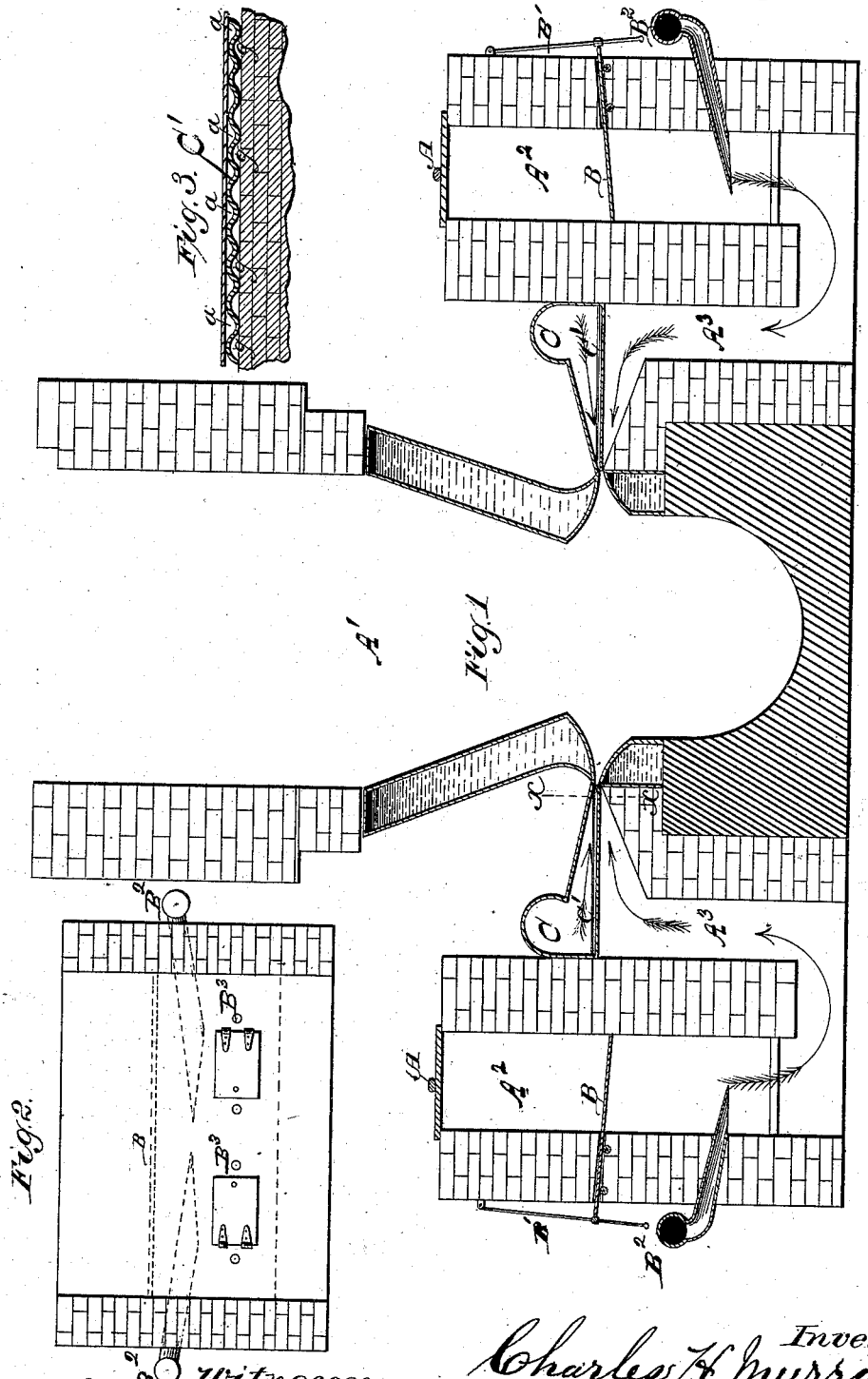
(No Model.)

C. H. MURRAY.

SMELTING FURNACE.

No. 265,128. Patented Sept. 26, 1882.



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UNITED STATES PATENT OFFICE.

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SMELTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 265,128, dated September 26, 1882.

Application filed February 8, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHARLES HAMMOND MURRAY, a citizen of the United States, residing at Leadville, in the county of Lake and State of Colorado, have invented a new and useful form of Smelting-Furnace, entitled a "Gas-Flame Blast-Furnace," of which the following is a specification.

This invention relates to an improvement in furnaces for smelting ores; and it consists in the combination and arrangement of devices substantially as hereinafter more fully set forth and claimed.

The character and construction of the furnace is shown in the accompanying drawings, of which—

Figure 1 is a transverse vertical section of the furnace, the gas-chambers, and the fuel-chambers as they stand in relation to one another. Fig. 2 is a side view of the fuel-chamber, indicating the position of the air-pipes, the grate-bars, and the cinder-doors. Fig. 3 is a sectional view on the line *x x* of Fig. 1.

The following is a detailed description of the invention.

The purpose of my invention is to secure the full heat value of any fuel consumed. I burn the fuel sufficiently to convert all its heat-making ingredients into gases. This is accomplished in fuel-chambers outside of the smelting-furnace, and before the gases have lost much of their heat by radiation or conduction they are introduced into the smelting-furnace in conjunction with jets of air, and there complete their combustion, suitably affecting the ores. To accomplish this I construct a fuel-chamber, A^2, and a gas-chamber, A^3, on each side of the smelting-furnace A and in close proximity to it. The fuel-chambers have midway between their grate-bars and the top of the chamber a slide, B, that serves as a bottom to receive the fuel when it is fed into the top of the chamber. This slide is constructed to push in or pull out by means of a lever, B′, attached to its outer edge. It is made to fit close in the wall, where it is worked in or out. The plate B being shoved in, the fuel is put in at the top door, A, which is then shut down air-tight, and the plate B is withdrawn, and the fuel is left free to settle as it is consumed below. In the lower part of the fuel-chamber, below the sliding plate B, are two sets of air-pipes, B^2 B^3. The first or upper set consists of two pipes, B^2, that extend for some distance into the chamber. These are cut off in a sloping fashion on their under side, so that as the air issues from them it blows downward through the fuel and carries with it any vapors or smoke that may be forming. These pipes are shown in Fig. 2. The lower set of air-pipes, (four or more in number,) B^3 B^3, penetrate the chamber at its front a few inches above the grate-bars, and keep the fuel in glowing incandescence. Through this heated fuel the smoke and vapors from above are caused to pass by the upper air-pipes, thereby burning the smoke and decomposing any aqueous vapors. The fresh air that comes down from the upper set of air-pipes, or that introduced by the lower set, is made to pass through several inches of glowing coal, which converts the carbon into carbonic-oxide gas. These gaseous products are forced downward through the grate-bars, and pass, as indicated by the arrow, up into the gas-chamber. From this chamber they are passed simultaneously into the smelting-furnace through corrugations in the plate C′. This plate C′ is the roof or covering of the gas-chamber, and separates the gas-chamber from the fresh-air passage above. It is made of sheet-copper, and is bent or pressed into corrugations, as shown in Fig. 3, which is an illustration of a cross-section of the plate. The corrugations or channels in the plate are about seven-eighths of an inch deep and three-eighths of an inch wide. The gases enter the flame-space of the smelting furnace through the under channels of the plate C′, these channels being lettered *g g g*, Fig. 3, while the fresh air is introduced through the upper channels, *a a a*, thus causing the gases and fresh air to enter the flame-space in the smelting-furnace in contiguous alternating jets on the same plane, where the combustion of the gases is completed.

Above the gas-chamber, and separated from it by the plate C′, is an inclosed fresh-air passage. Into this fresh-air chamber or passage fresh air is introduced by a blast and forced into the smelting-furnace through the upper channels on the plate C′, as indicated by the arrow. The upper plate or roof of this fresh-air passage may be of sheet-iron, and riveted to the plate C′ where the two come together.

(See the cross-sectional view, Fig. 3.) The plate C′ and this air-chamber are arranged to extend across the whole width of the smelting-furnace, and the opening in the latter for the introduction of the gases and the fresh air is unbroken, or extends the full width of each side of the furnace. The mouth of the fresh-air passage, which includes the end of the corrugated plate C′, fits tightly into the opening on either side of the smelting-furnace, and is a substitute for any kind of tuyere commonly employed.

In order to secure space for the generation and sustenance of a gas-flame, the water-jacket on the sides of the smelting-furnace is cut across horizontally and lengthwise of the furnace and divided into upper and lower sections. Between these sections is the opening for the introduction of the fresh air and gases. Where these upper and lower sections approach each other they are curved, the curves opening to the inside of the furnace, as shown in Fig. 1. The upper section is constructed to leave an opening about one inch wide between it and the lower section for the admission of the end of the plate C′, by which the gases and fresh air are introduced into the smelting-furnace. The curve or shoulder on the upper section of the water-jacket projects or extends four inches farther into the furnace on either side of the furnace than the curve on the lower section. By this construction the descending ore is held off and prevented from clogging or filling up the flame-space between the two curves. Above the curve, on the upper section of the jacket, the bosh of the furnace slopes outward at a sharp angle, so that the ore above the smelting-zone may be loose and allow the products of combustion to freely escape into the stack above.

It must be understood that the above description applies to rectangular furnaces only.

The two doors represented on the side of the fuel-chamber, Fig. 2, are for the purpose of removing any clinkers from the fuel-chamber. To insure their shutting air-tight, they and also the door A on the top of the fuel-chamber are bordered on their margin with asbestus felt.

Having thus fully described my invention, I claim and desire to secure by Letters Patent—

The combination, in a blast-furnace, of the smelting-chamber A′, provided on each side with a horizontal blast-opening, a gas-generating chamber, A^2, on each side, connecting gas-flues A^3, air-blast chambers C, having bottom corrugated plate, C′, the whole constructed as described, whereby the corrugated plate forms the roof of the delivery end of the gas-flue, substantially as set forth.

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