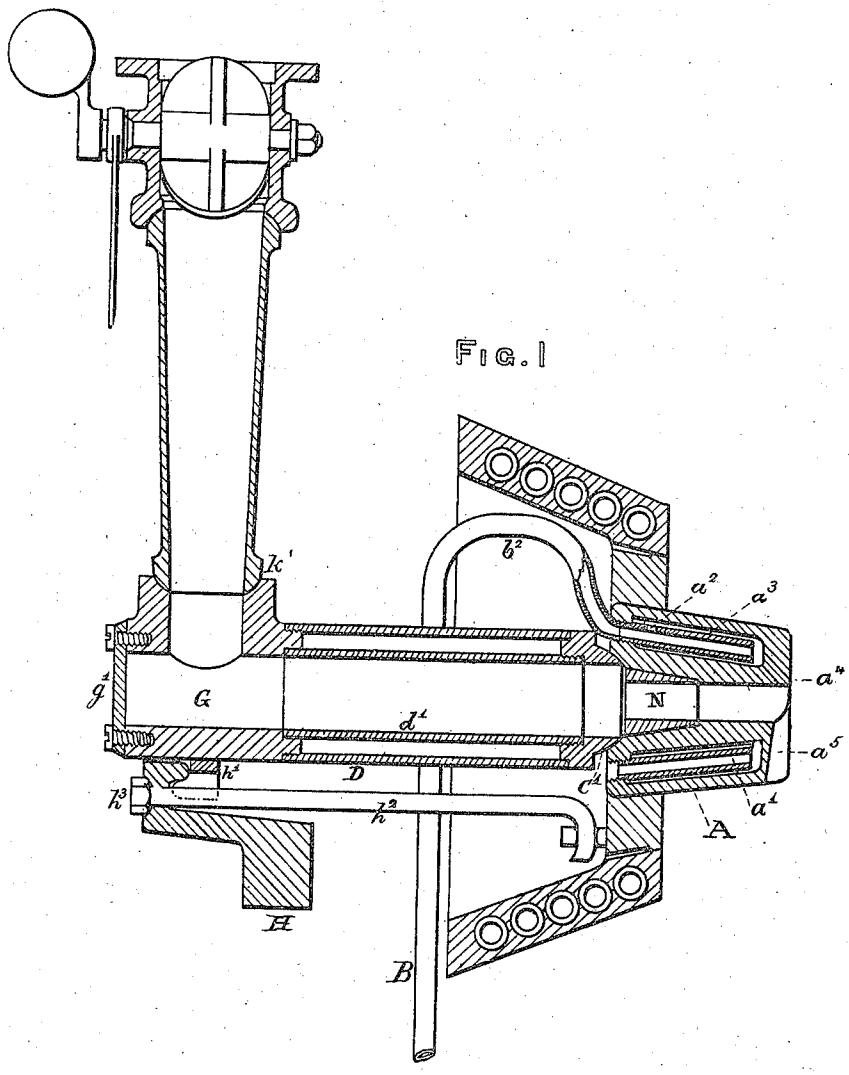
J. M. HARTMAN.

Tuyere.

No. 205,744. Patented July 9, 1878.

Fig. 1



Witnesses.

John F. Grant.

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Inventor:

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UNITED STATES PATENT OFFICE.

JOHN M. HARTMAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO TAWS & HARTMAN, OF SAME PLACE.

IMPROVEMENT IN TUYERES.

Specification forming part of Letters Patent No. **205,744**, dated July 9, 1878; application filed February 26, 1878.

To all whom it may concern:

Be it known that I, JOHN M. HARTMAN, of Philadelphia, Pennsylvania, have invented a new and useful Improvement in Tuyere and Blast Nozzles, which improvement is fully set forth in the following specification and accompanying drawing, in which—

Figure 1 is a vertical section.

The invention relates to improvements in water-cooled tuyeres; and consists, first, in a novel construction of the nose of the tuyere for the better protection of the same; secondly, in the construction and arrangement of the water inlet and outlet pipes and air-outlet; thirdly, in the combination, with the tuyere, of a siphon or a suction-pump, whereby the circulation of water through the tuyere is effected; fourthly, in the construction of the tuyere-pipe and its connections, as hereinafter particularly described; fifthly, in the combination, with the tuyere and pipe, of a tapered nozzle or reducer, and in the means provided for the removal from the tuyere of said reducer without detaching the tuyere-pipe and connections from the tuyere; sixthly, in the combination, with the tuyere and pipe, which are connected by means of a ball-and-socket or oscillatory joint, of devices whereby said joint is closed or held together by a flexible pressure, thereby dispensing with the use of bolts or their equivalent.

A is the tuyere, cast in the form of two annular shells, with a water-space between. a^1 is the receiving-pipe, which delivers the water at the nose of the tuyere.

In some tuyeres the water will flow in a current direct across to the discharge at the opposite corner a^2, and not circulate around the top of the nose, which is the vital part of the tuyere. To obviate this I carry a pipe, a^3, from the discharge-opening, which pipe terminates near the nose, thereby giving a much better circulation at the nose of the tuyere.

To prevent the accumulation of air at the upper corner, I drill a small hole in the pipe at a^2, through which the air will be carried with a small portion of the circulating water, thereby causing a more perfect circulation of the water throughout the tuyere, and consequently a greater durability.

Tuyeres heretofore in use have been supplied with water from a level much higher than the tuyere. In the event of a tuyere leaking, this pressure forces the water into the furnace to its great detriment. To obviate this I attach a siphon, B, or other suction arrangement, to the discharge-pipe of the tuyere, and suck the water through the tuyere.

To assist the escape of air, as previously described, from the discharge-opening at a^2, I carry the discharge-pipe to a higher level, b^2, than the top of the tuyere. While the blast is on the furnace its pressure forces the coal away from the nose of the tuyere; but as soon as it is turned off, the coal is crowded against the nose and deflects the trickling iron inside the nose, and cuts through the bottom side of the tuyere. To obviate this I cast the tuyere with the top projecting beyond the bottom in the form of an overhanging lip, as shown, a^4 being the overhanging lip, and a^5 the recess.

In tuyeres heretofore in use the end of the tuyere-pipe is put into the tuyere, and the joint made by ramming in clay and pounded brick, or the end of the pipe is turned taper and fitted in. This method gives no flexibility, and the pipe breaks by expansion or contraction. It also requires all the parts to be in line, which can be secured only by great waste of time. To obviate this I turn a face, C′, on the metal forming the tuyere—a globe-face preferred—and turn a corresponding face on the end of the tuyere-pipe. The circulation of water in contact with the metal forming the face keeps it cool, and prevents it from springing out of shape. The globe-face on the end of the tuyere-pipe D is cooled by contact with the face turned on the tuyere.

A tuyere-pipe constructed of a single pipe or cylinder under high temperatures of blast, above 1,200°, loses its shape, and also radiates a great amount of heat. To prevent this I make the pipe of two or more rigid hollow cylinders, D d', inclosing an air-tight space between. The front end is closed by a cap; the rear end is fitted upon the T-piece G. The outside pipe D remains cool enough to preserve the pipe in shape and give it rigidity. If the heat used is very high I place a sheet-iron pipe between the shells d' and D to cut off the radiation.

To preserve the contact of the joint C′, I do away with the rigid bolts heretofore in use, and substitute the flexible pressure caused by the weighted lever H, hinged upon the fulcrum h^1, which exerts a constant pressure upon the connecting-link h^2, which is hooked into a rigid staple upon the wall of the furnace near the tuyere.

A spring-tension may be placed upon the rod h^2 by means of a spring below the nut h^3, and accomplish the same purpose.

By this arrangement any expansion of the tuyere-pipe is taken up by the yielding of the weighted lever H, and the joint remains tight. This same device is applicable to connect the other joints of the tuyere-pipe. The globe-joint h' can also be made on each end of the T-piece G when great angularity is required.

Small projecting pins are cast on the lower side of the tuyere to support the tuyere-pipe while connecting the parts together.

The nozzles of tuyeres heretofore in use have been plastered with clay and inserted in the tuyere. The clay, being a non-conductor, allows the nozzle to burn away. To obviate this I form a quick taper in the interior of the tuyere, and fit the nozzle N, metal to metal, against the tuyere. The water in the interior of the tuyere conducts the heat from the nozzle and prevents it from burning.

The operation of a furnace requires a frequent change of nozzles, which has been done heretofore by taking down the tuyere-pipe. To obviate this I form a detachable cap, g', upon the piece G, through which the nozzle, which is smaller than the tuyere-pipe d', can be slipped into its place in the tuyere.

I claim—

1. A water-cooled tuyere formed with a projecting upper lip, a^4, and a recess, a^5, below, as herein described.

2. The combination, in a hollow tuyere, A, of the inlet and outlet pipes a^1 a^3, extending to near the nose of the tuyere, and the air-outlet a^2, as herein described.

3. With a water-cooled tuyere, the combination of a siphon or suction pump to draw the water through the cavity of the tuyere, as and for the purpose herein described.

4. The hollow tuyere A, in combination with the inlet and outlet pipes a^1 a^3, the latter being provided with the air-hole a^2, and the bend b^2 above the level of the water-cavity in the tuyere.

5. A tuyere-pipe formed of two or more hollow rigid cylinders, D d', inclosing an air-space between them, the T-piece G, and the faced cap C′, as herein described.

6. The combination of the taper nozzle N, the tuyere-pipe d', of larger internal diameter than the nozzle, and the removable cap g' upon the T-piece G.

7. The combination of the fulcrum h^1, the connecting-link h^2, and a yielding tension upon the said link by the weighted lever H, or its equivalent, to secure the joint C′ by a flexible pressure, as herein described.

8. The combination of an oscillating joint upon a water-cooled tuyere, an oscillating tuyere-pipe, and a link connecting the same by a yielding pressure, substantially as specified.

JOHN M. HARTMAN.

Witnesses:
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JOHN F. GRANT.