

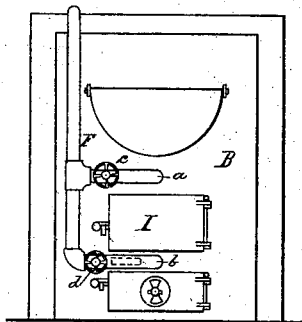
(No Model.)

E. R. STEGE.  
SMOKE PREVENTING FURNACE.

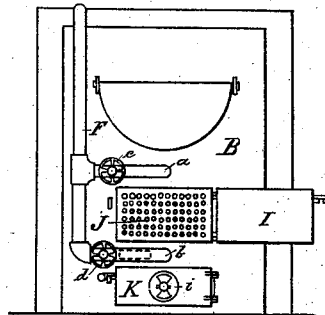
No. 260,625.

Patented July 4, 1882.

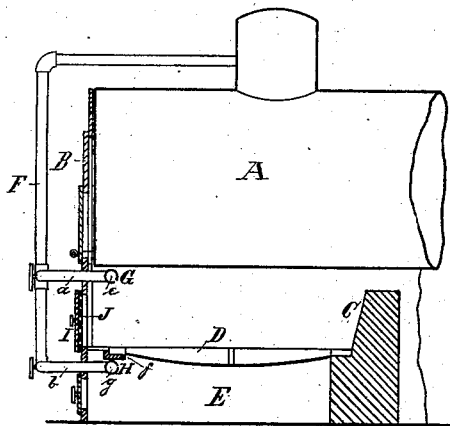
*Fig. 1.*



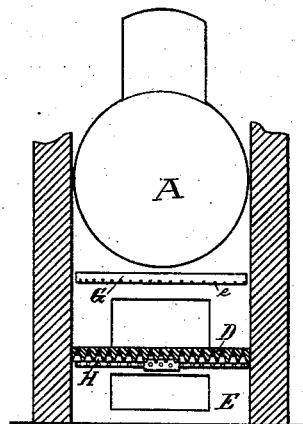
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



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# UNITED STATES PATENT OFFICE.

EDWARD R. STEGE, OF CHICAGO, ILLINOIS.

## SMOKE-PREVENTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 260,625, dated July 4, 1882.

Application filed December 27, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD R. STEGE, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Smoke-Preventing Furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The nature of my invention relates to devices for bringing about a perfect combustion of the fuel in boiler or other furnaces; and it consists of a combination of devices heretofore separately secured by Letters Patent No. 200,674, granted to me February 26, 1878, and No. 219,994, granted to me November 23, 1879, comprising an arrangement of a steam-blast from under the grate, a steam-blast from above the grate, and a perforated secondary fuel-door. Neither one of the devices claimed in the above-specified patents brought about the result aimed at; but since both were combined the result was all that could be desired, and the raising of smoke has been entirely prevented with a reasonable adjustment of the steam-blast.

In the accompanying drawings, Figure 1 represents an elevation of the boiler-front with my attachments; Fig. 2, a similar elevation with the exterior fuel-door opened. Fig. 3 is a longitudinal section of the boiler-furnace, and Fig. 4 a transverse section of the same.

Like letters represent corresponding parts in all the figures.

A denotes the boiler; B, the boiler-front; C, the bridge-wall; D, the grate, and E the ash-pit, all of which are arranged in the usual manner.

F is a pipe leading from the boiler-dome vertically down in front of the boiler-front B. This pipe F has two branches, *a* and *b*, each provided with a valve, *c* and *d*. The branch *a* is projected through the center of the boiler-front, and connects with a pipe, G, which is closed at both ends and has a series of small holes, *e*, drilled through its wall at equal distance apart and on a straight line. This pipe G is placed transversely against the internal face of the boiler-front above the fuel-door and below the boiler end, and so that the perfora-

tions therein will point to the rear end of the grate, and that the steam-jets issuing therefrom will blow in that direction.

The grate D is composed of a series of longitudinal bars, arranged in the usual manner, and supported at their front end upon a transverse supporting-bar, *f*. The branch *b* of the steam-supply pipe F extends across the boiler-front B between the fuel and ash-pit doors, where it passes through the center of such boiler-front into the furnace just below the plane of the grate.

To the inner end of the branch pipe *b* is centrally connected the blast-pipe H, which is placed transversely beneath the front support, *f*, of the grate. This pipe H is closed at its ends, and is provided with steam-openings *g* on one side, arranged in line with the interstices between the grate-bars and pointing more or less in an upward direction, so as to direct the jets of steam against the burning fuel on the grate. The steam thus projected will create a strong draft of air to the fuel at the most desirable point, will loosen the coal so as to get no chance for baking together, whereby the admission of atmospheric air would be prevented, which air is essential for combustion, and will preserve the grate-bars from overheating and burning away. By having this blast-pipe H situated directly under the supporting-bar *f*, this pipe is protected from the destructive heat of the furnace, and also from the falling ashes, so that no ashes will drop upon the pipe or into the steam-openings when the blast is not in operation.

I is the fuel-door, hinged to the boiler-front in the usual manner, and J is an auxiliary door, interposed between the door I and the boiler-front B, and swinging on common hinges with the door I. This door J is perforated with numerous small holes for admitting atmospheric air above the grate-bars in many small streams.

The ash-pit door K is provided with a register, *i*, for regulating the amount of air to be admitted to the fire from below the grate-bars. When fire is first started the fuel-door is to be closed and the entire supply of air is to be drawn from the ash-pit until a sufficient amount of coal has become incandescent. Now the ash-pit door K is closed and only the register *i* therein is opened, and the fuel-door I is

opened, leaving the perforated door J closed, and next steam is admitted into the perforated pipes G and H, which steam will become superheated, will be decomposed by coming in  
5 contact with the particles of incandescent carbon, and will supply to the fire not only a large amount of oxygen that will combine with the carbon to form carbonic-acid gas, but also by  
10 the highly-combustible hydrogen gases that are set free by the decomposing of the steam and by the oxygen in the atmospheric air propelled into the fire by the force of the steam-jets that will assist to bring about a perfect  
15 combustion. These steam-blasts, directed to the incandescent coal upon the grates near the bridge-wall from below and above, will facilitate not only the perfect combustion of the gases generated from the coal which they come  
20 in direct contact with, but they will create such a heat that the gases generated from the coking coal upon the front end of the grate, which have to intermingle with these highly-heated  
25 gases before they can pass the bridge-wall, will be also ignited and consumed. My experiments have proved that neither a steam-blast to the fuel from below the grates nor the same  
30 from above the grates, when used independently, will bring about the desired result, but that both combined will bring about a perfect combustion; also, that a sufficient amount of  
air through multiple orifices, and not in a compact stream, and at the proper location, so as  
to have time to intermingle with the gases

generated from the coking coal, will enable a perfect combustion.

The device, as will be noticed, is very simple, is easy to attach to boilers already set up, can be readily repaired, and is readily adjusted by any engine-tender or fireman having common sense.

I am aware that it is not new to arrange pipes within furnaces so that a blast of steam or air is supplied to said furnace both below and above the grate-bars, and such I do not claim.

What I claim is—

The combination, in a boiler-furnace, of a transverse steam-pipe just above the fuel-door, provided with downwardly-tending perforations, and a transverse steam-pipe placed beneath the front support of the grate and having perforations arranged in line with the interstices between the grate-bars, in combination with a fuel-door uniformly perforated throughout, and a solid fuel-door to shut off  
55 the air from the combined steam and air blast, all substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

EDWARD R. STEGE.

Witnesses:

F. W. KASEHAGEN,  
FRED WILLIAMS.