(No Model.)

J. M. HARTMAN.

TUYERE.

No. 399,263. Patented Mar. 12, 1889.

Fig. 2.

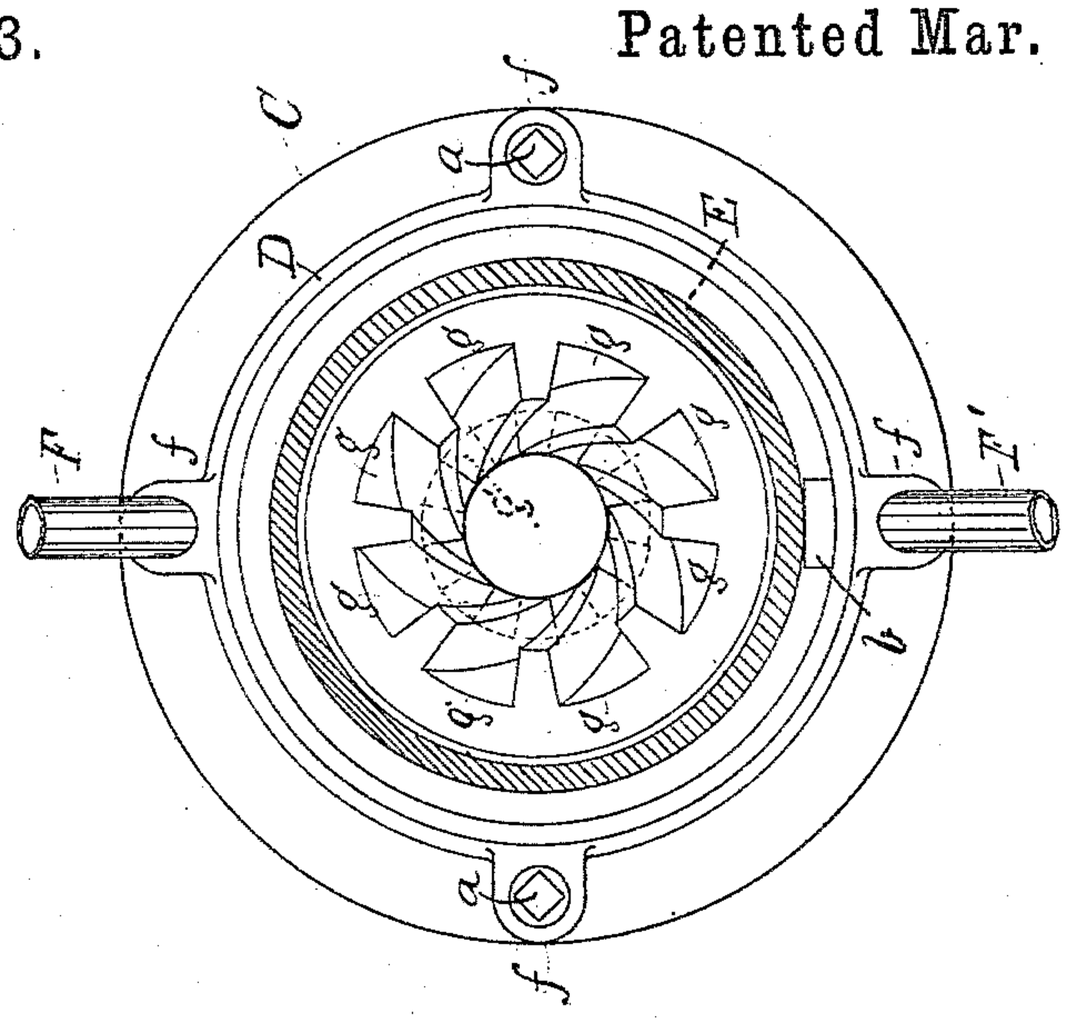
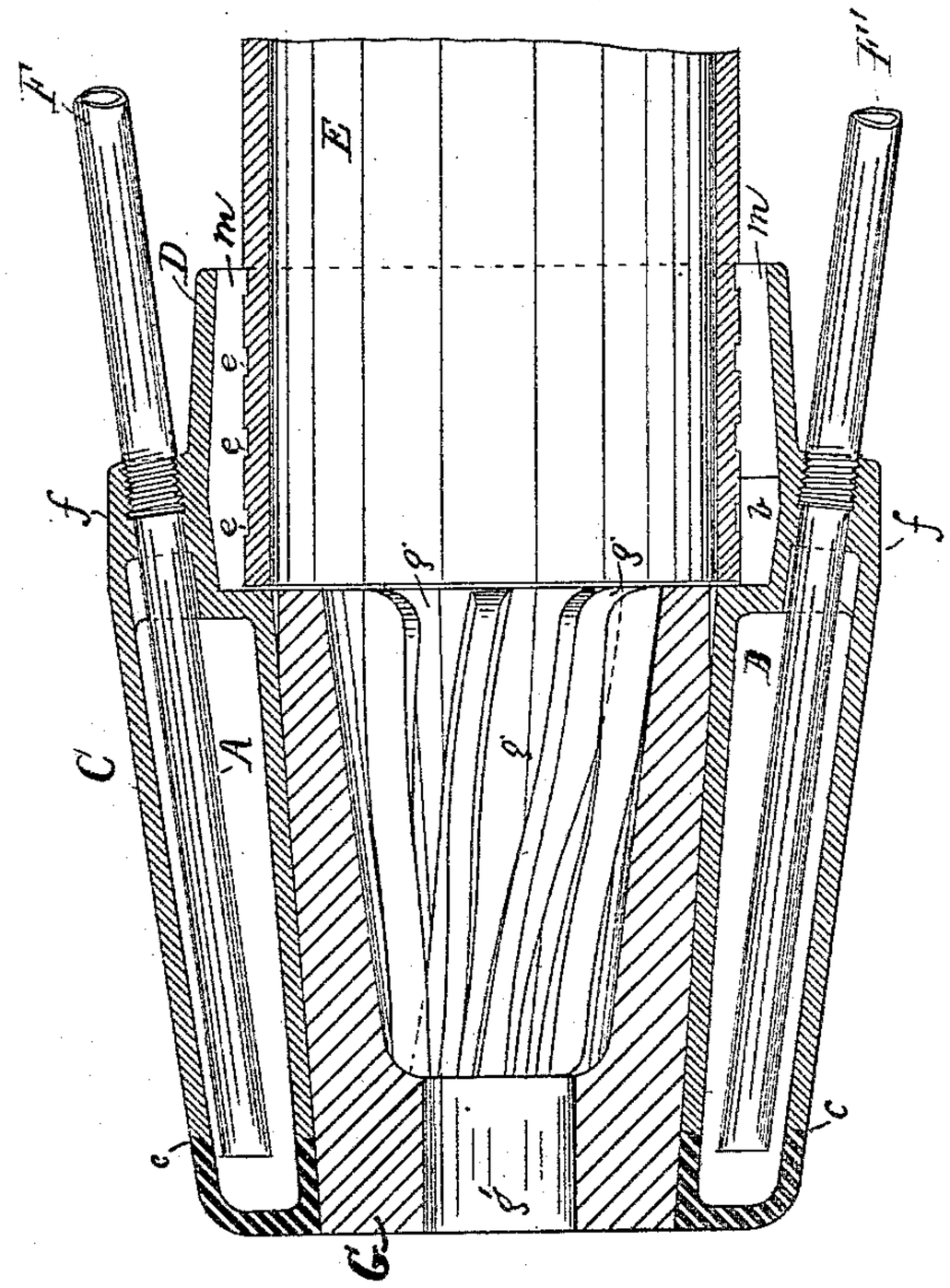


Fig. 1.



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TUYERE.

SPECIFICATION forming part of Letters Patent No. 399,263, dated March 12, 1889.

Application filed August 13, 1885. Serial No. 174,346. (No model.)

To all whom it may concern:

Be it known that I, JOHN M. HARTMAN, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Tuyeres.

The following is a specification of my said improvements, reference being had to the accompanying drawings, wherein—

Figure 1 represents a central vertical section through the axis of the tuyere; Fig. 2, a rear view showing the tuyere-pipe in section and the interior construction of the nozzle-piece.

The chief objects of my improvements are to cheapen the construction and prolong the life of the tuyere.

In the drawings, C represents the tuyere, which is hollow, as shown, and which consists of two grades of metal, being constructed in the following manner:

In casting the tuyere I first pour into the mold fine metal in quantity sufficient to form the nose. In the drawings this is indicated by the heavy section-lines extending backward to about the point *c*. This fine metal may be a bronze whose composition ranges from copper, eighty per cent., tin, ten per cent., and zinc, ten per cent., (these proportions comprising the minimum of copper,) up to substantially pure copper. As soon as the fine metal of the nose has been poured into the mold, the baser metal, (which may be common yellow brass or scrap metal, included under the general commercial term "brass,") and which is to form the remainder of the tuyere, is immediately poured in upon the metal of the nose before the latter is chilled, which allows them to unite perfectly and keeps the baser metal above. As the burning of a tuyere takes place chiefly at the nose and for a distance of about two inches back, I thus construct that part in a very durable manner, since the high conducting power of the copper enables the heat to be abstracted from the interior with great rapidity, and thus prevents it from burning. The remainder of the tuyere, which is not exposed to the same danger, is thus cheaply constructed and the cost is very materially reduced. The butt-end of the tuyere is provided with a rearwardly-projecting flange, D, of sufficient diameter to permit the insertion of the tuyere-pipe E and leave a tapering annular space for clay or similar packing, *m*. I construct the flange D with an inward taper, as shown, so that when once packing is inserted the pressure of the blast tends to jam it still more tightly between the converging flange D and the outer periphery of the tuyere-pipe E. To further assist in the retention of the clay or packing, I cast a series of small circumferential channels upon the outside of the tuyere-pipe near its end, into which channels the soft clay enters and is thus firmly held.

The interior diameter of the tuyere-pipe E should be not less than the diameter of the interior of the tuyere proper, as shown, in order to permit the removal and replacement of the nozzle-piece G without destroying the joint between the tuyere and the tuyere-pipe. Inside of the flange D, and at the bottom thereof, I provide a single lug, *b*, of such height that when the tuyere-pipe rests thereon it registers properly with the bore of the tuyere. The purpose of this lug is to sustain the tuyere-pipe at the proper point while the packing is being inserted around it.

The nozzle-piece G, which is constructed of plumbago, fire-brick, or other refractory material, fits snugly within the tuyere, and is provided with a series of spiral grooves, *g*, to increase the penetrating power of the blasting by giving it a spiral motion. I have found it expedient, however, instead of continuing these grooves to the extreme front end of the nozzle-piece, to construct such end portion with a plain cylindrical surface of reduced diameter, as shown at *g'*, the discharge thus obtained being found highly effective as the necessary amount of spiral motion is obtained by the grooves and the plain or cylindrical discharge-nozzle prevents any dispersion sidewise.

The water-circulation I arrange in the following manner: Outside of the projecting flange D, I provide upon the rear end of the tuyere a series of couplings, consisting of bosses *f*, arranged diametrically opposite to one another, and preferably four in number, at the respective quadrants, as shown in Fig. 2. Each of these bosses is provided with an internal screw-thread to attach the outer water-circulating pipes, F and F', respectively. Experience has shown that the points of the

tuyere which are attacked most rapidly by the melted iron are the top and bottom portions of its nose. To protect this in the most efficient manner, I introduce the inner water supply and discharge pipes, A B, at the top and bottom only and prolong them down close to the end of the nose. I have found that the maximum distance from the end of the pipes A B to the end surface of the tuyere should not be more than the bore of the pipe. This system supplies an active quick circulation of water at the two vital points where it is most essential.

The disposition of the bosses *f* upon the rear end of the tuyere at diametrically-opposite points enables me, when the tuyere is worn thin at the top and bottom, to turn it axially, say, ninety degres, and thus obtain a fresh top and bottom surface. This operation can be performed without altering the existing arrangement of the outside water-pipes, F F′, and as the rapidity with which these changes can be made is of importance I thus greatly facilitate the manipulation of the tuyere. The bosses or couplings which are for the time being not used are closed by screw-caps *a*, as shown in Fig. 2.

I am aware that the use of bronze as a material for tuyeres is not new, and that it is common to attach a tip of platinum to ordinary blow-pipes and to construct tuyeres with detachable noses of various metals.

I do not claim a detachable nose, since the very object of my invention is to avoid any joint in that locality; nor do I claim, broadly, a bronze nose for the tuyere, nor the use of an infusible tip, save when these features are embodied in the particular form above specified, so that the nose, though of different metal from the body, is integral therewith. By this method of construction I obtain all the advantages of bronze at but little more than the cost of scrap metal or brass and produce a structure containing no joint, like that of a platinum-tip blow-pipe. No joint could withstand the changes of temperature when constructed upon the scale of a blast-furnace tuyere and subjected to the conditions of its use.

As the water-circulation in the interior of the tuyere is in direct contact with the metal thereof, it is obvious that the integrity of the structure must be maintained; otherwise the leakage which would occur at any accidental opening of a joint would be disastrous.

Having thus described my invention, I claim—

The tuyere having a hollow interior for water-circulation in direct contact with the metal thereof, and having a rear portion of brass and a nose of bronze, said nose being integral with said rear portion, substantially as set forth.

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Witnesses:
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