# Z. ELLIS.

## Cupola Furnace.

No. 45,030. Patented Nov. 15, 1864.

Fig. 1.

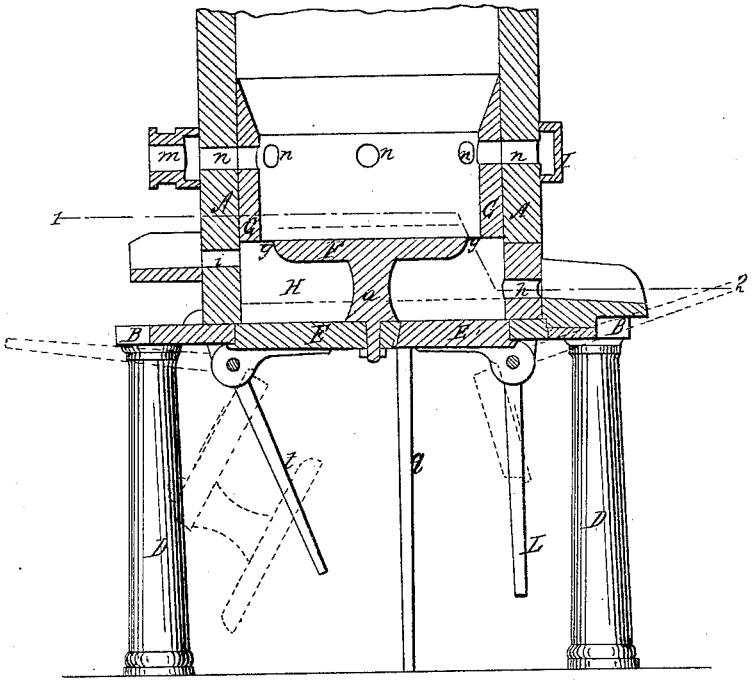


Fig. 2.

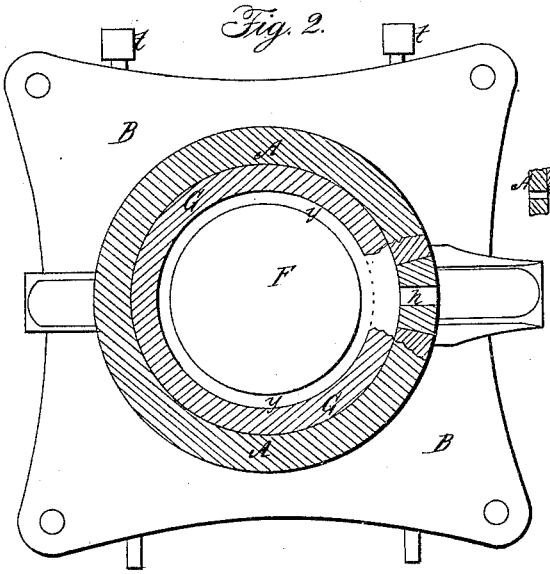
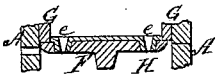


Fig. 3.



**Witnesses:**

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# UNITED STATES PATENT OFFICE.

ZABINA ELLIS, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVED FURNACE AND CUPOLA.

Specification forming part of Letters Patent No. **45,030**, dated November 15, 1864.

*To all whom it may concern:*

Be it known that I, ZABINA ELLIS, of Philadelphia, Pennsylvania, have invented an Improvement in Furnaces and Cupolas; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention consists in forming within the body of a furnace or cupola, and immediately beneath the bed of the same, a reservoir having a tapping-hole and slag-hole, substantially as described hereinafter, so that the slag may pass from the metal which flows into the said reservoir, and so that the metal may be withdrawn from the tapping-hole in a pure state.

My invention further consists of certain doors and a plate for supporting the charge in the furnace, and combined with the latter, substantially as described hereinafter, so that the contents of the furnace, when not required for use, may be precipitated to the ground.

In order to enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation.

On reference to the accompanying drawings, which form a part of this specification, Figure 1 represents a vertical section of my improved furnace or cupola; Fig. 2, a sectional plan on the line 1 2, Fig. 1; and Fig. 3, a section showing a modification of my invention.

A represents the body of the furnace, which is, as usual, composed of a sheet-iron casing lined with brick. This body of the furnace rests on a plate, B, which is supported by suitable columns, D.

In the plate B is an opening, in which the two doors E and E′ fit snugly, the latter door overlapping the former at *x*, and each door being hinged to the under side of the said plate B.

To the door E is secured the stem *a* of a circular plate, F, which extends as high as the lower edge of a lining, G, of fire-brick arranged in the interior of the body of the furnace, the diameter of the interior of this lining G and that of the circular plate F being such that there shall be a narrow annular space, *y*, between the two. A tapping-hole, *h*, is made in the body of the furnace immediately above the doors E and E′, and at a point higher up and on the opposite side of the furnace another hole, *i*, is made, for a purpose described hereinafter.

I is a hollow ring fitting to the body of the furnace, and forming a chamber, to which the blast is admitted through a branch, *m*, the compressed air passing from the chamber through a number of openings, *n n*, into the furnace.

In preparing the furnace for melting or smelting iron, the doors E and E′ are elevated to the position shown in the drawings, and are supported by a stand, *q*. The upper surface of the doors are then protected by a layer of fire-brick or fire-clay, as is also the plate F. The tapping-hole *h*, having been plugged as usual and the furnace charged, the blast is admitted, and the operation of melting proceeds as in other furnaces. It should be understood that the whole of the charge rests on the plate F, and that the annular opening *y* is too small to permit the passage through it of fuel, but large enough to permit the molten metal and slag to pass into the space H below. As the molten metal accumulates in this space, the slag which floats on the top will pass through the opening *i*, thus leaving a mass of pure molten metal in the space H, to be drawn off through the tapping-hole at pleasure. When the furnace is not required for further use, the prop *q* is removed, and the doors E and E′ fall, the door E carrying with it the plate F, so that the entire contents of the furnace are precipitated to the ground.

It will be seen that the shafts or spindles by means of which the doors E and E′ are hinged to the plate B are provided with levers *t* to facilitate the raising of the doors, preparatory to the furnace being put in order for melting.

In the modification shown in Fig. 3 the circular plate F is so arranged as to be in contact with the lining G, and to fit against the under edge of the same, the molten metal flowing through any suitable number of openings, *e*, in the plate to the reservoir below, and these openings being suitably protected by a lining of fire-clay.

I claim as my invention and desire to secure by Letters Patent—

1. Forming within the body of a furnace and beneath the bed of the same a reservoir, H, having a tapping-hole, *h*, and slag-hole *i*, all substantially as described.

2. The doors E and E′ and plate F, combined and arranged in respect to the body of the furnace substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ZABINA ELLIS.

Witnesses:
A. H. SHOEMAKER,
EUGENE G. KUHN.