E. Thayer,

Furnace Grate.

No. 49,172. Patented Aug. 1, 1865.

Fig. 1.

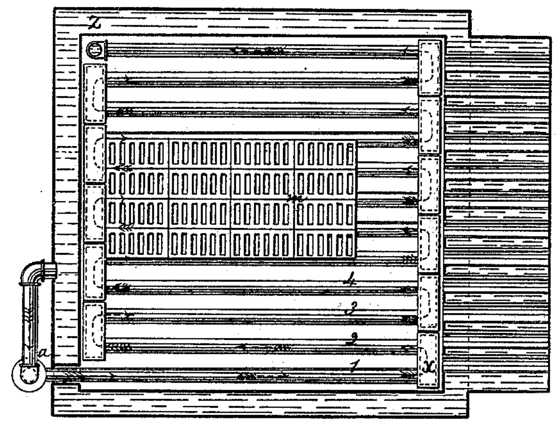


Fig. 3.

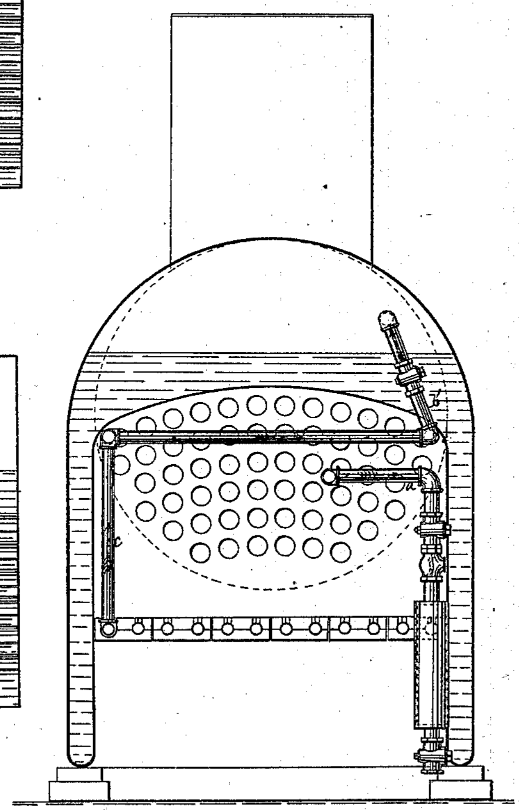
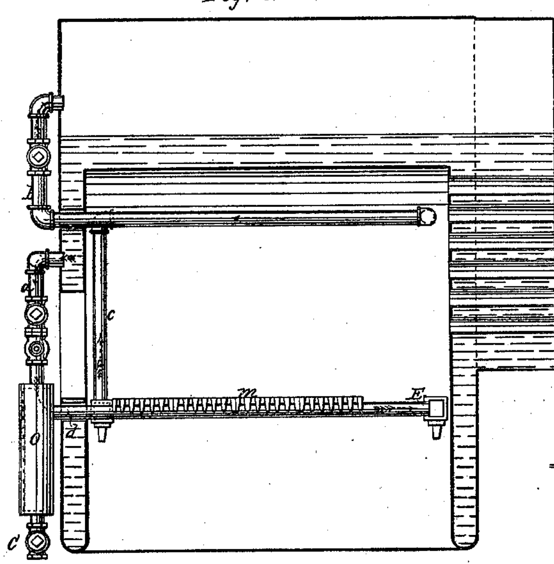


Fig. 2.



Witnesses;

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UNITED STATES PATENT OFFICE.

ELI THAYER, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. **49,172**, dated August 1, 1865.

To all whom it may concern:

Be it known that I, ELI THAYER, of the city and county of Worcester, and State of Massachusetts, have invented a new and Improved Method of Generating Steam; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of my invention consists in using pipes or tubes containing water to support the grate or floor of a furnace, and in extending the same so that a portion of such tubes or pipes shall be exposed to the heat of the furnace above the fire, by being so arranged as to extend into or through or around or across the combustion-chamber or the direct flue of the furnace.

Figure 1 represents a ground plan of the tubes or pipes which support the grates upon which the fuel is consumed. It also represents a part of the floor of the furnace. Fig. 2 represents a side elevation. Fig. 3 represents a front view.

The same letters represent the same parts in all the figures.

To enable others skilled in the art to make and use my invention, I proceed to give a full description of its construction and mode of operation.

The letter *o* represents the sediment-extractor, (described in my patent issued April 11, 1865.) Into this vessel the water is conducted from the boiler by the pipe *a*. From the sediment-extractor it enters the pipe marked 1, which is the first of a series of grate-supporters. This pipe is connected with the pipe marked 2 by the return-bend *x*. The second pipe is in like manner connected with the third, the third with the fourth, and so across the entire width of the furnace, till we reach the point marked Z. At the point Z an upright or vertical pipe is attached to the last of the pipes supporting the grate, and extends upward through the fire. At its upper extremity it is again connected with a horizontal pipe extending into, through, or around the combustion-chamber, varying in length according to the increase of power desired and discharging into the boiler at a higher point than the one from which the water was at first taken from the boiler.

In this description there is one continuous pipe or water-passage from the point where the water is taken from the boiler to the point where the water or steam is returned into it. The intense heat applied to that part of the pipe above the fire very materially increases the rapidity of the circulation of the water through its entire length, besides determining the direction of the current. In this passage through many feet of continuous pipe (in some furnace not less than two hundred feet) steam is rapidly formed, and the power of the boiler to which this improvement is attached is thereby greatly increased. For this reason I much prefer the continuous pipe for this use; but, nevertheless, the several supporters of the grate may have each a connection with the boiler at both ends, or all or several of them may have a common connection with a single pipe entering the boiler.

The pipe which I have used in my applications of this invention varies in internal diameter, according to the size of the furnace, from one to two inches, and is of the kind called "extra strong." These pipes are not used for grate-bars, for the reason that from the constant circulation of water in them their temperature is so low as to prevent the combustion of fuel in immediate contact with them. It is therefore found necessary in practice to cover them with metallic bars or perforated sheets of metal, which, while kept below a red heat by contact with the tubes containing water, are of a sufficiently high temperature to allow the fuel in contact with them to burn freely, so that the ashes readily fall through and do not (as is the case when the fuel rests upon the pipes) obstruct the draft and prevent combustion. The same result may be secured, though not so conveniently, by making the upper portion of the pipe of sufficient thickness to allow the part in contact with the fuel to become sufficiently heated to allow combustion upon it. This method, however, would be much more difficult and expensive.

This invention, in combination with the sediment-extractor, may be used either with or without the check-valve and stop-cocks described in my patents of 28th of March and April 11, 1865, for in this case the sediment-extractor prevents any sediment entering the pipes, and the constant circulation of water is

secured without a check-valve by means of the steam first forming in that portion of the pipe or pipes above the fire, thus securing a column of steam in the discharge-pipe, while there is always a column of water in the supply-pipe. The difference of weight between these two columns is the motive power of the circulation. In addition to the above, the air-chamber in the upper part of the sediment-extractor serves to prevent the return of water to the boiler through the same pipe by which it is taken out, so that from the first kindling of the fire in the furnace the circulation is continuous and constant.

The length of pipe in the combustion-chamber and the form in which it is arranged will depend upon the size and form of the furnace and the increase of power desired.

Having thus described its construction and mode of operation, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The tubular supporters of grates, substantially as set forth.

2. In combination with these supporters, the extension or continuation of the pipe or pipes into the combustion-chamber, substantially as set forth.

3. The combination of these supporters with the screen, grates, or bars resting upon them, and also with the sediment-extractor.

ELI THAYER.

Witnesses:
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