

(No Model.)

J. M. HARTMAN.
TUYERE.

No. 485,381.

Patented Nov. 1, 1892.

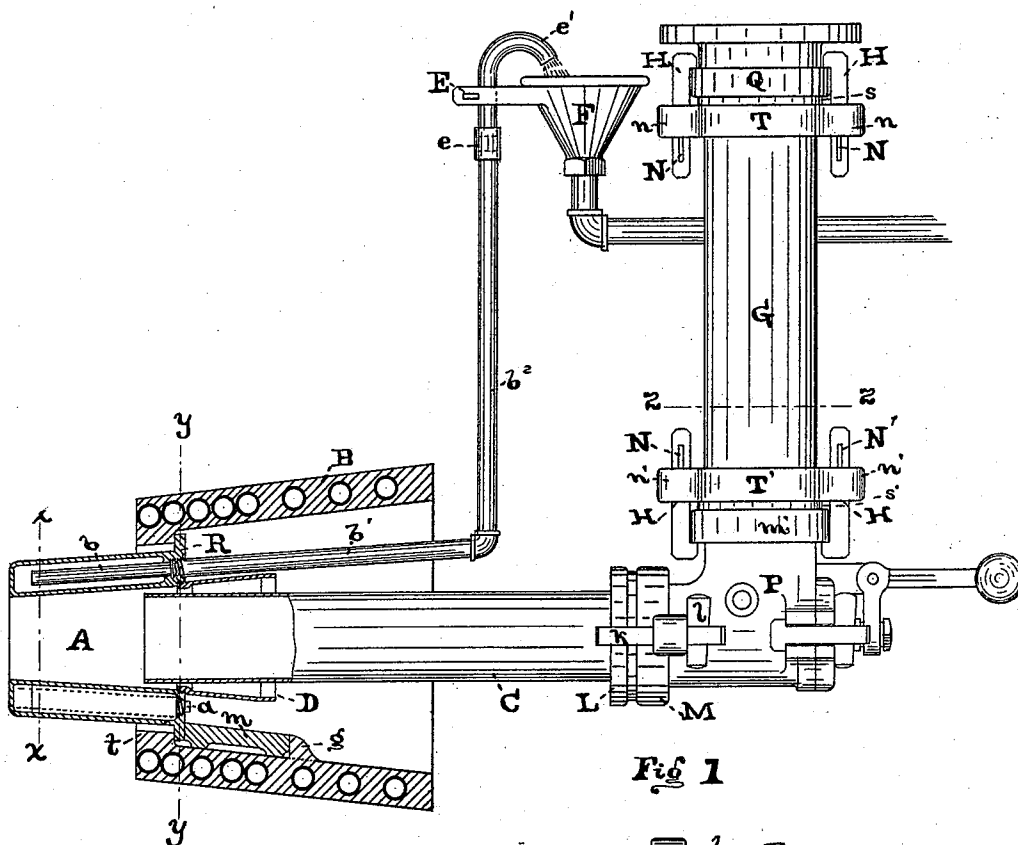


Fig 1

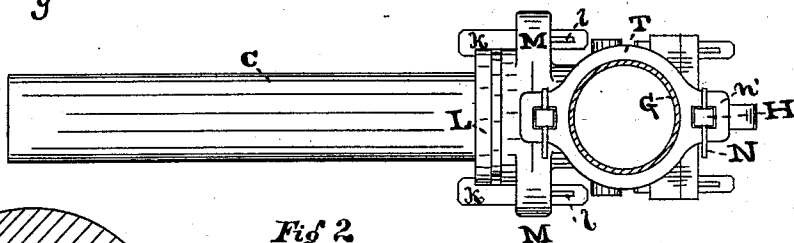


Fig 2

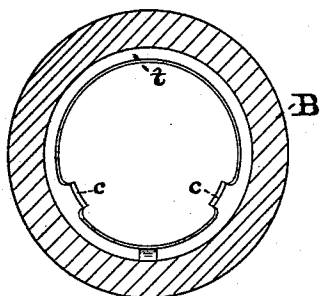


Fig 3

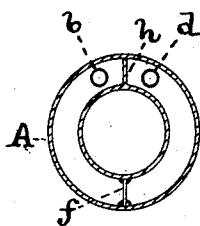


Fig 4

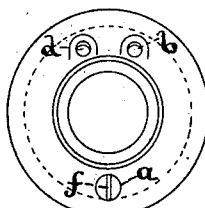


Fig 5

WITNESSES:

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TUYERE.

SPECIFICATION forming part of Letters Patent No. 485,381, dated November 1, 1892.

Application filed April 21, 1887. Serial No. 235,599. (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, of which the following is a specification, reference being had to the accompanying drawings, wherein—

Figure 1 represents a vertical longitudinal section through the tuyere, tuyere-breast, and end of the tuyere-pipe, certain other parts connected therewith being shown in elevation. Fig. 2 is a top view of the tuyere-pipe, showing, also, the vertical blast-pipe in section on the line *zz* of Fig. 1. Fig. 3 is a transverse section through the tuyere-breast on the line *yy* of Fig. 1. Fig. 4 is a transverse section through the nose of the tuyere on the line *xx* of Fig. 1, and Fig. 5 is a rear view of the tuyere.

Among the objects of my improvements are the following: to insure a positive water circulation at the vital points, to facilitate the removal of deposit from the tuyere, to hold the tuyere firmly in the breast and at the same time prevent it from sticking or jamming therein, to provide a detachable packing-cup, to prevent the internal pressure from blowing the tuyere-pipe out of position, while at the same time it is left free to expand longitudinally and thus avoid breakage, and to provide a better method of supporting and applying the water-discharge of the tuyere.

In the drawings, A represents the tuyere, cast, as usual, with double shell, but having an interior partition *h* extending between the shells the entire length at the top, and a partition *f* at the bottom, which extends to within a short distance of the nose of the tuyere-pipe.

The water-inlet pipe *d* extends from the butt down to within a short distance of the nose, so as to deliver the fresh water directly against the same without previous contact with the heated wall of the tuyere and is placed close to the partition *h* on the one side, while the exit-pipe *b* is similarly placed close to the other side of said partition. The partitions *h* and *f* may be cast in one piece with the tuyere, or they may be cast separately and inserted in suitable grooves on the inner surface of the tuyere-shell. An opening *a* of a sufficient size to permit the insertion of the

partition *f* is formed in the lower side of the butt, and closed when not in use by a screw-plug, as shown, and a similar opening and plug are used for the partition *h*, when it also is detachably applied.

As is well known, the points most liable to destruction are the upper edges of the top and bottom of the nose, upon which the melted iron and cinder impinge, and the above method of construction compels the circulation of water to come into contact with said parts in a more efficient manner than do the devices heretofore used, where only a single partition between the inlet and the exit pipes was applied, and where, consequently, the water could be driven back from the front end of the tuyere. The opening *a* on the lower side of the butt, extending as it does on each side of the bottom partition *f*, enables the operator to readily remove the mud or deposit from the tuyere.

B represents the tuyere-breast, which is constructed in the ordinary manner, except that it has at its front end an inwardly-projecting flange *t*. Heretofore it has been customary to fit the tuyere closely against the correspondingly-tapered inner surface of the breast; but it has been found that this method of construction rendered the tuyere liable to jam or stick to the breast and great difficulty has been experienced in removing it therefrom. To prevent this, I make the opening in the front end of the breast somewhat larger than the exterior diameter of the tuyere-butt and cast upon the latter an annular flange *R*, which brings up against the inside of the flange *t* of the tuyere-breast. Centering-lugs *cc* (see Fig. 3) are cast upon opposite sides of the flange *t* to maintain the tuyere in proper position, and it is secured by means of a key *m*, which abuts against the lug *g*, cast upon the inside of the tuyere-breast. Heretofore a rearwardly-projecting deep flange to receive the clay packing around the tuyere-pipe has been cast in one piece with the tuyere itself, which not only increased the difficulty of casting, but used up a considerable quantity of expensive tuyere metal, and, moreover, had to be thrown aside when the tuyere was discarded. To obviate this, I use a detachable packing-cup *D*, which may be of cast-iron or other cheap metal and which has a screw-

thread upon its front end corresponding with one upon the interior of the tuyere-butt. In this way I not only can make the parts interchangeable, so that one packing-cup may be used for a number of tuyeres, but can extend the packing-cup to a greater length, as to maintain a better packing around the tuyere-pipe.

C represents the tuyere-pipe, which, instead of bearing at its front end against the butt of the tuyere or the packing-flange, passes entirely through the packing-cup D and projects into the interior of the tuyere without coming into direct contact therewith. The tuyere-pipe is truly cylindrical in form and can expand lengthwise through the packing, and since it does not abut against the tuyere or any rigid bearing-surface at its front end the risk of breaking is avoided and undue strain upon the support for the rear end of the pipe is prevented. Instead of holding the tuyere-pipe in position by means of a rod extending from its rear end to the tuyere-breast or by other direct fastenings, I provide the following system of attaching the vertical blast-pipe G, which carries the rear end of the tuyere-pipe and which, I have found, enables me to dispense with the tie-rod or other distinct support.

At the top and bottom of the vertical blast-pipe G are strong bands T T', cast upon or otherwise rigidly secured to said pipes. These bands have projections or lugs *n n*, which are in line with the axis of the tuyere-pipe C and are directly over the prolongation of said axis. Openings are formed in said lugs to permit the passage of bolts H H'. The lower ends of the bolt H' project under and engage with a flange *m*, formed on the upper part of the elbow P, which connects the tuyere-pipe C and blast-pipe G. The bolt H projects over and engages with a flange Q', formed on the pipe, from which the vertical blast-pipe G is suspended. Suitable keys N N' hold the bolts H H' firmly in position, and I have found that by thus placing said bolts vertically above and in the line of the axis of the tuyere-pipe C the structure is rendered sufficiently rigid to resist the internal pressure transmitted by the tuyere-pipe without other fastenings. The tuyere-pipe C itself is attached to the elbow P by a similar system of bolts *k* and keys *l*, which, however, need not be particularly described. The exterior water-discharge pipe *b'* is carried upward by a vertical pipe *b''* to a distance of, say, three or four feet above the tuyere and is connected by a flexible hose *e* with a goose-neck *e'*, suspended by a clamp E and projecting over into a discharge-funnel F. This method of giving a positive though flexible support to the discharge-pipe I have found useful, since with the rigid connections heretofore used the discharge-pipes were frequently broken or dis-

placed, and were, moreover, difficult to adapt to the tuyeres of different size or shape.

I am aware that spiral partitions have been tried to convey water to the nose of the tuyere; but in such cases the water is admitted directly into the annular space between the shells at the butt of the tuyere, and consequently is heated before it reaches the nose, owing to the long distance which it has to travel through the spiral passage, and I know that such devices have for this reason failed in use. My improvement conveys the water direct to the nose, and thus not only acts very effectually, but uses less water to do the work.

I do not confine myself to the exact position shown of the centering-lugs. They can be placed on the tuyere itself.

Having thus described my invention, I claim—

1. In combination with a tuyere having a double shell forming an annular water-space, the straight longitudinal partition extending the entire length at the top of the tuyere and completely dividing said space at that point, the water-inlet pipe projecting inward on one side of said partition to a point in close proximity to the nose, the water-exit pipe similarly arranged upon the opposite side of said partition, and the straight partition arranged diametrically to the first one and extending from the butt to a point in close proximity to the nose, substantially as set forth, whereby the fresh water is delivered without previous contact with the tuyere metal directly against the upper portion of the nose and is compelled to travel to the point of discharge around the metal of the nose.

2. The combination, with the tuyere, of a removable partition *f*, extending longitudinally partly along the bottom, and an opening *a* in the butt and extending on each side of said partition, as and for the purposes set forth.

3. The combination of a tuyere-breast having an inwardly-projecting annular flange at its front end, a tuyere of less external diameter than the opening of said flange and having an outwardly-projecting flange around its butt, and means, substantially as set forth, whereby said flanges are secured in contact and an annular chamber is formed between the exterior of the tuyere and the corresponding end portion of the tuyere-breast, substantially as and for the purposes set forth.

4. The combination, with the tuyere, of the packing-cup D, removably secured to its rear end, and the water supply and discharge pipes of the tuyere, arranged externally to said packing-cup, as set forth.

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Witnesses:

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