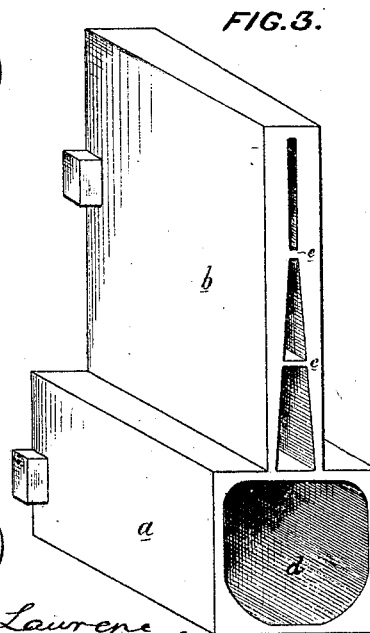
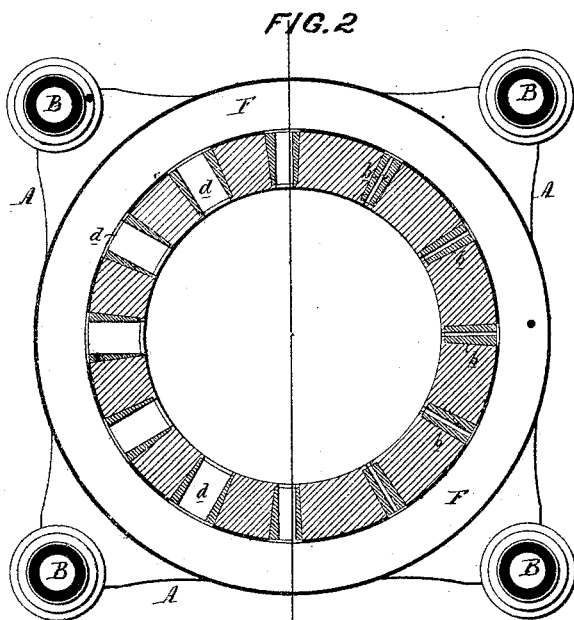
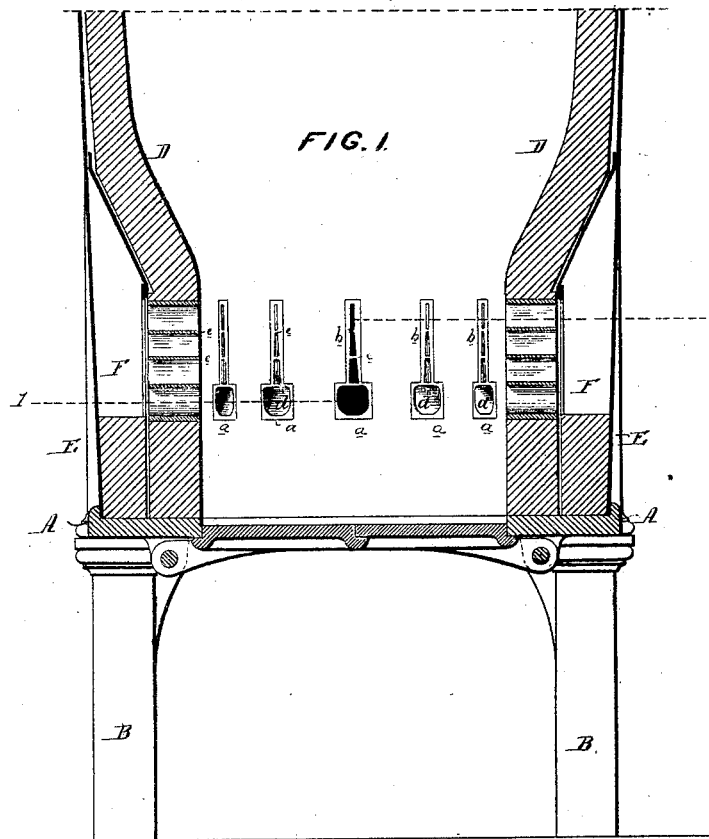


F. LAWRENCE.

Improvement in Tuyeres for Cupola-Furnaces.

No. 114,158.

Patented April 25, 1871.



WITNESSES { *Jas. B. Harding.*  
*Thos. W. Swan*

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# United States Patent Office.

FRANKLIN LAWRENCE, OF PHILADELPHIA, PENNSYLVANIA.

Letters Patent No. 114,158, dated April 25, 1871.

## IMPROVEMENT IN TUYERES FOR CUPOLA-FURNACES.

The Schedule referred to in these Letters Patent and making part of the same.

I, FRANKLIN LAWRENCE, of Philadelphia, county of Philadelphia, State of Pennsylvania, have invented an Improved Tuyere for Cupola-Furnaces, of which the following is a specification.

### *Nature and Object of the Invention.*

My invention consists of a cast-iron tuyere made in the peculiar manner too fully explained hereafter to need preliminary description, for the purpose of introducing into the furnace blasts of a more efficient character than are forced into ordinary furnaces of this class, and for the purpose of affording facilities for building the said tuyeres into the wall of the furnace.

### *Description of the Accompanying Drawing.*

Figure 1 is a vertical section of part of a cupola-furnace illustrating my improved tuyeres;

Figure 2, a sectional plan on the line 1 2, fig. 1; and

Figure 3, a perspective view of one of the tuyeres.

### *General Description.*

A is the base plate of the cupola, supported by brackets on columns B in the usual manner, and

D is the brick lining of the furnace, inclosed by a casing, E, which extends to the base plate A, the interior of the furnace being contracted at the lower end as usual, and an annular blast-chamber, F, being formed around this contracted portion of the furnace.

My improved tuyeres will be best understood by referring to the perspective view, fig. 3, each tuyere being made of cast-iron and of the peculiar shape there shown—that is, with a large square base, *a*, united to and forming a part of the contracted upper portion *b* of the same length as the base, in which is the large thyere-hole *d*, the contracted portion having a tuyere-hole which decreases in width from the bottom upward,

and which may be subdivided into any desired number of separate holes by webs or partitions *e e*, the sole object of which, however, is to strengthen the casting.

These tuyeres are built in the lining of the contracted portion of the furnace, as shown in figs. 1 and 2, their holes forming the sole communication between the blast-chamber F and the interior of the furnace.

I have found by repeated and long-continued experiments that by so arranging the tuyeres of cupola-furnaces that the volume of compressed air forced into the furnace is greater below than above, the effect as regards the reduction of the metal is much more rapid than when the blast is admitted in the usual manner through round holes; and in carrying out this principle I have found that cast-iron tuyeres of the form shown in fig. 3 are both efficient and economical, for while the holes are so arranged that the blast through them decreases in volume from the base upward, the exterior of the tuyeres is of such shape as to admit of their being easily built in and form a part of the lining.

It should be understood that the tuyeres do not extend quite to the inner surface of the lining, but that they are there protected by a layer of clay.

### *Claim.*

A cast-iron tuyere having an enlarged hole below and contracted hole or holes above, and having an exterior shape, substantially as shown and described.

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

FRANK. LAWRENCE.

Witnesses:

WM. A. STEEL,  
HARRY SMITH.