W. Ennis.

Boiler Furnace.

No. 87,917. Patented Mar. 16, 1869.

Fig. 3.

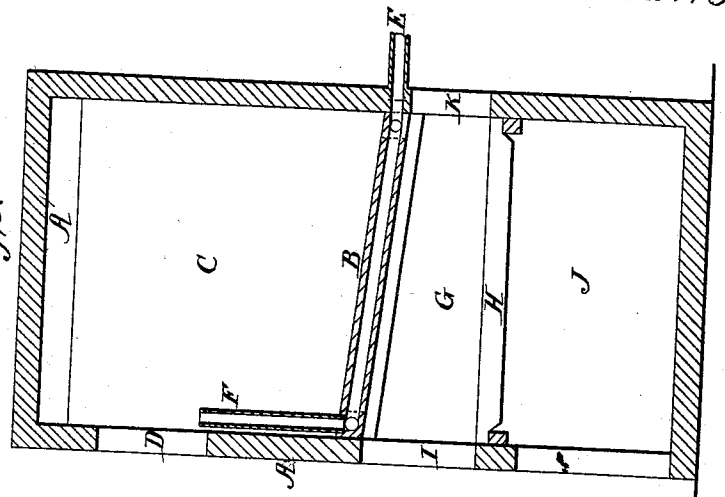


Fig. 2.

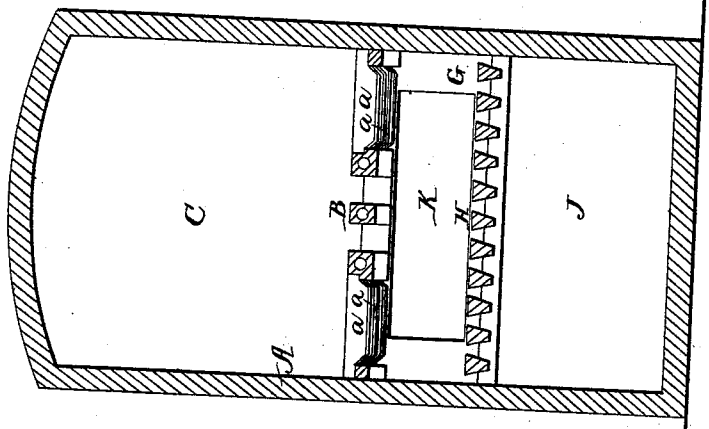
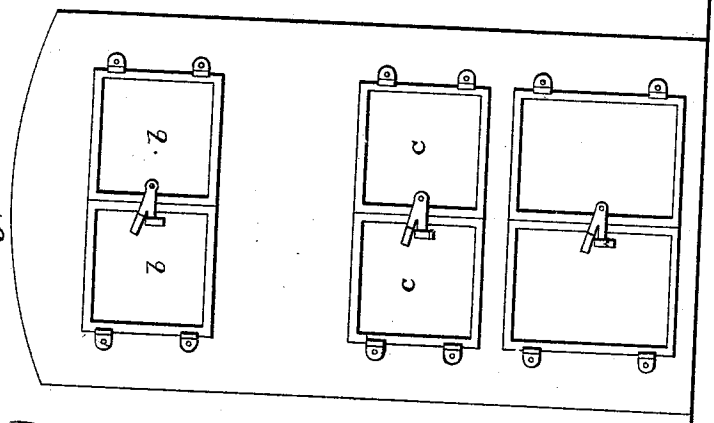


Fig. 1.



Witnesses;
A. Leclerc
N. Kimmie

Inventor;
William Ennis

UNITED STATES PATENT OFFICE.

WILLIAM ENNIS, OF PHILADELPHIA, PENNSYLVANIA.

STEAM-BOILER FURNACE.

Specification forming part of Letters Patent No. **87,917**, dated March 16, 1869.

To all whom it may concern:

Be it known that I, WILLIAM ENNIS, of the city and county of Philadelphia, in the State of Pennsylvania, have invented a new and useful Improvement in Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming part of this specification, and in which—

Figure 1 represents a front view of a furnace constructed in accordance with my improvement, and Figs. 2 and 3 vertical sections of the same at right angles to each other.

Similar letters of reference indicate corresponding parts.

This invention relates to an improvement in that class of furnaces in which steam or a spray of water is brought into contact with the burning fuel, in order that its decomposition may increase the combustion of the fuel, and more especially has reference to an improvement in furnaces secured to me by Letters Patent No. 55,079, dated the 29th day of May, 1866, in which the furnace has a downward draft, and the steam introduced above the grate in such manner as that it passes downward through the burning fuel and through the grate, which is preferably made of a hollow or tubular character, and arranged to connect with an elevated steam-chamber for operation in concert with a draft-opening or chimney below the grate.

My invention consists in a combination, with a furnace of such character, of a second grate or fire-place arranged beneath the grate of said furnace, and supplied with atmospheric air, whereby the fire resting on the lower grate is made to consume the gases liberated by the action of the steam in passing downward, by, among, or through the fuel on the upper grate.

Referring to the accompanying drawing, A A represent the outer walls of the furnace. B is the upper grate, arranged at the bottom of a close chamber, C. This grate is preferably made of a tubular character, and may be formed of a hollow center frame of metal, with cross-bars *a a* of any suitable material on either side of it.

D is the feed-opening for the fuel to the grate B, and *b b* doors for closing the same. E is an inlet-pipe supplying water to the grate B, or tubular portion of it; and F, an upward delivery-pipe for the same or steam, into which it may have been converted, the upper end of said pipe being either wholly open at or near its top, or being perforated with numerous holes, to allow of the steam or water in a spray form escaping into the fire place or chamber C.

Arranged below the grate B is a second fire-place, G, of which H is the grate; I, the feed-pipe opening, provided with doors *c c;* and J, the ash-pit.

K is a draft-outlet and heat-escape opening, common to both fire-places, and arranged below the upper one.

The fire on the lower grate is supplied with atmospheric air, either by a forced or natural current.

In working the furnace, fuel is fed onto both grates, B and H, and both fires started; or the lower one at first only lighted, and the fuel on the upper grate ignited from the lower fire.

As the steam or water in a spray form escapes from the pipe F into the upper fire-chamber, C, it is drawn downward through the burning coal on the grate B by the draft of the outlet K, whereby its particles are evenly distributed and brought in contact with the incandescent coal on the grate B. This decomposes said particles into their elements, the combustion of which increases the heat of the fire. Said vapor also loosens or breaks up the mass as it cokes on the grate, and liberates confined gases, which, instead of allowing to escape unconsumed, I cause to be burned by, in the downward draft from the fire-place C, bringing them into contact with the fire on the grate H, and atmospheric air supplied thereto or through. Ashes, too, falling from the grate B, are reburned or utilized in the lower fire.

After the furnace has been set going, and requires recharging, the coke formed on the upper grate may be broken up by a slicer, and made to feed or supply with fuel the lower fire, and a fresh supply of green coal be fed to the upper fire, and such process be kept up as often as required.

This combination of two fire-places, the one of them being a coking-oven, as it were, and having a downward draft, with steam or water

supplied to it, as described, and the other being an ordinary fire-place supplied with atmospheric air, effects a most perfect combustion of the fuel and gases contained in it, and produces great heat at comparatively little expense.

What is here claimed, and desired to be secured by Letters Patent, is—

The combination of a secondary grate, H, to which atmospheric air, for the purpose of promoting combustion, is supplied, with or relatively to an upper grate, A, of a furnace, supplied with steam or water introduced above its grate for passage among or through the fuel resting thereon, as induced by the draft arranged below the upper grate, and made common to both grates or fire-places, substantially as and for the purpose or purposes herein set forth.

WILLIAM ENNIS.

Witnesses:
A. LE CLERC,
A. KINNIER.