E. VOISIN.

CUPOLA-FURNACE.

No. 172,836. Patented Feb. 1, 1876.

Fig. 1.

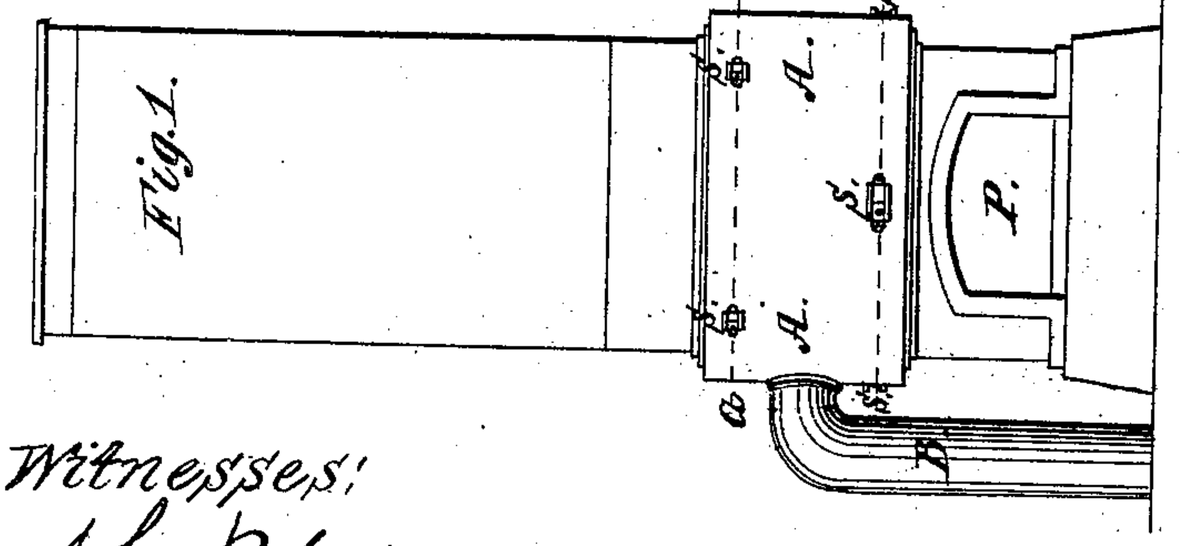


Fig. 2.

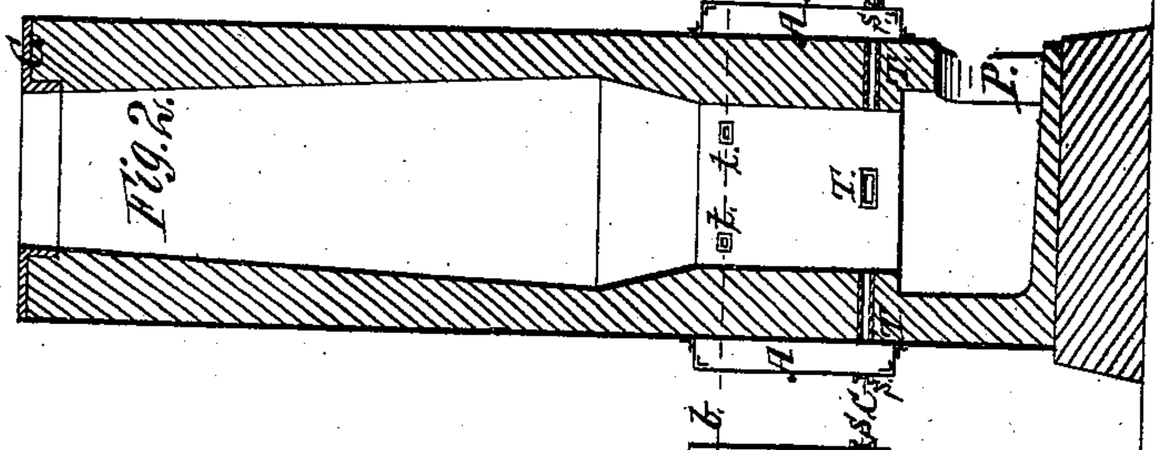


Fig. 3.

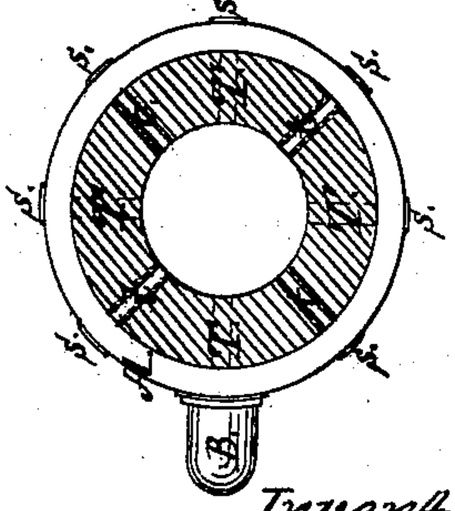


Fig. 4.

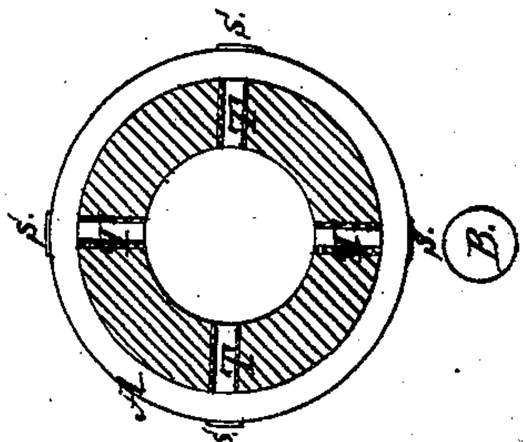


Fig. 5.

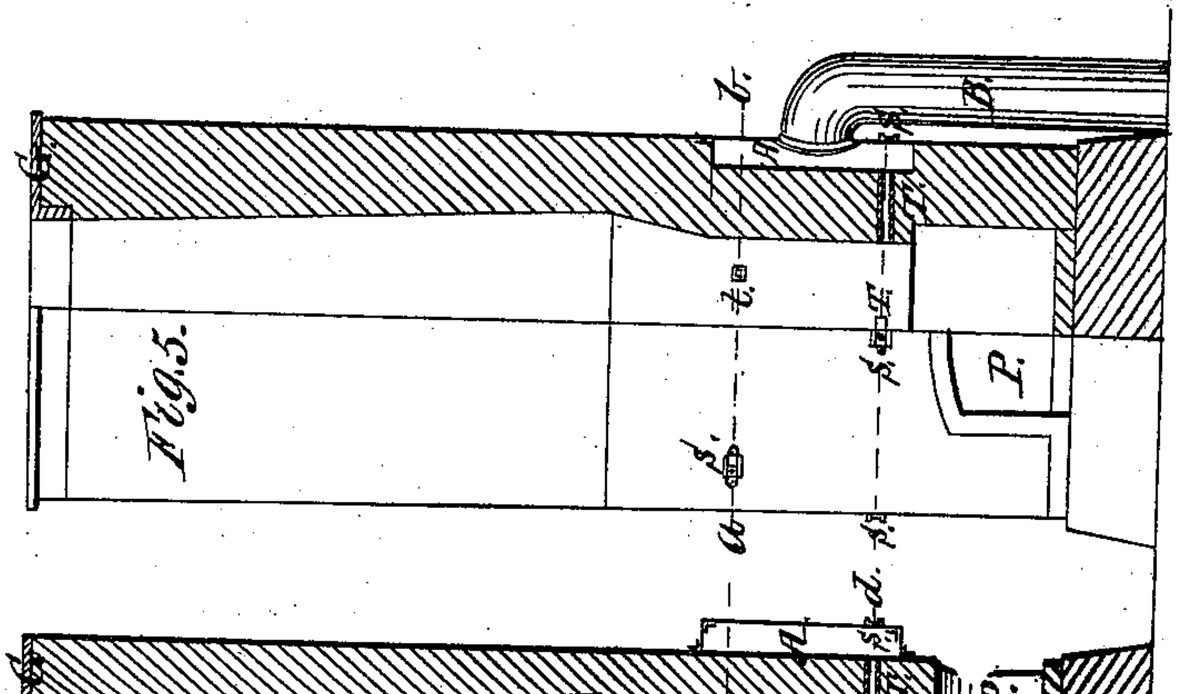


Fig. 6.

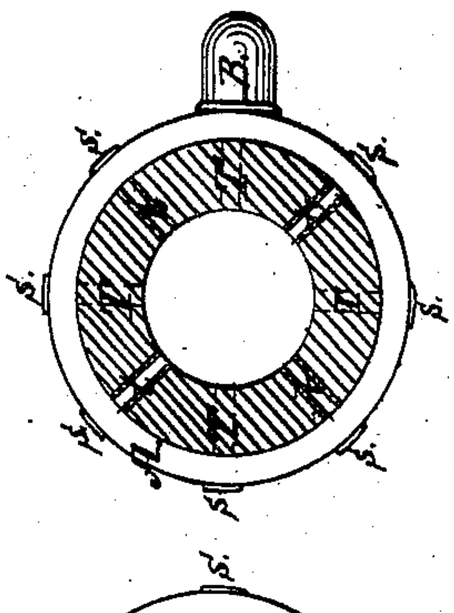


Fig. 7.

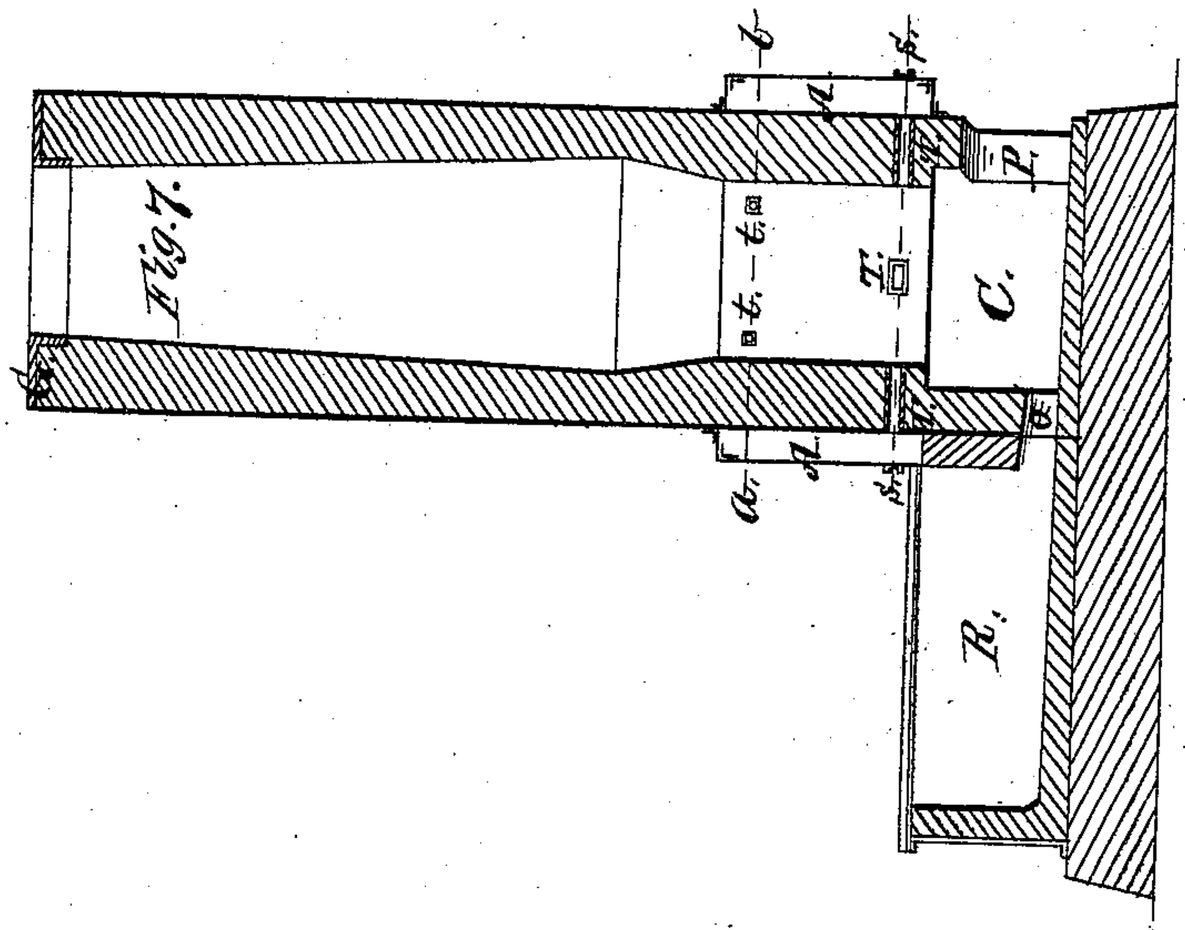
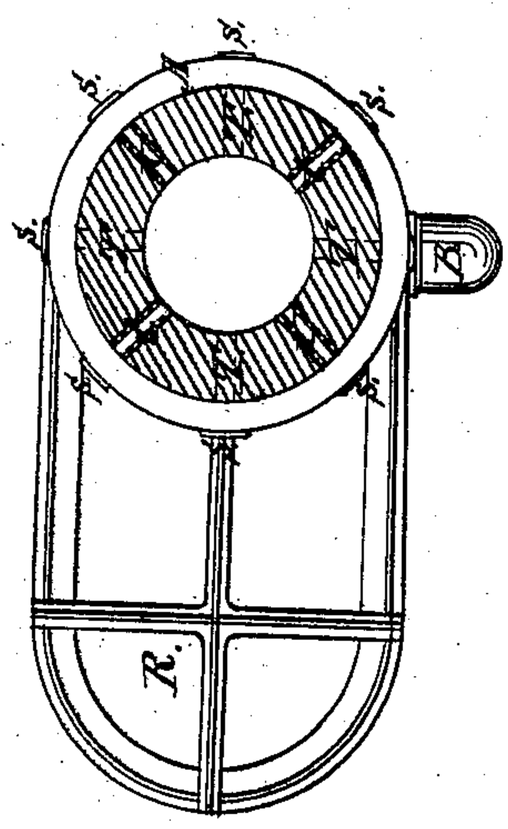


Fig. 8.



Witnesses:
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Geo T. Smallwood Jr

Inventor:
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per John J. Halsted, atty.

UNITED STATES PATENT OFFICE.

EUGÈNE VOISIN, OF BOURGES, FRANCE, ASSIGNOR TO PIERRE AIMABLE VICTOR LE LUBEZ, OF LONDON, ENGLAND.

IMPROVEMENT IN CUPOLA-FURNACES.

Specification forming part of Letters Patent No. **172,836**, dated February 1, 1876; application filed November 13, 1874.

To all whom it may concern:

Be it known that I, EUGÈNE VOISIN, of Bourges, in the Republic of France, civil engineer, have invented certain Improvements in Cupola-Furnaces, of which the following is a specification:

The object of these improvements is, first, to effect the combustion in the interior of the furnace itself of the gases, which in the ordinary construction of a cupola-furnace are burnt at the throat or top thereof, and by which improvements I economize fuel, greatly increase the melting-power of the furnace, and keep the throat of the furnace comparatively cool; secondly, to enable a much larger quantity of molten metal than hitherto to be collected from a furnace at one time, thereby effecting an economy of time and labor where large castings have to be made.

To carry out the first part of my invention, I employ, instead of the ordinary tuyere or tuyeres, a definite number or set of tuyeres, which act on and utilize the coke to the full extent in the ordinary manner, producing carbonic-acid gas (CO_2.) This gas is incombustible, but, passing through the red-hot coke contained between the two rows of tuyeres, it becomes transformed into carbonic oxide, (CO,) which is highly combustible; and I place a second set or row of tuyeres, equal in number with the lower ones, and of such specific dimensions, as compared with such lower ones, as shall serve to supply to the above-mentioned combustible gas (CO) just the quantity of air necessary for effecting its thorough combustion in the interior, instead of letting it burn to waste at the throat of the furnace, as hitherto. This second set of tuyeres is so placed that the said combustible gas is consumed while it is in contact with the metal, thus producing a second zone of fusion, thereby considerably reducing the consumption of coke and accelerating the melting-power of the furnace.

The gases being consumed in the interior of the furnace no flame is produced at the throat of the furnace while it is charged. The number of tuyeres varies according to the size of the cupola, and is the same for each row.

The two rows or sets of tuyeres are always worked together, the air being supplied thereto from an annular distributing chamber formed on the outside or within the iron casing of the furnace, and communicating with the fan or blast engine.

The second part of this invention consists in the application to or placing at the back of cupola-furnaces of a chamber or receiver on a level, and always in communication, with the crucible or hearth of the furnace, in such a way as to cause the molten metal to retain its heat while it is being collected, thereby enabling a larger quantity of metal than hitherto to be run off at one time, and so allow of large castings being made from a comparatively small furnace.

Having thus described the nature of my said invention, I will now proceed to more particularly describe the same, and the means for carrying it into effect, by reference to the accompanying drawing, in which—

Figure 1 is a front elevation of a cupola-furnace with the first part of my improvements applied thereto; Fig. 2, a vertical section of same. Fig. 3 is a horizontal section on line *a b* of Fig. 1; and Fig. 4, a horizontal section on line *c d*, Fig. 1; Fig. 5, vertical section, and Fig. 6, a horizontal section of a cupola-furnace, showing the distributing-chamber placed inside the iron casing; Fig. 7, vertical section of a cupola, showing all my improvements applied thereto; and Fig. 8, horizontal section on line *a b*, Fig. 7, of same.

Similar letters in all the figures represent similar parts.

A A, Fig. 1, is the annular distributing-chamber for supplying air to the tuyeres. In the drawing this chamber is shown placed outside the furnace in Figs. 1, 2, 3, and 4; but it may also be placed within the iron casing, as hereinbefore described, and as shown in Fig. 5. B is a pipe for conveying the blast into the chamber A; T T, the first row of tuyeres for burning the coke producing the gas CO^2, and forming the first zone of fusion; *t t*, second row of tuyeres of a smaller size than the first row, and serving to consume the gas—oxide of carbon—immediately after its production, thus creating the second zone of fusion. I place the two rows of tuyeres at a distance from each other of from one foot eight inches

for small cupolas, as shown in the drawing, to two feet four inches for large cupola-furnaces. I make the area of the section of the second or upper row of tuyeres one-half that of the lower or first row of tuyeres.

S S, cast-iron sight-hole frames, with colored glass, to allow of examining the progress of the fusion. These sight-holes are placed opposite the tuyeres. P is the ordinary door for drawing off the molten metal from the crucible; G, cast-iron lining to protect the brick-work at the throat of the furnace from the effects of the concussion of the pieces of metal thrown into the furnace.

In Figs. 7 and 8, R is the chamber or receiver placed at the back of the cupola, and constantly communicating with the crucible or hearth C by means of the opening O in the lower part of the sole-plate, thus allowing the molten metal to run from the crucible into the receiver while still remaining in communication with the metal in the crucible.

When the receiver contains a sufficient quantity of metal for the required casting, the furnace is tapped and the liquid metal passes from the receiver through the opening O, and through the hot furnace out by the door P, having retained nearly the whole of its heat by being constantly heated by the incoming hot metal from the crucible.

When the receiver is not required the opening O is stopped up, and the cupola may then be used as if it had no receiver.

The improvements hereinbefore described are applicable to ordinary cupolas.

Having now described my said invention, and the best means I am acquainted with for carrying the same into effect, I would have it understood that I lay no claim, broadly, to the mere employment of two or more rows of tuyeres, irrespective of their character and the effects produced by them; nor, broadly, to an annular chamber communicating with two or more rows of tuyeres; nor to a receiver, *per se;* but only, as hereinbefore described, as to the manner in which it is to be used and the duty which it performs, such disclaimed devices having been before employed in connection with cupola-furnaces—but for other purposes—in a different manner and with different results from those herein claimed; but

What I do claim is—

1. In a cupola-furnace, the described combination and specific arrangement of tuyeres in two rows of equal number, the sectional area of each of those of the upper row being exactly one-half that of each of those of the lower row, and serving to supply to the gases the requisite quantity of atmospheric air for effecting their thorough combustion within the furnace, as and for the purpose set forth.

2. In a cupola-furnace, a second (as distinguished from a third, fourth, or other) set or row of tuyeres, having the same number of tuyeres as has the first set or row, and having tuyeres severally of one-half the area of the several tuyeres of the first row, and introducing streams of air in contact with the metal, and serving to create a second zone of fusion by consuming and thoroughly burning in the interior of the furnace the gases which have hitherto been consumed at the throat, as hereinbefore described.

3. The combination of the receiver R at the back of the cupola-furnace with the crucible or hearth, whereby the metal in the receiver is in constant communication with that in the crucible, and free, when the furnace is tapped, to pass back through the intensely-heated hearth of the furnace, as and for the purpose hereinbefore described.

E. VOISIN.

Witnesses:
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F. BAUY.