Aug. 26, 1930. R. E. BRAKEMAN 1,773,944

TUYÈRE

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Fig. 1

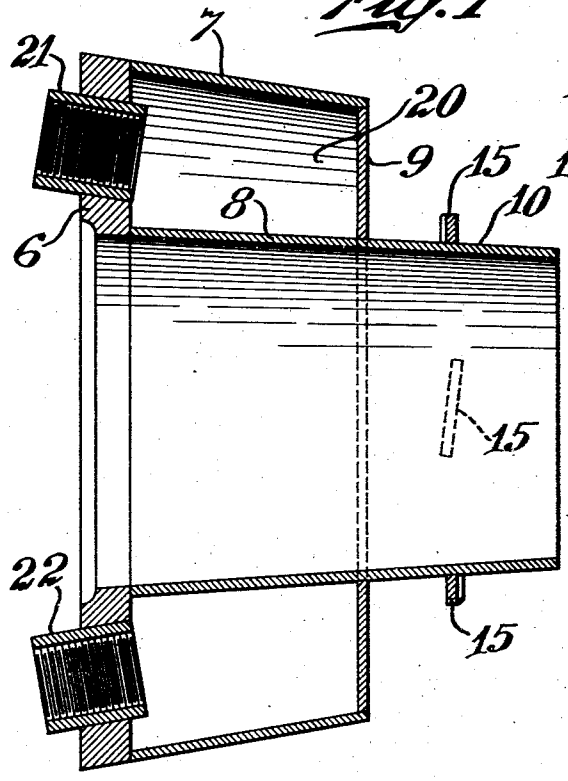


Fig. 2

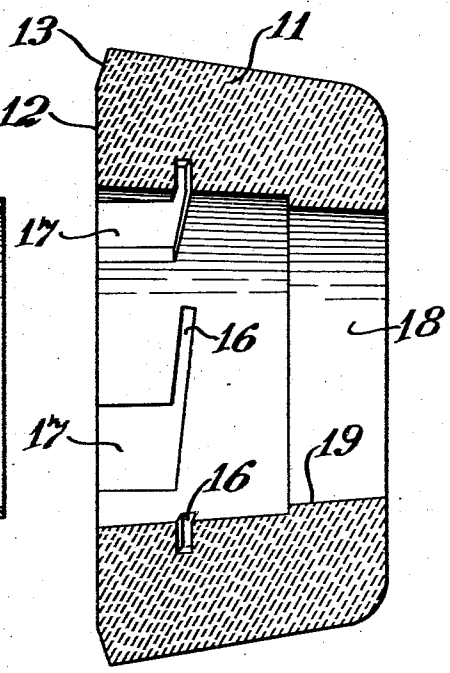
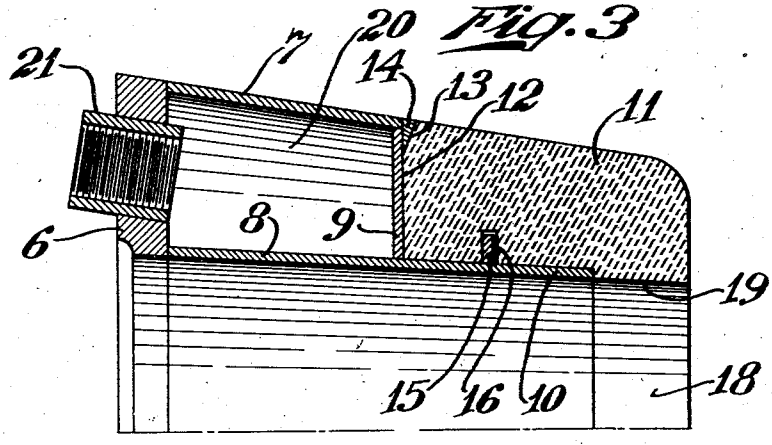


Fig. 3



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Fig. 4

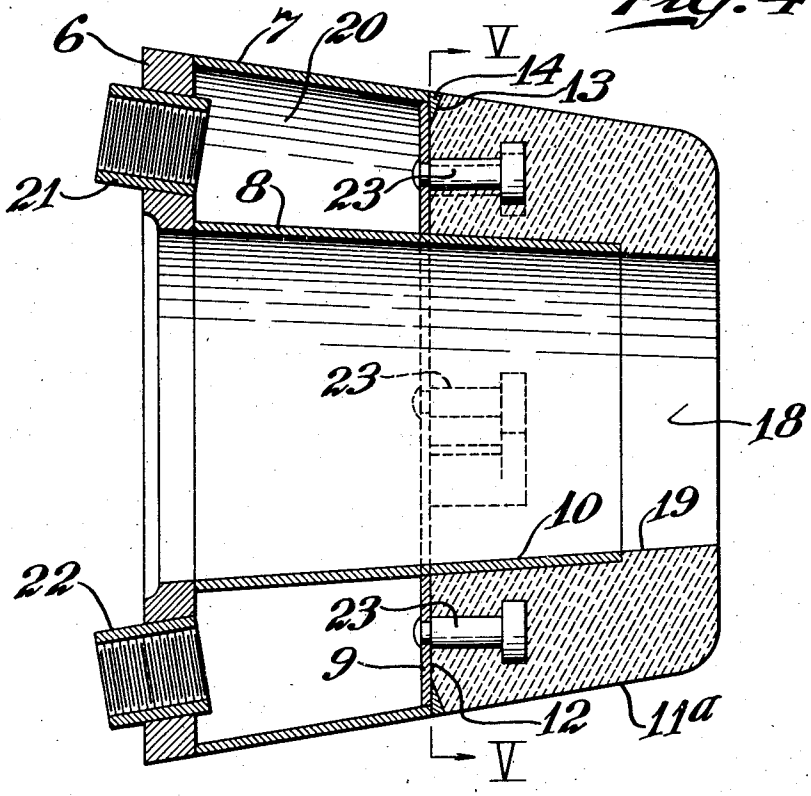
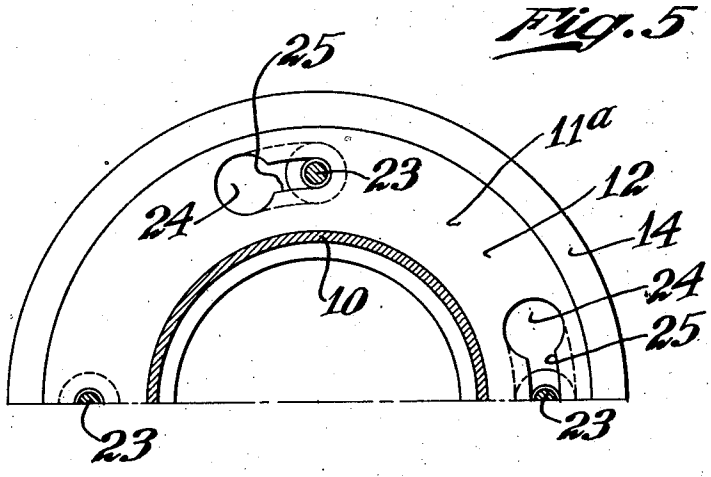


Fig. 5



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Patented Aug. 26, 1930 1,773,944

UNITED STATES PATENT OFFICE

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TUYÈRE

Application filed December 23, 1927. Serial No. 242,181.

My invention relates to tuyères and like water or air cooled fittings for metallurgical blast furnaces.

Heretofore tuyères, which term will be used broadly to apply to analogous devices, have been made in the form of bronze castings cored to provide an annular chamber extending the full length of the tuyère to receive the cooling fluid, usually a circulation of water that is carried forward to the thin inner end of the tuyère which is subjected to the greatest heat, thereby to longer preserve the life of the tuyère in service. When this inner end gives away, not only is the tuyère destroyed but the inrush of water into the furnace is most dangerous to life and property. As it is desirable that these castings be made with thin shells thereby to be more efficiently cooled, they have proven expensive to produce and being generally of short life have represented a material factor in the operating cost of blast furnaces.

I have conceived that the cost and durability of tuyères can be reduced by forming them of metal sheets welded together, as by such method of manufacture the uniformity of wall thickness of the tuyère is assured. To increase the life of a tuyère in service, I have conceived the idea of forming the metallic tuyère body with an annular cooling chamber only at its outer end and providing such chamber at its inner end with projecting means upon which I mount a thick refractory nose which forms the inner exposed end of the tuyère and serves to protect both the chamber's inner wall and its mounting means which are preferably such that the nose can be readily removed and replaced. My invention contemplates that the nose can be replaced until the mounting means are so destroyed as to require replacement of the production of a new tuyère body.

My invention further contemplates backing the refractory nose against the inner wall of the cooling chamber, thereby to keep the nose as cool as possible, and my invention contemplates various means by which this nose may be mounted on the tuyère body, notwithstanding that more or less of the mounting projections have been burned away, as thereby I obtain the maximum of useful life from the metallic tuyère body which constitutes the expensive part of the tuyère.

My invention further comprises the novel details of construction and arrangements of parts, which in their preferred embodiments only are illustrated in the accompanying drawings which form a part of this specification, and in which:—

Fig. 1 is a vertical transverse cross-section of the metallic body portion of the tuyère with the refractory composite nose removed.

Fig. 2 is a similar detail view of the refractory nose.

Fig. 3 is a quarter sectional view showing the tuyère assembled.

Fig. 4 is a cross-sectional view through a modified type of assembled tuyère.

Fig. 5 is a half cross-sectional view taken on the line 5—5 of Fig. 4.

Similar reference numerals refer to similar parts throughout the drawings.

In the embodiment of my invention illustrated in Figs. 1 and 3, I show a metallic tuyère body as comprising an outer annular head 6 having the customary central opening therein for the passage of the blast pipe. The tuyère body comprises an annular water chamber at its outer end, the chamber being formed by the head, the outer peripheral wall 7, the inner peripheral wall 8 and an end wall 9. These walls are preferably formed by metal plates which are welded along their line of junction with each other and with the head 6. The outside wall 7 is disposed to taper more sharply inwardly towards the long axis of the tuyère body than the inside wall 8 and this latter wall is preferably projected forward beyond the wall 9 so as to provide the slightly tapering tubular extension 10 upon which a composite refractory tuyère nose 11 is adapted to be mounted. The inner end wall 9 of the cooling chamber rises abruptly from the extension 10 and is preferably disposed in a plane at right angles to the axis of the tuyère. The nose 11 has a face 12 which is substantially complementary to the wall 9 and therefore adapted throughout its major portion to abut with full surface contact against said wall 9.

The outer peripheral edge of the surface 12 preferably is slightly beveled inwardly at 13 to make provision for the reception of a suitable cement or bonding material 14, also of a refractory nature, which seals the joint between the tuyère nose and the wall 9.

As it is desirable to have means for positively anchoring the nose on the tuyère body, I have shown one such means in Figs. 1 to 3, the same comprising inclined lugs 15 which are adapted to be received in slots 17 extending radially in the bore of the nose and each joint at its inner end with a lateral inclined notch 16 into which its respective lug is interlocked after the fashion of a bayonet joint to demountably hold the tuyère nose on the tuyère. The tuyère nose is provided at its inner end with a reduced opening 18 which leaves an annular lip 19 that overhangs and projects from the furnace heat the inner end of the extension 10. The annular cooling chamber 20 in the tuyère is supplied with a circulating cooling medium through the pipes connected to the threaded inlet and outlet nipples 21 and 22 mounted in suitable threaded openings in the head 6.

In Figs. 4 and 5 the lugs 15 are dispensed with and button head rivets 23 are mounted in the wall 9 and adapted to be received in holes 24 bored in the face 12 of the tuyère nose 11ª, these holes 24 being undercut at their inner end for their full diameters sufficiently to receive the rivet heads, there being slots 25 leading outwardly from the undercut portions and adapted to receive the shanks of the rivets, thereby permitting the rotation of the tuyère nose to interlock it with the tuyère body. It is contemplated that the joint will be sealed as described in connection with Fig. 3.

In operation, having constructed the tuyère body by welding or brazing the metal plates to the head 6 and providing the lugs 15 or mounting rivets 23, as may be desired, the appropriate refractory tuyère nose is interfitted with its anchoring means and mounted firmly on the tuyère body and its joint sealed and thereupon the tuyère is ready to be mounted in position in the blast furnace and the circulatory pipes for the cooling medium are then connected to the nipples 21 and 22, thereby circulating through the chamber formed in the tuyère body a cooling medium which acts through the relatively thin wall 9 to chill the tuyère nose 11 or 11ª and increase its life. After the tuyère nose is substantially burned away it is contemplated that the tuyère will be removed and a new nose replaced. If the burning away of the nose results in the destruction of a portion of the extension 10 the type of tuyère body shown in Figs. 1 to 3 can be used until the lugs 15 are lost. The type shown in Figs. 4 and 5 can be used even after the extension 10 is practically gone so long as the button head rivets remain in position to anchor a new hose in place. The employment of the thin plate walls in the welded type of tuyère body gives the most efficient heat transfer and it provides ample strength for the anchoring lugs or bolts and renders the tuyère bodies very cheaply constructed as compared with the molded tuyère.

Though I have described with great particularity the details of the embodiment of the invention herein shown, it is not to be construed that I am limited thereto, as changes in arrangement and substitution of equivalents may be made by those skilled in the art without departing from the invention as defined in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A blast furnace tuyère and the like, formed with an annular cooling chamber at one end, nose mounting means projecting beyond said chamber at the other end of the tuyère, and a preformed integral annular composite refractory nose adapted to be demountably interlocked with said mounting means and disposed to form the end of the tuyère exposed to the furnace blast.

2. A tuyère and the like according to claim 1, in which the mounting means comprise a single tubular extension adapted to form an internal support for the composite refractory nose.

3. A tuyère and the like according to claim 1, in which the mounting means comprise a tubular member forming an extension of the inside peripheral wall of the annular cooling chamber and terminating short of the end of the mounted nose.

4. A blast furnace tuyère and the like, comprising a tubular central body having a cooling chamber surrounding only its outer end, means for demountably fastening a nose on the inner end of said body, and an annular composite refractory nose adapted to fit snugly over the inner end of said body and to detachably interlock with said mounting means to hold it in position with its outer end wall abutting the inner end wall of said cooling chamber, the outer peripheral surface of said nose forming a continuation of the outer peripheral wall of the cooling chamber.

5. A blast furnace tuyère and the like, comprising a metallic body portion constructed of welded metal plates shaped to form a central air duct, an annular cooling chamber surrounding the outer end of said duct and having its inner end wall rising abruptly from said duct, an annular composite refractory nose formed as a separate molded element and adapted to be mounted on and to fit snugly over the inner end of said duct and project beyond same with its end wall abutting said abrupt inner end wall of the cooling chamber and its peripheral wall forming a continuation of the chamber's outer peripheral wall,

and means to demountably anchor the nose in position on the tuyère.

6. A blast furnace tuyère and the like, comprising a metallic body portion formed of welded sheets of metal which provide a central cylindrical element, an annular cooling chamber surrounding the outer end only of said element and having its inner end wall rising abruptly from said inner element so as to leave the inner end of said element projecting as an extension from the cooling chamber, an annular composite refractory nose adapted to fit snugly over and overhang beyond the inner end of said extension with its outer end abutting said abrupt inner wall of the cooling chamber, and its peripheral wall forming a continuation of the chamber's outer peripheral wall, and bayonet joint interlocking means to anchor the nose demountably in position on the tuyère.

7. A blast furnace tuyère and the like, comprising an outer annular head, a central tubular duct formed of sheet metal jointed to the inside periphery of the head, sheet metal walls jointed to the outside periphery of said head and to said duct to form a water chamber, nose mounting means projecting inwardly beyond the inner end of said chamber, and a premolded composite refractory nose adapted to be mounted on the tuyère by engagement with said mounting means.

8. A blast furnace tuyère and the like, comprising an outer annular cast head, a central tubular duct formed of sheet metal welded to the inside periphery of the head, sheet metal walls welded to the outside periphery of the head and to said duct at an intermediate point to form a water chamber, said duct forming a nose mounting means projecting from the inner end of the water chamber, and a molded annular refractory nose adapted to interlock demountably with said mounting means and to protect the inner end of the duct.

9. A tuyère formed of welded sheet metal shaped to provide an outer water chamber and a central air duct projecting beyond the inner end of said chamber, and a premolded annular refractory nose adapted to be mounted on the tuyère in position to abut and protect the inner end of the water chamber and to surround and protect the inner end of said air duct.

In testimony whereof I affix my signature.

ROY E. BRAKEMAN.