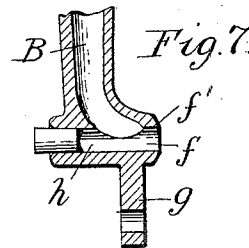
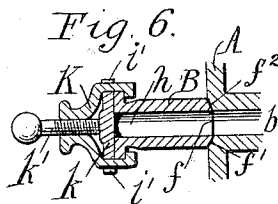
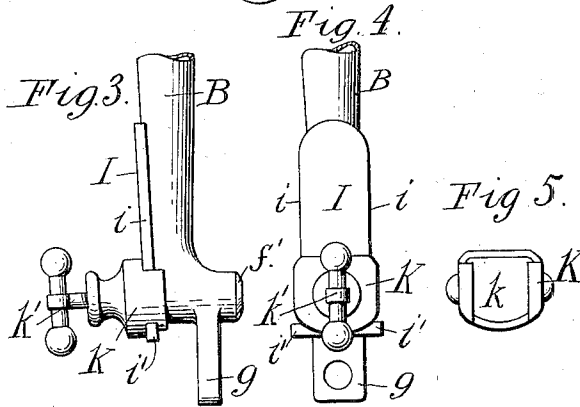
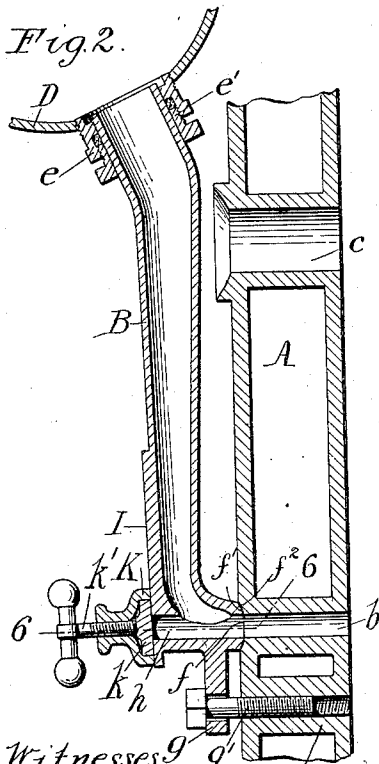
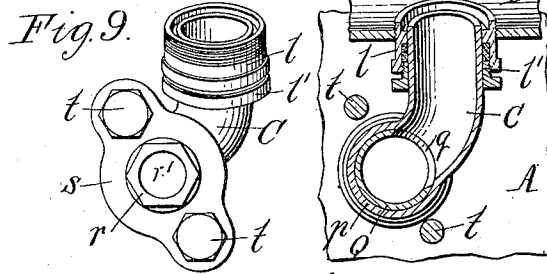
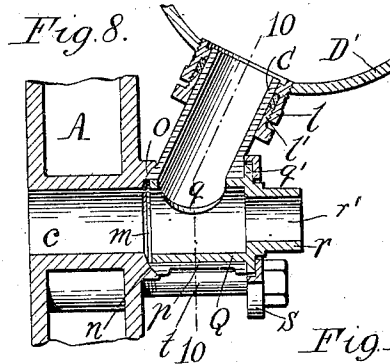
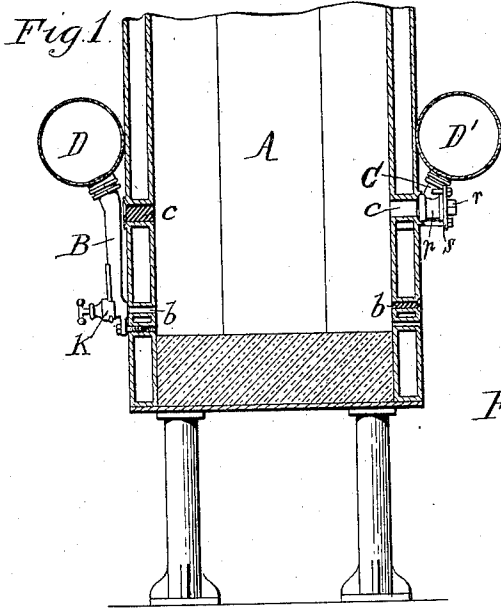


O. S. GARRETSON.
TWYER FOR BLAST FURNACES.

APPLICATION FILED FEB. 7, 1901. RENEWED OCT. 10, 1902.

NO MODEL.



Witnesses: *g g' g''*
E. A. Volk.
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UNITED STATES PATENT OFFICE.

OLIVER S. GARRETSON, OF BUFFALO, NEW YORK.

TWYER FOR BLAST-FURNACES.

SPECIFICATION forming part of Letters Patent No. 726,422, dated April 28, 1903.

Application filed February 7, 1901. Renewed October 10, 1902. Serial No. 126,804. (No model.)

To all whom it may concern:

Be it known that I, OLIVER S. GARRETSON, a citizen of the United States, and a resident of Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Twyers for Blast-Furnaces, of which the following is a specification.

This invention relates more particularly to that class of blast-furnaces which are designed for smelting the ores of copper, lead, silver, and gold and also for bessemerizing or converting the matte. A furnace of this character is provided below the slag-level with a row of converting or bessemerizing twyers, which are arranged at such a height above the furnace-bottom that they inject the blast into the molten matte, and also with a row of smelting-twyers, which are arranged above the slag-level at the proper height for delivering the smelting-blast. The converting-blast has usually a high pressure, ranging from four to five pounds per square inch or more, while the smelting-blast has a low pressure, ranging from eight to sixteen ounces per square inch or more. The converting-twyers are usually smaller in diameter and more numerous than the smelting-twyers. It sometimes happens that the molten matte or metal backs up into one or more of the converting-twyers, in which case such twyers become choked and require to be promptly cleared or replaced.

The objects of my invention are mainly to simplify the construction both of the smelting and converting twyer pipes and to construct the same in such manner that they can be readily attached to and removed from the furnace and the main blast-pipes; also, to so construct the twyer-pipes that those of the converting-twyers and those of the smelting-twyers can be readily interchanged or substituted one for the other if more of one kind or another are required for operating upon particular ores or mattes; also, to so construct the twyer-pipes that their blast-orifices can be readily cleaned out, and to provide the pipes of the smelting-twyers with simple and convenient valve-plugs for controlling the flow of the air through the same.

In the accompanying drawings, Figure 1 is a transverse vertical section of a blast-furnace provided with my improved twyers. Fig.

2 is a sectional elevation of one of the converting-twyer pipes, on an enlarged scale. Fig. 3 is a side elevation of the lower portion of this twyer-pipe. Fig. 4 is a front elevation of the lower portion of the same. Fig. 5 is a detached inside elevation of the valve of this twyer. Fig. 6 is a horizontal section in line 6 6, Fig. 2. Fig. 7 is a sectional elevation showing a modified construction of the lower portion of this twyer-pipe. Fig. 8 is a sectional elevation of one of the smelting-twyer pipes, on an enlarged scale. Fig. 9 is a front elevation of the same. Fig. 10 is a transverse vertical section in line 10 10, Fig. 8.

Like letters of reference refer to like parts in the several figures.

A represents the stack of a blast-furnace, preferably formed by water-jackets or sections which are provided below the slag-level with converting-twyers *b* and above the slag-level with smelting-twyers *c* of larger diameter.

B and C represent the twyer-pipes leading to these twyers from the main blast-pipes D D', which are arranged on opposite sides of the furnace above the twyers, one for the converting-blast and the other for the smelting-blast. Each converting-twyer pipe B extends from the blast-pipe D downwardly to the level of the twyer *b*, where it turns toward the furnace and is connected with the twyer. The upper end of each converting-twyer pipe is connected with the blast-pipe D by a packed slip-joint consisting of a collar *e*, secured to the blast-pipe, and a stuffing-box *e'*, arranged in said collar and receiving the upper end of the pipe. The latter is provided around the blast-orifice *f* at its lower end with an annular convex face *f'*, which is seated against a corresponding concave seat *f''* at the outer end of the twyer *b*, whereby the twyer-pipe can be adjusted to the position of the collar *e*, in which its upper end is inserted, while maintaining a tight joint with the outer end of the twyer.

g is an ear which is formed on the twyer-pipe below its blast-orifice, and *g'* is a bolt which passes through this ear into a stay *g''* of the furnace and whereby the twyer-pipe is secured in place. This stay extends from the inner to the outer wall of the water-jacket of the furnace and is preferably formed in one

piece with these walls by casting. A coating of clay, red lead, or other suitable material is preferably applied to the face f' and seat f'' before securing the pipe. If one of these twyer-pipes should become clogged by congealed matte or metal, it can be readily detached and replaced by a new one. As the main blast-pipes are arranged above the slag-level and the converting-twyer pipes extend downwardly from the blast-pipe D for a considerable distance, there is no possibility of the molten matte or metal backing up into the blast-pipe. Matte or metal which backs up into a converting-twyer can only obstruct the latter and the lower part of the twyer-pipe, and no obstruction of the blast-pipe can occur from that cause.

h is an opening which is formed in the outer portion of the lower part of the twyer-pipe B in line with the blast-orifice f for passing a poker through this opening into the blast-orifice and the twyer b when these parts are required to be cleaned of obstructions. The lower inwardly-turned portion of the twyer-pipe is narrow, and its blast-orifice and the twyer can be readily reached through the opening h . The latter is preferably closed by a valve, which is constructed as follows:

I is an upright face-plate formed on the lower front portion of the twyer-pipe. The opening h is arranged in the lower portion of this plate, and the latter has vertical side edges i and at the lower ends of the same projecting stops i' . K is a valve frame or casing which is mounted on this plate, so as to be capable of sliding up and down on the same. This frame is provided with hook-shaped side flanges which engage over the side edges i of the plate. The downward movement of the frame on the plate is limited by the stops i' .

k is a valve-disk which is arranged in the cavity of the valve-frame between the side flanges thereof and which bears against the face-plate I.

k' is a horizontal clamping-screw which is mounted on the frame and bears against the disk. When the valve-frame rests on the stops i' , the valve-disk covers the opening h , in which position it is tightened against the face-plate by the clamping-screw, whereby the frame is at the same time clamped to the face-plate. Upon releasing the screw the frame and valve-disk can be raised to expose the opening.

If the valve-frame should become detached and lost, the opening h can be closed by a wooden plug. If desired, the face-plate and valve may be omitted and the opening h constructed simply to receive a wooden plug, as represented in Fig. 7.

The pipes C of the smelting-twyers are connected with the blast-pipe D' by a packed slip-joint consisting of a collar l and stuffing-box l' , like the corresponding parts by which the converting-twyer pipes are connected with the blast-pipe D. Each smelting-twyer pipe

extends from this point downwardly to the level of the twyer c and is provided around its blast-orifice m with an annular convex face n , which bears against a corresponding concave face O at the outer end of the twyer c .

The lower end of the twyer-pipe has the form of a hollow horizontal cylinder or tube p , which is open at both ends. The open inner end of the cylinder forms the blast-orifice m .

Q is a hollow valve-plug which is arranged in the tubular portion p and provided in its side with an opening q , by which communication can be established between the twyer-pipe and the twyer c , with which it is connected. This plug has at its outer end a flange q' , by which it bears against the outer end of the cylindrical portion p of the twyer-pipe, and also a head r , which is six-sided, square, or otherwise shaped, so that it can be turned by a wrench. The head r is provided with a central opening r' , which opens into the cavity of the plug and by which access can be had to the blast-orifice of the pipe and the twyer. This opening is closed by a wooden plug or other suitable means.

The valve-plug is held in the cylindrical portion q of the twyer-pipe by a cap s and bolts t . This cap is applied to the outer end of the plug around the head r , and the bolts secure this cap and the twyer-pipe to the furnace. By turning the plug the flow of the air can be regulated or stopped.

As shown in Fig. 1, the furnace is provided on each side with a lower row of converting-twyers b and an upper row of smelting-twyers c . The converting-twyer pipes are usually arranged on one side of the furnace and the smelting-twyer pipes on the opposite side, and the twyers which are not connected with pipes are plugged up. Twyers of both kinds may, however, be arranged on the same side of the furnace. If it is desired to use smelting-twyers instead of some of the converting-twyers, or vice versa, this can be readily done by removing twyer-pipes of one kind and substituting therefor twyer-pipes of the other kind, which enter the same stuffing-boxes of the blast-pipe and connect with the appropriate twyers.

I claim as my invention—

1. The combination with a furnace and its twyer, of a blast-pipe arranged above said twyer and provided at its outlet with a stuffing-box, and a twyer-pipe having its upper end arranged in said stuffing-box and capable of being raised and lowered in the same and having its lower end turned inwardly and detachably connected with said twyer, substantially as set forth.

2. The combination with a furnace and its twyer having an annular concave face at its outer end, of a blast-pipe arranged above said twyer and provided at its outlet with a stuffing-box, a twyer-pipe having its upper end arranged in said stuffing-box and capable of being raised and lowered in the same and hav-

ing its lower end turned toward said twyer and provided with an annular convex face which is seated against the concave face of the twyer, and means for detachably connecting the lower end of the twyer-pipe to the twyer, substantially as set forth.

3. The combination with a furnace having upper smelting-twyers and lower converting-twyers, the smelting-twyers being arranged at a higher level than the converting-twyers, of a blast-pipe arranged above said twyers, and interchangeable long converting-twyer pipes extending from said blast-pipe down to the lower converting-twyers and short smelting-twyer pipes extending from said blast-pipe down to the upper smelting-twyers, substantially as set forth.

4. The combination with a twyer-pipe having an inwardly-turned lower end provided with a blast-orifice and having a passage extending from said blast-orifice to the outer side of said pipe and having on its outer side an upright face-plate which extends above said passage, of a valve for opening and closing said passage, a frame carrying said valve and capable of being raised and lowered on the face-plate, and means for tightening the valve against the face-plate, substantially as set forth.

5. The combination with a twyer-pipe having an inwardly-turned lower end provided with a blast-orifice and having on its outer side a vertical face-plate and having a passage arranged in line with said orifice and opening in said face-plate, of a valve-frame mounted on said face-plate and capable of vertical movement thereon, a valve arranged

in said frame to bear against said face-plate, and a clamping-screw arranged in the valve-frame and bearing against the valve, substantially as set forth.

6. The combination with a twyer-pipe having at its lower end a communicating horizontal tubular portion which is open at its inner end, of a hollow valve-plug arranged in said tubular portion and having in its side an aperture which coincides with the lower end of said twyer-pipe and having at its inner end a blast-orifice, substantially as set forth.

7. The combination with a twyer-pipe having at its lower end a communicating horizontal tubular portion which is open at its inner end, of a hollow valve-plug arranged in said tubular portion and having in its side an aperture which coincides with the lower end of said twyer-pipe and having at its inner end a blast-orifice and at its outer end a head provided with an aperture which opens into the cavity of the plug, substantially as set forth.

8. The combination with a furnace, of a twyer-pipe having a lower horizontal tubular portion open at both ends, a hollow valve-plug arranged in said tubular portion and open at its outer end, a cap applied to said plug, and bolts passing through said cap into the furnace, substantially as set forth.

Witness my hand this 31st day of January, 1901.

OLIVER S. GARRETSON.

Witnesses:

EDWARD WILHELM,
CYESTA HORNBECK.