(No Model.) 2 Sheets—Sheet 1.

W. LOWE.

BOILER FURNACE.

No. 304,332. Patented Sept. 2, 1884.

Fig. 1.

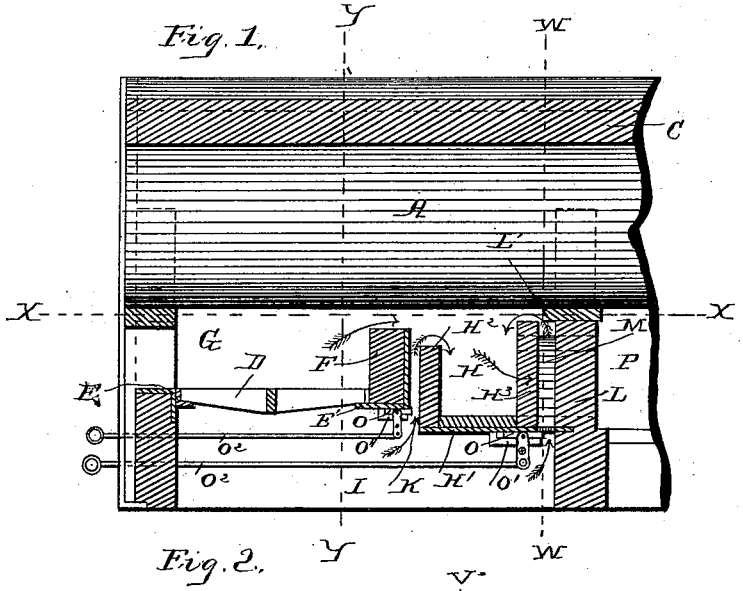
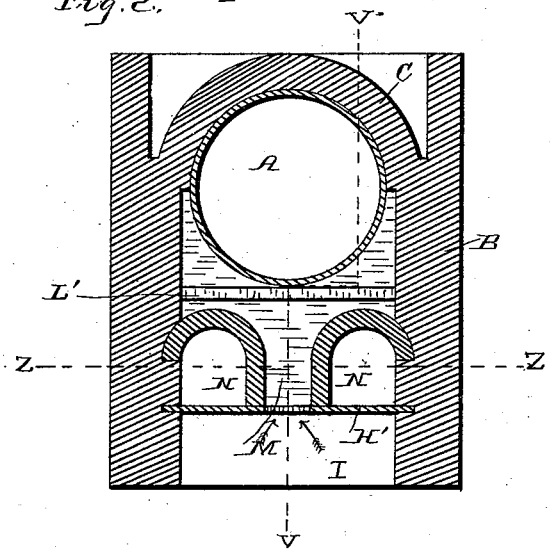


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

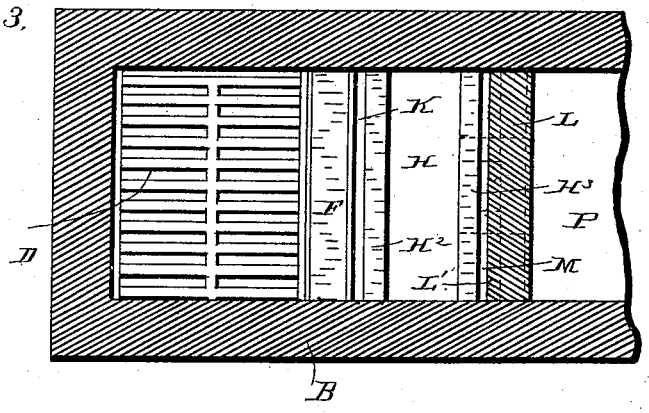


Fig. 4.

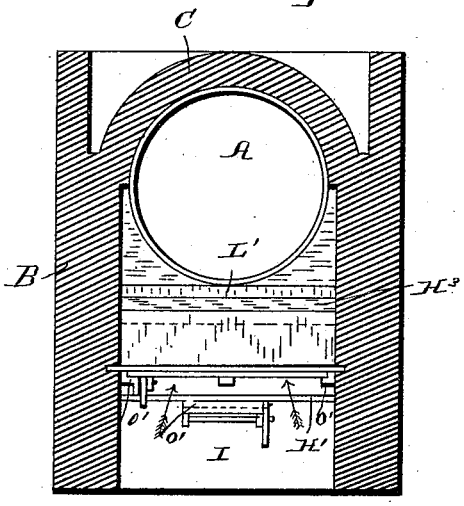
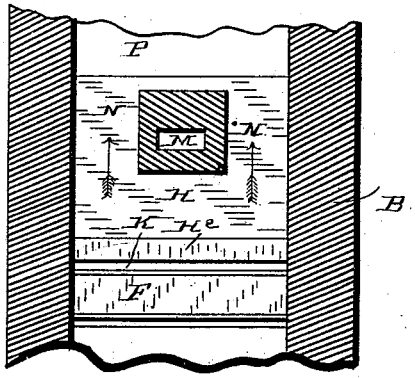


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM LOWE, OF BRIDGEPORT, CONNECTICUT.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 304,332, dated September 2, 1884.

Application filed May 19, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM LOWE, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Boiler-Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to economize in the use of fuel—in other words, to reduce the consumption of fuel, or to produce a greater quantity of heat from an equal amount of fuel. This I accomplish by a novel construction which causes thorough combustion of the gaseous products of the fuel.

My invention consists in the construction and combination of parts, as hereinafter fully described, and then pointed out in the claims.

In my description I shall refer by letters to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal section on the line *v v* in Fig. 2; Fig. 2, a transverse vertical section on line *w w* in Fig. 1; Fig. 3, a longitudinal section on line *x x* in Fig. 1, the boiler being removed; Fig. 4, a transverse vertical section on line *y y* in Fig. 1, the grate being removed, and Fig. 5 a transverse section on the line *z z* in Fig. 2.

Similar letters indicate like parts in all the figures.

A represents the boiler, which is supported in the usual manner; B, the side walls; C, the top wall, and D the grate, all of ordinary construction.

The boiler forms no part of my present invention, which is equally applicable to a plain cylindrical or to a flue or tubular boiler.

The grate is supported by plates E E′ in the ordinary manner. Plate E′ also supports a bridge-wall, F, at the rear of the fire-box G—*i. e.*, space between the grate and the boiler.

H is a combustion-chamber located back of the fire-box. This chamber is supported on a plate, H′, and is preferably constructed of or lined with fire-brick. The front wall, H^2, of the combustion-chamber is not as high as bridge-wall F, but the rear wall, H^3, of said chamber is considerably higher than the bridge-wall, all of which will be more fully explained.

I is an open space or air-box under the grate, which serves as an ash-pit, and also extends back under the combustion-chamber for the purpose of supplying air thereto.

K is an air-passage leading upward from the air-box between the fire-box and the front wall of the combustion-chamber.

L is a closing-wall a short distance back of the combustion-chamber, which is built up close under the boiler.

M is an air-passage leading upward from the air-box between the rear wall of the combustion-chamber and the closing-wall.

N N are passages leading out of the combustion-chamber and through the closing-wall into the open space beyond, where the products of combustion are again brought directly in contact with the heating-surface of the boiler. I have shown two passages leading out of the combustion-chamber into the open space beyond; but of course the number of these passages is not an essential feature of my invention. The opening of air-passage M into the air-box is between passages N N, as clearly shown in Figs. 2 and 5. Above the walls of passages N N passage M widens out and occupies the entire width of the space under the boiler. At the top of passage M the closing-wall L is so constructed as to project over and partially close said passage, as at L′, there being a narrow opening between projection L′ and the top of wall H^3 extending clear across the passage. The effect is to cause a sheet of air to enter the combustion-chamber over the top of the rear wall. Air-passages K and M are both provided with air gates or dampers O. These gates slide in suitable ways or rabbets, O′, and are operated by rods O^2, which extend to the front of the furnace. By means of these gates or dampers I am enabled to regulate the quantity of air admitted to the combustion-chamber.

In starting a fresh fire the gates will be closed so as to shut the air off in both passages. The operation is as follows: The products of com-

bustion, including, as is always the case, a large amount of unconsumed gaseous matter that is distilled from the fuel in the fire-box, pass over the bridge-wall and into the combustion-chamber. This chamber might be termed with equal propriety a "heating and mixing chamber." As the products of combustion pass over the bridge-wall and the front wall of the combustion-chamber, they come in contact with an upward current of air through passage K, which comes up under the volume from the fire-box. As the only outlets of the combustion-chamber are passages N N, it follows that the products of combustion are deflected downward and the volume divided. This checks and delays the volume in the chamber. As the volume of gases passes into this chamber and downward, and while it is being mixed with the air-current through passage K, it is also brought in contact with the current of air which enters the chamber through passage M over the volume of gases from the fire-box, both of which are drawn downward into the chamber. The volume of unconsumed gases as it enters this chamber is thus brought in contact with two independent currents of air, one of which enters under the volume from the fire-box, owing to the front wall of the chamber being lower than the bridge-wall, the other over said volume, as the rear wall of the chamber is carried up higher. Both air-passages extend entirely across the chamber. It follows, therefore, that the unconsumed gases must be thoroughly mixed with atmospheric air in this chamber. It is of course thoroughly understood that the specific gravity of atmospheric air is much greater than the gases from the fire-box. In my furnace, however, I secure thorough mixing of the air and gases by providing independent currents of air, which enter the chamber both over and under the volume of gases. While the fuel in the fire-box is under full action the bridge-wall and the walls of the combustion-chamber become highly heated, in fact red-hot, which heats the air in both of the passages K and M. After once becoming heated these walls do not quickly become cool again.

The effect of thus mixing independent currents of heated air with the volume of gases in a highly-heated chamber is particularly marked when a fresh charge of fuel is placed on the fire. When the fire is in this condition—*i. e.*, "green"—the gaseous portion of the fuel is almost wholly unconsumed in the fire-box and enters the combustion or mixing chamber at a comparatively low temperature, considerably lower, in fact, than the temperature of the walls of the chamber, where they are reheated and instantly ignite. It results, therefore, that practically-perfect combustion of the gaseous portion of the fuel takes place in this chamber, and beyond it in the open space under the boiler, which I have indicated by P, so that an uninterrupted volume of flame-heat pours through passages N N and against the heating-surface of the boiler, the ultimate effect of the combustion-chamber and air-passages, as I construct them, being the perfect and uniform combustion of the gaseous portion of the fuel, the combustion being equally perfect when a fresh charge of fuel is placed on the fire. It should be observed that all portions of this furnace with which it is possible for heated gases to come in contact are solid walls, preferably built of fire-brick, no metal being used. The construction is exceedingly simple and inexpensive, and practically impossible to burn out.

It will of course be understood that I do not desire to limit myself to the exact details of construction which I have shown, as it is apparent that they may be varied within reasonable limits without departing from the spirit of my invention. As stated above, the size or number, and likewise the shape of the passages through the closing-wall, may be varied to produce the best results with different kinds of fuel. Air may be supplied to the passages in the front and rear of the combustion-chamber through the front or side walls of the furnace, or through pipes provided with suitable gates or dampers for regulating the quantity of air supplied as is common in all classes of furnaces.

Having thus described my invention, I claim—

1. In a furnace, a combustion-chamber under the boiler, into which the gaseous products of combustion pass from the fire-box, and in which they are deflected downward over a current of air admitted between the bridge-wall and the front wall of the chamber, and are met by a current of air admitted over said gases between the rear wall of said chamber and the closing-wall.

2. The combustion-chamber adjoining the fire-box, in combination with an air-passage between the front wall of said chamber and the bridge-wall, which admits air under the volume of gases, an air-passage between the rear wall and the closing-wall, which admits air at the rear of said chamber over the volume of gases, and passages through the rear wall of the chamber and the closing-wall, which admit the volume of gases to the usual chamber under the boiler.

3. The bridge-wall F, over which the products of combustion pass, and closing-wall L, built out at the top, and having passages, as shown, in combination with wall H^2, made lower than the bridge-wall, and wall H^3, made higher than the bridge-wall, substantially as described.

4. Air-passages K and M, having air-gates, as shown, in combination with the combustion-chamber, and passages N, substantially as described.

5. Bridge-wall F and wall H^2, forming air-passage K and closing-wall L, and wall H^3, forming air-passage M, in combination with

gates O, operated by rods O^2, and passages N through the closing-wall.

6. The combustion-chamber having outlets N, and closing-wall L, having projection L′, in combination with the fire-box, the bridge-wall, and the air-gates, all combined and arranged as described, and for the purpose set forth.

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

WILLIAM LOWE.

Witnesses:
A. M. WOOSTER,
J. T. WOOSTER.