

Cupola Furnace.

Patented Aug. 25, 1868.

Fig. 6.

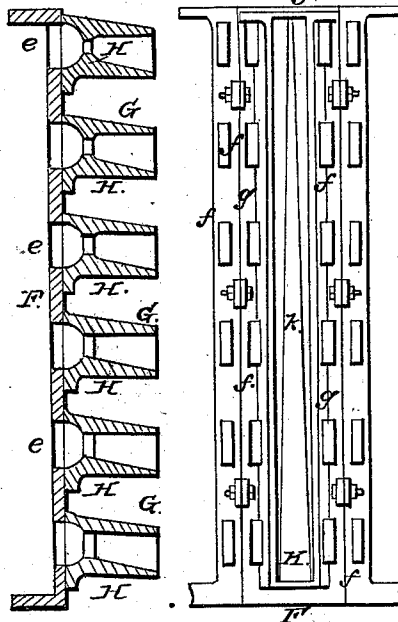
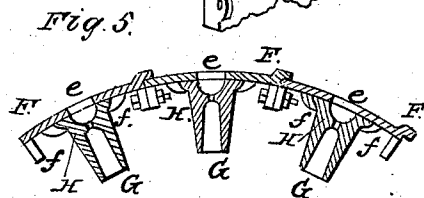


Fig. 4



Inventor.

Charles Truesdale
By Knight Bros Attys

United States Patent Office.

CHARLES TRUESDALE, OF CINCINNATI, OHIO, ASSIGNOR TO HIMSELF AND
WILLIAM RESOR AND COMPANY, OF SAME PLACE.

Letters Patent No. 81,561, dated August 25, 1868.

IMPROVEMENT IN CUPOLA AND BLAST-FURNACE.

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

TO WHOM IT MAY CONCERN:

Be it known that I, CHARLES TRUESDALE, of Cincinnati, Hamilton county, Ohio, have invented certain new and useful Improvements in Cupolas and Blast-Furnaces; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification.

My invention has for its object the obtaining a more effective blast-action in cupolas and other blast-furnaces, whether employed for the reduction of ores or for the melting of metals.

The blast-issues or "tuyeres" of cupolas and smelting-furnaces, having hitherto been few in number, of large individual area, and at or near a common level, have had the effect of chilling those portions of the stock exposed to their immediate action, so as to form solid projections or "bridging," which has seriously restricted the free passage of the blast inward and upward, and of the molten metal downward, and greatly circumscribed the effective yield and capacity of the furnace. In order to avoid these defects, and to obtain a more rapid and effective fusion and delivery of the metal with a given expenditure of fuel, I have devised the improved arrangement of blast-issues which I now proceed to describe.

Figure 1 is an axial section of a cupola or melting-furnace embodying my invention.

Figure 2 is a horizontal section thereof at the line $x\ x$.

Figure 3 is a section, in their common axial plane, of one of my vertical series of graduated tuyeres.

Figure 4 represents the upper end of one of the "staves," which compose the inner shell of my annular blast-chamber, together with the upper tuyere here shown detached.

Figure 5 is a horizontal section, through a portion of the inner shell and its accompanying tuyeres.

Figure 6 shows a modification, in which a slot, converging upward, replaces a vertical series of graduated tuyeres.

A represents the supporting-piers, B the bed-plate, C the shell proper, and D the fire-brick lining of a cupola.

That portion of the lining-wall which surrounds and protects the tuyeres, is carried inward, so as to make a contracted throat to the cupola at this part, and the discharging-ends of the tuyeres are brought flush with the lining. By this means the tuyeres are brought near the centre of the cupola, and are at the same time fully protected by the lining-wall, while the enlargements R and S above and below the tuyeres afford room for the stock and melted metal respectively.

E is an annular blast-chamber, whose inner or convex wall is composed of a series of iron plates or "staves," F, fastened together by bolts, P, and flanges, Q, or otherwise, so as to form collectively a cylindrical casing to the fire-brick D in which the tuyeres are embedded.

Projecting from the concavity of each stave are duffs or dove-tails, f , each pair of which receives and holds one of the tuyeres G, of which each is furnished with dove-tails, g , to fit within the duffs f , and a shoulder, g' , to rest upon them and hold the tuyere to its place, and yet to permit of its removal when desired. Each stave has a series of apertures, e , corresponding in number and position to the tuyeres.

Each tuyere has, near its receiving-end, a contracted throat, H, whence the interior of the tuyere flares slightly downward into the fire-space of the cupola. This throat is least in the uppermost tier of tuyeres, and greatest in the lowermost tier, with a regular graduation in the intervening tuyeres between these extremes. This preferred form of my tuyeres is clearly represented in fig. 3.

Entering the annular blast-chamber are one or more customary blast-pipes I.

It will be perceived that the system of staves composing the inner wall of the annular blast-chamber E, and which afford attachment for the tuyeres, may be applied to any ordinary cupola, with but little change thereof, other than the necessary excavation for said chamber; and, also, that any tuyere injured by heat or accumulation of slag or clinkers may be readily unshipped and replaced by a new one.

While preferring the form here selected for illustration, I reserve the right to vary the same; for example, instead of the separate tuyeres, each stave may have a single tuyere, K, whose ventage may consist of a single slot, *k*, narrowed towards its upper end, as shown in fig. 6.

That portion of the lining-wall enclosing the tuyeres may be flush with the other parts of the interior, or may incline inward or outward, instead of being vertical, while the excess of blast-area below may be accomplished by a greater number instead of a greater area of the individual tuyeres at that part.

The greater capacity of the lower tuyeres, in comparison with the upper ones, is beneficial on the following grounds, to wit:

Near the bottom of the furnace the central upward suction or draught is less decided than in the part above, and consequently a greater force of external blast becomes requisite to reach the central mass, while the stream of descending stock and debris acquires at the lower parts a more central direction and greater compactness and impenetrability; and, further, it is from this lower part that the blast has the greatest volume of stock and slag to pass through in making its way upward in the furnace.

The numerous tuyeres, of small individual area, distribute the blast uniformly over every part, without local cooling at any part.

By placing the throat or regulating-orifice of the tuyere somewhat removed from the extreme inner or discharging-end, the said throat is protected from the change of effective area to which the ordinary tuyere is subject, by reason of the burning off or clogging up of said end.

I claim herein as new, and of my invention—

1. A cupola or blast-furnace, having its blast formed by a multitudinous number of tuyeres on different levels, and of small individual area, and adapted to deliver a diminished blast upward in the series, substantially as herein described, for the purposes set forth.

2. A cupola or blast-furnace, whose tuyeres and fire-brick lining are supported upon an iron back or casing composed of staves or sections, F, substantially as set forth.

3. The mode of fastening the tuyeres upon the inner surface of the air-chamber by means of a dove-tail or its equivalent.

4. A tuyere, whose inner or discharging-end projects beyond the opening which regulates the amount of blast discharged through the same, for the purpose set forth.

5. A tuyere, whose regulating-throat or more contracted portion is protected by a prolongation, which inclines more or less downward to the interior of the cupola or furnace, substantially as and for the purpose stated.

6. The slotted tuyere K, so arranged as to discharge a greater volume below than above, for the purpose set forth.

In testimony of which invention, I hereunto set my hand.

CHARLES TRUESDALE.

Witnesses:

GEO. H. KNIGHT,

JAMES H. LAYMAN.