

J. FEIX.  
Metallurgic Furnace.

No. 160,662.

Patented March 9, 1875.

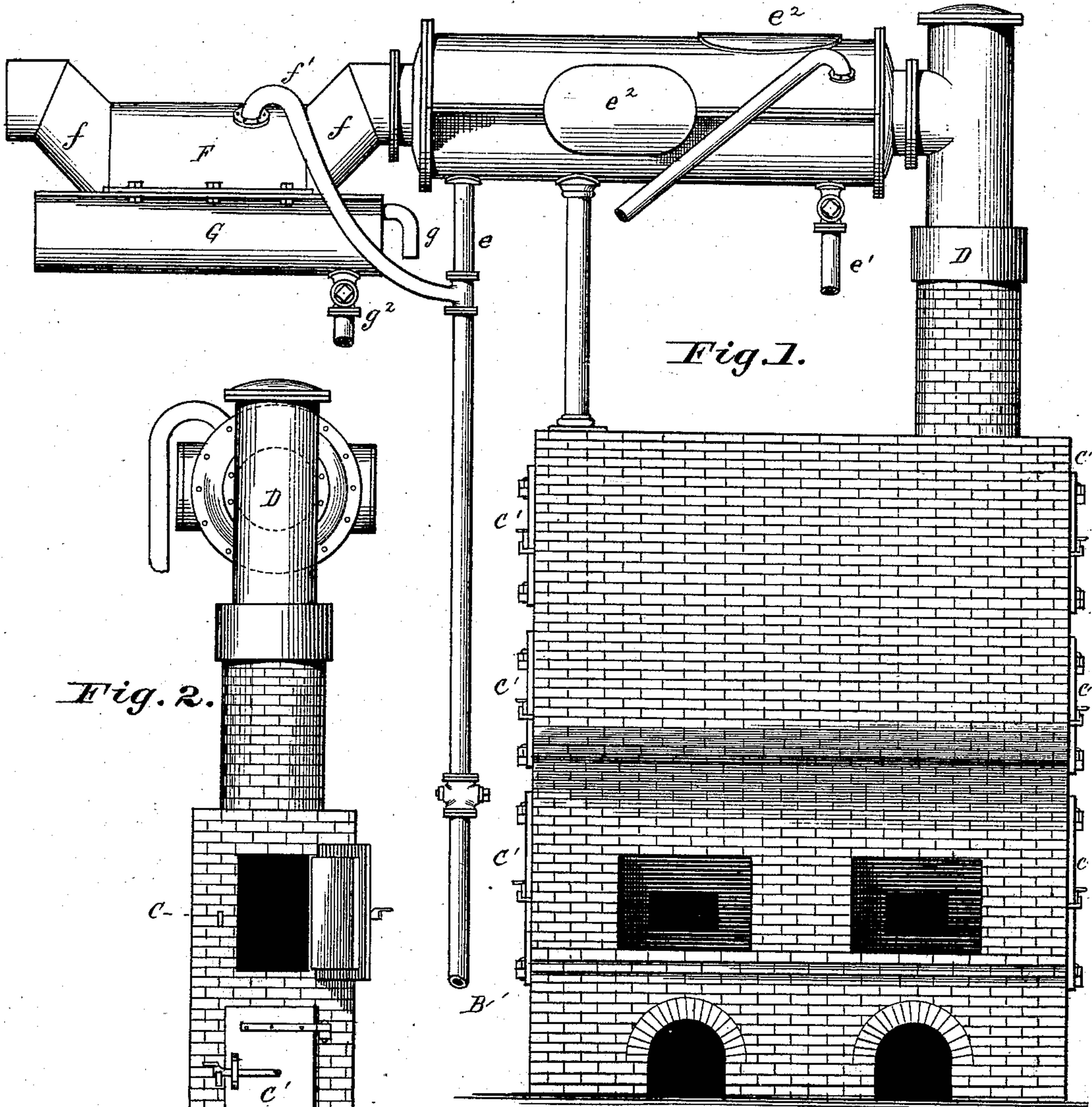


Fig. 1.

Fig. 2.

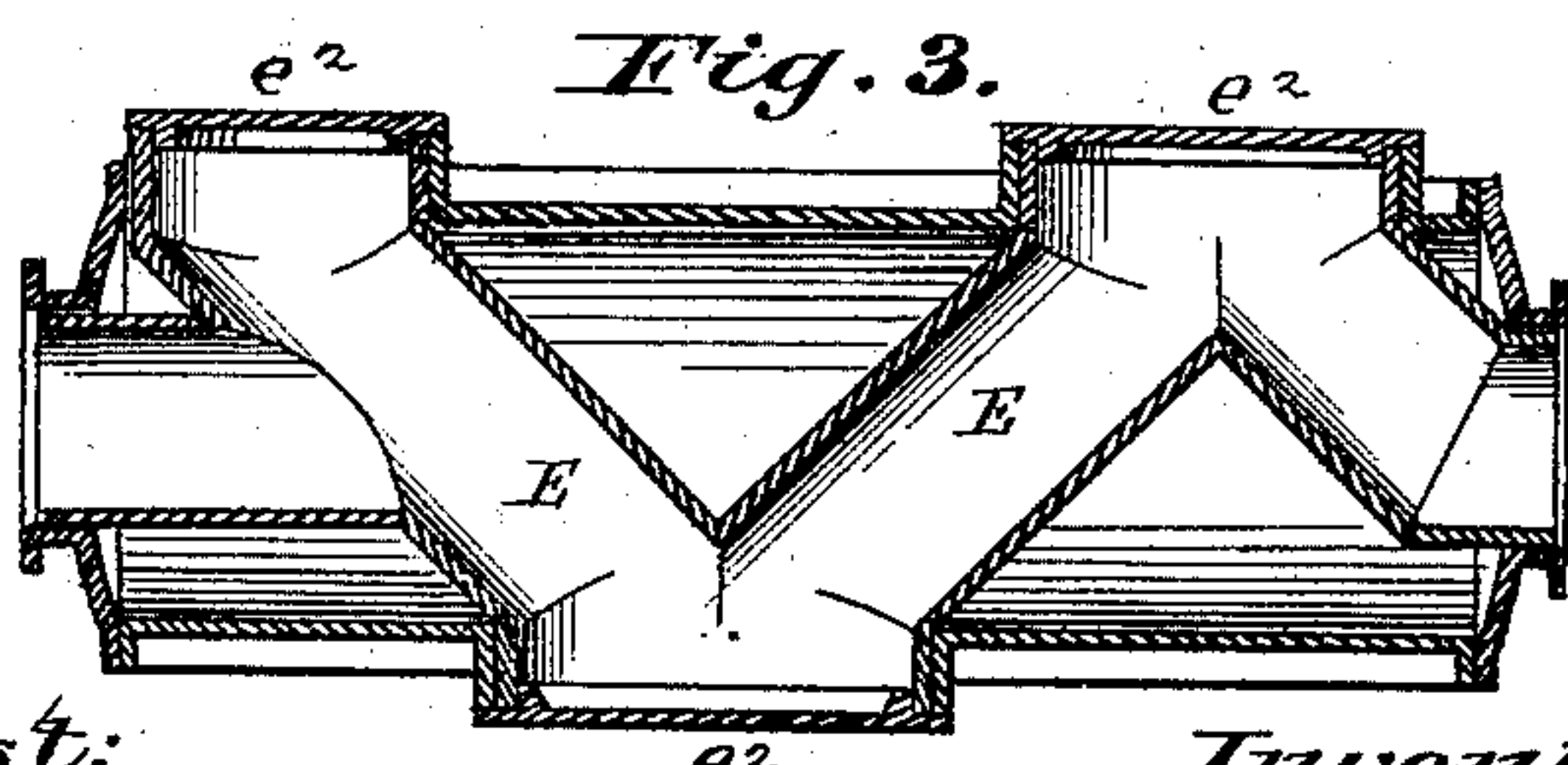
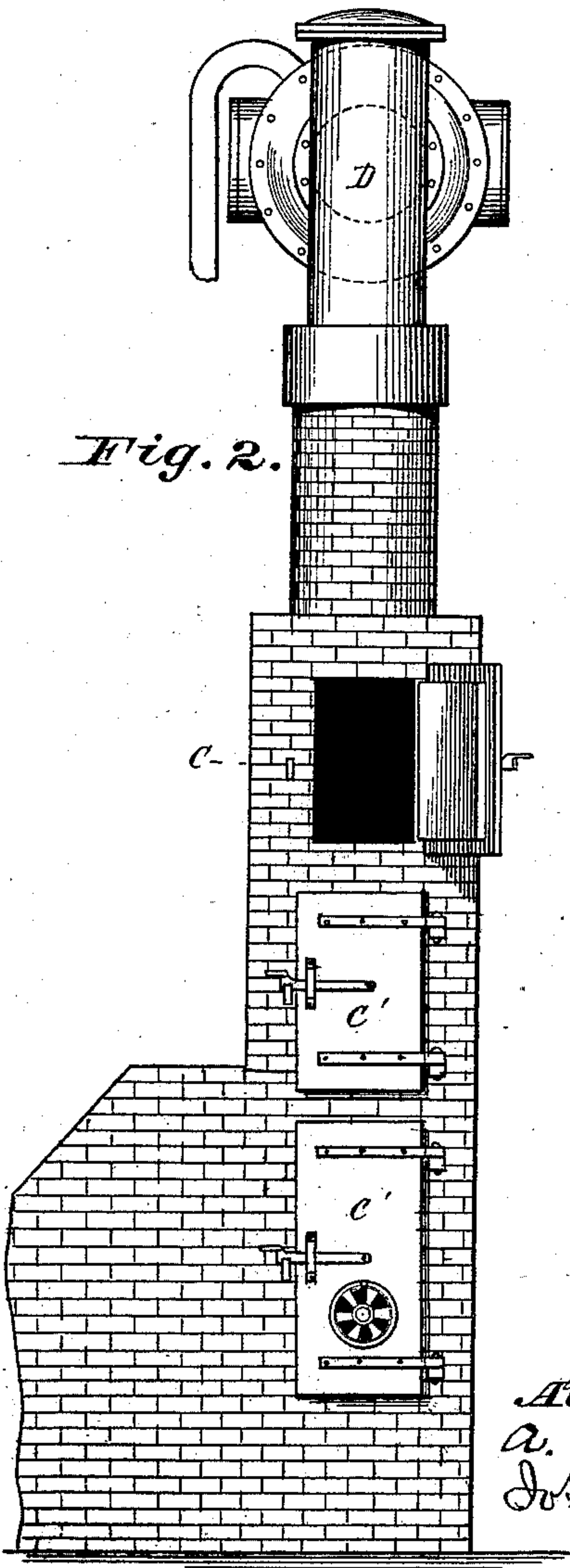


Fig. 3.

Attest:  
a. H. Norris  
J. L. Norris

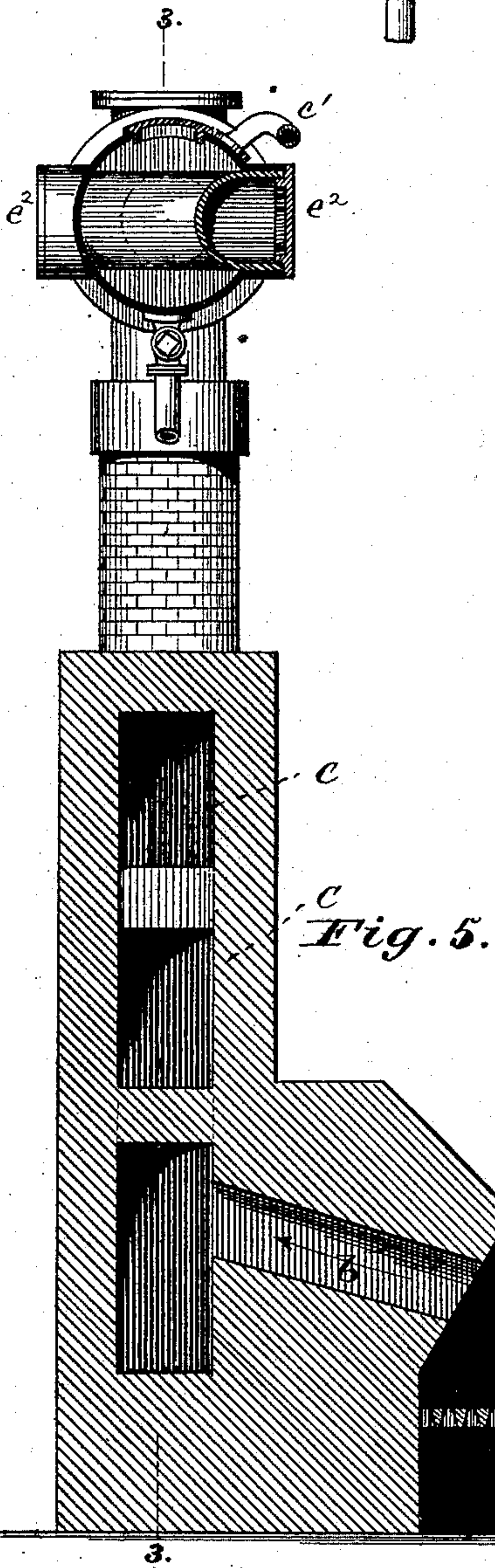
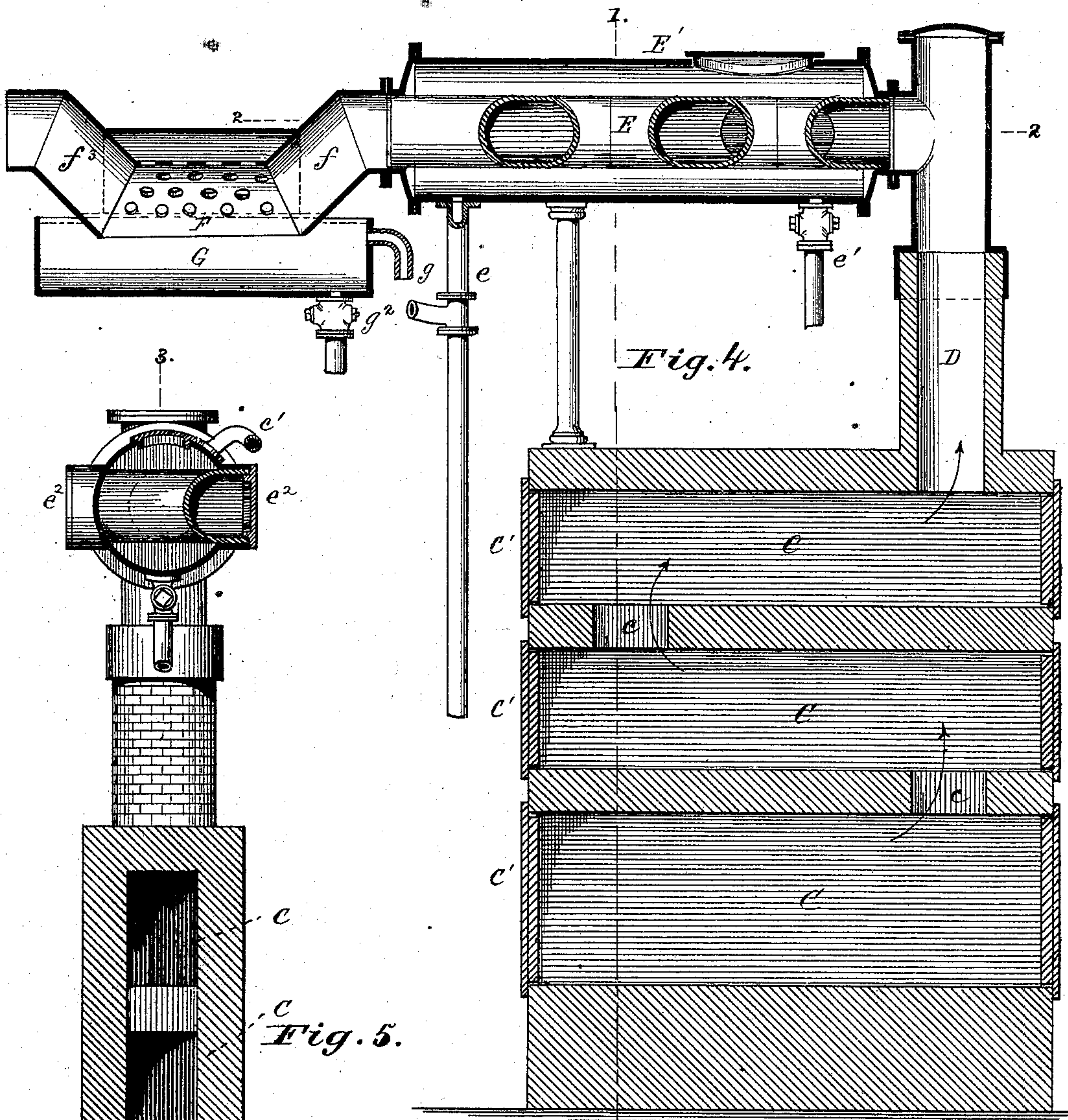
Inventor:  
John Feix  
By James L. Norris  
Att'y



J. FEIX.  
Metallurgic Furnace.

No. 160,662.

Patented March 9, 1875.



Attest  
asb Norrie  
J. S. Boonby  
Inventor.  
John Feix  
By James L. Norris  
att'y



# UNITED STATES PATENT OFFICE.

JOHN FEIX, OF SAN FRANCISCO, CALIFORNIA.

## IMPROVEMENT IN METALLURGIC FURNACES.

Specification forming part of Letters Patent No. 160,662, dated March 9, 1875; application filed December 16, 1874.

*To all whom it may concern:*

Be it known that I, JOHN FEIX, of San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Melting-Furnaces for Gold and Silver, of which the following is a specification:

My invention relates to a new and improved furnace for melting and refining the precious metals, and is especially designed for recovering the gold and silver now lost by volatilization during the treatment of the copper alloys, and retorted amalgams of such metals, and also for recovering the mercury driven off from the amalgams in the form of vapor.

It is a well-known fact that when alloyed gold and silver, and especially the copper alloys and retorted amalgams of the same, are melted in the ordinary furnaces, great waste or loss of metal is experienced by volatilization, and in the case of retorted amalgams a large amount of mercury, which might be effectively used, is carried off additionally, and wasted in the form of vapor.

The loss in operating upon the alloyed precious metals is principally owing to the carelessness or inexperience of the workmen; but when said metals are to be fused and refined from their retorted amalgams, it is almost impossible, in the ordinary furnaces for even the most experienced operative to prevent waste.

My invention is intended to overcome these difficulties; and it consists, first, in combining, with the ordinary melting-furnace, a series of air-chambers, and a tortuous condenser extending through a water-jacket, wherein the volatilized precious metals are condensed, both the chambers and the condensers being provided with doors for the removal of the condensed metal, as will be fully hereinafter described; second, in the combination, with the tortuous condenser, or flue leading from the furnace, of a condenser for the mercurial vapors, consisting of a semi-annular chamber, perforated on the under side, supported over a trough containing water, by means of which a continuous spray of cold water may be showered through the mercurial vapors which pass from the furnace, and are carried beneath said annular chamber, as will be hereinafter set forth.

In the drawings, Figure 1 is a front elevation of my improved apparatus. Fig. 2 is a side elevation of the same. Fig. 3 is a longitudinal section through the condenser and water-jacket. Fig. 4 is a longitudinal vertical section of the apparatus, and Fig. 5 is a transverse vertical section of the same.

A represents the body of the furnace, built of brick-work or other suitable fire-proof material; and B, the fire box or chamber in which the crucible containing the alloy or amalgam is placed. Said fire box or chamber is provided with a grate, B<sup>1</sup>, as usual, and a door or cover to give access to the operator. The furnace is provided with an ash pit, H, below the fire-chamber, and said ash-pit with a door and slide, as usual, by means of which the heat of the furnace can be regulated and controlled. The fire box or chamber communicates with a series of air-chambers, C, arranged in the upper part, and at the rear of the furnace by means of a flue, b. These chambers receive the vapors at opposite ends alternately through passages c, the last chamber of the series discharging into a flue, D, leading to the condenser E. The chambers C C are provided with doors C' C' at each end, so that access may be had to the interior of the chambers in order to remove the condensed metal. The condenser E consists of a tortuous pipe, composed of a series of short pipes, joined together at their ends at any convenient angle, forming a continuous worm, which is surrounded by a water-jacket, E'. The water-jacket is provided with suitable induction and eduction pipes e e<sup>1</sup>, by means of which a stream of cold water is kept continuously circulating through the same. At each angle of the condenser E a door or cover, e<sup>2</sup>, is provided, which may be removed when desired, in order to get at the interior of said condenser for the purpose of removing the condensed metal. The condenser E communicates with another condenser, F, by means of a pipe, f. This condenser consists of a semi-annular chamber, perforated on the under or concave side, below which the mercurial vapors are led through the pipe f<sup>1</sup>. Said chamber is arranged over a receiving-trough, G, clamped in such a position below the condenser F that the water therein will always run in at sufficient height



to cover the open bottom of said condenser, and is provided with an overflow-pipe,  $g$ , and a pipe,  $g^2$ , for drawing off the condensed mercury. The semi-annular chamber communicates with the water-supply pipe  $e$ , by means of which a continuous spray of water may be showered through the gases and vapors passing beneath said chamber, in order to condense the mercurial vapors, and recover the mercury which is usually wasted. The condenser  $F$  communicates with the open air or a suitable chimney by means of a pipe,  $f^3$ , through which the products of combustion and uncondensable gases pass off. The condenser  $F$  may be, if desired, attached directly to the flue leading from the furnace.

The operation of my apparatus is as follows: The crucible containing the alloys or retorted amalgams of the precious metals is placed in the fire-chamber of the furnace through the door  $B^2$ , and the fire started in said furnace. The door is then closed, and the melting and refining commences. The products of combustion from the fire, with the volatilized metal, are driven off from the crucible into the chambers  $C$   $C$ , where a greater portion of the precious metal is condensed and recovered. The vapors and gases then pass to the condenser  $E$ , where any precious metal that may be carried over from the chambers  $C$   $C$  will be completely condensed. The mercury, being more volatile than the precious metals, will pass on with the uncondensable gases to

the condenser  $F$ , where they will meet with a shower of cold water, which will condense the mercury and precipitate it in the trough  $G$ , from which it may be removed, when desired, through the pipe  $g^2$ , and the uncondensable gases pass off to the open air, or into a suitable chimney, through the pipe  $f^3$ .

When the operation is finished, the condensed metals may be removed from the chambers  $C$  and condenser  $E$  by opening the doors  $C'$  and  $e^2$ , provided for the purpose.

What I claim is—

1. The combination of the furnace  $B$ , series of air-chambers  $C$ , and the condenser  $E$ , having induction and eduction pipes, and connected with the air-chambers by a flue,  $D$ , substantially as described, for condensing and separating the volatilized precious metals, as set forth.

2. In combination with the condenser  $E$ , the condenser  $F$ , consisting of a semi-annular chamber, perforated on the under side, and supported over a receiving-trough,  $G$ , for the purpose of condensing the mercurial vapors by subjecting the same to a shower of cold water, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand.

JOHN FEIX.

Witnesses:

BERNHARDT KUHLEWEIN,  
SAML. HERMANN.