(No Model.)

J. IRWIN, Jr.

APPARATUS FOR THE PRODUCTION OF SOUND CASTINGS.

No. 359,974. Patented Mar. 22, 1887.

Fig. 1.

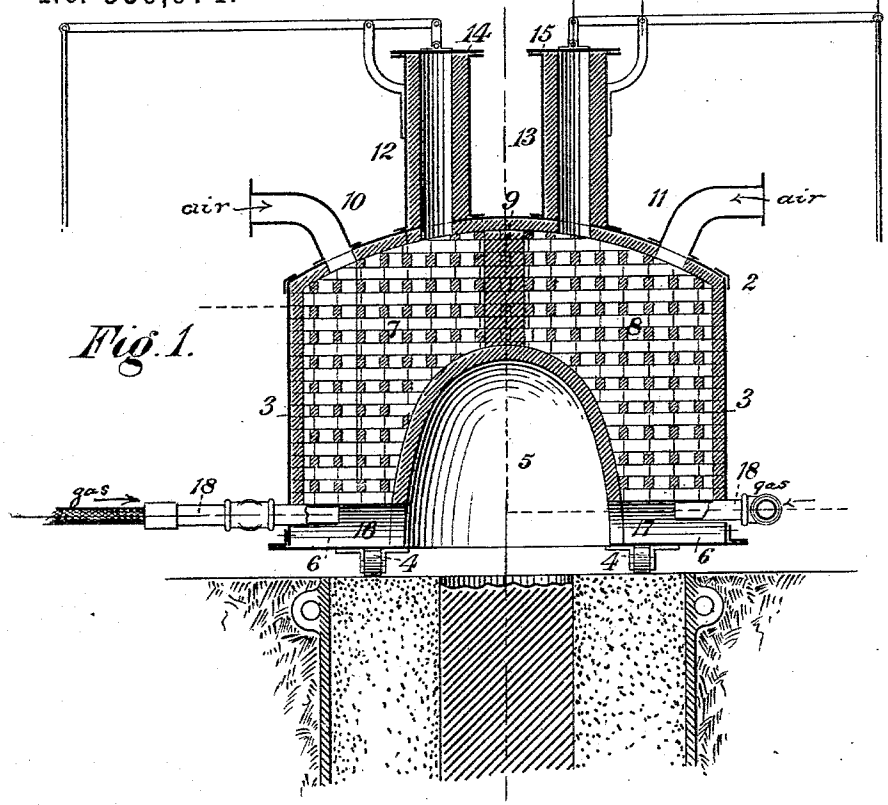
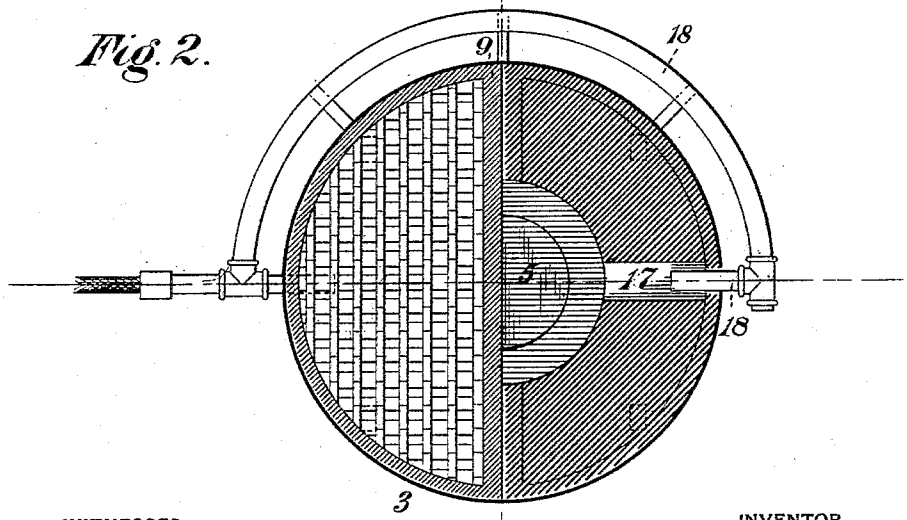


Fig. 2.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE PRODUCTION OF SOUND CASTINGS.

SPECIFICATION forming part of Letters Patent No. 359,974, dated March 22, 1887.

Application filed July 14, 1886. Serial No. 207,964. (No model.)

To all whom it may concern:

Be it known that I, JOHN IRWIN, Jr., residing at Edgeworth, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Apparatus for the Production of Sound Castings, of which improvement the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a view in sectional elevation of my improved heating apparatus in position over a mold, a portion of which is also shown in sectional elevation. Fig. 2 is a horizontal section on the lines *x x*, Fig. 1.

The invention relates to certain improvements in apparatus for the production of iron or steel castings practically free from blow-holes and other defects arising from unequal cooling and contraction of the metal in the mold.

Great difficulty has been heretofore encountered in producing large ingots and other castings free from blow-holes and other internal cavities and porosity caused by the shrinking or contraction of the metal during cooling. These defects arise from the fact that the metal in the mold cools more rapidly around the sides and at the top of the mold than elsewhere, as such parts are more exposed, and hence the heat thereof radiates away with considerable rapidity. As the metal chills and solidifies at the sides an external rigid shell is formed, toward which the molten or semi-molten metal in the interior of the casting is drawn, thus forming internal cavities or producing a considerable amount of porosity. It has been attempted in many ways to keep the metal at the top of the mold in a molten condition, in order that it may flow down and fill the cavities formed, as above stated, during the chilling of the sides of the casting. The means heretofore resorted to have been only partially successful, owing to the fact that no greater heat than that of the metal poured into the mold has been used for this purpose. As, for example, large sinker-heads or auxiliary bodies of metal have been arranged at or around the top of the main mold; but, as above stated, the heat of these masses of metal is no greater than that of the metal poured into the mold, and is liable to cool more rapidly, owing to their exposed condition, as compared with that of the metal in the mold.

The object of the invention is to provide for the application of a degree of heat at least equal to that of the molten metal when poured at and around the top portion of the mold, and for the maintenance of such a degree of heat for as long a period as necessary, thereby insuring a constant supply of molten metal at the upper portion of the mold, wherewith to replace that drawn from the center by the contraction toward the sides.

In making large castings the molds therefor are usually placed in a pit, with their upper ends on a level with or very slightly projecting above the surface of the foundry-floor, as shown at 1 in Fig. 1.

In carrying out my invention the mold 1 is prepared in the usual manner, with a sinker-head of sufficient capacity to replace any loss in the central portion of the mold caused by the contraction or shrinking of the metal in cooling. As soon as the mold and sinker-head have been filled with metal a furnace, 2, capable of generating sufficient heat to retain metal in the mold in a molten condition, is placed over the mold and kept there until the metal in the mold proper has cooled and solidified. The heat generated by this furnace will heat not only the top of the mold directly subjected thereto, but the heat will penetrate for a considerable distance down along the mold, thereby retarding the chilling and consequent solidification of the metal. Under these conditions the cooling and solidification of the metal will occur from the bottom of the casting upward, and the superincumbent metal will be in such a state of fluidity that it will flow down and fill the cavities formed by the shrinkage of the metal below. In addition to the advantages above stated the maintenance of the metal in a fluid condition affords an opportunity for the escape of gas from the metal, thus avoiding the formation of blow-holes.

Although any furnace in which the desired degree of heat can be generated and maintained

is suitable and can be applied for the purpose above specified, I prefer to use a furnace constructed as hereinafter described.

The furnace 2, shown in the drawings, consists of a shell-casing, 3, lined with fire-brick, and preferably mounted on wheels or rollers 4, for convenience of movement, although it may be moved by means of a crane or other suitable device. Within the casing 3 is formed a combustion or heating chamber, 5, preferably annular in contour, the walls of which are formed of fire clay or brick, and are supported by a metal plate, 6, forming the bottom of the furnace, said plate having an opening corresponding in area to the mouth of the chamber 5. Between the casing and the walls of the combustion-chamber a checker-work of fire-brick is formed, the space occupied by the checker-work being divided into two compartments or regenerative chambers, 7 and 8, by wall 9, extending over the chamber 5 and diametrically across the furnace. Each of the regenerative chambers 7 and 8 is provided with an air-inlet pipe, 10 and 11, and with stacks 12 and 13, respectively, said stacks being provided with dampers 14 and 15, for the regulation of the draft.

Gas is admitted to the combustion-chamber 5 through flues 16 and 17, formed along the bottom of the furnace, pipes 18, leading from any suitable source of supply, being inserted into said flues, which are also in communication with the regenerative chambers.

In using my improved furnace for the purpose above specified gas is admitted, as, for example, through the flue 16, and is burned in the chamber 5, air being supplied thereto through the inlet-pipe 10, the regenerative chamber 7, and the flue 16. The damper on the stack 12 being closed and that on the stack 13 being opened, the products of combustion escape through the flue 17, the regenerative chamber 8, and stack 13. As soon as the checker-work in the chamber 8 has been thoroughly heated by the products of combustion passing therethrough the dampers 14 and 15 are reversed, and gas is admitted through the flue 17, air being admitted through the pipe 11 and chamber 8, where it is highly heated before mixing with the gas in the flue 17. The products of combustion escape through the chamber 7 and stack 12, highly heating the checker-work in said chamber.

As soon as the furnace is in good working order it is moved over the mold 1, into which the metal has been cast, and the space between the bottom of the furnace and the top of the mold on the floor adjacent thereto being closed by sand or in any suitable manner the furnace is operated in the manner above stated. With such a furnace it is possible to obtain a heat much above the melting-point of iron or steel, and hence the metal in the upper portion of the mold can be maintained in a molten condition as long as desired. When desired, the heat in furnace can be gradually reduced, so as to permit of the complete cooling of the top of the casting.

I claim herein as my invention—

1. The combination of a mold and a portable heat-generating apparatus constructed to cover and surround the mouth of the mold, substantially as set forth.

2. The combination of a mold and a portable regenerative furnace constructed to cover and surround the mouth of the mold, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOHN IRWIN, JR.

Witnesses:
W. B. CORWIN,
DARWIN S. WOLCOTT.