(No Model.) 3 Sheets—Sheet 1.

J. B. ARCHER.

FURNACE.

No. 492,653. Patented Feb. 28, 1893.

Fig. 1.

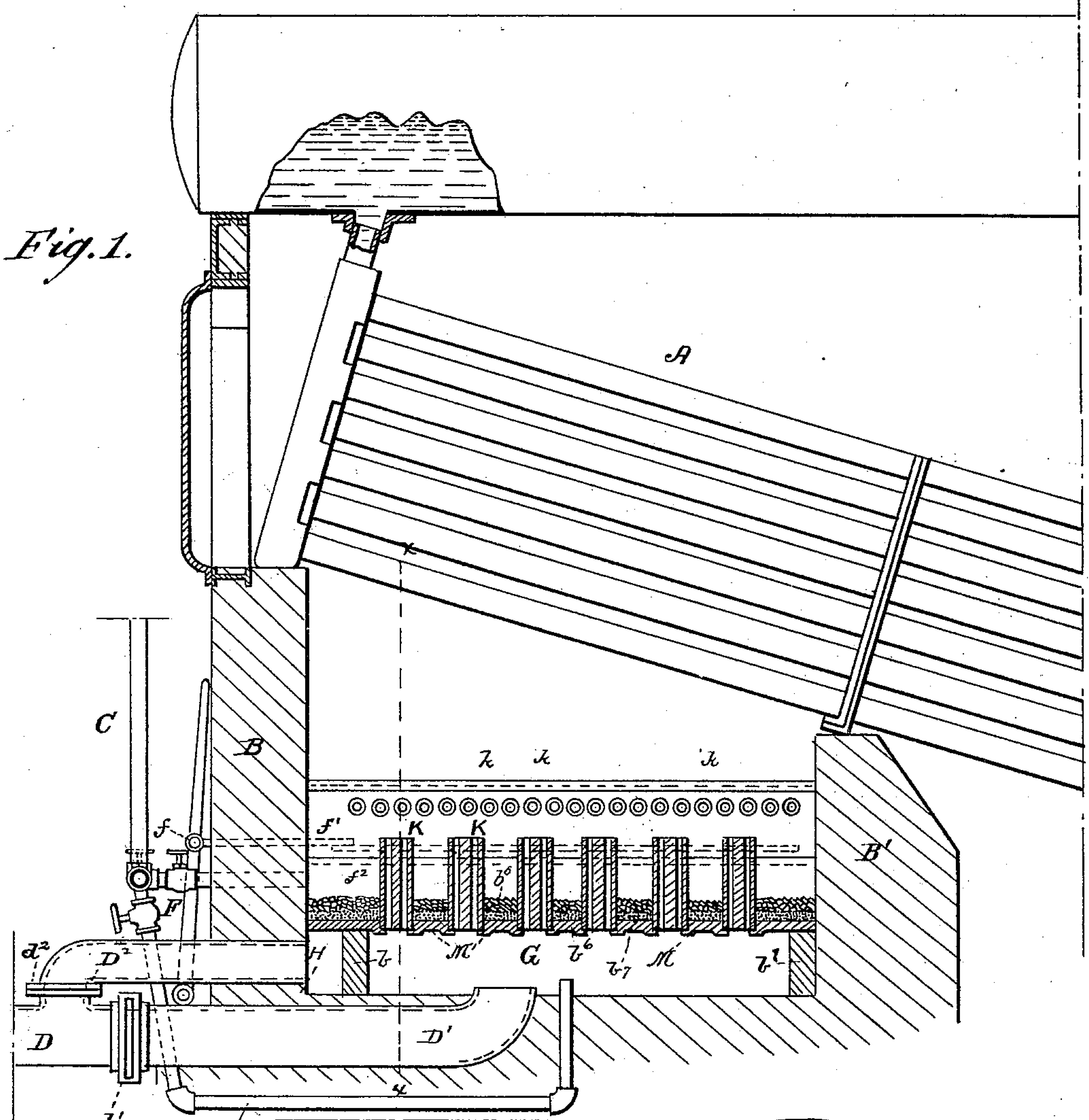
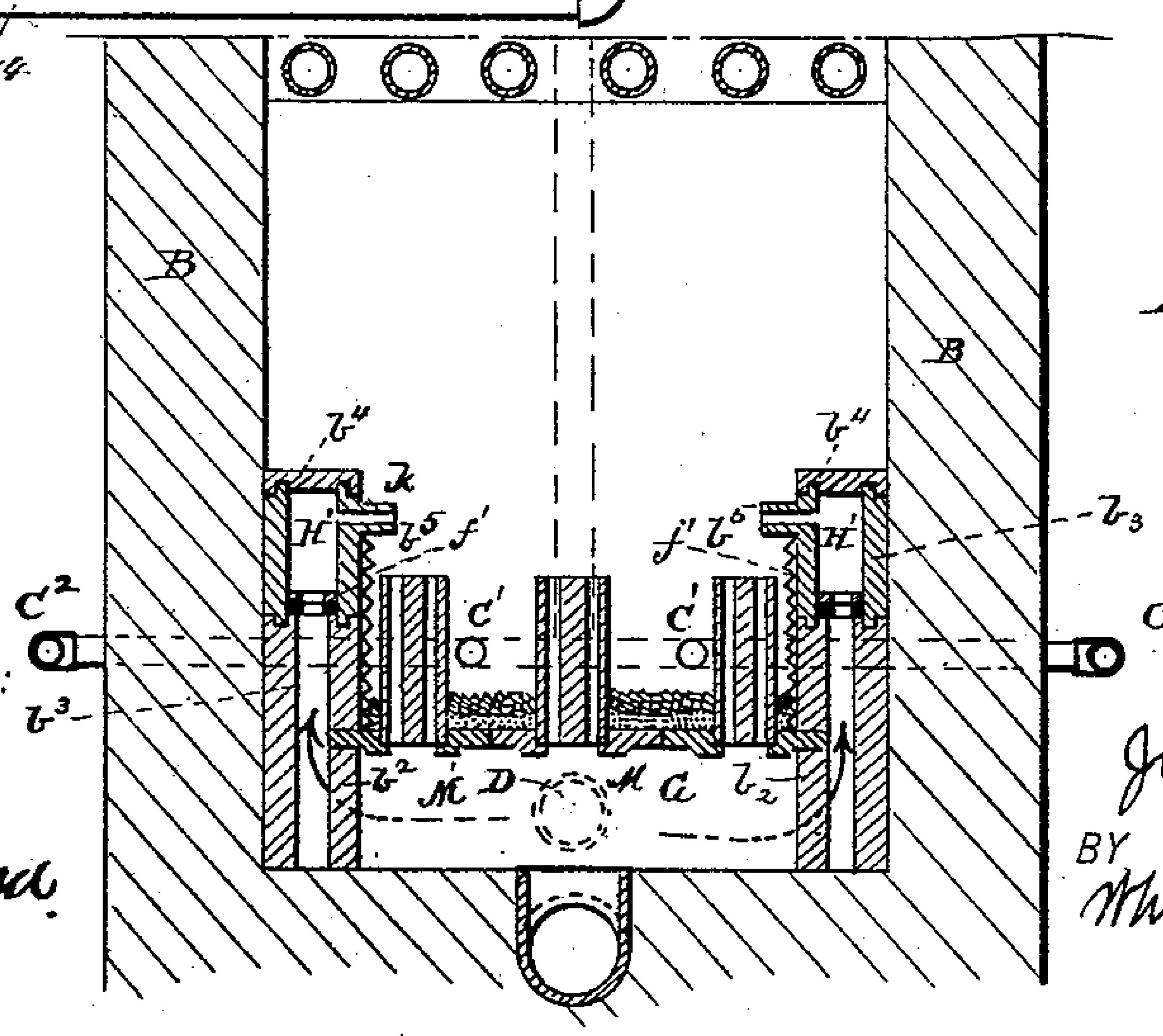


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

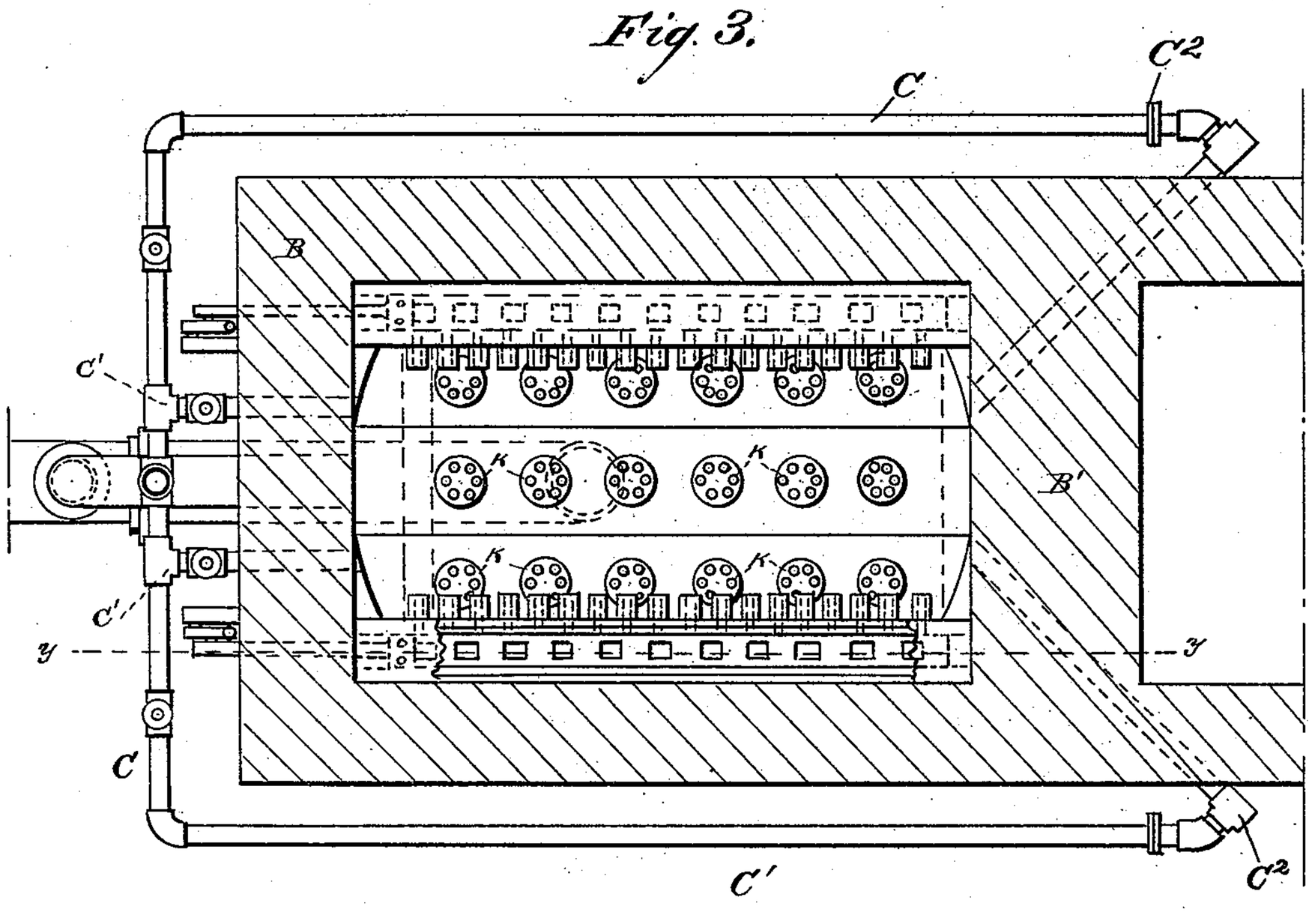


Fig. 4.

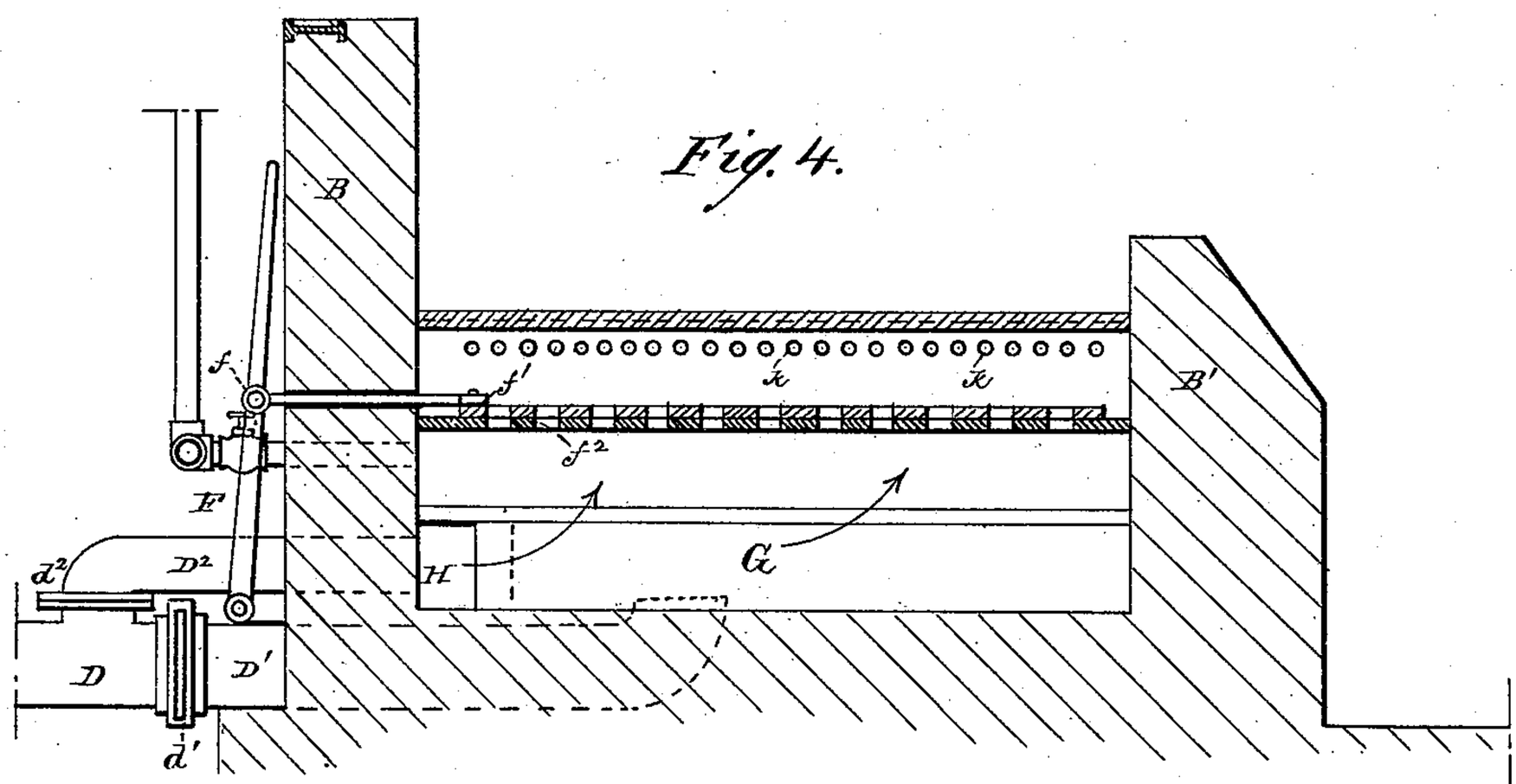
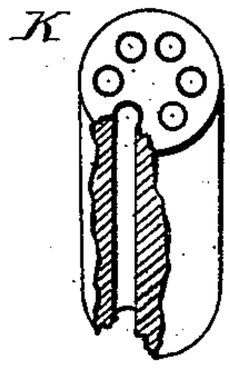


Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

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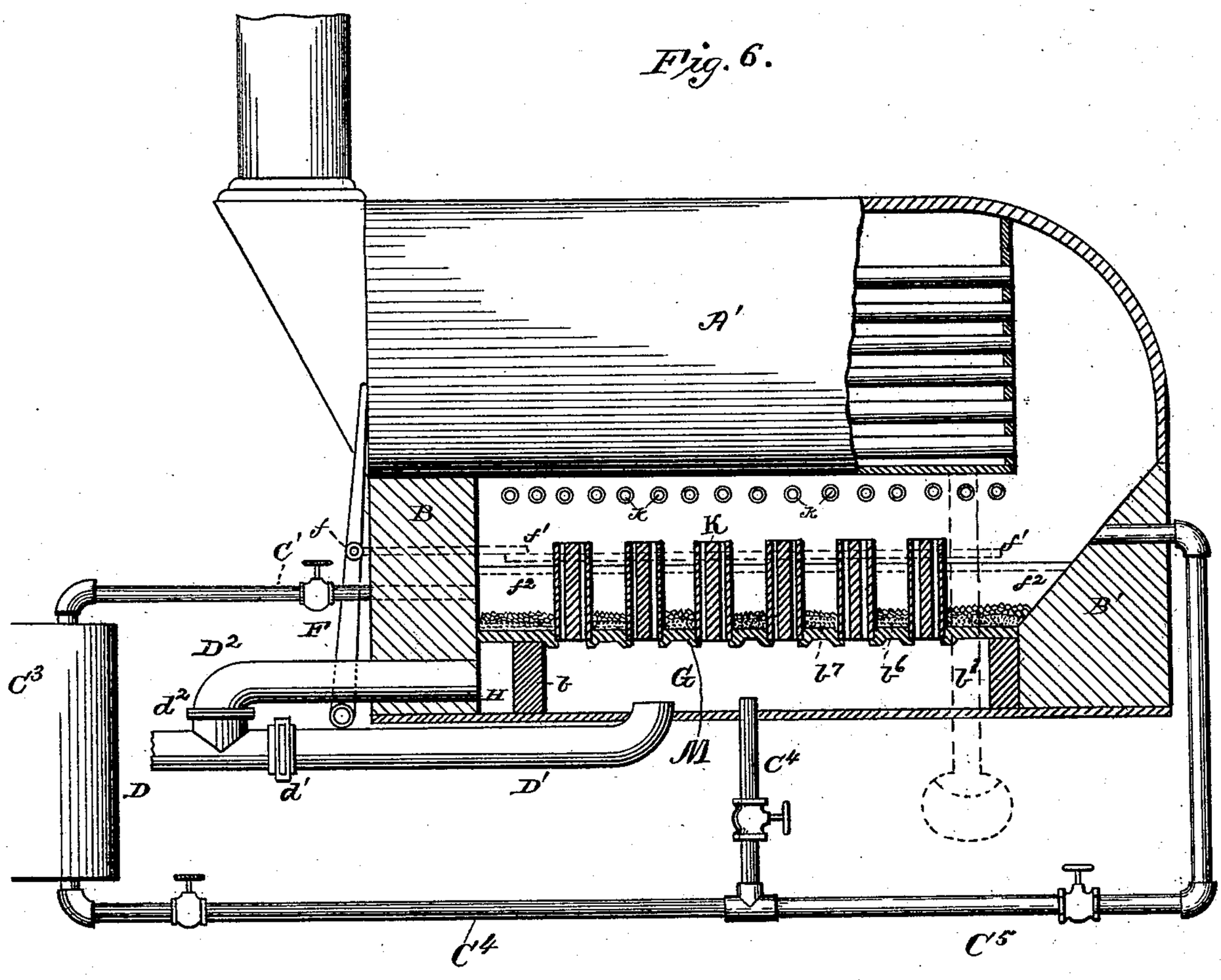
Fig. 6.



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UNITED STATES PATENT OFFICE.

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FURNACE.

SPECIFICATION forming part of Letters Patent No. 492,653, dated February 28, 1893.

Application filed April 1, 1892. Serial No. 427,368. (No model.)

To all whom it may concern:

Be it known that I, JOHN B. ARCHER, a citizen of the United States, residing at Washington, in the District of Columbia, 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 appertains to make and use the same.

My invention relates to certain improvements in furnaces for burning gaseous fuel, and in the process hereinafter to be described by which the complete combustion and consequently the maximum effect of the fuel is obtained.

Reference is to be had to the accompanying drawings, wherein the same parts are indicated by the same letters.

Figure 1 represents a vertical longitudinal section of my improved furnace arranged to heat a "Babcock & Wilcox" boiler. Fig. 2 represents a transverse vertical section along the line $x x$ of Fig. 1, and looking to the left. Fig. 3 represents a plan view of the furnace, the boiler being removed. Fig. 4 represents a vertical section along the line $y y$ of Fig. 3, looking across the furnace, parts being omitted. Fig. 5 represents a perspective view partly broken away of one of my tile air-flues or tuyeres. Fig. 6 represents a vertical longitudinal section of my improved furnace arranged to heat a horizontal tubular boiler.

A and A′ represent the boiler. B and B′ the walls of the furnace.

b, b', b^2, and b^3 are walls made of fire brick or tiling.

b^4 represents a refractory cap over the walls b^2 and b^3.

b^5 represents a serrated lining of fire brick or tile.

b^6 represents a layer of broken angular fragments of fire brick, and b^7 is a layer of sand.

C represents the gas pipe for the supply of fuel.

C′ C′, represent two pipes for conveying gas into the front of the furnace; and C^2, C^2, represent two pipes for conveying the gas into the rear of the furnace; and C^4 one for conveying it beneath the hearth plate M.

In Fig. 6, C^3 represents the supply vessel containing the gas, while the pipe C^4 goes somewhere near the center of the furnace beneath the plate M, and has a branch C^5 leading to the rear of the furnace.

D represents an air supply pipe furnished with a blower, not shown, for a forced draft.

D′ is an air pipe, controlled by the damper d', and leading to the air chamber G beneath the center of the furnace.

D^2 is an air pipe, controlled by the damper d^2, and leading to the air chamber H, whose branches H′ extend along the sides of the furnace.

F is a lever for moving the grid iron damper f' across the grating f^2 for further regulating the quantity of air admitted into the upper part of the side chambers H′.

K, K are tile cylinders perforated longitudinally; they are set in the plate M which is protected from the high heat of the furnace by the layer of sand and fire bricks laid thereon.

k, k, are nipples made in one with or let into the tiling on the wall b^2.

The operation of my device is as follows:— The gas is turned on through C into the space above the plate M, and at the same time air is admitted to G and H through D′ and D^2; the air from D′ comes up through the tuyeres K, unites with the carbon forming a mixture of CO, CO_2, and N; a further supply of air entering from H′ through the tuyeres k, converts the CO remaining into CO_2 insuring perfect combustion. By regulating the supply of air admitted through the tuyeres K and k in proportion to the flow of gas, the exact supply of oxygen to complete combustion may be admitted, and the great loss of heat usually carried off by the large excess of air in the products of combustion from open furnaces may be avoided. Moreover, the fiercest heat of the furnace is generally not far above the grate bars, while with the furnace herein described; by regulating the supply of air passing the damper d' so that about sixteen parts by weight of oxygen may be admitted to every twelve parts by weight of carbon admitted above the tuyeres K, then the carbon will be converted into CO, developing forty-five hundred units of heat in the lower part of the furnace; while the heated gases rising meet a sufficient supply of oxygen admitted through

the tuyeres *k* to convert the CO into CO_2 developing ten thousand units of heat immediately below the heating surface of the boiler.

Another merit in the furnace described is that it obviates the danger incident to contraction of the boiler sheets upon sudden changes of temperature of the furnace, and prevents the wasteful formation of soot and smoke. Thus by having the gas admitted in several places and having the tuyeres numerous and the holes small, the air is always highly heated by passing through the hot tuyeres, and entering in small streams it mingles everywhere with the gas insuring complete combustion.

While I have only alluded to the carbon in the gas, the benefits to be obtained from this process and apparatus with respect to the combustion of the free hydrogen would be very great.

While I have only shown my invention as applied to two kinds of boilers; it will be obvious that it is equally applicable to vertical tubular boilers, and furnaces of a vast variety of description.

I claim as new—

1. In a gas furnace, the combination with inclosing walls of fire-proof material, of an air chamber with means of controlling the admission of air thereunto; a combustion chamber adjacent to the said air chamber; a perforated metal plate separating the said air chamber and combustion chamber; a plurality of refractory tuyeres over the perforations in said plate and extending into the combustion chamber; a second air chamber with means of controlling the admission of air thereunto, said chamber having lateral passages running along the sides of the combustion chamber; a plurality of tuyeres projecting into the said combustion chamber and connecting said lateral passages with said chamber, and a pipe or pipes for the gas entering said combustion chamber near said plate, substantially as described.

2. In a gas furnace, the combination with inclosing walls of fire-proof material, of an air chamber with means of controlling the admission of air thereunto; a combustion chamber adjacent to the said air chamber; a perforated metal plate separating the said air chamber and combustion chamber; a plurality of refractory tuyeres over the perforations in said plate and extending into said combustion chamber; means for supplying the gas to said combustion chamber a second air chamber with means of controlling the admission of air thereto, said chamber having lateral passages running along the sides of the combustion chamber; and a plurality of tuyeres projecting into said combustion chamber and connecting said lateral passages with said chamber, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN B. ARCHER.

Witnesses:
JOHN C. WILSON,
PERCY C. BOWEN.