UNITED STATES PATENT OFFICE.

ADOLPHUS J. LUSTIG, OF NEWARK, NEW JERSEY, ASSIGNOR OF TWO-FIFTHS TO ISAAC LEHMAN, OF SAME PLACE, AND LOUIS KAHN, OF NEW YORK, N. Y.

APPARATUS FOR MAKING BOTTOM-CAST INGOTS.

SPECIFICATION forming part of Letters Patent No. 672,948, dated April 30, 1901.
Application filed July 16, 1900. Serial No. 23,714. (No model.)

To all whom it may concern:

Be it known that I, ADOLPHUS J. LUSTIG, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Making Bottom-Cast Ingots; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in supports for molds for casting steel ingots; and the invention has for its primary object to provide a novel construction of mold-support for the arrangement thereon of a group of ingot-molds, in connection with which is employed a stand-pipe and connecting-runners, such as are used in the processes of casting—commonly termed "bottom" casting, the several parts of the mold-support being arranged and constructed to secure a more perfect exclusion of atmospheric oxygen from the molten steel during the operation of casting ingots, and thus to prevent decarburization and produce desulfurization, as well as oxidation, and to secure many other advantages and results, all of which will be hereinafter more fully set forth.

My present invention therefore consists in the novel construction of bottom-cast mold-support and parts connected therewith, to be hereinafter fully set forth; and, furthermore, my invention consists in the several novel arrangements and combinations of the various parts, as well as in the details of the construction thereof, all of which will be fully described in the accompanying specification and then finally embodied in the clauses of the claims thereto appended.

The invention is clearly illustrated in the accompanying drawings, in which—Figure 1 is a central vertical section of a group of molds and a supporting-base such as is employed in bottom-casting, the several parts being constructed to enable the use thereof in my novel process or method of casting set forth and described in an application for Letters Patent filed by me on the 1st day of February, 1900, Serial No. 3,620. Fig. 2 is a plan or top view of the several parts represented in said Fig. 1; and Fig. 3 is a vertical cross-section, on an enlarged scale, taken on line 3 in said Fig. 2.

Similar letters of reference are employed in all of the said above-described views to indicate corresponding parts.

In this arrangement of "bottom-cast" mold-support comprising the principles of my present invention I have represented in Fig. 1 of the drawings one form of base-plate or foundation a, which may be circular in outline, but may be of any other desirable and suitable configuration, as will be clearly evident. This base-plate or foundation has an upwardly-extending and surrounding wall a', formed with an internal annular step or shoulder a'' and a chamber a''' for the reception of a loose material a—such as pumice-stone, asbestos, or other material of a like nature and which is a non-conductor of heat. Leading into this chamber a'' are one or more pipes or ducts a'' for the supply of a hydrocarbon gas or hydrogen gas into the said chamber. This support b is placed upon the step or shoulder a'' and is provided with suitably-disposed channels b', which radiate from the center of the said support and are for the reception of clay or tile pipes to be used as conductors or runners for flowing the molten metal from the central stand-pipe c to the respective molds d, to be hereinafter more fully set forth. Each conductor or runner is indicated by the reference-letter c and is preferably made rectangular in cross-section, so as to be readily fitted into the said channels b', being provided with a central duct c', and each conductor or runner having a projection c'' at one end and a recessed portion c''' at the other end, whereby the several runners or conductors can be operatively connected, so as to form continuous conveying ducts or passage-ways from the central conductor c'', directly beneath the stand-pipe c, to the end conductors directly beneath the open bottom of each mold d. This central conductor c'' is provided with a central opening c''' for establishing com-
munication with the stand-pipe e, substantially as illustrated in Figs. 1 and 2. Each end conductor is preferably provided with a pair of outlets c to establish communication with the bottom of the mold, the said end conductors and the openings c therein being suitably spaced to correspond with the open bottom of different-sized molds. By means of this arrangement of the pair of outlets or openings c two streams of molten metal can be admitted into the mold close to the inner sides thereof instead of one stream in the center of the mold, as heretofore, whereby the sides of the mold are more immediately heated, and the fluid steel is hydrogenized by the hydrocarbon gas, which has thus been conducted near the inner edges of the ingot and between the mold-walls and the cooling ingot, and thereby carbonizing the ingot of steel by such passage of the hydrocarbon gas between the walls of the mold and the cooling mass of steel within the same. At the same time the temperature is more evenly distributed and the mass cools evenly and uni-
formly at the sides as well as in the center.

As will be seen from Figs. 2 and 3, directly beneath the conductors or runners c is a space b, which communicates with certain other open spaces b, formed by an arrangement of vertical ribs or projections b at the inner sides of each channel b, the inner edges of said ribs or projections terminating directly at the sides of the runners c to permit of the proper arrangement of said runners in said channels b, as illustrated more especially in said Fig. 2. These open spaces b are for the expulsion of any atmospheric oxygen in the channels by the gas coming from the chamber a in the base or foundation, as presently described. In the spaces b, directly beneath each line of runners c, I have arranged a gas-conveying pipe b, provided with perforations b, as represented more particularly in Fig. 3, and surrounded by mineral wool b or other similar material. This pipe is in communication, through ducts b, with the chamber a, as shown, and takes the hydrocarbon gas therefrom and conducts it through the perforations b in said pipe directly beneath the runners or conductors c and into the surrounding spaces b, as will be clearly evident. The hydrocarbon or hydrogen gas then passes through the pores in the material of which the runners are made and also into the joints of the adjacent runner-sections and mixes with the molten metal flowing through the said runners from the stand-pipe e to the several molds d. Arranged directly above the said runners or conductors c and also closing up the openings b are suitably-constructed covers f for retaining the gas around the heated runners or conductors and preventing the loss of the gas. Each cover f is preferably provided with a small hole or perforation f’, forming a test-hole for the ignition of the hydrocarbon gas to enable the operator to determine when all atmospheric oxygen has been expelled from the apparatus and when the proper amount and sufficient hydrocarbon gas is contained in the several channels b. Each mold d may also be surrounded at the bottom, where it rests upon the support, with a frame-like device g, which is filled with a carbonaceous material, of asphaltum and tallow or any suitable compound of asphaltum with mineral oils, for the purpose set forth in my previous application for Letters Patent filed February 1, 1900, Serial No. 3,620. The construction and arrangement of the said frame-like devices g do not form any part of this invention and are fully described and claimed in my previous application for Letters Patent filed November 28, 1900, Serial No. 738,581.

In all respects the process and method of 85 deoxidation and hydrogenizing a column of fluid steel are the same as that set forth and described in my application for Letters Patent filed February 1, 1900, Serial No. 3,620, and hence need not be further described here.

Having thus described my invention, what I claim is 1. The combination, with an ingot mold or molds for “bottom” casting, of a base and a mold-supporting means in said base, runners or conductors embedded in said supporting means, the said runners or conductors being made of a porous material, means for conducting a non-oxygen-containing gas, means for conducting the gas from said base to said runners or conductors, substantially as and for the purposes set forth.

2. The combination, with an ingot mold or molds for “bottom” casting, of a base and a mold-supporting means in said base, runners or conductors embedded in said supporting means, the said runners or conductors being made of a porous material, means for conducting a non-oxygen-containing gas into said base, means for conducting the gas from said base to said runners or conductors, and a cover or covers above said runners or conductors, substantially as and for the purposes set forth.

3. The combination, with an ingot mold or molds for “bottom” casting, of a chambered base, means for conducting a reducing-gas into said base, means within said base for the support of the mold or molds, a channel or channels in said means of support, means for conducting molten metal through said channel or channels into the bottom of the mold or molds, and means for conducting the gas from said base to said channel or channels, and the conducting means in said channel or channels, substantially as and for the purposes set forth.

4. The combination, with an ingot mold or molds for “bottom” casting, of a chambered base, means for conducting a reducing-gas into said base, means within said base for the support of the mold or molds, a channel or channels in said means of support, runners or conductors of a porous material in said channel or channels, and means for conduct-
ing the gas from said base to said channel or channels and to said runners or conductors, substantially as and for the purposes set forth.

5. The combination, with an ingot mold or molds for "bottom" casting, of a chambered base, means for conducting a reducing-gas into said base, means within said base for the support of the mold or molds, a channel or channels in said means of support, runners or conductors of a porous material in said channel or channels, means for conducting the gas from said base to said channel or channels and to said runners or conductors, substantially as and for the purposes set forth.

6. The combination, with an ingot mold or molds for "bottom" casting, of a chambered base, means for conducting a reducing-gas into said base, a mold-support in said base, a channel or channels in said means of support, means for conducting molten metal through said channel or channels into the bottom of the mold or molds, a gas-conveying pipe or duct in said mold-support, and a means of communication between said pipe or duct and the chamber in the base, substantially as and for the purposes set forth.

7. The combination, with an ingot mold or molds for "bottom" casting, of a chambered base, means for conducting a reducing-gas into said base, a mold-support in said base, a channel or channels in said means of support, runners or conductors of a porous material, in said channel or channels, for conducting molten metal through the same into the bottom of the mold or molds, a gas-conveying pipe or duct in said mold-support, and a means of communication between said pipe or duct and the chamber in the base, substantially as and for the purposes set forth.

8. The combination, with an ingot mold or molds for "bottom" casting, of a chambered base, means for conducting a reducing-gas into said base, a mold-support in said base, a channel or channels in said means of support, runners or conductors of a porous material, in said channel or channels, for conducting molten metal through the same into the bottom of the mold or molds, a gas-conveying pipe or duct in said mold-support, a means of communication between said pipe or duct and the chamber in the base, and a cover or covers above said runners or conductors, substantially as and for the purposes set forth.

9. The combination, with an ingot mold or molds for "bottom" casting, of a chambered base, means for conducting a reducing-gas into said base, means within said base for the support of the mold or molds, a channel or channels in said means of support, vertical ribs in said channel or channels, runners or conductors of a porous material, between said ribs, forming with said ribs open spaces $b$, and means for conducting the gas from said base to said channel or channels and to said runners or conductors, substantially as and for the purposes set forth.

10. The combination, with an ingot mold or molds for "bottom" casting, of a chambered base, means for conducting a reducing-gas into said base, means within said base for the support of the mold or molds, a channel or channels in said means of support, vertical ribs in said channel or channels, runners or conductors of a porous material, between said ribs, forming with said ribs open spaces $b$, a cover or covers above said runners or conductors, and means for conducting the gas to said channel or channels and to said runners or conductors, substantially as and for the purposes set forth.

11. The combination, with an ingot mold or molds for "bottom" casting, of a chambered base, means for conducting a reducing-gas into said base, a mold-support in said base, a channel or channels in said means of support, vertical ribs in said channel or channels, runners or conductors of a porous material, between said ribs, forming with said ribs open spaces $b$, a perforated gas-conveying pipe or duct in said mold-support, and a means of communication between said pipe or duct and the chamber in the base, substantially as and for the purposes set forth.

12. The combination, with an ingot mold or molds, for "bottom" casting, of a chambered base, means for conducting a reducing-gas into said base, a mold-support in said base, a channel or channels in said means of support, vertical ribs in said channel or channels, runners or conductors of a porous material, between said ribs, forming with said ribs open spaces $b$, a perforated gas-conveying pipe or duct in said mold-support, a means of communication between said pipe or duct and the chamber in said base, and a cover or covers above said runners or conductors, substantially as and for the purposes set forth.

13. The combination, with an ingot mold or molds for "bottom" casting, of a mold-support provided with a channel or channels, runners or conductors of a porous material in said channel or channels formed of separate sections, the end sections to said runners or conductors being provided with a plurality of delivering-openings for conducting molten metal at different points into the bottom of the mold or molds, covers over said runners or conductors, and means for conveying a gas to said channel or channels, substantially as and for the purposes set forth.

14. The combination, with an ingot mold or molds for "bottom" casting, of a mold-support provided with a channel or channels, runners or conductors of a porous material in said channel or channels, formed of separate sections, the end sections to said runners or conductors being provided with a plurality of delivering-openings for conducting molten metal at different points into the bottom of the mold or molds, covers over said runners
or conductors, and a perforated gas-conveying pipe or duct beneath said runners or conductors, substantially as and for the purposes set forth.

15. The combination, with an ingot mold or molds, of a mold-supporting base, a perforated gas-conveying pipe \( b^t \) in said support, molten-metal-conveying runners arranged directly above said pipe, and means for conveying gas to said pipe \( b^t \), substantially as and for the purposes set forth.

16. The combination, with an ingot mold or molds, of a mold-support, having a channel or channels, and ribs in said channel or channels, molten-metal-conveying runners arranged in said channel or channels between said ribs and forming open spaces \( b^5 \), and a perforated gas-conveying pipe beneath said runners, arranged in spaces \( b^s \) in said support and connected with said spaces \( b^s \) for conducting gas beneath said runners and into said spaces \( b^s \) around said runners, substantially as and for the purposes set forth.

In testimony that I claim the invention set forth above I have hereunto set my hand this 13th day of July, 1900.

ADOLPHUS J. LUSTIG.

Witnesses:

FREDK. C. FRAENTZEL,

GEO. D. RICHARDS.