Sept. 11, 1934. E. L. FARABAUGH 1,973,374

INGOT MOLD AND INGOT

Filed April 21, 1931 2 Sheets-Sheet 1

Fig. 1.

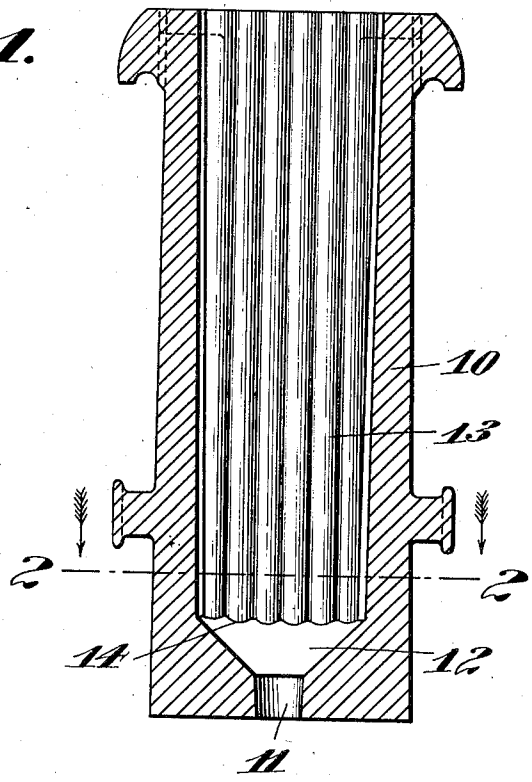
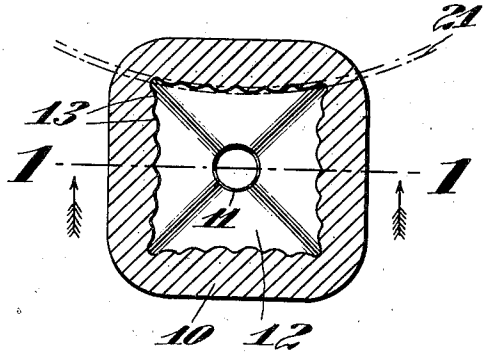


Fig. 2.



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Fig. 3.

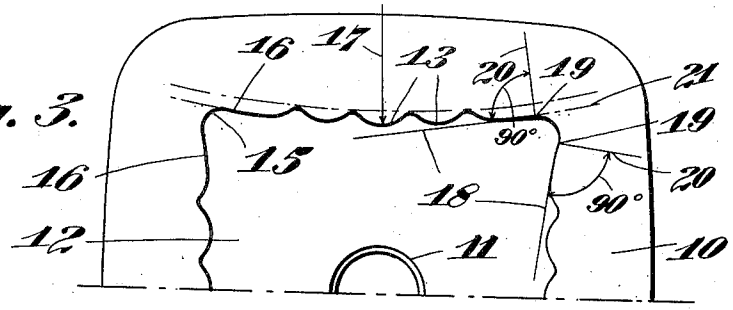


Fig. 4.

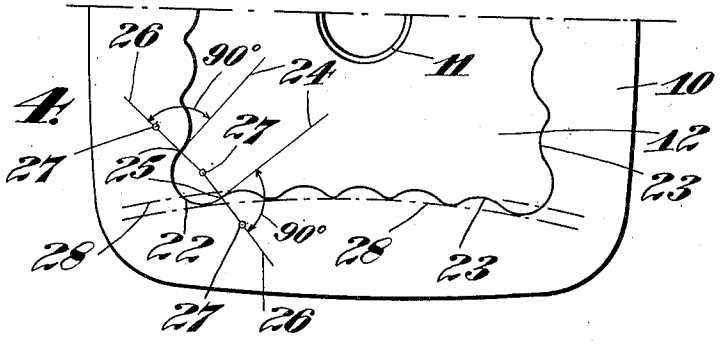
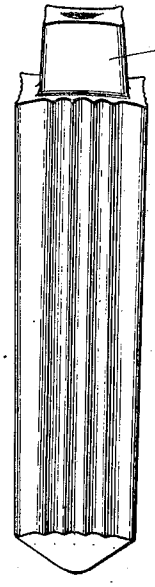


Fig. 5.



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UNITED STATES PATENT OFFICE

1,973,374

INGOT MOLD AND INGOT

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Application April 21, 1931, Serial No. 531,678

7 Claims. (Cl. 22—139)

This invention relates to the casting of metallic ingots and involves certain improvements in the contour of the horizontal cross section of the vertically extended mold chamber and of the ingot formed therein. More especially my present invention relates to improvements in the form of convex mold chambers and ingots having concave surfaces.

It is a known fact to those familiar with this art, ingots provided with concave surfaces solidify with less danger of surface or skin cracking and seams, as contraction is less obstructed and the ingot thus formed is more free from these defects. At the same time such ingots as embodying this invention may be easily rolled.

The present object of my invention is to construct or shape the mold chamber so that the chilling effects of the walls will be transmitted to the ingot to quickly solidify the corners and surface of the ingot so as to reduce the tendency of corner cracks and to so shape the vertical walls of the mold and the ingot produced in the mold so that the ingot may be rolled or reduced in section with less danger of producing what is termed reduction laps, cracks or tears on the surface of the ingot. Other features of my invention and the details of construction will be hereinafter more fully described.

The accompanying drawings show molds and ingots constructed in accordance with my invention.

Fig. 1 is a sectional elevation of a big end up mold taken on the line 1—1 of Fig. 2 embodying my improvement.

Fig. 2 is a horizontal cross section taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged view of a portion of the upper end of the mold.

Fig. 4 is an enlarged view of a modification of the upper end of the mold.

Fig. 5 is a view of an ingot and shrink head formed in a mold of the type shown in Fig. 3.

Fig. 1 illustrates a big end up type of mold, open at its top and bottom. The mold is made of cast iron in which the walls 10 are made thicker, and thus more absorptive in the lower portion of the mold than in the upper portion. The lower portion of the mold is necked-in in the manner illustrated to prevent splashing of the metal as it is poured into the mold. The mold is provided with a tapered bottom opening 11 communicating with the lower necked-in portion 12.

The necked-in portion 12 is formed after the manner of an inverted four-sided frustrum of a pyramid. Each side of the frustrum being flat and tapering downwardly toward the hole 11. The inside faces of the mold walls are provided with corrugations 13 starting at the top of the mold and extending downwardly to the top 14 of the necked-in portion 12, where said corrugations terminate.

According to my invention I have combined the advantages of the convex walls with the corrugations as illustrated in Figs. 2, 3 and 4. This construction not only provides for a mold having strong corners where cracks are most likely to develop in the mold, but also produces an ingot which is less liable to corner and surface cracks when solidifying and during rolling.

Referring to Fig. 3, it will be noted that the corrugations 13 are formed on the arc of a circle struck from a point outside of the mold, thus producing convex inner walls with the corrugations conforming to said arc. Preferably, the corner radii 15 are comparatively small, with the tangent portions 16 defining an angle of less than 90°. These corner tangent portions may conform to the larger radius 17 or they may be straight if so desired, it being preferable to construct the corners and their tangent portions so that the included angle between the tangent portions 16 will be less than 90°. This mold construction provides a corner of great cooling surface and a comparatively thin corner on the ingot, whereby quicker cooling and solidification of the corners of the ingot will be produced, thereby resisting the shrinkage strains set up within the body of the ingot while solidifying.

It will be noted that lines 18 struck from the tangent points 19 and at right angles to lines 20, which are the radius lines of the arcs 21, that lines 18 diverge inwardly into the body of the ingot or chamber of the mold, thus forming projecting corner sections of less than right angles. These reduced corner sections account for the quick solidification of the metal at these points which enables the corners to resist cracking while the remaining body portion of the ingot is cooling.

The depth and spacing of the corrugations are preferably uniform throughout their length and breadth.

In the modification of my invention as illustrated in Fig. 4, it will be seen that the corner radius 22 is somewhat larger than the corner radius 15 as shown in Fig. 3 and that the corrugations 23 blend into radius 22 without any

intermediate tangent portions 16 as shown in Fig. 3.

In this case, lines 24 struck from the tangent points 25, and at right angles to lines 26 which intersect the radius points 27, will diverge inwardly toward the center of the mold chamber or ingot, and the included angle between lines 24 will be less than 90°. This corner construction in combination with the corrugations 23 formed on the arc 28 will also provide quick cooling of the corner portions, and reduce surface defects in the ingot when rolled. The shrink head 29 on the ingot is formed in the well known manner by placing a suitable hot top on the upper end of the mold before casting.

While I have shown my mold and ingot as being substantially square, it will be obvious to those skilled in the art that they are not so limited, but are susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art, or as are specifically set forth in the appended claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A mold having a chamber which tapers upwardly and outwardly from its base, side walls defining said chamber which are thicker at their lower ends than at their upper ends, the inside faces of said walls having a convex contour, and corrugations extending longitudinally of said faces.

2. A mold having a chamber provided with convex side walls, a necked-in portion at the lower end of said chamber, a hole through the bottom of the mold, corrugations extending longitudinally of said chamber, said necked-in portion being formed after the manner of an inverted four-sided frustrum of a pyramid, each of said four sides being flat and tapering downwardly toward said hole.

3. An ingot mold having a chamber provided with walls of transverse convexity, longitudinal corrugations conforming to said convexity, rounded corners connecting said walls, said corrugations blending into said corners so as to form inwardly diverging portions adjacent said corners, and the included angle between said portions being less than 90°.

4. An ingot mold having a chamber provided with walls of transverse convexity, longitudinal corrugations conforming to the arcs of said convexity, angularly projecting corners connecting said walls, said corners being less than right angles and tangent with the arcs of the transverse convexity of said walls and the arcs of said corrugations.

5. A tapered metallic ingot of concave cross section, a tapered end section at its small end, corrugations extending from the large end of the ingot to the top of the tapered section at the small end of the ingot, said tapered end section being formed after the manner of a frustrum of a pyramid, each side of the tapered end being flat and tapering inwardly toward the apex of of the pyramid.

6. A metallic ingot of concave cross section and rounded corners, longitudinal corrugations conforming to said concavity, said corrugations blending into said corners so that the lines connecting said rounded corners and said corrugations will diverge inwardly toward the body of the ingot, and the included angle between said lines being less than 90°.

7. An ingot having side walls of transverse concavity, longitudinal corrugations conforming to the arcs of said concavity, the corners of the ingot forming angular projections of less than right angles and tangent with the arcs of the transverse concavity of said walls and the arcs of said corrugations.

EDWARD LOUIS FARABAUGH.