupling, *m*, made of cast-iron, as shown in fig. 4.

Remarks.

It is well known that the construction of steam-boilers of cast-iron has been often attempted, and for some purposes with considerable success where only a low pressure of steam is required; but where a high pressure and rapid generation of steam is required, the difficulties of the greater thickness of metal necessary, the necessary absence of internal tubes or flues, and other difficulties unavoidable in cast-iron boilers interfering with the rapid production of steam, together with the greater liability of cast-iron to be injuriously affected by overheat, have presented serious objections to the use of cast-iron as a material of construction.

In the construction I have described, however, these objections are overcome or obviated, the inclosure of the entire circumference of the boilers and pipes in a reverberatory furnace giving a concentration of heat upon them, and a greater exposure of surface, more than sufficient to compensate for the additional thickness of metal necessary, while the adjustment of the water-level above the inside of the crown of the reverberatory furnace, and the arrangement of the steam-drum outside of the furnace, as described, prevents any undue action of the heat upon parts not protected from such action by contact with the water.

The water being first supplied to the lower boilers A A, and they being connected by tubes, as described, to the boilers B B above them, favorably affects the action of the heat in producing steam, as the water becomes considerably heated in the boilers A A before it ascends into the boilers B B, where it is subjected to the very powerful action of the heat reflected downward from the crown of the furnace.

This mode of construction is also particularly valuable for marine-boilers, as it is well adapted to prevent injurious shifting of the water-level in the different parts of the boiler by the vibration of the boat.

The arched form given to that portion of the pipes D which connect the boilers B B to each other also very much contributes to their strength, and prevents their being liable to sag if subjected to extreme heat.

This form also throws them very much up into the arch of the furnace, when arranged in the furnace in the manner described, and thereby adds very materially to their efficiency as generators of steam.

Claim.

I claim as my invention—

The arrangement hereinbefore described, in combination with each other, of the boilers B B, arched pipes D D, steam-drum E, and furnace F, the arched portion of the pipe D being inclosed within the furnace, substantially as hereinbefore set forth.

LEFFERT RYERSON CORNELL.

Witnesses:

CHAS. T. HICKS.

WM. COWIE.