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SEPARABLE HOT TOP FOR INGOT MOLDS

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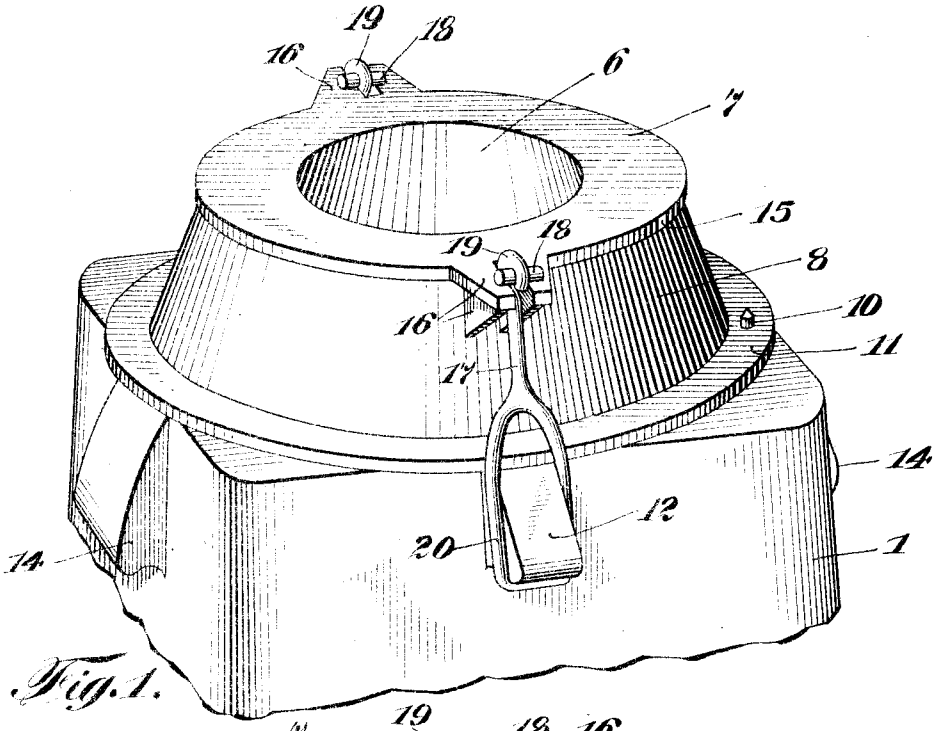

Fig. 1.

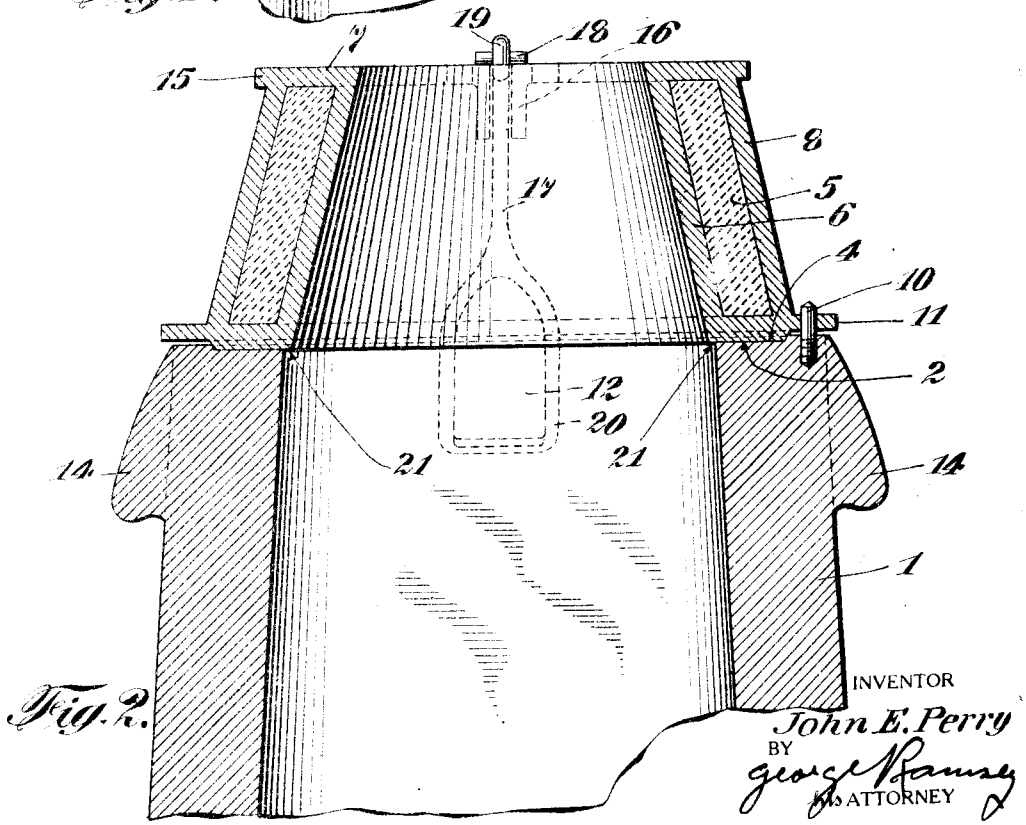

Fig. 2.

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SEPARABLE HOT TOP FOR INGOT MOLDS.

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The present invention relates broadly to metallurgy and more specifically to the combination of a hot top and an ingot mold, and also to the hot top itself.

Heretofore in the art, the most common form of hot top has comprised tile constructions adapted to set on the mouth of an ingot mold and to form a continuation of the cavity of the mold into which a head of molten steel might rise and be retained hot to provide a supply of molten steel adapted to feed into the steel in the matrix of the mold as the molten steel contracted during freezing. The tile constructions of the prior art are fragile and a tile hot top is destroyed with the production of each ingot. Furthermore, there was a tendency of particles of the tile to stick to the steel and when the ingots were heat treated the pieces of the tile would melt and run over and soak into portions of the ingot, to the detriment of the steel.

The present invention overcomes the difficulties of the known art by providing a construction in which the heat insulating material, comprising the effective portion of the hot top, is completely enclosed and surrounded by metal protecting walls, which are preferably formed of cast iron. This construction retains the full advantages of the heat insulating qualities of the tile or brick and at the same time protects the brick against breakage as well as protects the steel from contact with the brick.

The disclosures herewith are more or less diagrammatic and it is realized that the invention may be carried out in constructions other than those specifically disclosed herewith, so therefore the disclosure is to be understood as illustrative and not in the limiting sense.

Like parts in the drawings are indicated by like characters throughout the several figures thereof.

Fig. 1 is a perspective top view of one embodiment of the invention showing a portion of an ingot mold.

Fig. 2 is a sectional view of the construction shown in Fig. 1.

Referring now more particularly to the drawings, an ingot mold 1 of any well known type is preferably provided with a smooth seat 2 adjacent the mouth thereof on which seat a hot top structure is adapted to set in such manner that the base 4 of the hot top structure forms a tight metal to metal joint with the seat 2 from the mouth of the mold. The hot top structure comprises a shell member which preferably completely encloses heat insulating material 5. The shell structure preferably comprises the base 4, an inner wall 6, a top 7, and an outer wall 8. Preferably, the heat insulating material comprises fire brick or the like around which the shell walls are cast, by pouring molten iron into a matrix in which the heat insulating material is suspended. The base 4 is made smooth in such manner as to cooperate with the seat 2 on the ingot mold and forms a slight extension on the bottom part of the hot top member. Preferably, though not necessarily, the end of the ingot mold carries a dowel pin 10, which is adapted to pass through an opening in the lower flange 11 of the hot top member to guide the same in proper position on the end of the mold.

In the use of this hot top member, particularly with big end down type of ingot molds, the hot top member may be securely fastened to the ingot mold to be carried therewith during pouring and stripping operations, but to be removable therefrom when desired. The hot top member will be subjected to greater wear than the ingot mold proper, and therefore, the life of the hot top member will likely be less than that of the ingot mold. Therefore, it may be necessary to replace worn out hot tops for use on ingot molds which have not become worn out. In order to carry this desideratum, the ingot mold 1 may be provided with locking lugs 12 which preferably are arranged at right angles to the position of the stripping lugs 14 on the mold. The upper flange 15 on the hot top member may be provided with slotted ears 16, and stirrup rods 17 may be locked in the slotted ears 16 by means of pins or keys 18 driven through the eyes 19 of the stirrup rods 17 after the foot portions 20 of the stirrup rods 17 are hooked beneath the locking lugs 12.

This construction comprises an arrangement whereby a substantially permanent hot top member forms a continuation of the ingot mold during casting operations, but is capable of removal for replacement for use with another ingot mold; so that while the hot top member is a permanent structure in the sense that it is not destroyed with each set up, it is independent of the mold in the sense of mobility and removability.

The hot top member having a continuous metal surface prevents molten steel which may come in contact with any portion of the surface from injuring the hot top. Furthermore, the metal to metal joint between the end of the ingot mold and the hot top prevents any undesirable fin from being formed on the upper end of the ingot.

The base of the hot top member slightly overhangs as at 21 the matrix of the mold in order that no shoulder may form on the ingot to lock the ingot in the mold.

Furthermore, the inner walls 6 of the hot top are inclined upwardly and inwardly so that as the molten metal in the hot top cools, it will tend to shrink away from the side walls of the hot top and form a heat insulating air space between the metal within the hot top, and hot top inner wall.

Having described my invention, what I claim is:

1. In a set-up for casting steel ingots the combination of an ingot mold having a substantially plane seating surface adjacent the mouth thereof, a hot top member having a metal inner face forming substantially an extension of the matrix side wall of the mold, heat insulating material to retain heat in molten metal within said hot top, said hot top being provided on the base with a substantially plane seating surface cooperating with the seating surface on the end of the mold to form a metal to metal joint with the top end of the mold, a portion of said base on said hot top extending over the mouth of the mold and entirely above said mold to comprise a metal shoulder adjacent said joint to prevent formations of fins in said joint when an ingot of steel is cast in the set-up.

2. The combination of an ingot mold having an accurate smooth seating surface on the mouth end of the mold, a hot top member comprising a cast iron shell completely enclosing brick heat insulating members which are embedded in said cast iron, said hot top having an accurate seating surface on the bottom thereof and forming a tight metal to metal joint with the smooth seating surface on the end of said mold, lifting lugs on said mold adjacent the mouth thereof, locking lugs on the sides of the mold adjacent the mouth thereof, and means to lock said hot top to said locking lugs to tightly close the metal to metal joint between the hot top and the mold.

3. The combination of an ingot mold having an accurate seating surface adjacent the mouth thereof, and a hot top comprising brick completely embedded in cast iron, a smooth seating surface on the bottom of said hot top and extending over and above the matrix of the mold and forming a tight metal to metal joint with the mold, and means to lock said hot top to said mold.

4. The combination of an ingot mold having an accurate seating surface adjacent the mouth thereof, and a hot top comprising a shell of cast iron, heat insulation carried thereby, a smooth seating surface on the bottom of said hot top, a portion of the seating surface on the bottom of the hot top extending over and above the matrix of the mold and another portion of said surface forming a tight metal to metal joint with the mold, and means to securely lock said hot top to said mold, whereby the combined mold and hot top may be used for a plurality of heats.

5. The combination of an ingot mold having a smooth seating surface on the mouth end thereof, a hot top member having a metal base provided with a smooth seating surface on the bottom thereof and forming a tight metal to metal joint with the end of the mold and with a portion of said surface extending over and above the matrix of the mold, heat insulating material within said hot top, locking lugs upon said mold adjacent the mouth thereof, and means extending from said locking lugs to said hot top to tightly clamp said hot top to the end of said mold so that said mold and said hot top may be used as an entity for a plurality of heats.
ing lugs upon said mold adjacent the mouth

6. An article of manufacture comprising a cast iron hot top for steel ingot molds having metallic exterior and interior side wall faces and with brick entirely embedded within said side walls.

7. The combination of a vertical ingot mold for steel ingots provided with a substantially horizontal seating surface on the top end thereof, and a hot top having a metal shell provided with a seating surface on the bottom thereof forming a tight unluted metal to metal substantially horizontal joint with the top end of the ingot mold, and with a portion of the base of said hot top shell extending over the matrix of the mold and above the end of the mold whereby no part of the hot top extends down into the matrix of the mold.

8. The combination of an ingot mold and a hot top, said ingot mold being provided with a smooth machined seating surface on the mouth end of the mold, said hot top having a metal base portion provided with a smooth flat under surface with a portion thereof extending over the matrix of the mold and another portion thereof forming an unluted metal to metal joint with the seating surface on the end of the mold, lifting lugs on said mold, locking lugs adjacent the mouth end of said mold, and locking means cooperating with said locking lugs to maintain said metal to metal joint tightly closed whereby said hot top and said mold are adapted to be used as a unit during successive stripping and casting operations.

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