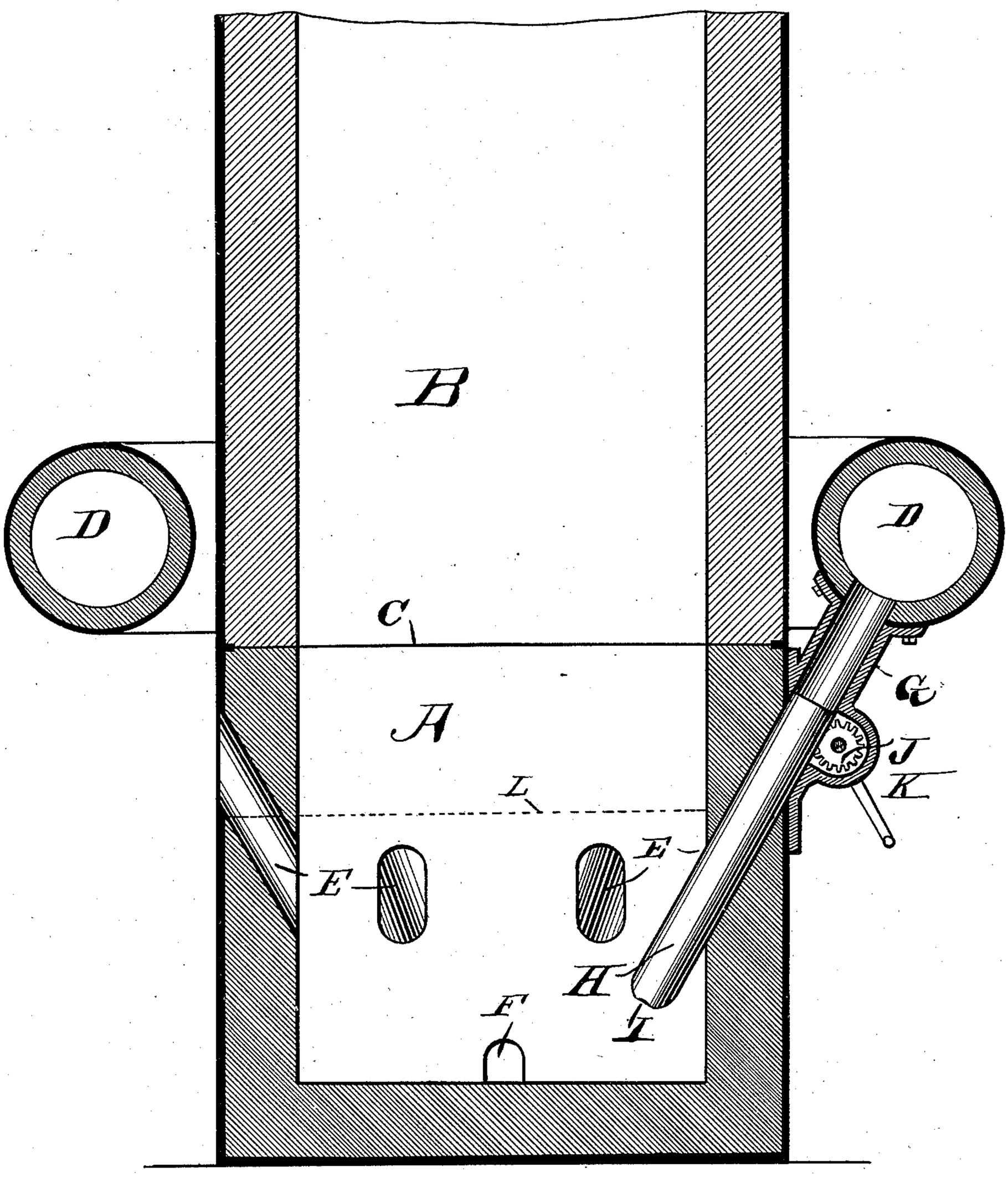
(No Model.)

F. W. GORDON.

CUPOLA FURNACE.

No. 308,665. Patented Dec. 2, 1884.



Witnesses:
W. A. Seward.
John Lorenz

Fred W. Gordon
by James W. See
Inventor
Attorney

UNITED STATES PATENT OFFICE.

FRED. W. GORDON, OF PITTSBURG, PENNSYLVANIA.

CUPOLA-FURNACE.

SPECIFICATION forming part of Letters Patent No. 308,665, dated December 2, 1884.

Application filed February 18, 1884. (No model.)

To all whom it may concern:

Be it known that I, FRED. W. GORDON, of Pittsburg, Allegheny county, Pennsylvania, have invented certain new and useful Improvements in Cupola-Furnaces, of which the following is a specification.

This invention pertains to that class of cupola-furnaces in which the blast is injected below the surface of the molten metal, as in case the furnace is used for the treatment of molten iron for the purposes of purification or conversion.

Heretofore in furnaces or converters arranged for such use the force of the blast served to keep the molten metal from entering the immersed tuyeres.

In some forms of converters—as Bessemer, for instance—care is always taken to keep the blast on so long as the tuyere-apertures are exposed to the inflow of the metal—that is, the converter is either tipped or empty when the blast is off. In other forms of converting-furnaces where the tuyere-apertures are below the surface of the molten metal, stoppers are provided, by which the tuyeres can be closed previous to or at the time of shutting off the blast.

My invention relates to such an arrangement of the tuyeres with reference to the walls of the converting-furnace that the tuyeres may be withdrawn at an angle from the molten metal in which they are immersed during the blow, leaving tuyere-receiving apertures in the furnace-walls so disposed at an angle that the metal will not flow from them, thereby dispensing with the necessity of tuyere-stoppers or tipping furnaces.

The invention will be fully understood from the following description, read in connection with the accompanying drawing, which is a vertical diametrical section of a cupola-furnace illustrative of my improvements.

In the drawing, A represents the lower or vessel portion of a furnace adapted to receive a charge of molten metal; B, the upper portion or stack of the same; C, the horizontal line of separation between the vessel and stack part; D, an ordinary bustle-pipe, through which the blast is transmitted from the blowing machinery; E, a circumferential series of tuyere-receiving apertures arranged through the wall of the vessel at an angle, the lower end of each aperture being upon the inside of the wall of the vessel, below the point at which the molten metal is to be carried, the upper end of each aperture being upon the outer surface of the wall of the vessel, above the level of the point at which the molten metal is to be carried; F, the tapping-hole; G, a tuyere stock or neck secured to the bustle-pipe at the location of each tuyere and arranged with its axis coinciding with the axis of its appropriate tuyere-aperture in the vessel; H, the tuyere-pipe, fitted to move longitudinally in its tuyere-aperture and tuyere-stock; I, a tuyere at the lower extremity of the tuyere-pipe; J, a pinion carried by the tuyere-stock and engaging a suitable rack in the tuyere-pipe; K, a crank upon the shaft of the pinion, and L the line or surface of the molten metal in the vessel. As many tuyeres may be employed as is deemed desirable. The drawing represents the vessel as provided with apertures for six tuyeres. One tuyere is shown in blowing position, and all of the tuyeres employed are to be similarly arranged. By means of the rack-and-pinion movement the tuyeres may be elevated out of the molten metal and withdrawn entirely from the wall of the vessel, permitting the metal to enter the tuyere-apertures in the vessel-wall without danger of flowing from them. All of the tuyeres may, if desired, be geared to operate simultaneously, and instead of the hand movement the tuyeres may be arranged to adjust by means of power from steam or compressed air, or by other means. When the tuyeres are withdrawn, the vessel, with its contained charge of molten metal, is at liberty to separate from its stack and be transported to a new position for pouring, which operation of pouring is performed by drawing off the metal through the tapping-hole. It is desirable that the blast be not shut off until the tuyeres have been entirely withdrawn from the molten metal; but with tuyeres constructed of material sufficiently refractory the observance of this rule is not essentially imperative.

The tuyeres, instead of being connected with the bustle-pipe, may obviously be independently connected to a blast-main arranged otherwise than around the furnace.

It is not new in furnace practice to insert the tuyeres at an angle, so as to produce a plunging blast, nor to have tuyeres thus arranged with

their noses immersed in the molten metal; but in all such cases the tuyeres have been inserted metal-tight in their breasts, and have essentially required water-cooling devices to prevent their destruction when the blast was cut off. Hollow air-injecting puddling-tools have been inserted at an angle through furnace-walls and fitted to reciprocate; but no provision has been made for preserving the tool-noses when the blast was cut off, in case the molten metal stood above the level of the apertures through which the tools were inserted.

I claim as my invention—

1. The combination of a walled vessel adapted to receive a charge of molten metal, a circumferential series of tuyere-receiving apertures through the wall of said vessel, each aperture being arranged at an angle with its interior end below the metal-line of the vessel and its exterior end above the metal-line of the vessel, and tuyeres fitted to reciprocate through said apertures into the bath of metal and connected with a source of blast, and mechanism for withdrawing the tuyeres from the wall of the vessel.

2. The combination of a walled vessel adapted to receive a charge of molten metal, a circumferential series of tuyere-receiving apertures arranged in the wall of said vessel and disposed angularly, and with their interior ends below the metal-line, as set forth, a stack part above said vessel, but separated from it, and retractile tuyeres fitted to be reciprocated through said apertures, protruded into and withdrawn from the charge of molten metal, and protruded inward through or withdrawn entirely from the vessel-wall.

FRED. W. GORDON.

Witnesses:
THOMAS DEEGAN,
V. O. STROBEL.