(No Model.)

# W. B. DEVEREUX.

## BLAST FURNACE TUYERE.

No. 318,604. Patented May 26, 1885.

Fig. 2.

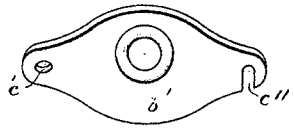





Fig. 1.

Fig. 3.




Fig. 4.




Fig. 5.




Fig. 6.




Witnesses
Geo. W. Young.
Henry A. Lamb.

Inventor
Walter B. Devereux.
By his Attorneys
James & Kinkle

N. PETERS. Photo-Lithographer. Washington, D. C.

# UNITED STATES PATENT OFFICE.

WALTER B. DEVEREUX, OF ASPEN, COLORADO.

## BLAST-FURNACE TUYERE.

SPECIFICATION forming part of Letters Patent No. 318,604, dated May 26, 1885.

Application filed November 29, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, WALTER B. DEVEREUX, a citizen of the United States, residing at Aspen, in the county of Pitkin and State of Colorado, have invented a new and useful Tuyere for Blast-Furnaces, of which the following is a specification.

My invention relates to an improved tuyere arrangement for supplying blast-furnaces with blast and for controlling the direction and quantity of the same. In the ordinary forms of tuyeres used in blast-furnaces the air is supplied to the furnace through nozzles or openings, the direction of which cannot be easily or conveniently changed.

The object of my invention is to provide a convenient means of effecting such a change, as well as for regulating and controlling the air-current without interfering with the regular working of the furnace, and the same will be best understood by reference to the accompanying drawings, which are to be taken as a part of this specification, and in which—

Figure 1 represents a vertical section of the tuyere, a portion of the wall of a furnace, and a supply-pipe; and Figs. 2, 3, 4, 5, and 6 are views of details.

Similar letters refer to similar parts throughout the several views.

In the drawings, A, Fig. 1, represents a vertical cross-section of a portion of the side walls of an ordinary water-jacket furnace, and O is a permanent opening in the same. The walls of the opening O may be made of the same material as the furnace-jacket, or of any refractory material, such as fire-clay. The opening O may be of any convenient shape and size; but in practice it is made circular, and with a diameter of about five inches.

The tuyere consists of a hollow sleeve or nozzle, *s*, of such exterior dimensions and form that it will fit closely into the permanent opening O in the manner shown in Fig. 1. The hollow interior of the sleeve forms an opening, *s'*, for the passage of the blast, and by having a series of interchangeable sleeves with different-sized openings in their interior, and with such openings running through them at different angles, it is possible, by substituting different sleeves, to change the direction and to control the quantity as well as pressure of the blast at pleasure. A series of such sleeves are shown in Figs. 3 to 6. The sleeves are in all cases of such dimensions that the cross-section of the same shall be sensibly larger than the cross-section of any desired blast-opening or air-passage, so that the blast-opening may take any desired angle through the sleeve, and still leave sufficient strength of material to form substantial side walls in contact with the walls of the opening O.

The sleeves are made of fire-brick, cast-iron, or any other fire and heat resisting material, and, being comparatively small, are easily manipulated.

Upon the outer walls of the furnace, around the opening O, is fixed a flange, *f*, and upon the outside of this flange is attached a bonnet or connecting-piece, *b*, which is connected with the main air-supply pipe *p* by means of a metal or canvas feed-pipe, *p'*. The bonnet or connecting-piece covering the opening O is of the same general cross-section, but slightly larger than the same. In Fig. 1, where a circular opening is shown, the bonnet is also circular in cross-section, and is provided with a movable back plate or section-piece, *b'*, secured upon the bolts *c' c''*. By means of this movable back access can be obtained through the bonnet to the opening O. The plate *b'* is removed by unscrewing the bolt *c''* and revolving the plate over from right to left upon the bolt *c'*. In the back plate, *b'*, there is placed a peep-hole, which is covered with a sheet of mica or other translucent material. The angle of the bonnet shown by the vertical longitudinal section in Fig. 1 is made so slight that it will not retard the force of the air-current, and will not sensibly diminish the flow of the current by escaping when the plate *b'* is removed during the operation of changing the sleeves. The angle of the bonnet will, however, vary according to the arrangement of the main supply-pipe in reference to the tuyeres. The drawings show but a single tuyere; but there may be any number of similar tuyeres arranged radially around the furnace-boshes in the same plane, and supplied from the same main supply-pipe running around the furnace as is usually met with in the arrangement of blast-furnaces. The sleeves are removed and from time to time replaced or substituted through the bonnet *b*, according to the various conditions which arise

in working the furnace. They may be inserted in cold-blast furnaces without cutting off the blast, as the form of bonnet is such that sufficient pressure will be maintained to prevent the flame from blowing out from the interior of the furnace. The back plate, *b'*, is opened, and the sleeve manipulated by tongs or by the hand of the workman. Where the angle of the blast is to be only slightly changed, the workman has merely to insert his hand, if cold-blast is used, and to revolve the sleeve in the opening until the proper point is reached.

If it is desired to concentrate the blast from one particular tuyere at a certain point above or below the plane of the tuyeres, a sleeve of the character of that shown in Fig. 4, with a small interior opening at a sharp angle, is inserted and used as long as may be advisable, and is then replaced by one having a more horizontal direction. By means of an entire series of tuyeres of this character perfect regulation of the direction and force of the blast-current of the particular tuyere can be effected in the shortest space of time and without in any way interfering with the remaining tuyeres.

In furnaces using hot-blast it may sometimes be advisable to cut off the blast from any particular tuyere. This may be effected by any convenient form of cut-off valve in the upper portion of each connecting-pipe *p'*.

As applied to furnaces for smelting lead or silver ores, it is desirable, as hereinbefore stated, to make the opening O of a diameter of about five inches, permitting an opening in the movable sleeve of the usual diameter of three inches.

I claim as my invention—

1. A blast-furnace tuyere consisting of a removable sleeve fitting into a permanent opening in the side walls of the furnace, and arranged to be removed and replaced without disturbing the bonnet by a similar sleeve having an interior opening of a varying size, shape, or inclination, according to the pressure, quality, and direction of the blast desired.

2. In a blast-furnace tuyere, the combination, with a removable sleeve, of a bonnet or connecting-piece covering the tuyere-opening and connecting it with the supply-pipe, and having an opening in its side walls provided with a movable cover, said bonnet and cover being of such size and shape as to permit the removal of the sleeve without disconnecting said bonnet from the wall of the furnace, substantially as specified.

3. In a blast-furnace tuyere, the combination, with a removable sleeve, of a bonnet or connecting-piece surrounding the tuyere-opening and connecting it with the supply-pipe, and having an opening in its rear walls provided with a movable cover, said bonnet being of such shape and dimensions that the sleeve may be removed and replaced without substantially diverting the direction of the blast.

4. In a blast-furnace tuyere, the combination, substantially as hereinbefore set forth, of the permanent tuyere-opening in the side walls of the furnace, the movable sleeve fitting into the same and capable of being replaced by interchangeable sleeves of various dimensions and shapes, and the bonnet or connecting-piece covering the tuyere-opening and connecting it with the supply-pipe, having an opening in its side walls provided with a movable cover, whereby the sleeve may be removed at pleasure without disconnecting said bonnet.

5. In a blast-furnace tuyere, the combination, substantially as hereinbefore set forth, of the permanent tuyere-opening in the side walls of the furnace, the movable sleeve fitting into the same and capable of being replaced by interchangeable sleeves of various dimensions and shapes, the bonnet or connecting-pieces covering the tuyere-opening and connecting it with the supply-pipe, having an opening in its side walls provided with a movable cover, and of such shape and size that the sleeve may be removed and replaced without sensibly diverting the direction of the air-current, and without disconnecting said bonnet, and the peep-hole in the movable cover, for the purposes specified.

6. A blast-furnace tuyere consisting of a sleeve fitting into a permanent opening in the side walls of the furnace, said sleeve having an inclined air-passage therethrough, and being arranged so as to be rotated in said opening as desired, thereby changing the direction of the air-passage, substantially as set forth.

In testimony whereof I have hereunto subscribed my name this 21st day of November, 1884.

WALTER B. DEVEREUX.

Witnesses:
JOHN B. GLASSER,
E. STEVENS WHITEHEAD.