(No Model.)

J. M. HARTMAN.

Tuyere.

No. 238,503. **Patented March 8, 1881.**

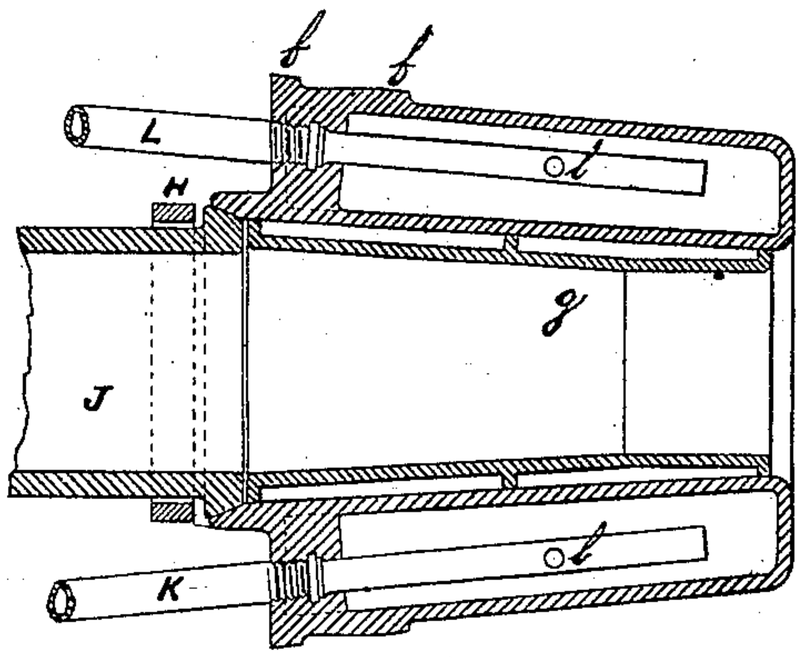

FIG 1

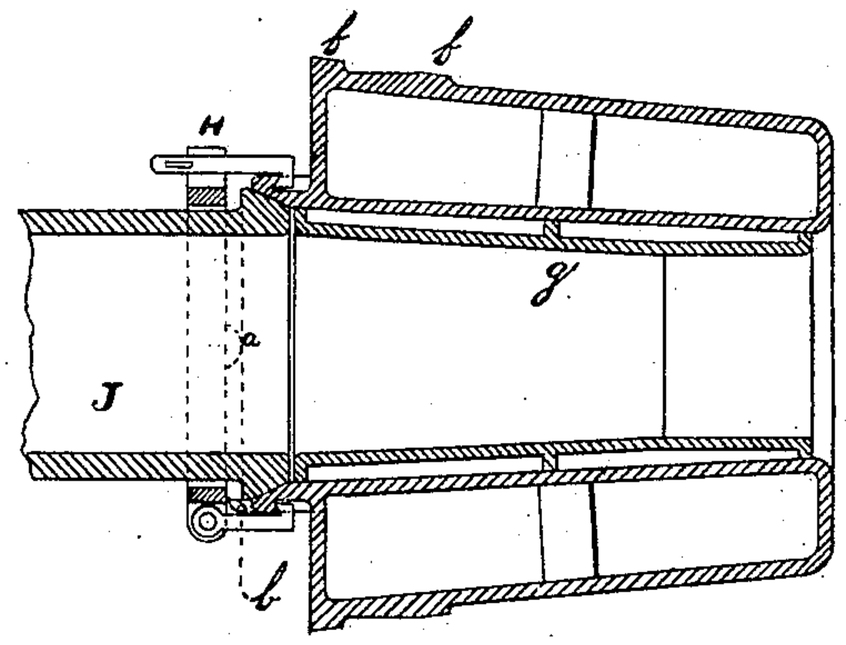

FIG 2

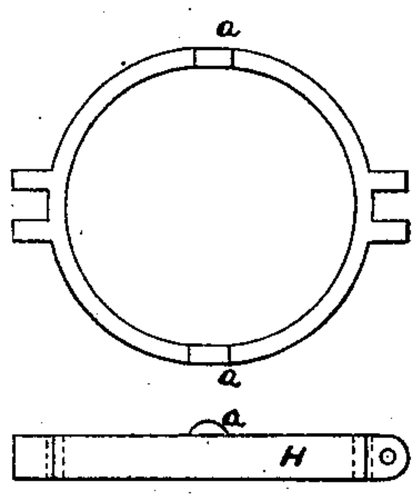

FIG 3

WITNESSES

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JOHN M. HARTMAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO LOUIS TAWS, OF SAME PLACE.

TUYERE.

SPECIFICATION forming part of Letters Patent No. 238,503, dated March 8, 1881.

Application filed October 12, 1880. (No model.)

To all whom it may concern:

Be it known that I, JOHN M. HARTMAN, a citizen of the United States, and resident of Philadelphia, State of Pennsylvania, have invented new and useful Improvements in Tuyeres for Metallurgical Purposes, of which the following is a specification.

The object of this invention is improvement in tuyeres and tuyere-pipes; and it consists, first, in the manner of connecting the tuyere-pipe to the tuyere; second, in the manner of supplying the water to the tuyere and discharging it; third, in the use of rings on the large end of the tuyere; fourth, in the use of a shield in the tuyere to prevent the transmission of heat. I attain these objects in the manner hereinafter described, and illustrated in the drawings, in which—

Figure 1 shows a sectional view of tuyere-pipe, clamps, shield, and water-pipes. Fig. 2 shows a sectional view of tuyere-pipe, clamps, shield, and stays. Fig. 3 shows plan and elevation of clamps.

Similar letters refer to similar parts in all the drawings.

In the Patent No. 205,744, July 9, 1878, granted me, I used a link with a flexible tension to overcome the expansion of the tuyere-pipe, and at the same time to hold the pipe against the tuyere. I now connect the end of the pipe to the tuyere by a clamp and collar at the end of the pipe, as shown in Figs. 1 and 2, by which I avoid the expansion of the pipe. The clamp is held to the tuyere-pipe and tuyere by two hooks, one of which is hinged to the clamp and the other held by a key. The two semicircular lugs *a a* on the clamp allow the pipe to adjust itself to any angle. The hole in the clamp is made oblong, which permits it to adjust itself to any angularity of the pipe. On the end of the tuyere are cast two hooks, which the clamp-bolts hook onto. These bolts are fitted loosely to allow for any angularity of the pipe. This clamp, H, can be formed on the end of the tuyere-pipe J as part of it; but I prefer making it as shown on the drawings.

The clamp H can be attached to the water-breast into which the tuyere fits; but I prefer to attach it to the lugs on the tuyere, as shown in Fig. 2.

To connect the tuyere-pipe to the tuyere is a difficult matter as the interior diameter of the water-breast in which the tuyere fits is so small that little space is left to work in.

On placing the tuyere-pipe against the tuyere it is liable to slip off the globe-face at the tuyere before it can be connected by the clamp. To obviate this I cast a lug, *b*, on the end of the tuyere which supports the pipe until it is connected by the clamp.

Heretofore tuyeres have been used with the water-supply pipe having but one exit or opening, which was at the inner end of the pipe, and near the nose of the tuyere. This was done to cause a rapid circulation of water at the nose of the tuyere, and prevent its melting or burning off.

When the tuyeres are over ten inches long the surface exposed to the fire between the nose and the large end becomes too great for the circulation at the nose to keep the tuyere cool, and the tuyere melts between the nose and the large end. To obviate this I use a larger supply-pipe, K, and drill one or more holes, *l*, in the water-supply pipe, placing the openings about half-way between the nose and large end of the tuyere. The inner end of the water-supply pipe is reduced in area an amount equal to the area of the outlets in the side of the pipe. By this means I obtain a uniform flow of water into the tuyere at different points. Holes *l* similar to those in the water-supply pipe are placed in the tuyere water-discharge pipe L, which gives a circulation both at the nose and part way back on the tuyere. The same object can be attained, when using two receiving and two discharge pipes, by making one of the pipes long and the other short; but I prefer using one pipe.

Heretofore the taper on the large end of the tuyere has been made one straight, continuous line. This taper is turned in a lathe to make it fit the water-breast. This machine-work makes additional cost, and owing to the large surface on this taper the tuyeres jam in the breast, and are difficult to get out. I find in practice that by forming two narrow rings, *f f*, on this taper part, with a depression between them, that the tuyeres do not jam in the breast. The part of the tuyere-pattern forming these

rings is made of metal turned true. This metal retains its form perfectly, and a casting made from it is so true that no turning of the taper part of the tuyere is required.

Heretofore the nozzles in tuyeres have only extended part of the length of the tuyere. In the past blast heated to 800° was used. Fire-brick stoves are now coming into use, and blast heated to 1,400° is used. The blast passing through the tuyere at a velocity of seventeen thousand feet per minute imparts heat to the tuyere-water rapidly, endangers its burning, and requires a larger volume of tuyere-water to keep it cool. The heat abstracted by the tuyere-water has to be replaced by using more coal in the furnace. To obviate this I use a shield, *g*, extending from near the nose to the larger end of the tuyere, and cover as much surface as possible with it. This cuts off the rapid conduction of heat, lessens the danger of burning the tuyere, besides saving coal and tuyere-water.

I claim as my invention—

1. The combination of a tuyere with a hooked lip on the butt-end, a tuyere-pipe with a collar, and a globe-joint, and an oscillating clamp with hook-bolts to attach the tuyere-pipe to the tuyere, whereby the expansion of the tuyere-pipe cannot interfere with the joints, all as substantially set forth.

2. The combination of a tuyere-pipe with a globe-face and a closed tuyere having the lug *b*, for coupling the pipe and tuyere, as and for purposes herein described.

3. In combination with a closed tuyere, a water-supply pipe inserted at the bottom of the tuyere, and having two or more points of delivery.

4. In combination with a closed tuyere, a water-discharge pipe inserted in the top of a tuyere, and having two or more points of discharge.

5. In tuyeres having internal shields for protection of the tuyere proper, making said shield detachable, and thereby interchangeable with other similar shields when a shield becomes injured by use.

JOHN M. HARTMAN.

Witnesses:
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