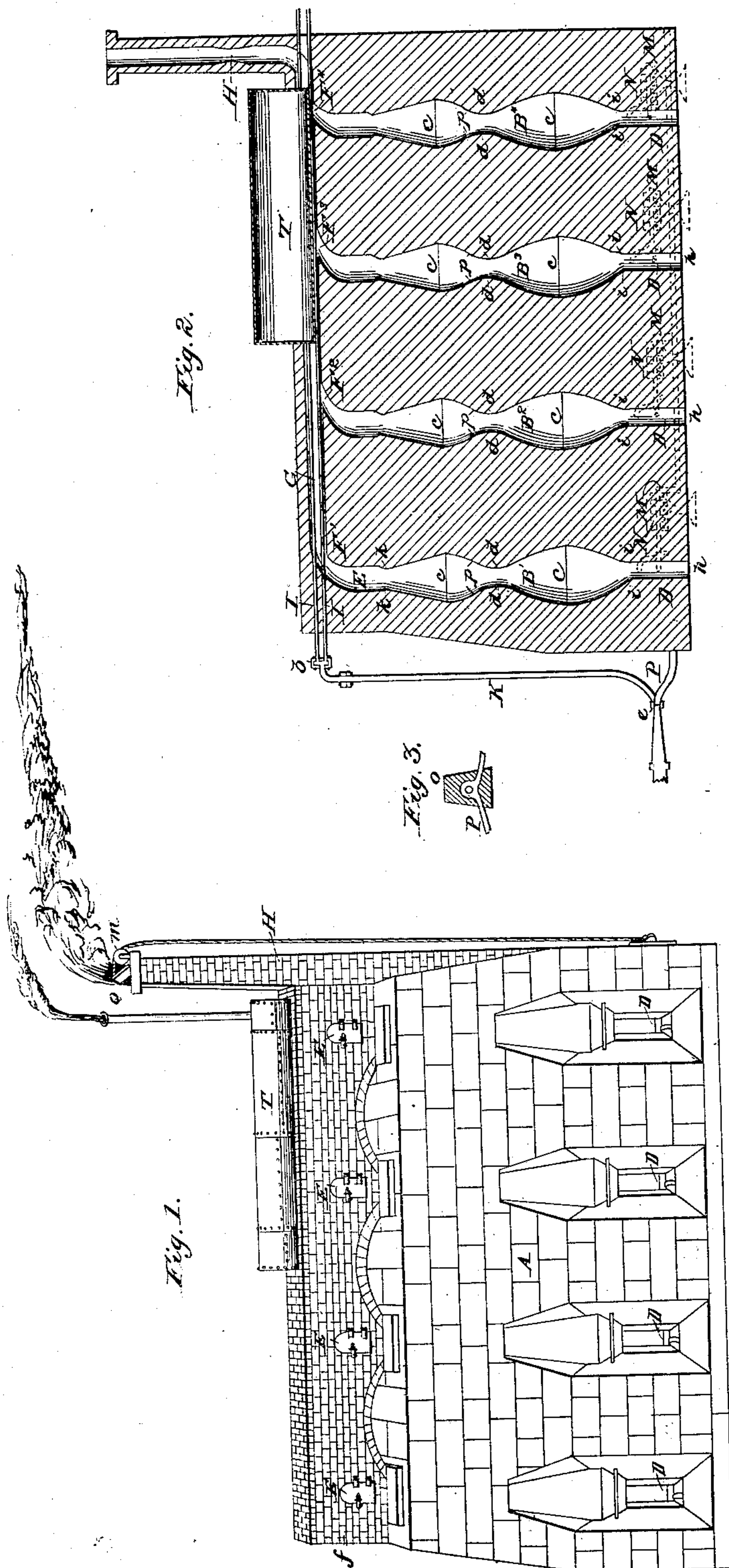


No. 1,396.

PATENTED OCT. 31, 1839.

A. ROTH.

CONSTRUCTION OF FURNACES FOR SMELTING IRON ORE.





# UNITED STATES PATENT OFFICE.

AUG. ROTH, OF POTTSVILLE, PENNSYLVANIA.

## IMPROVEMENT IN THE CONSTRUCTION OF FURNACES FOR SMELTING IRON ORE.

Specification forming part of Letters Patent No. 1,396, dated October 31, 1839.

*To all whom it may concern:*

Be it known that I, AUGUSTUS ROTH, of Pottsville, in the county of Schuylkill and State of Pennsylvania, have invented a new and useful Improvement in the Furnace for Smelting Ores to Produce Metals, called Roth's Combination-Furnace, which is described as follows, reference being had to the annexed drawings of the same, making part of this specification.

The nature of this invention and improvement consists, first, in a certain new and useful construction and arrangement of several furnaces by which a new and beneficial effect is produced, the upper part of the charge being prevented from descending rapidly upon the lower part, which is effected by contracting the fire-chambers in the center; and, second, in increasing the draft by conveying the several flues into one long flue extending from the top of the last furnace of the stack to the chimney; third, in placing a boiler in said flue for creating steam by the waste heat of the furnaces sufficient to work an engine for making the blast of the furnaces, which is first driven by said engine through pipes placed in the before-mentioned extended flue, where it is heated, and then through said pipes leading through reservoirs of cold water, where the temperature of the same is regulated previous to passing through the tuyeres to the crucibles of the furnaces; and, fourth, in conveying, by the power of said engine, a column of cold air through a tube around the tuyere for preventing the same being burned out rapidly by the intensity of the heat in the smelting operation.

To enable others skilled in the art of making furnaces to make and construct one on my plan, I will proceed to describe the mode of constructing and operating one containing four fire-rooms.

Figure 1 in the annexed drawings is a perspective front view of the combined furnaces, the draft-regulating doors being shut, the furnace in operating, and the boiler generating steam for an engine. Fig. 2 is a vertical longitudinal section of said furnaces through the center thereof, showing the interior of the same; Fig. 3, a sectional view of one of the tuyeres, showing the pipes for conveying the air around the same.

Similar letters refer to similar parts in the several figures.

To illustrate my invention, I will here describe a combination of four furnaces, it being understood that the number may be increased or diminished, as may be deemed expedient.

The furnaces are all contained in a body of masonry called a "stack," (marked A,) of any required length, breadth, and thickness. In this masonry are constructed the crucibles D, which are made of any required length, breadth, and depth, rising from the hearths *h* to the lower part of the boshes at *i i*. The fire-chambers B resemble two truncated ovals placed endwise together, or a single truncated oval contracted in the center at *d d*, and extending from *i i* to E E, where it curves, as at F, contracts and unites with the long horizontal flue G. There will thus be two boshes in each fire-chamber. The object of contracting the fire-room at *d d* is to prevent the upper part of the charge from descending with its whole weight upon the lower part, and thus obstructing the draft and preventing the free escape of the light substances upward into the atmosphere, which is effected by the gradually-approaching sides of the upper boshes at *p p*, upon which the upper portion of the charge is in part sustained, and prevented from descending too suddenly. The crucibles and boshes are lined, in the usual manner, with brick or clay. The tuyeres O are inserted at any convenient parts of the crucibles.

The long horizontal flue G is a continuation horizontally of flue F' from fire-room B' at one end of the stack to a chimney, H, at the other end of the stack, which flue, being the longest, will, of course, have the strongest draft. The branch flues F<sup>2</sup>, F<sup>3</sup>, and F<sup>4</sup>, leading from the tops of the other fire-rooms into the horizontal flue G, will have more or less draft in proportion as they are farther from or near to the chimney, one having a tendency to increase the draft of the other by thus leading into and uniting with each other, such increased draft being essentially necessary in separating the light substances from the ore, and passing the same into the atmosphere, which is effected through the chimney H.

The boiler T, for generating steam for creating the blast, &c., is made in the usual manner, and is placed in the horizontal flue G near the chimney H, and is heated by the waste heat passing through said flue.



The engine is also of the ordinary construction, and therefore need not be represented or described.

Above each of the upper boshes in the masonry there is left an opening for charging the furnaces with the fuel, and one of which openings is closed by doors E, which also serve as valves to regulate the draft, being opened to decrease it, and closed to increase it.

Two parallel tubes, I I, are placed in the before-mentioned long horizontal flue G for conveying air through the same, which air is to be heated during its passage through said flue, and is afterward used to supply the blast. These tubes are united by a coupling-box, b, to a single tube, K, through which the cold air to be heated is forced by the steam-engine, the cold air entering at e. The other ends of the parallel tubes I are united by another coupling-box, g, to another single tube, L, which conveys the air when heated through the tuyeres to the furnaces. The air, however, before entering the furnaces is made to pass through branch pipes M, passing through reservoirs N of water (represented by dotted lines) for imparting to the air a proper degree of temperature, which reservoirs are kept filled with running cold water supplied by the engine, or from other reservoirs placed above them, or by any other means preferred.

The rapid destruction of the tuyeres by the heat is prevented, by a column of cold air forced around them by the steam-engine

through a pipe, P, having branch pipes, the air entering at e. Fig. 3 shows the air-pipe passing around one of the tuyeres, which is made of cast-iron and marked O.

A hinged damper, Q, is placed at the top of the chimney for regulating the draft, and is operated by means of a cord, l, and pulley m whenever required.

The furnaces are charged through the doors E, and the melted metal is drawn off at the bottom of the hearths in the usual manner.

Having described the construction and operation of my improved furnace for smelting ores, I will now state what I claim as my invention and desire to secure by Letters Patent.

1. The arrangement of the fire-chambers or boshes opening into one horizontal flue above, in combination with the boiler for generating steam and the pipes I I, for heating the blast, placed in said flue, the whole being constructed and operating as described.

2. The method of constructing the fire-chambers by contracting them at the center, forming two boshes in each chamber for causing the charge to descend gradually, so as not to obstruct the draft and prevent the ascent of the lighter substances, as before described.

AUGUST. ROTH.

Witnesses:

EDMD. MAHER,  
WM. P. ELLIOT.