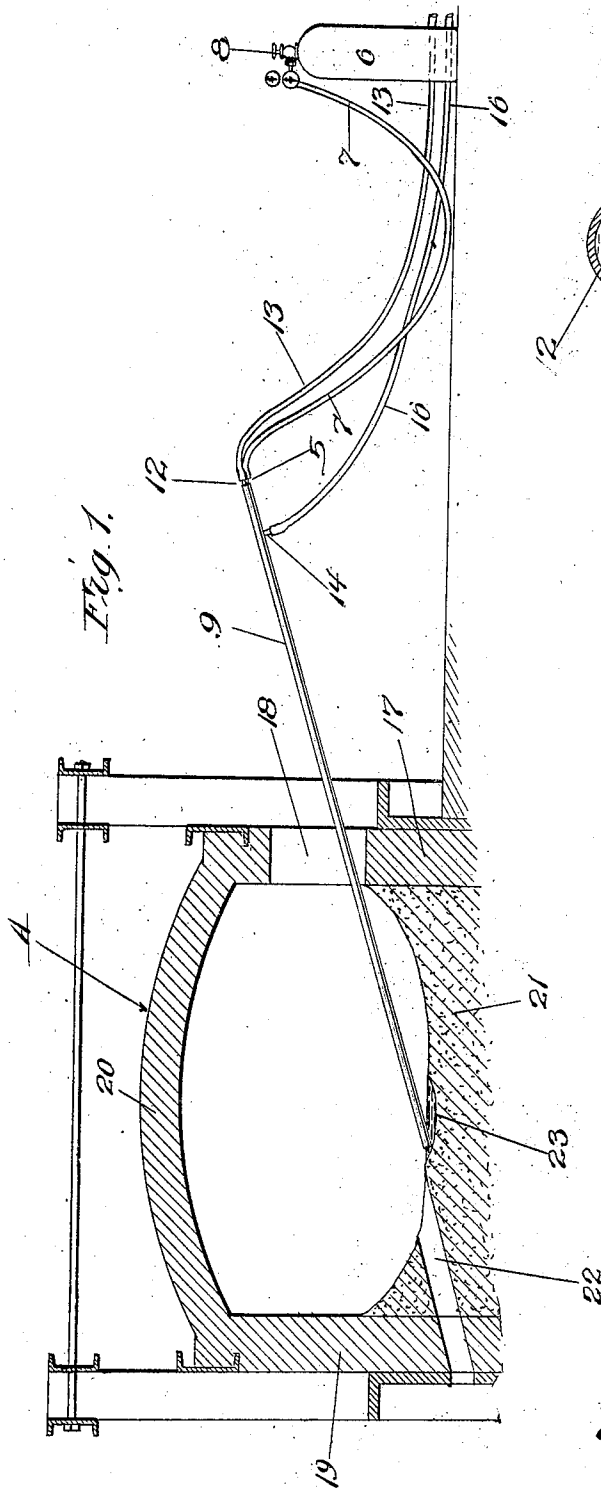
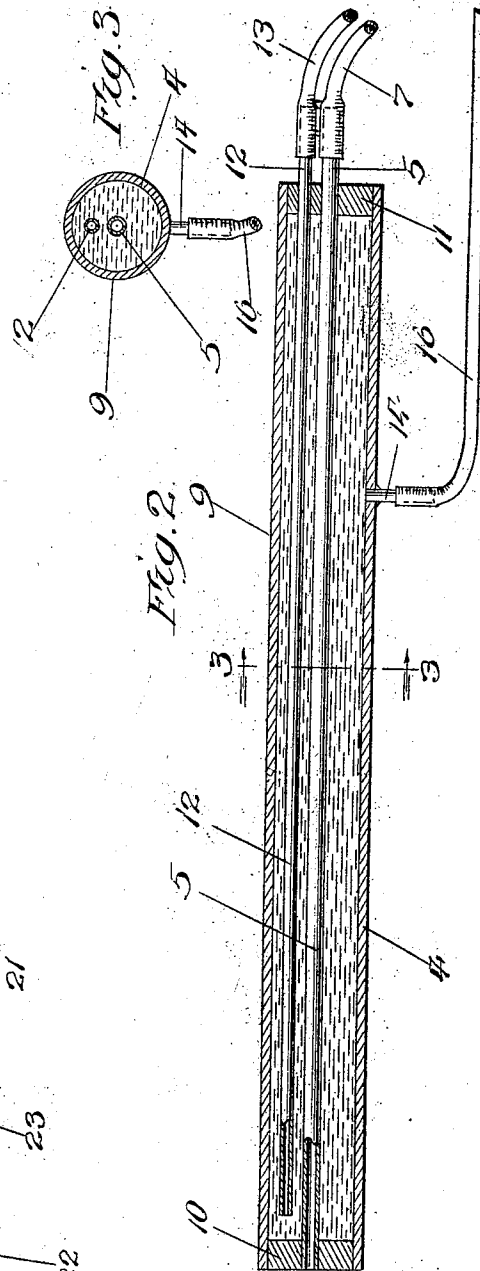


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 APPARATUS FOR AND METHOD OF CUTTING DRAINS IN FURNACE BOTTOMS;
 APPLICATION FILED NOV. 24, 1919.

1,376,935.

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APPARATUS FOR AND METHOD OF CUTTING DRAINS IN FURNACE-BOTTOMS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN O. GRIGGS, a citizen of the United States, and a resident of Youngstown, Mahoning county, and State of Ohio, have invented certain new and useful Improvements in Apparatus for and Methods of Cutting Drains in Furnace-Bottoms, of which the following is declared to be a full, clear, and exact description.

This invention relates to apparatus for and method of cutting drains in furnace bottoms, and the invention has been specially adapted for use in connection with open hearth furnaces, although its use is not limited thereto.

In open hearth practice, cavities or depressions frequently occur in bottoms of the furnaces. These are due to various causes and great difficulty arises in discharging the molten metal remaining in the cavities or depressions. The usual method employed is to splash the molten metal out of the cavities or depressions by the use of rabbles, but this is an irksome, slow and tedious task, requiring the service of several men.

Another method is to blow the molten metal out of the cavities by compressed air, but this is not practical and has not gone into general use. Ofttimes a cavity or depression, in the furnace bottom, will be so located that it is quite impossible to clear it out properly with rabbles. In such cases pig iron is charged and melted to the point where the entire bottom of the furnace is boiled out—all for the single purpose of mending the bottom. This operation requires upward of twenty-four hours of furnace time, which is a great loss in time and labor.

In some instances, when the furnace is tapped the tapping hole is found to be too high for all of the molten metal to run out and enough of it remains in the furnace to make several ingots. In ordinary open hearth practice it is the custom, in such cases, to use silicon, fluor spar and so forth to cut down the tapping hole. This takes considerable time and is not always effective, though very expensive. Although in any case where silicon and fluor spar are used and the steel in the bath saved, it must be run out, broken up and later charged again as scrap, through the doors of the furnace.

With the use of the present invention all of the delays and expenses, above referred to, will be entirely eliminated, as by its use

open hearth furnace operators will be enabled to keep tapping holes in such condition that all of the molten steel will drain into the ladle at the tapping time, and any repairs, necessary to the bottom of the bath, can be quickly effected. Pools in any depressions or cavities or any other places, which may be obstructed by slag or other ridges, can be quickly drained out by cutting through the obstruction to provide a drain or drains, through which the molten metal may readily flow to and out through the tapping hole.

The invention consists in an apparatus embodying a tool or burner, which may be thrust through a furnace door and having a conduit or passage way, through the discharge end of which oxygen may be delivered directly to the surface of the hot furnace bottom or in fact under the surface of the molten metal.

The invention further consists in a tool or burner for delivering oxygen, the discharge end of which may be moved along the furnace bottom to the tapping hole, whereby a drain or passage may be cut in the bottom of the furnace, through which the molten metal may readily flow from and out through the tapping hole.

The invention further consists in an apparatus embodying a tool or burner, having a conduit or passage for the oxygen, surrounded by a water jacket through which water or other cooling medium may be circulated to prevent the tool or burner from being destroyed by the intense heat in the furnace.

The invention further consists in the herein described method of cutting drains in furnace bottoms, which consists in conducting and delivering oxygen to the hot furnace bottom in contact with the molten metal, whereby drains may be formed in the furnace bottom.

The invention further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly illustrated in the drawing accompanying this specification, in which:

Figure 1 is a vertical cross section through an open hearth furnace of ordinary and well known construction and showing, in side elevation, an apparatus embodying a simple form of the present invention; Fig. 2 is a detail, central, longitudinal section through

the burner or tool of the apparatus, partly broken away, and Fig. 3 is a detail, vertical, cross section taken on the line 3—3 of Fig. 2.

In the embodiment of the invention, as illustrated in said drawing, a comparatively long oxygen feed pipe 5 is employed, one end of which is connected to an oxygen tank 6 by a flexible connection 7, preferably in the form of an armored rubber tube. Oxygen, under pressure, is contained in the tank 6 and as is customary suitable valve mechanism 8 is employed for controlling the admission of oxygen to the pipes 7, 5.

To guard against the oxygen feed pipe 5 being destroyed by the intense heat in furnaces, I provide a water jacket 9 around the pipe 5, which for convenience may be in the form of a tubular member or pipe 4, considerably larger in diameter than pipe 5, which tubular member is closed at the ends by heads 10, 11, welded or otherwise secured to the tubular member. The discharge end of the pipe 5 terminates at the outer face of the head 10 and its other end protrudes through the head 11 sufficiently to provide a connection with the flexible pipe 7. Water or other cooling medium is circulated through the water jacket 9 and to accomplish this end, in the form of the invention illustrated, I have shown a water pipe 12, extending into the jacket and terminating adjacent the discharge end of the oxygen feed pipe 5, the other end of said water pipe 12 protruding through the head 11 and being connected to a flexible pipe or tube 13, which as attached to any suitable source of water supply under pressure. A discharge pipe or tube 14 leads out from the water jacket at a point near the head 11 and is connected to a flexible pipe tube 16 that may lead to a gutter, sewer or other place into which the water may be discharged.

In order to better understand the operation of the apparatus and the method of cutting drains, I have illustrated, in Fig. 1, an open hearth furnace, A, of ordinary and well known construction, in which 17 designates the front wall, which has the usual door openings 18 closed by suitable doors, 19 designates the back wall and 20 the roof or arch connecting said walls. The bottom 21 of the furnace is constructed of refractory material as is customary. A tapping hole is illustrated at 22 through which tapping hole the heat is tapped. A cavity or depression is shown in the furnace bottom at 23, and

cavities or depressions of this kind frequently occur below the level of the tapping hole so that pools of molten metal are caught in the cavities or depressions and fail to run out through the tapping hole. Sometimes ridges are caused by slag or other substances which prevent the molten metal from flowing to the tapping hole.

In carrying out the present method of discharging the pool of molten metal caught in any depression or cavity in the furnace bottom, the burner of the apparatus is inserted through one of the door openings 18, the valve on the oxygen tank opened and the nozzle end or discharge end of the burner is moved along the furnace bottom from the pool to the tapping hole. By supplying oxygen along this place a groove or passage way is cut in the bottom, which forms a drain through which the molten metal may flow to the tapping hole and be discharged. By directing and moving the discharge end of the burner over the bottom, and thereby delivering oxygen thereto, grooves or drains may be made from any of the cavities or depressions or through any ridges to the tapping hole, and thus all of the molten metal may be drained out. The surface of the furnace bottom is cut away to form the drain by supplying oxygen to the pool of molten metal (which is done by inserting the oxygen pipe into the pool with the oxygen turned on), and moving the end of the pipe across the furnace bottom from the pool to the tapping hole. It appears that the intense heat developed when oxygen is thus supplied is sufficient to wear away the surface of the furnace bottom, thus creating a groove through which the molten metal flows and finally runs out of the tapping hole. The operation of cutting the paths or drains occupies but little time and all of the contents of the furnace is thereby saved.

I claim as new, and desire to secure by Letters Patent:

1. The herein described method of cutting drains in furnace bottoms, which consists in delivering oxygen directly to the part which is to be cut, while under the influence of intense heat.

2. The herein described method of draining pools in furnace bottoms, which consists in leading oxygen directly along the surface of the furnace bottom from the pools to the tapping hole of the furnace.

JOHN O. GRIGGS.