2 Sheets—Sheet 1.

J. FERGUSON.

HEATING AND FEEDING AIR TO FURNACES.

No. 184,361 Patented Nov. 14, 1876.

Fig. 1.

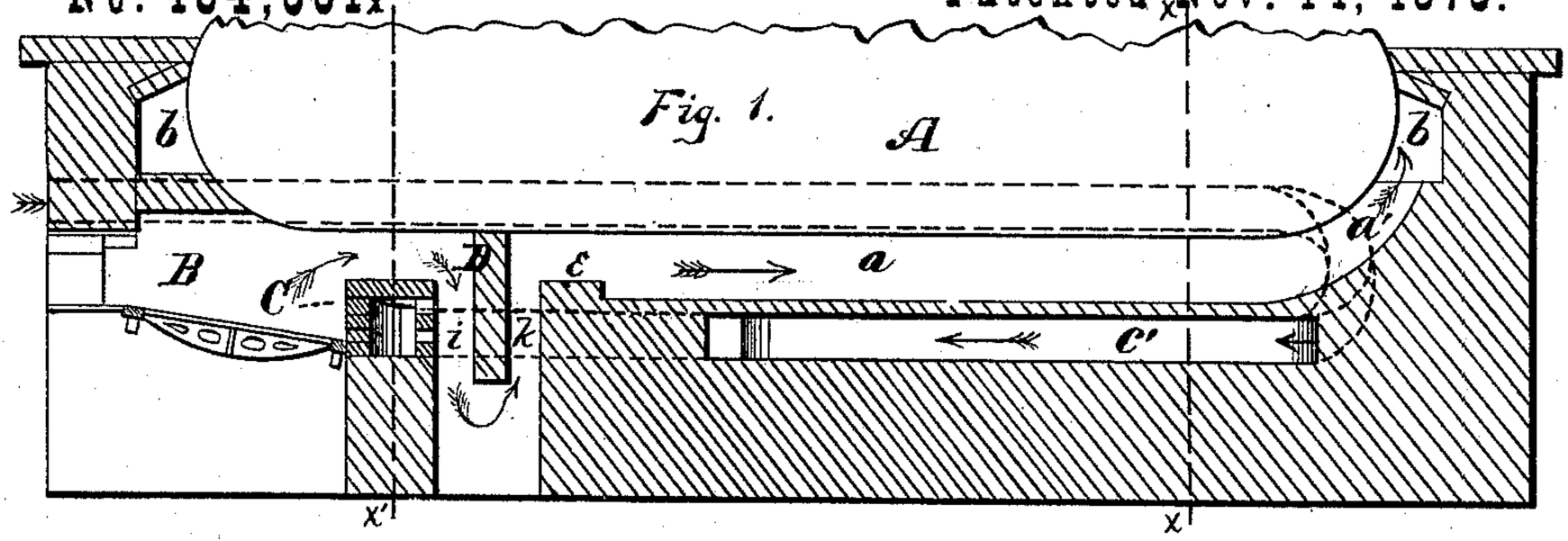


Fig. 2.

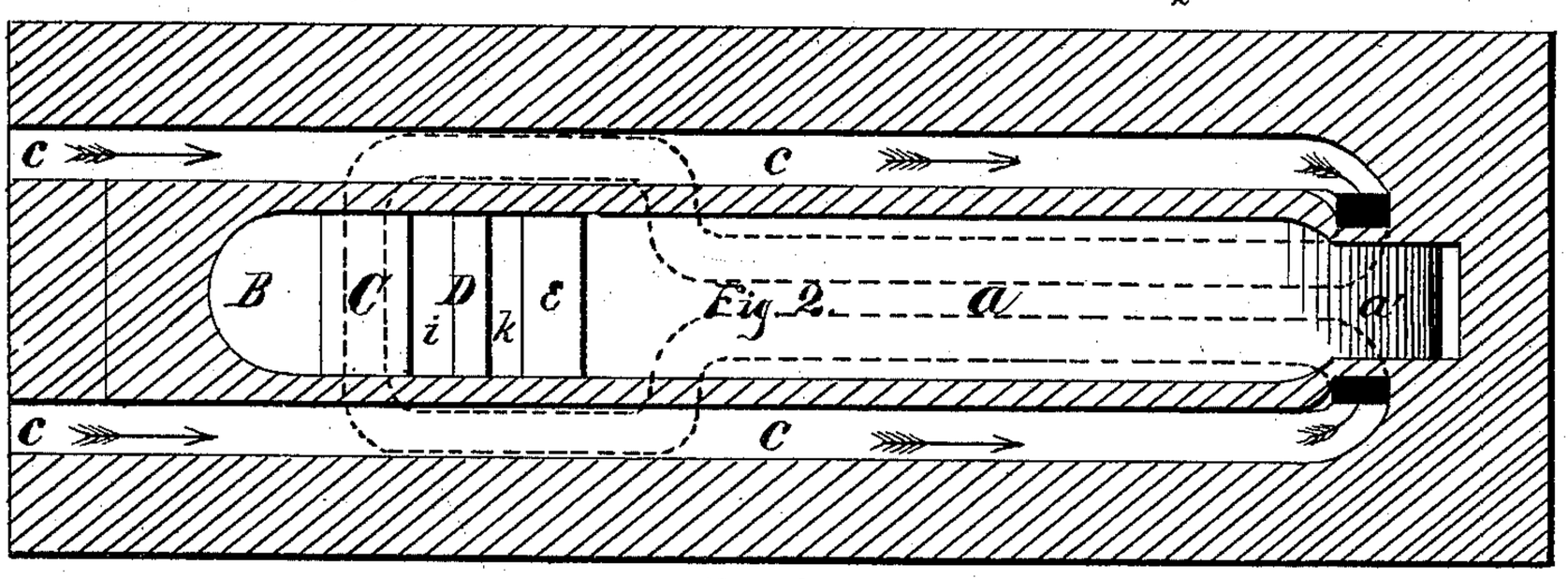


Fig. 3.

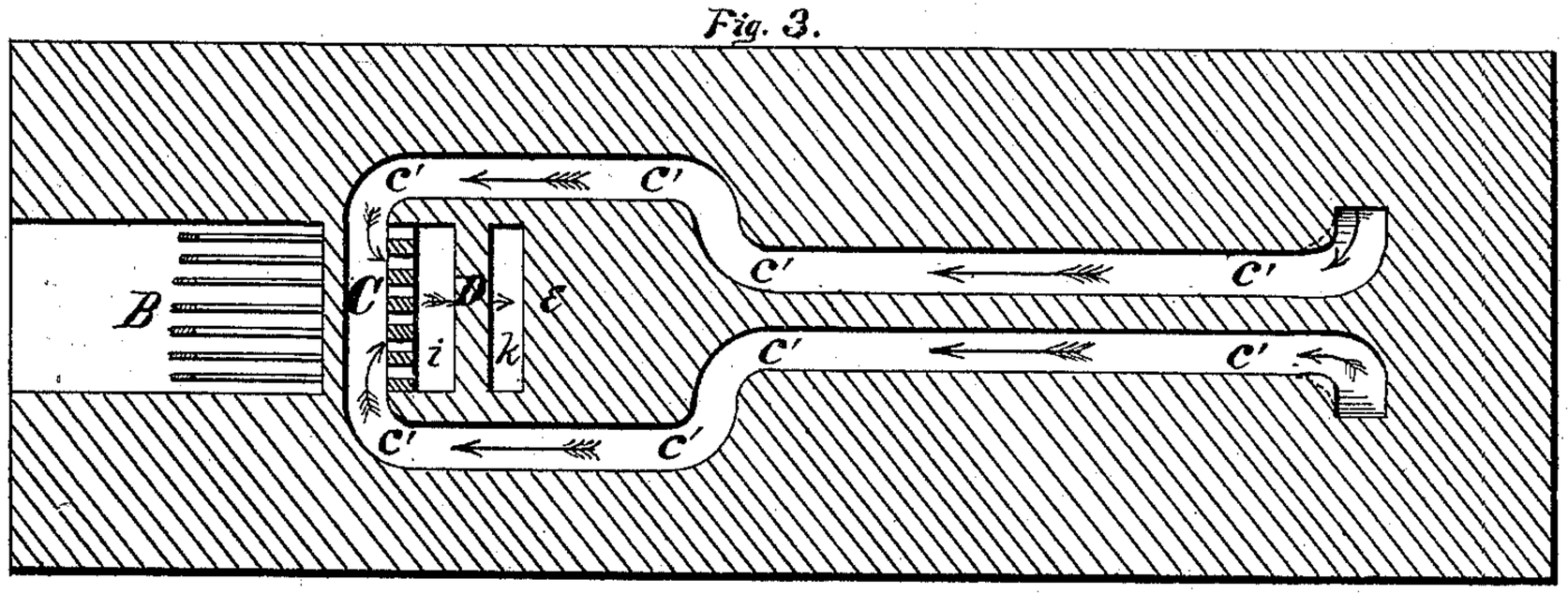


Fig. 4.

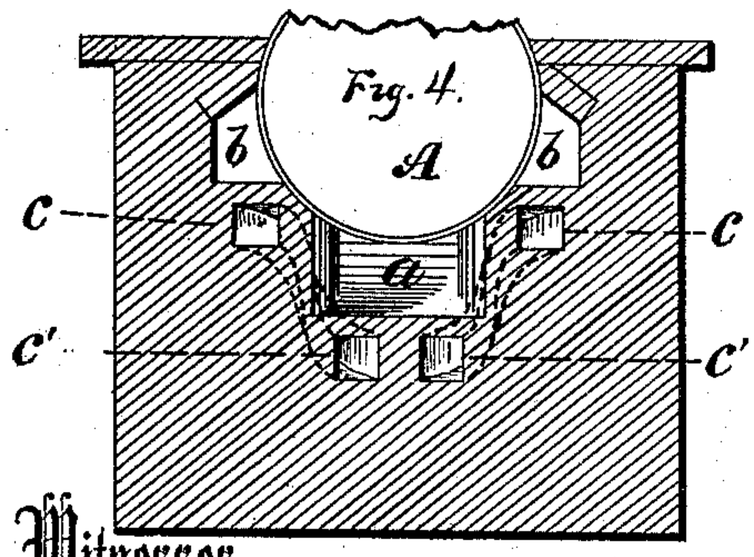
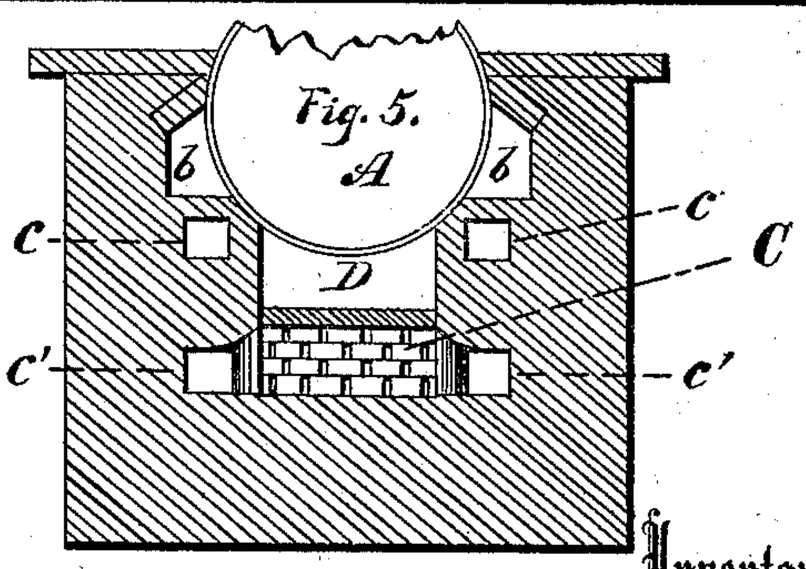


Fig. 5.



Witnesses

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2 Sheets—Sheet 2.

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HEATING AND FEEDING AIR TO FURNACES.

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Fig. 6.

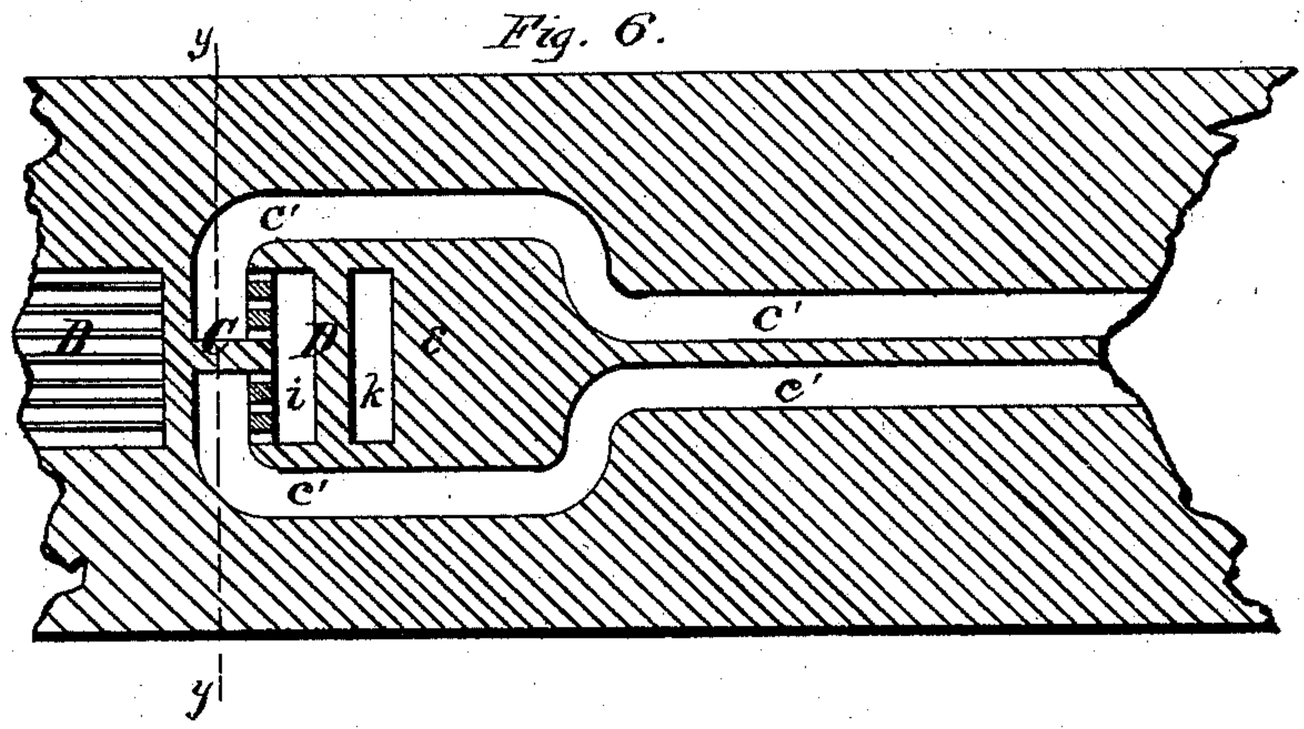


Fig. 7.

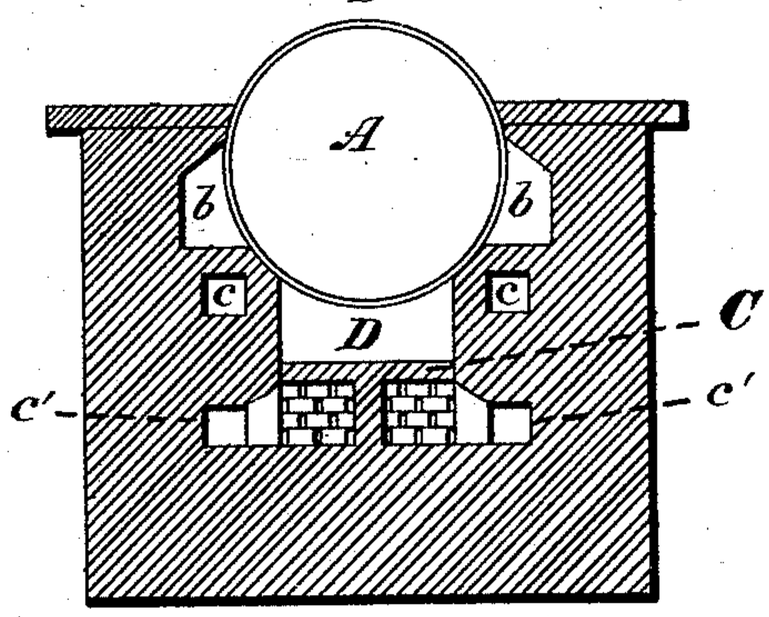
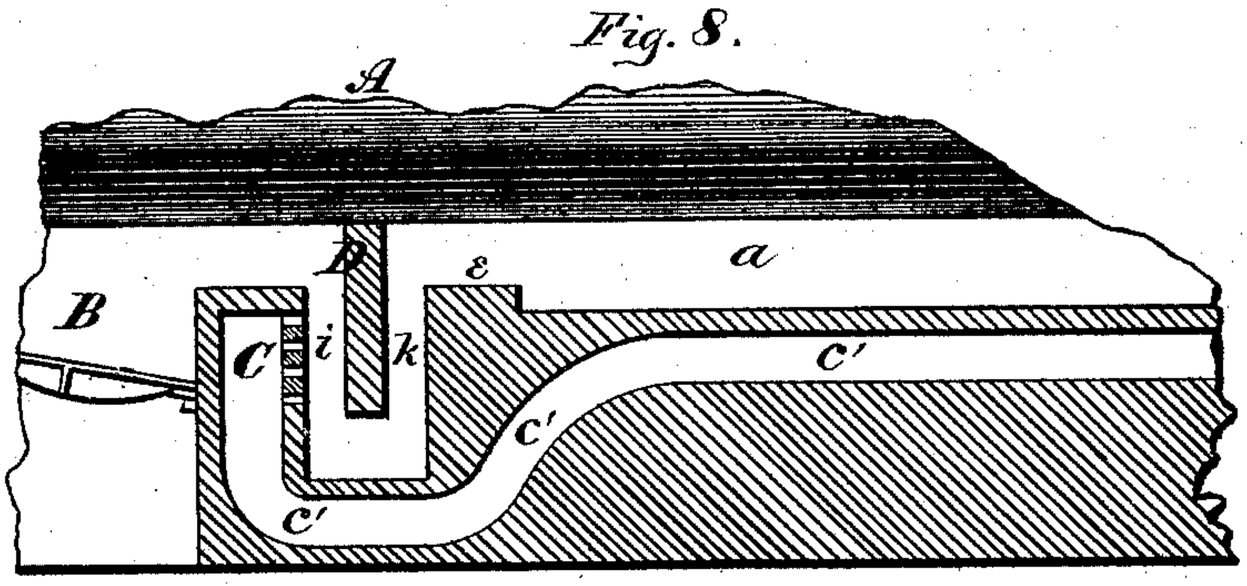


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOHN FERGUSON, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN HEATING AND FEEDING AIR TO FURNACES.

Specification forming part of Letters Patent No. **184,361**, dated November 14, 1876; application filed September 1, 1876.

To all whom it may concern:

Be it known that I, JOHN FERGUSON, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a longitudinal vertical section. Fig. 2 is a horizontal section through flues *c*. Fig. 3 is a horizontal section through flues *c'*. Fig. 4 is a transverse section on line *x x*. Fig. 5 is a transverse section on line *x' x'*. Fig. 6 is a detail. Fig. 7, another. Fig. 8 shows flues *c'* dipping vertically.

This invention relates to furnaces of that class in which the products of primary combustion are mingled with highly-heated atmospheric air, to form an inflammable gas, which is ignited by the flames and consumed; and consists in the arrangement and combination of parts, as hereinafter fully described and claimed.

In the drawings I illustrate my invention as applied to a steam-boiler, A, which in this case is of the dome-headed construction, but may be of any other kind. B is the combustion-chamber, at or about the end of the boiler. At the inner end of this chamber I erect a hollow bridge, C, having its rear wall perforated, as in Fig. 5. Beyond this bridge, starting from the surface of the boiler, is a hanging bridge, D, whose lower edge dips below the level of the lowest perforations in bridge C. This construction causes the flames and smoke or gases to dive down and up, as indicated by the arrows in spaces *i* and *k*; thence up over the solid bridge *e*, so as to be forced or directed against the boiler. Then it passes along the open space *a* under the boiler, turns upward through *a'*, and passes around the boiler, through flue *b*, to the smoke-stack. As this encircling-flue *b* is no part of the present invention, I need not describe it further, or allude to it in any way.

Entering from the front of furnace or thereabout, and passing through its containing-walls, as seen in Figs. 2, 4, and 5, on a line above the level of the fire-grate, are one or more air-flues, *c c*, which pass longitudinally alongside of and close to the fire-space, in a direct line nearly to the rear end of the furnace. Here they dip downwardly and inwardly to a point directly under the tiles forming the bottom of the main fire-flue under the boiler, as in Figs. 3 and 4, where they continue as flues *c' c'* in a reverse direction—that is, toward the front of the furnace. Just before reaching the bridge *e* the flues *c' c'* diverge laterally, as in Fig. 3, or vertically as in Fig. 8, then pass along parallel to their former direction, still toward the front, till they reach a point laterally or vertically in line with the hollow bridge C, into which they then immerge. The specific arrangement of these flues forms the chief part of my invention. The air receives heat from the very moment of its entrance, because the flue passes along the walls of the combustion-chamber; and, throughout the length of the air-flues, air is in almost immediate contact with the flames, separated by only a few inches at every point. Hence, there must be a constant accession to the air of the radiated heat, and the heat increases constantly up to the very point where the air should be hottest—viz., where it emerges from the hollow bridge into the space *i*. In fact, I have succeeded in bringing the air to such degree of heat that it sufficed to melt zinc, requiring a temperature of no less the 600° Fahrenheit. The air, thus highly heated, passes through the rear of bridge C, strikes into, and is intimately mingled with, the gases of combustion in space *i*. The consequence is, the heated oxygen feeds the gases until they ignite and produce an intense heat, which is then carried upward to heat the boiler. The boiler is thus heated by an intensely hot flame which produces no smoke, and therefore no carbon or soot is deposited on the boiler to form a non-conducting surface. Thus I utilize a large amount of the heat actually produced, but wasted, under ordinary circumstances; and I do away with the necessity of cleaning surfaces, while at the same time I effect complete combustion of the fuel products, and thereby add largely to the heat first developed by the initial con-

sumption of the fuel. The result is, intense steam is formed for use in a short space of time, and the furnace consumes but little fuel.

The characteristic of my invention is in combining simplicity of construction with such arrangement of air-flues, with relation to the fire-space, as shall effect a constant steady increase in the temperature of the incoming air from its first entrance up to the point where it is utilized—so that at no time in its passage shall it suffer cooling, or a stand-still in temperature.

Having thus described my invention, what I claim as my invention is—

The combination of the flues *c* and *c'*, arranged substantially as described, with the hollow bridge C, having its rear surface perforated for the admission of air to the main flue, substantially as specified.

In testimony that I claim the foregoing, I have hereunto set my hand this 29th day of August, 1876.

JOHN FERGUSON.

Witnesses:
PHILIP ARBOGAST,
THOS. J. MCTIGHE.