(No Model.)

R. R. ZELL.

FURNACE.

No. 480,378. Patented Aug. 9, 1892.

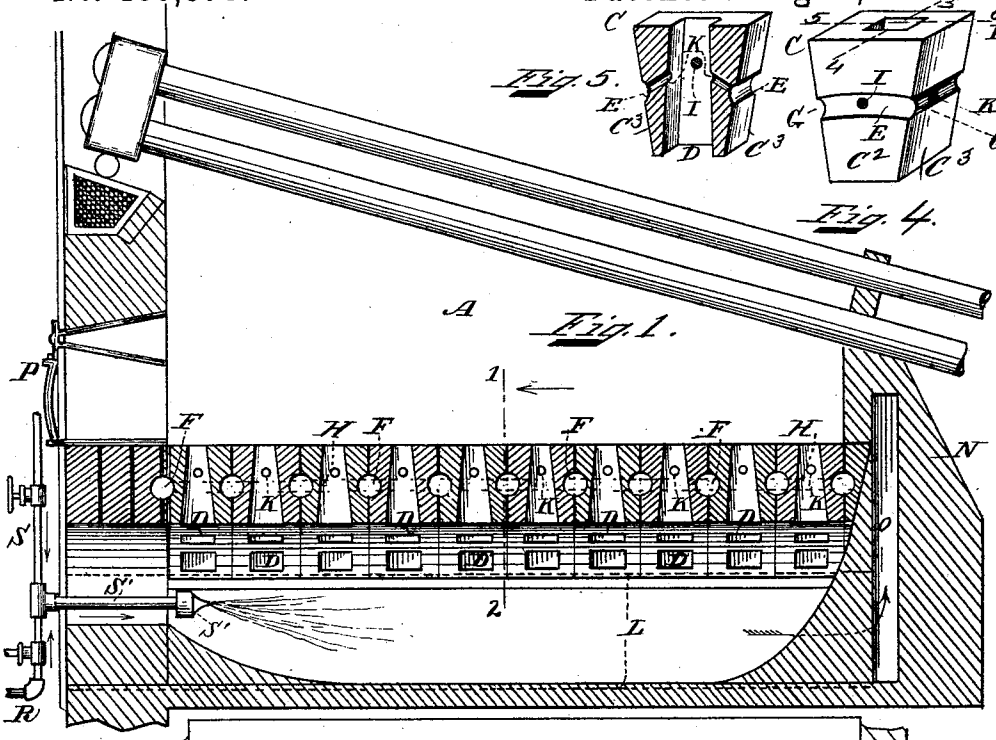

Fig. 1.

Fig. 5. Fig. 4.

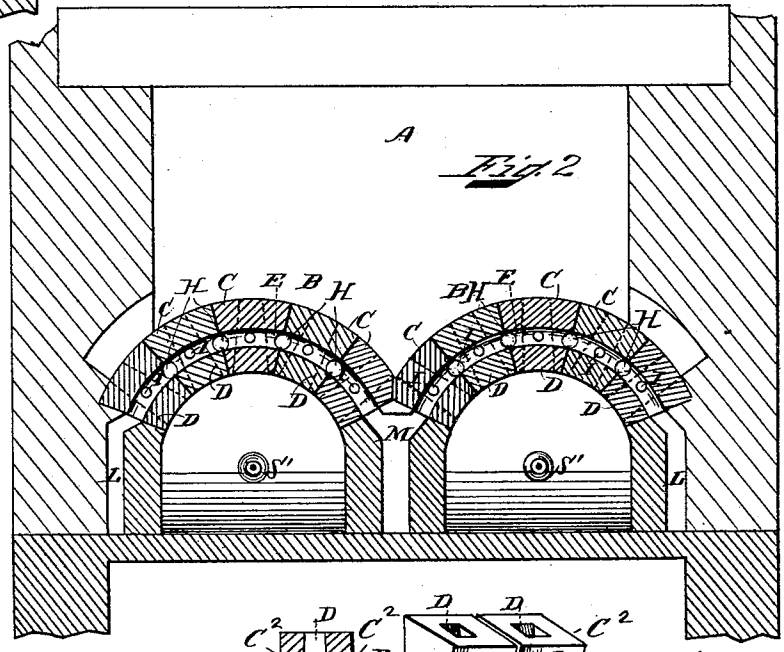

Fig. 2.

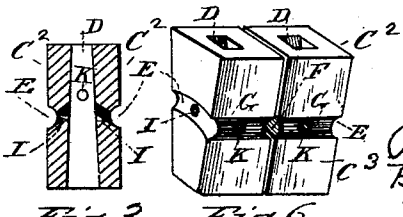

Fig. 3. Fig. 6.

Witnesses.
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UNITED STATES PATENT OFFICE.

ROBERT R. ZELL, OF BALTIMORE, MARYLAND.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 480,378, dated August 9, 1892.

Application filed February 15, 1892. Serial No. 421,541. (No model.)

To all whom it may concern:

Be it known that I, ROBERT R. ZELL, of Baltimore, in the State of Maryland, have invented a new and useful Improvement in Furnaces, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to improvements in furnaces, and especially to fire-arches, through which the products of combustion are compelled to pass on their way from the fire-bed to the chimney.

The invention has for its object to provide an improved fire-arch through which air is continually circulating, so that, owing to the perfect ventilation and continuous current of air, the life of the said arch is lengthened beyond those in use at the present time.

My invention consists of a fire-arch constructed of a number of blocks of refractory material, each block having a flue for the products of combustion through its body; and it further consists in admitting air into each of said flues, so as to cause the complete combustion of the gases.

My invention also consists of communicating air-passages throughout the fire-arch, each block of which is surrounded on all sides by said air-passages, which communicate with the flue passing through the body of each block.

My invention further consists of certain other novel features, arrangements, and combinations, as will be hereinafter pointed out in the description, and particularly set forth in the claims.

In the accompanying drawings, which illustrate my invention, Figure 1 represents a vertical central longitudinal section through one of the fire-arches and furnace. Fig. 2 is a transverse section of the furnace, taken on the line 1 2 of Fig. 1. Fig. 3 is an enlarged cross-sectional view of one of the blocks, taken on the line 3 4 of Fig. 4. Fig. 4 is a perspective view of one of the blocks composing the fire-arch. Fig. 5 is a perspective view, half in section, taken on the line 5 6 of Fig. 4. Fig. 6 is a perspective view showing the junction of two blocks, by which the passages F are formed.

Like letters of reference refer to like parts throughout the several views.

Within the furnace A one or more fire-arches B, of refractory material, are arranged above the fuel, and through the said arches flues D are provided to allow the gases to pass through the said arches, as the only exit for the gases is through the flues of the arch. The arches are composed of a number of fire-brick blocks C, each of which has through the center of its body a flue D, the sides of which preferably converge upwardly, which tends to increase the draft of the gases through the blocks.

As shown in the drawings, the blocks have two opposite vertical parallel sides C^2 and two opposite converging sides C^3. The sides C^2 are each provided with a recess E, of semicircular shape, and the sides C^3 are also each provided with a recess G, the recesses G being of same depth as the recesses E, as shown. The arches being made up of blocks identical in construction to each other, it will result that the semicircular recesses on each block will match with the opposing semicircular recesses of the surrounding blocks, and thereby form circular passages on all sides of each block, so that there will be formed the air-passages F through the arch transversely of the furnace and the air-passages H through the arch longitudinally with the furnace, the said air-passages crossing each other and being in open communication. The recesses E on the sides C^2 of each block are provided with the opposite openings I I from the air-passages F, formed by the recesses E, and with the opposite openings K K from the air-passages H, formed by the recesses G, the air, heated by its passage through the arch, being drawn into each of the flues D through the openings I and K, and, mixing with the gases, passing upwardly through the said flue of each block of the arch.

The air-conduits L and M (see Fig. 2) in the walls of the furnace have suitable openings to the air and are controlled by any of the well-known dampers. The air admitted to the said conduits is heated by contact with the heated walls and passes to the passage O in the bridge-wall N into the cross air-passages F through the arch, then into the longitudinal air-passages H, and finally from the said passages surrounding each block into

the flues D, through the openings I and K, into contact with the gases, as described. The gases, mixed with the heated air, pass above the arch and perfect combustion takes place, as the heated air introduced is of sufficient temperature not to cool the gases below the igniting-point, but to burn them, the oxygen of the air mixing with the carbonic-oxide gas, producing carbonic-acid gas, the result of perfect combustion. The amount of air required can be regulated by any of the well-known steam-dampers, so that the air is fed automatically in such amounts as may be required. In the construction, as shown, for burning oil the steam can be raised in the boiler by throwing wood on the arch through the door P, so that the steam from the pipe S can force the oil from the pipe R beneath the arch through the injector S′.

While I have shown my invention as applied to a furnace adapted to burn oil, yet it will be understood that it is equally well adapted to a furnace burning coal, gas, or any other fuel, as the invention is entirely independent of any particular kind of fuel, as it consists in means for producing perfect combustion, so that it has no connection whatever to any particular kind of fuel.

The present mode of constructing fire-arches, so far as I am aware, is to provide flues between the bricks for the products of combustion. The intense heat and dust of the furnace, however, soon burns and cuts away the edges of the blocks composing the arch, and the life of the arch is consequently short. By my invention the flues are through the body of the block and the sides thereof are kept in close contact with each other, so that the edges are not soon burned away, and the perfect ventilation or draft of air through the said arch keeps it from burning out.

I am aware that it is not new to locate a fire-arch above the fuel and provide passages for the gases between the sections of the fire-brick; but I am not aware that flues for the gases have been made through the body of the fire-brick, and, further, that the air has been introduced into such flues to cause complete combustion.

As shown in Figs. 3 and 5, the air-openings I and K from the surrounding passages F and H in the sides of each block are arranged at about an angle of forty-five degrees, as the draft will be assisted and the mixture of the oxygen and fuel-gases be accelerated by arranging them obliquely; but such a construction is not essential, as they may be arranged at a right angle or any other angle, as may be desired.

I do not limit myself to the exact construction shown, as the same may be varied without departing from the spirit of my invention.

Having thus ascertained the nature and set forth the construction of my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a furnace, a fire-arch having flues for the products of combustion, transverse and longitudinal air-passages, and connections between both sets of said air-passages and the said flues, substantially as set forth.

2. In a furnace, a fire-arch consisting of a number of blocks, each having a flue through its body for the products of combustion, and transverse and longitudinal air-passages, said air-passages being in communication with one another and with the said flues, substantially as fet forth.

3. In a furnace, a fire-arch consisting of a number of abutting blocks, each having a flue through its body for the products of combustion, air-passages surrounding each block and formed by recesses in the sides of the abutting blocks, and air-openings from the said passages to the flue of each block, the said blocks having two opposite converging sides and two opposite parallel sides, substantially as set forth.

4. In a furnace, a fire-arch consisting of a number of abutting blocks, each having a flue, the sides of which upwardly converge, through its body for the products of combustion, air-passages surrounding each block, and air-openings from said passages to the flue of each block, substantially as set forth.

5. In a furnace, a fire-arch consisting of a number of abutting blocks, each having a flue, the sides of which upwardly converge, through its body for the products of combustion, air-passages surrounding each block, and air-openings from the said passages to the flue of each block, each of the said blocks having two opposite converging sides and two opposite parallel sides, substantially as set forth.

6. In a furnace, a fire-arch consisting of a number of blocks, each having a flue through its body for the products of combustion, transverse and longitudinal air-passages, said air-passages being in communication with one another, and means for admitting air to said flues, so as to cause complete combustion, substantially as set forth.

7. In a furnace, a fire-arch consisting of a number of blocks, each having a flue through its body, air-passages surrounding each block, and air-openings from the said passages to the flue of each block, substantially as set forth.

8. In a furnace, a fire-arch consisting of a number of blocks, each having a flue through its body, air-passages surrounding each block, and air-openings from the said passages to the flue of each block, said air-passages being formed by recesses in the sides of the abutting blocks, substantially as set forth.

9. In a furnace, a fire-arch consisting of a number of blocks, each having a flue through its body, air-passages surrounding each block, and air-openings from the said passages to the flue of each block, said air-passages being formed of recesses in the sides of the abutting blocks and one series of said air-passages extending transversely of and another

series extending longitudinally with the furnace, substantially as set forth.

10. In a furnace, a fire-arch consisting of a number of blocks, each having a flue through its body, air-passages surrounding each block, and air-openings from the said passages to the flue of each block and being in open communication with each other, substantially as set forth.

11. In a furnace, a fire-arch consisting of a number of blocks, each having a flue through its body, air-passages surrounding each block, and air-openings from said passages to the flue of each block, the said air-passages being in open communication with each other and being formed by recesses in the sides of the abutting blocks, one series of the said air-passages extending transversely of and another series extending longitudinally with the furnace, substantially as set forth.

12. In a furnace, a fire-arch consisting of a number of blocks, each having a flue through its body, air-passages surrounding each block, and oblique air-openings from the said passages to the flue of each block, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 28th day of January, A. D. 1892.

ROBERT R. ZELL.

Witnesses:
GEO. P. FLINN,
H. LINDEN ZELL.