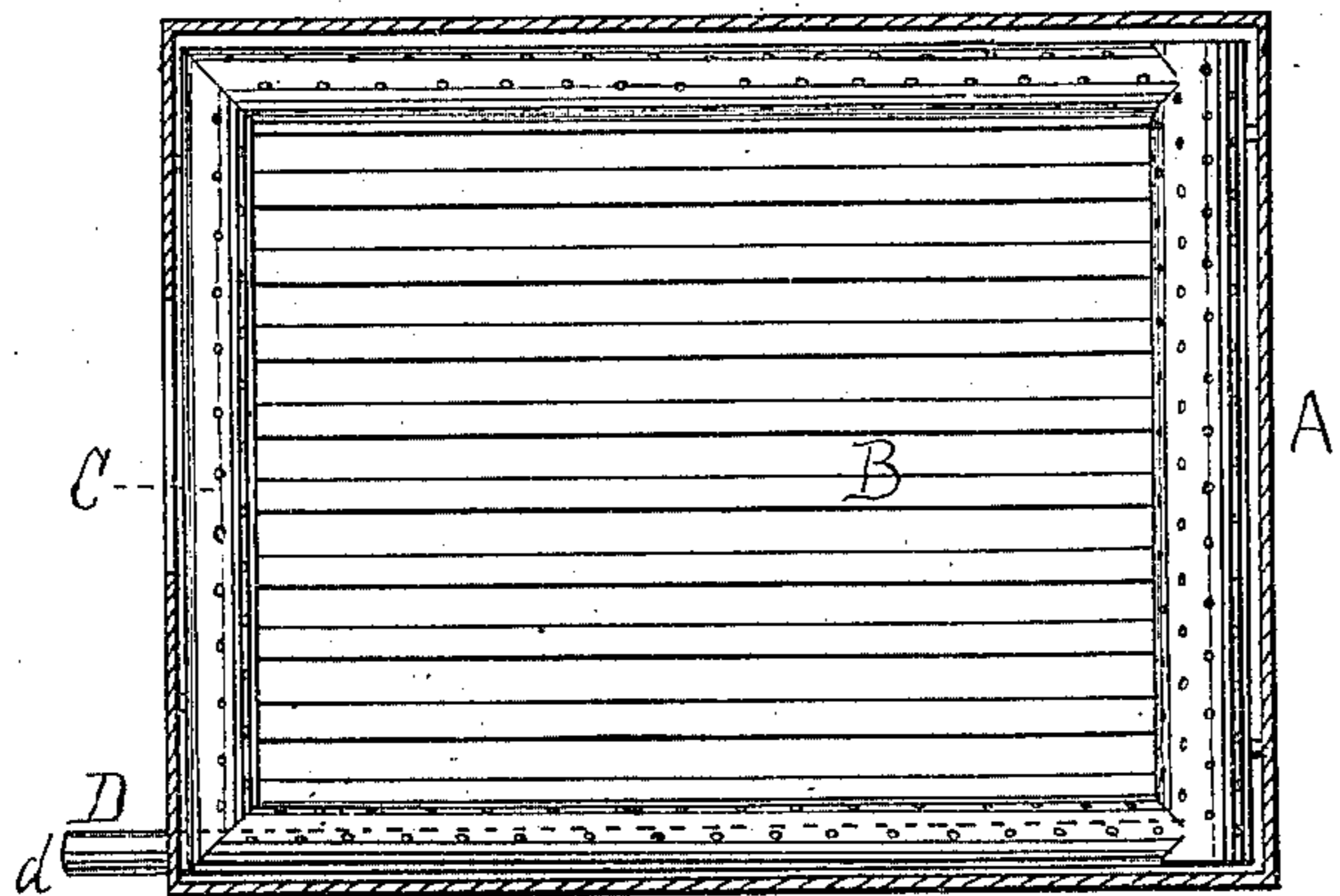


A. W. CRAM.  
Steam-Boiler Furnaces.

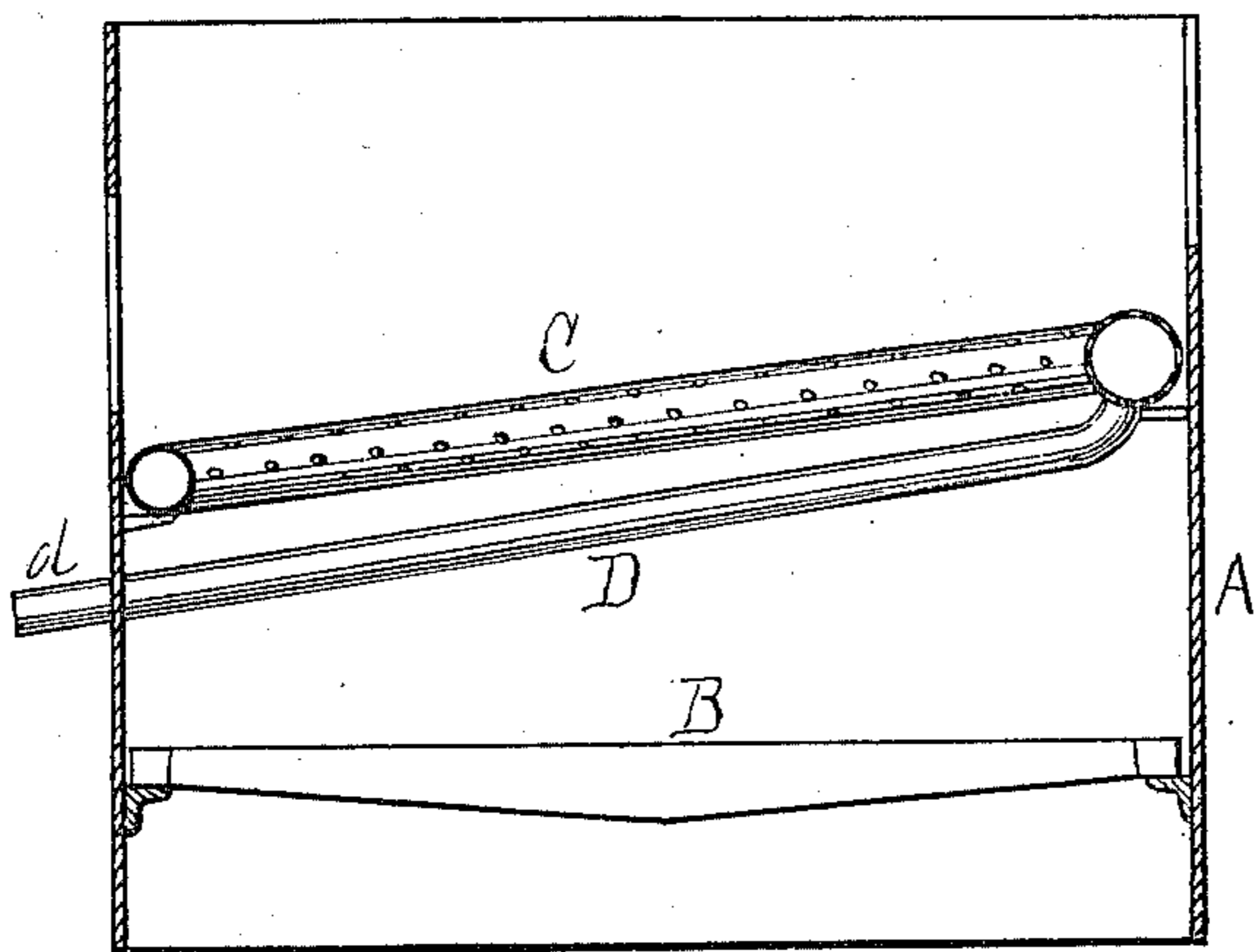
No. 134,465.

Patented Dec. 31, 1872.

*Fig. 1.*



*Fig. 2.*



*Witnesses:*  
Edwin James.  
H. D. Gordon.

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Attorney.

# UNITED STATES PATENT OFFICE.

ALONZO W. CRAM, OF LITCHFIELD, ILLINOIS.

## IMPROVEMENT IN STEAM-BOILER FURNACES.

Specification forming part of Letters Patent No. 134,465, dated December 31, 1872.

*To all whom it may concern:*

Be it known that I, ALONZO W. CRAM, of Litchfield, in the county of Montgomery and State of Illinois, have invented certain new and useful Improvements in Boiler-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing and the letters of reference marked thereon making part of this specification, in which—

Figure 1 is a top view, and Fig. 2 is a vertical sectional view.

The nature of my invention consists in arranging within the fuel-chamber of a steam-boiler or other furnace, and in close proximity to the walls of the same, a perforated pipe graduated so as to be largest at its air-receiving point, and of such dimensions as to surround, or nearly so, the entire interior surface of the furnace, said pipe to be inserted and secured above the grate-bars. My invention also consists in connecting this perforated pipe with the air-supply pipe in such a manner that the air which is designed to discharge through and around the burning fuel shall be heated as it is being fed or supplied to the distributing-pipe.

I am well aware that perforated pipes have heretofore been used in connection with steam-boilers and other furnaces, and which aimed to attain the results accomplished by my invention; but the defect in all these former devices and arrangements has resulted from one of two causes: The perforated pipe was introduced below the grate-bars, and the air discharged chiefly served to aid the draft, and did not so intermingle with the gases generated within the fire-chamber and the particles of unburned fuel as to insure their consumption, and, consequently, instead of securing and utilizing for the furnace their immense heating properties simply by increasing the draft, as they did, aided to drive them off; and when the perforated pipes were used, and were not secured under the grate-bars, they were invariably so arranged that the air which they are designed to supply is discharged in a cold volume and at a given section of the furnace. Thus discharging a volume of cold air at a given point fails to do what it is designed to accomplish; being heavy, it does not rise

through the mass of fuel and so commingle with the gases and small particles of light and floating fuel as to insure their perfect consumption, but on the contrary the coldness of the air serves rather to deaden the fire and retard the heat than to accelerate and intensify the same.

With my improvement, by an exceedingly simple arrangement, as practical experiment has fully attested, both of the classes of difficulties above referred to are entirely remedied. The air I introduce is not discharged at a given point or section, but is distributed equally through and around the burning fuel, thus insuring the permeation of the entire mass, and, being superheated in its passage to the distributing-pipe, does not, when poured in, deaden the fire, but readily rises through the same to the gases, and so intermingles with the same as to insure their consumption, and thus avoiding all waste, and securing from the smallest amount of fuel the most intense and greatest degree of heat; and this result is accomplished without the great and uniform draft heretofore deemed indispensable.

The construction and operation of my invention are as follows: A is a steam-boiler or other furnace, and may be of any desired form. B B are the grate-bars, and are of any ordinary or desired pattern. C is a graduated pipe, (being the largest where it first receives the supply of air,) which is constructed of metal or other suitable material, and is introduced within the furnace A, close to the walls of the same, and running nearly or entirely around the whole fire-surface thereof. This pipe C is provided with numerous perforations, and which are made at regular intervals throughout its entire length. D is a superheating air-pipe, and is arranged in the furnace, and connected with the pipe C, as shown in Fig. 2, and by reference to which it will be clearly seen that the cold fresh air is supplied to the pipe at one section of the furnace—the front, for instance—and is fed to the pipe C for distribution at the rear or opposite side wall, thus causing the air, after being received, to be heated in its passage through the pipe D, and before entering for distribution the pipe C. Fresh air is received through the nozzle *d*, and may be driven therein, if desired, by a siphon or any other suitable means.

When the siphon is used a certain degree of steam mixes and is distributed with the heated air.

From the foregoing full and detailed description the operation of my improvement as well as its great advantages will be readily understood. The air is driven into the nozzle *d*, and is superheated in its passage through the pipe *D*, and is caused to circulate throughout the pipe *C*, and through the perforations it is in uniform quantities distributed in and around the entire mass of burning fuel; and being heated before being discharged it is sufficiently light to ascend, and to so intermingle with the gases generated by the fire and the small particles of escaped fuel as to insure their thorough consumption.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The graduated perforated pipe *C*, arranged within a furnace and above its grate-bars so that it shall entirely surround the fire-surface of the same, substantially as shown, and for the purpose specified.

2. In combination with the perforated graduated pipe *C*, the superheating-pipe *D*, when connected and arranged to operate substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

Witnesses: ALONZO W. CRAM.

EDWIN JAMES,  
JOS. T. K. PLANT.