Dec. 19, 1939. L. B. LINDEMUTH 2,183,576

CASTING STEEL INGOT

Filed May 26, 1936

Fig. 1.

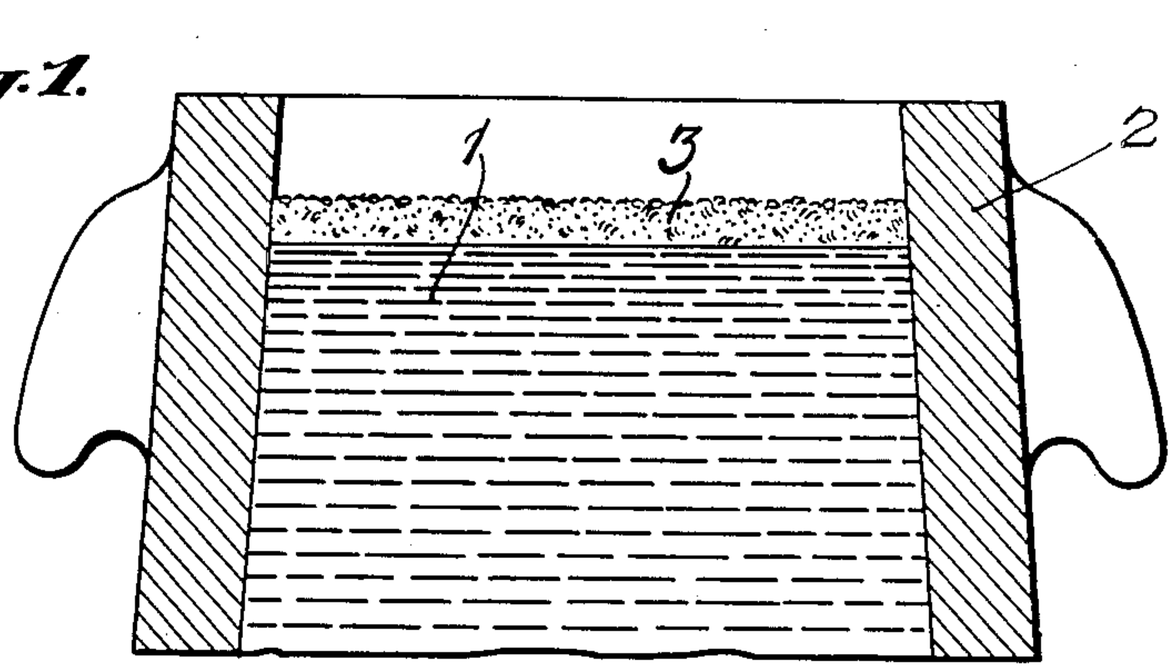


Fig. 2.

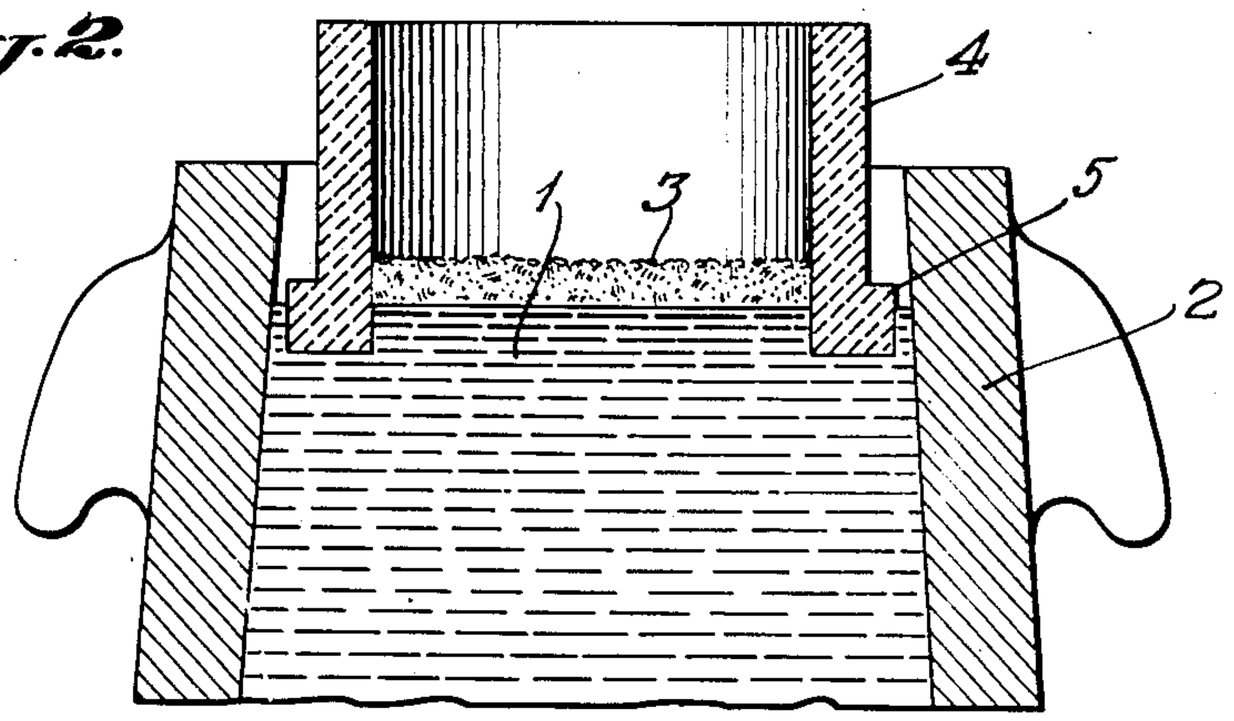
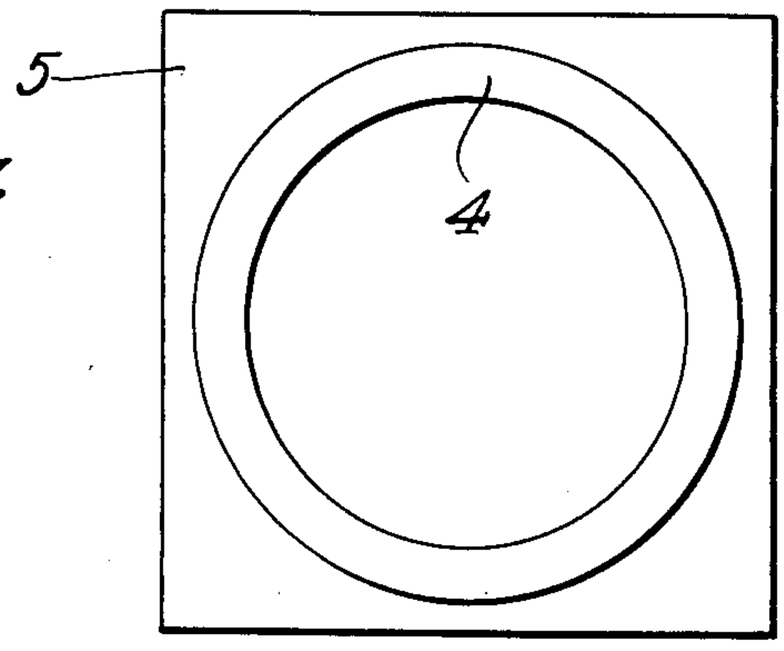


Fig. 3.



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CASTING STEEL INGOT

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Application May 26, 1936, Serial No. 81,806

9 Claims. (Cl. 22—216)

In certain previous applications, Ser. Nos. 712,729 and 712,730, filed February 24, 1934, I have described apparatus and processes of casting ingots by which to eliminate or greatly reduce the usual piping and segregation which have necessitated the cropping of a considerable percentage at the upper end.

The present invention is directed to similar purposes. Embodiments of the invention are illustrated in the accompanying drawing.

Fig. 1 is a vertical section through the upper part of an ingot mold; Fig. 2 is a similar view illustrating a modification and Fig. 3 is a plan of the retainer of Fig. 2.

The purpose of the invention is to retain the heat in the top part of the cast metal so as to keep it fluid. I propose for this purpose to apply on top of the hot metal 1 in the ingot mold 2 a layer of ground cork 3.

This may be ground to any size, from dust to say particles of one-half inch. In order to retard the normal burning rate of the cork it is preferably impregnated by admixture with a small amount of water glass or silicate of soda; which can vary, for example, from five to twenty per cent by weight of the cork. Insofar as we keep the surface of the molten metal deoxidized, it will solidify less rapidly than an oxidized surface. It is preferable, therefore, to incorporate into the cork-water glass mixture a small amount, say one per cent, of some deoxidizing agent such, for example, as ferro-silicon or powdered aluminum. As the cork burns the deoxidizer falls on to the surface of the liquid metal and prevents the formation of a film of oxide on it. The cork, of course, is a heat insulating material and itself assists in maintaining a reducing or non-oxidizing atmosphere on top of the ingot.

A great advantage in the use of cork arises from its lightness. The total carbon content of the weight of cork used is insufficient to alter the composition of the top of the ingot. This is true even though the ingots are refilled, as described in my application (712,729), and the metal for refilling poured through the cork or mixture on the top of the ingot.

Using the mixture of cork, silicate of soda and ferro-silicon on an ingot twenty inches square, a quantity between one-half and one cubic foot is sufficient to maintain the top of an ordinary open-hearth steel ingot fluid for a period of thirty to sixty minutes. Such a quantity of the mixture represents a layer varying from about two to four and one-half inches in depth.

The invention has particular value in casting ingots of rimming steel. By maintaining the surface in an unoxidized condition and insulated against cooling losses, the steel will remain fluid and will rim for a longer period, therefore producing a thicker skin on the ingot. In such steel there is a continued circulation of gases. The cork layer by extending the period of fluidity also extends the period during which the circulation continues. The lightness of the cork tends to prevent its being drawn down into the metal by the circulatory movement thereof. And the quantity of carbon contained is so slight, as explained above, as not to affect the composition of even the upper part of the ingot.

Other materials have been proposed and even used for similar purposes but they have burned away too quickly or have supplied too great a quantity of carbon or have presented other disadvantages in casting ordinary steel and have been practically useless in casting rimming steel.

Where there is to be a second teeming of hot metal into the top of the ingot, I preferably use the scheme shown in Figs. 2 and 3. A retainer 4 having a widened base 5 is placed on top of the primary teeming. It fits loosely in the mold and floats on the metal, its broadened base ensuring that it shall enter only to a slight depth into the metal. The layer of cork or mixture 3 is applied to the surface of the metal within the retainer 4 and the secondary teeming is poured through said layer. This is the method of my above cited application (712,729) with the addition of the layer 3 to hold the heat.

Various other modifications may be made by those skilled in the art without departing from the invention as defined in the following claims.

I claim:

1. The method of casting steel ingots which includes pouring the molten steel into the ingot mold and applying to the top a layer of ground cork to retard the cooling of the top of the cast metal.

2. The method of casting steel ingots which includes pouring the molten steel into the ingot mold and applying to the top a layer of ground cork mixed with a combustion retardant to retard the cooling of the top of the cast metal.

3. The method of casting steel ingots which includes pouring the molten steel into the ingot mold and applying to the top a layer of ground cork mixed with a deoxidizing agent to retard the cooling of the top of the cast metal.

4. The method of casting steel ingots which includes pouring the molten steel into the ingot

mold and applying to the top a layer of ground cork to a depth of about two to five inches to retard the cooling of the top of the cast metal.

5. The method of casting ingots of rimming steel which includes pouring the molten steel into the ingot mold and applying ground cork to the top to retard the cooling of the top of the cast metal and extend the period of rimming.

6. The process of claim 1 followed by a second pouring of molten steel through the layer of cork.

7. The process of claim 1 followed by the application of a floating retainer and a second pouring of molten steel through the layer of cork within the retainer.

8. The method of casting steel ingots which includes pouring the molten steel into the ingot mold and applying to the top a layer of ground cork impregnated with silicate of soda to the extent of about 5 to 20 per cent by weight of the cork to retard the cooling of the top of the cast metal.

9. The method of casting steel ingots which includes pouring the molten steel into the ingot mold and applying to the top a layer of ground cork impregnated with silicate of soda to the extent of about 5 to 20 per cent by weight of the cork with which is incorporated a small percentage of a deoxidizing agent to retard the cooling of the top of the cast metal.

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