P. H. G. DURVILLE.

APPARATUS FOR AND PROCESS OF CASTING INGOTS OF METALS AND ALLOYS.

APPLICATION FILED NOV. 10, 1913.

1,189,548.

Patented July 4, 1916.

2 SHEETS—SHEET 1.

Fig.1

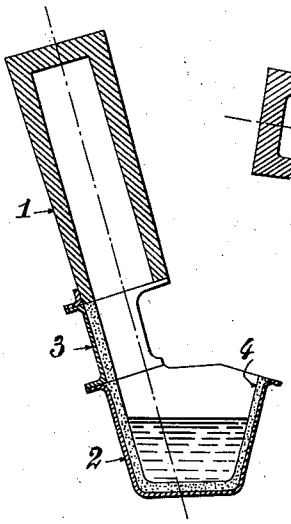


Fig.2

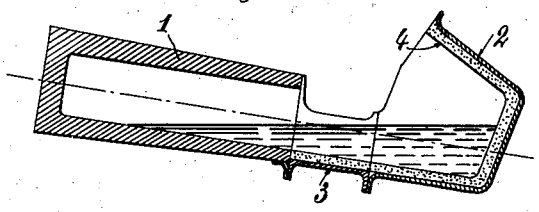


Fig.3

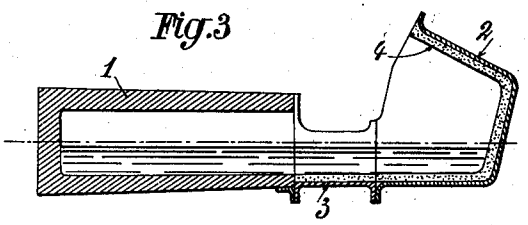


Fig.4

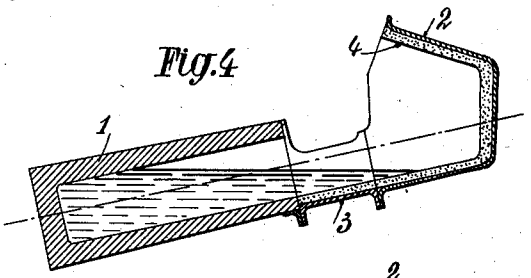


Fig.5

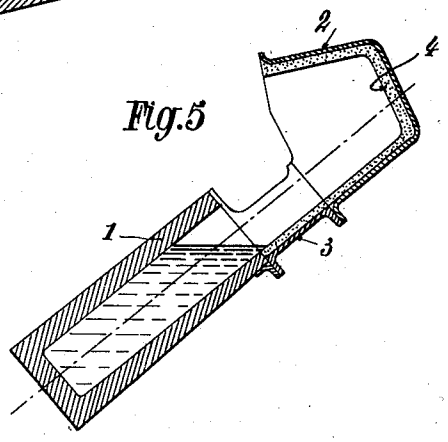
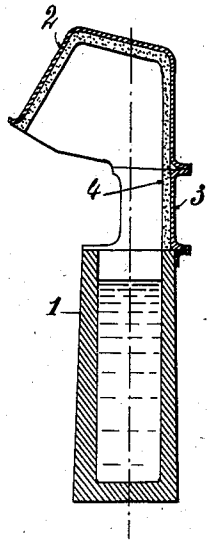


Fig.6



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2 SHEETS—SHEET 2.

Fig. 7

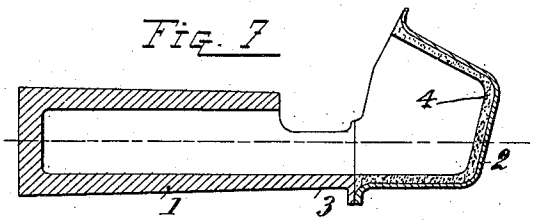


Fig. 8

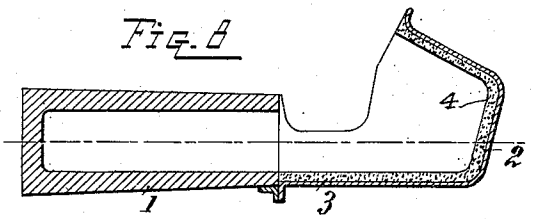


Fig. 9

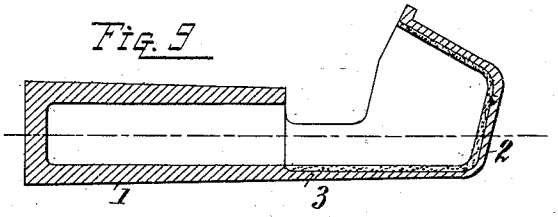


Fig. 10

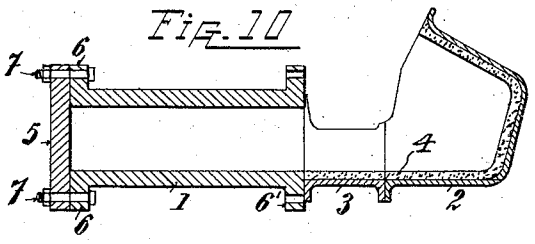
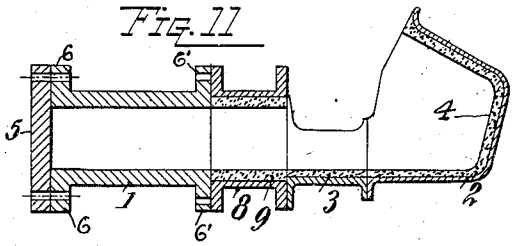


Fig. 11



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UNITED STATES PATENT OFFICE.

PIERRE HENRI GASTON DURVILLE, OF PARIS, FRANCE.

APPARATUS FOR AND PROCESS OF CASTING INGOTS OF METALS AND ALLOYS.

1,189,548. Specification of Letters Patent. Patented July 4, 1916.

Application filed November 10, 1913. Serial No. 800,190.

To all whom it may concern:

Be it known that I, PIERRE HENRI GASTON DURVILLE, a citizen of the French Republic, and residing at 65 Rue d'Amsterdam, Paris, Department of the Seine, France, have invented certain new and useful Improvements in Apparatus for and Processes of Casting Ingots of Metals and Alloys, of which the following is a specification.

The present invention relates to an improved process of casting ingots of metals and alloys and has in view the production of ingots free from blow holes or slag.

In the casting of ingots of metal or metallic alloys the prevention of the inclusion of slag or other oxidizing particles and also of air bubbles, in the cast ingot, is attended with considerable difficulties. Various proposals have already been made for overcoming these difficulties, but hitherto without complete success.

Known casting processes are affected by the drawback that the metallic liquid is poured into the mold in the form of a stream, the height of fall being the difference existing between the level of the liquid in the pouring ladle and that in the mold. This causes eddies and makes an intermingling of the fluid mass with included slag and other oxidizing particles, and also with air, inevitable. Pouring in a liquid stream has also the defect that the casting can only proceed slowly, from which there ensues the risk of a partial solidification of the liquid while pouring, and of an interruption in the continuity of the liquid stream, the consequences being further oxidation and inclusion of air and lack of homogeneousness in the solidified ingot.

The process according to the present invention differs fundamentally from known processes, by reason of this that the metallic liquid is first introduced into a reservoir and is then transferred from said reservoir into the mold without any change of altitude. The surface of the metallic liquid in the reservoir and in the mold remains horizontal throughout and there is no real pouring of the liquid mass of metal but only a change in the position assumed by the metallic liquid, without any change of direction on the part of the metallic surface. By means of the new method, the casting process can go on very quickly, and nevertheless—since there is no fall, and the surface of the liquid remains in the same position throughout—no intermingling of the metallic liquid with slag or other oxidizing particles, or with air, occurs, especially since the liquid is protected therefrom by the layer of oxid remaining throughout in a horizontal position on the surface of the liquid.

The apparatus for carrying out the process consists of a combined reservoir and mold, the two being rigidly attached together in such a way that the pouring-out surface of the reservoir and the pouring-in surface of the mold lie in the same straight line, the connecting passage between the reservoir and mold being of uniform sectional area.

In the accompanying drawing Figures 1 to 6 illustrate a typical example—in section—of an apparatus serving to carry out the present process, in the different working positions. Figs. 7 to 11 illustrate modifications of the apparatus shown in Figs. 1 to 6.

The apparatus consists of the mold 1, the reservoir 2 and a connecting passage or neck 3 arranged between them. The three parts may be formed separately from each other as shown in Figs. 1 to 6, 10 and 11, or, the parts, 1 and 3 may be integrally connected and the part 2 firmly connected to the part 3, (see Fig. 7) or, the parts 2 and 3 may be integrally connected and the part 1 firmly connected to the part 3, (see Fig. 8) or, the three parts may all be integrally connected.

The relative arrangement of the three members 1, 2 and 3, is such that, along an internal edge, they form a straight line. The sectional form of the connecting link 3 is essentially the same as that of the adjacent portions of the mold 1 and reservoir 2, as represented in Fig. 9, but the peripheral dimensions of the neck are only about two thirds those of the mold. The neck and reservoir are provided with a lining 4 of fireproof material.

The molten metal is first introduced into the reservoir 2, when the apparatus is in the position shown in Fig. 1, in which reservoir the metal may be further prepared for the actual casting process. Casting is effected by tilting the apparatus through an angle of about 180° whereby the liquid metal passes from the reservoir 2 into the mold 1.

Figs. 2–6 represent the successive positions assumed by the apparatus during the operation of tilting. As will be understood,

the liquid metal retains its horizontal surface in all positions and there is merely a gradual change in the position of the metallic liquid from the reservoir 2 to the mold 1, until, finally, the metallic liquid takes up the position, shown in Fig. 6, inside the mold, and is there able to solidify into the form of an ingot. During the passage of the metallic liquid from the reservoir 2 into the mold 1, no throttling or damming up occurs in the connecting channel 3, and therefore, in spite of the rapidity with which the apparatus can be turned over, the transference proceeds in a perfectly quiet and uniform manner. No intermingling of the liquid metal with air, slag or other oxidizing particles can occur during this operation.

The mold 1 may also as shown in Figs. 10 and 11 be provided at the closed end with a detachable plug or the like, 5, adapted to be secured by bolts 7 to lugs 6 or 6', so that the reservoir and connecting neck can be attached to one end or the other of the mold alternately. This keeps the temperature of the mold more uniform.

The mold 1 and reservoir 2 may be arranged as single or multiple units, and of course the described arrangement can be provided with any of the means commonly used for the prevention of piping, especially (as shown in Fig. 11) an attachment, made of a casing 8, having a lining 9 which is a bad conductor of heat and interposed between the mouth of the reservoir and that of the mold. The three members: mold 1 attachment, 8, 9, neck 3 and mouth of the reservoir 2 must, in such case, fulfil the conditions of the invention, namely that they form a straight, continuous line when connected together during the casting process.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. The hereindescribed improvement in the method of casting ingots comprising transferring molten metal from a suitable receptacle to a mold by means which cause the surface of the liquid to remain horizontal throughout the operation.

2. The hereindescribed improvement in the method of casting ingots comprising supporting the molten metal throughout the operation of introducing it into a mold so that the surface of the liquid body is maintained continuously horizontal.

3. The hereindescribed improvement in the method of casting ingots comprising introducing molten metal to a mold connected with a reservoir by means permitting liquid to flow from the reservoir to the mold with its upper surface horizontal throughout the operation, and then tilting the connected reservoir and mold to transfer metal from the reservoir to the mold.

4. An ingot casting apparatus comprising a reservoir and a mold connected by means forming a continuous straight line surface from one end of the interior of the reservoir to the opposite end of the mold, whereby when the apparatus is tilted the liquid body flowing from the reservoir to the mold will be supported so that the surface thereof is horizontal throughout the transfer operation.

5. An ingot casting apparatus comprising a reservoir, a mold, and a neck portion connecting the mold and reservoir, the openings at the ends of the neck being respectively of the same diameter as the outlet from the reservoir and inlet to the mold, and the body of the neck forming with the reservoir and mold an unbroken surface extending continuously from the closed end of the reservoir to the closed end of the mold, for the purpose described.

6. An ingot casting apparatus comprising a reservoir, a mold having a body, open at both ends, and a detachable end piece adapted to close either end of said body, and a neck portion connecting the open end of the mold and the reservoir, the openings at the ends of the neck being respectively of the same diameter as the outlet from the reservoir and inlet to the mold, and the body of the neck forming with the reservoir and mold an unbroken surface extending continuously from the closed end of the reservoir to the closed end of the mold, for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

PIERRE HENRI GASTON DURVILLE.

Witnesses:
RAOUL THOMAS,
HANSON C. COXE.