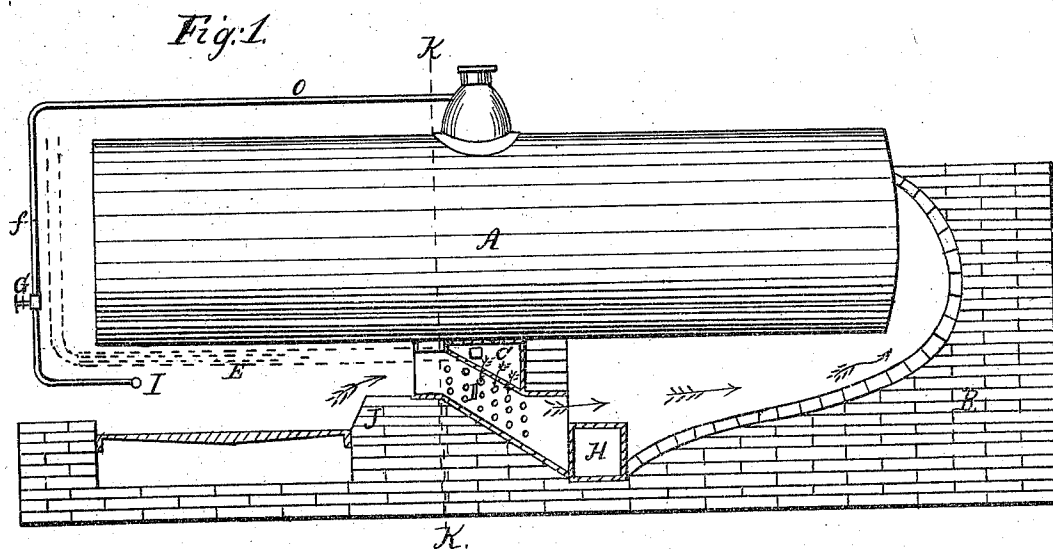
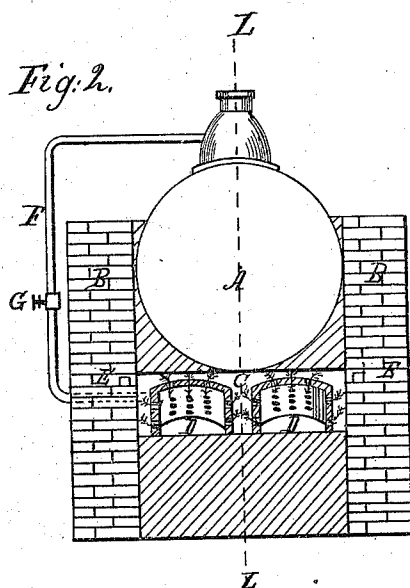


S. A. FORD.  
Boiler-Furnaces.

No. 141,870.

Patented August 19, 1873.



Witnesses.

John F. Collins.  
J. G. King.

Inventor.

Samuel A. Ford.

# UNITED STATES PATENT OFFICE.

SAMUEL A. FORD, OF CHICAGO, ILLINOIS.

## IMPROVEMENT IN BOILER-FURNACES.

Specification forming part of Letters Patent No. **141,870**, dated August 19, 1873; application filed May 23, 1873.

*To all whom it may concern:*

Be it known that I, SAMUEL A. FORD, of the city of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Boiler-Furnaces, of which the following is a specification:

My invention is especially adapted for use in connection with steam-boilers and heating-furnaces, but I shall more particularly describe its application to steam-boilers, it being observed that in the case of heating-furnaces the top of the wall of the furnace corresponds to the bottom of the boiler, as herein referred to. The object of my invention is to provide a cheap and effective method of promoting the combustion of the volatile hydrocarbon and other gases which, in passing off as smoke, occasion great loss of heat and consequent waste of fuel. The principle involved is that well-known principle of combining with the flame of burning fuel a suitable amount of atmospheric air at the time and place where the greatest expansion of the gases is had, and hence the highest temperature obtained.

To accomplish this purpose I construct in the following manner a chamber for heating and distributing air: The space immediately in the rear of the bridge-wall in general use is bricked up as far as may be desirable, the top line of this brick-work having a sharp deflection beginning at the level of the bridge-wall. Above the bridge-wall and this brick-work, and resting upon the same, there is constructed an arched chamber or series of chambers at the front end, setting close against the bottom of the boiler, but as extended deflected, so as to be parallel with the deflection of the brick-work below. At the rear end of the arched chamber or chambers the brick-work is carried up close against the boiler, thus forming an intermediate space or chamber between the top of the arch or arches and the bottom of the boiler. The space between the walls sustaining the arches and the brick-work of the boiler setting or space between the several arches, as the case may be, form a part of the air-chamber, and by means of perforations the heated air is minutely mingled with the gases while passing through the arched chamber or chambers constructed as

described. The deflection referred to leaves as large a hot-air space between the boiler and the arched passage as may be desired, and, being narrowed at the front end where the heat first strikes it, the temperature of the air within it is equalized as nearly as possible, thus preventing any chilling of the gases while passing through the chambers, and being mingled with the air admitted through the perforations in the arch or arches and the walls sustaining the same. The object of constructing the hot-air space or chamber above the line of the bridge-wall, and the rear of the same, and of giving it a suitable deflection, or as great a deflection as may be had without obstructing the draft, is to overcome the difficulty hitherto experienced in perfectly burning the smoke, arising from the tendency of the lighter gases to hug close to the bottom of the boiler, and thus prevent a proper combination with atmospheric air, as heretofore admitted, requisite to perfect combustion. In some instances, however, in using fuel where a large amount of air is required, I construct an air-chamber in the brick-work immediately under the one here described, and connected with the same by means of the spaces referred to between the walls of the boiler-setting and the walls of the arches, or between the walls of the several arches. But where this is done the bottom of each arched passage is perforated as well as the top, thus completely surrounding the current of flame and gases with the appliance for distributing and combining the air. The lower chamber is, however, rarely required where the upper one is constructed of suitable length and capacity, that in any event being far more effective for the purpose desired.

The arched passage or passages may be constructed of any material capable of resisting a very high temperature. The object of arching the top of the passages herein described is simply to give strength and durability, but when the space is not too great they may be made flat, that form answering the purpose equally well. Into the hot-air space underneath the boiler and over the arched passages formed as there described, air is admitted in any convenient manner, but the mode I have shown in the accompanying

drawings I have found most satisfactory, as thereby the air becomes highly heated before entering the hot-air chamber.

In order to control the supply of air, thereby meeting the variable demands of different stages of combustion, as also to increase the draft where, from any cause, defective, a small steam-pipe is conducted from the dome of the boiler to the hot-air chamber in any convenient manner, but one or the other of the two plans of introducing this steam-pipe shown in the drawings I have found suitable to almost all furnaces. The pipe is extended across the hot-air chamber at right angles with the boiler, and by means of small perforations in the steam-pipe the supply of steam is equally distributed, and the supply of air thereby easily controlled. When it is inconvenient to use steam any ordinary blast will answer the same purpose. A steam-pipe is also taken from the dome to the front of the boiler and admitted either into the fire-box above the furnace-door and hence above the fuel or underneath the same, as may be most convenient. In either case the same object is accomplished, viz., to give an accelerated draft immediately after renewing the supply of fuel, and in certain conditions of the atmosphere. An ordinary blast may be substituted for steam here also, if more convenient.

In the accompanying drawings forming a part of this specification the outline of an ordinary boiler with the best interior form of setting is shown, the better to illustrate the nature and application of my invention.

Figure 1 is a vertical longitudinal section through lines L L. Fig. 2 is a vertical cross-section through lines K K.

A represents an ordinary boiler; B, parts of the brick-work incasing the same; C, the hot-air chamber; D, the passages or chambers for flame and gases; E, the air-pipe leading to the hot-air chamber C; F and O, steam-pipes; G, globe-valves to regulate the supply of steam; H, door-opening for cleaning out behind the bridge-wall, &c.; I, the fire-box; J, the bridge-wall.

What I claim, and desire to secure by Letters Patent, is—

The hot-air chamber C, and deflected perforated chamber D, in combination with the air-pipes E, steam-pipes F and O, arranged substantially as specified and shown, and for the purpose set forth.

SAMUEL A. FORD.

Witnesses:

JOHN F. COLLINS,  
J. G. KING.