Feb. 28, 1950 W. E. BLACK 2,499,292

METHOD OF AND APPARATUS FOR SHEARING FINS FROM INGOTS

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Fig. 1.

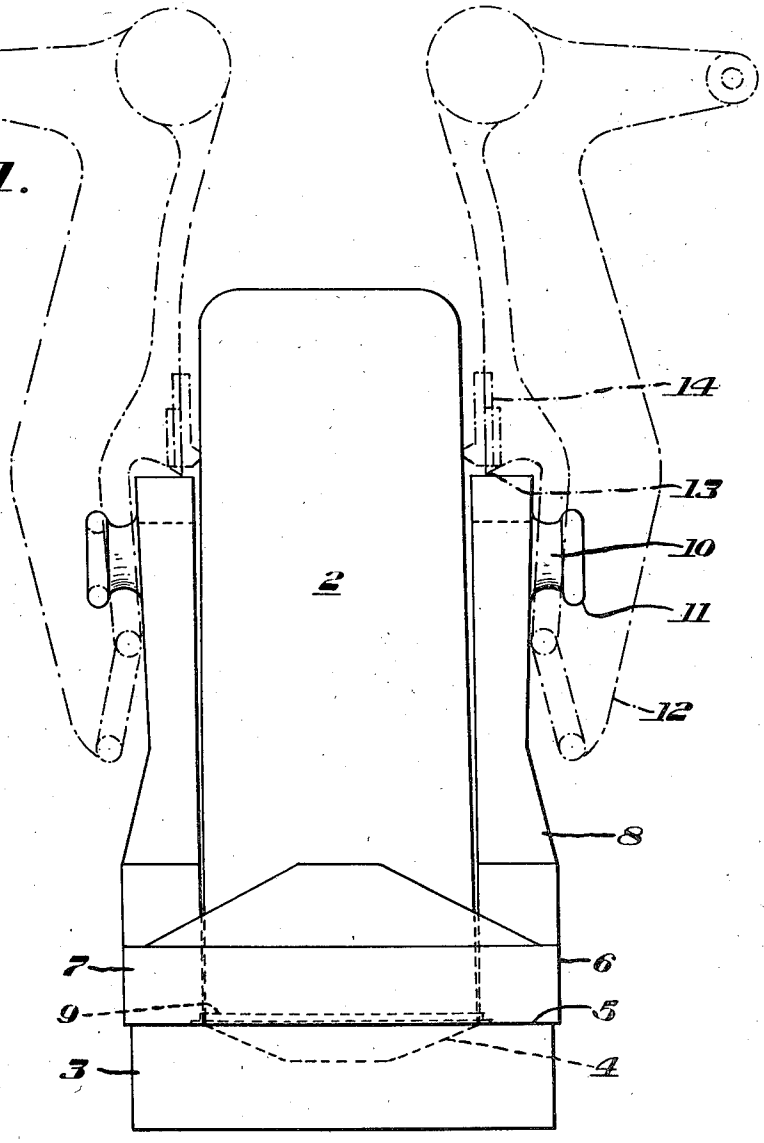
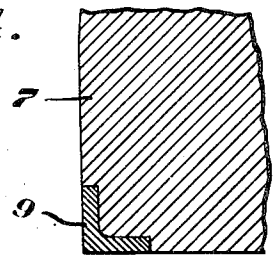


Fig. 4.



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Fig. 2.

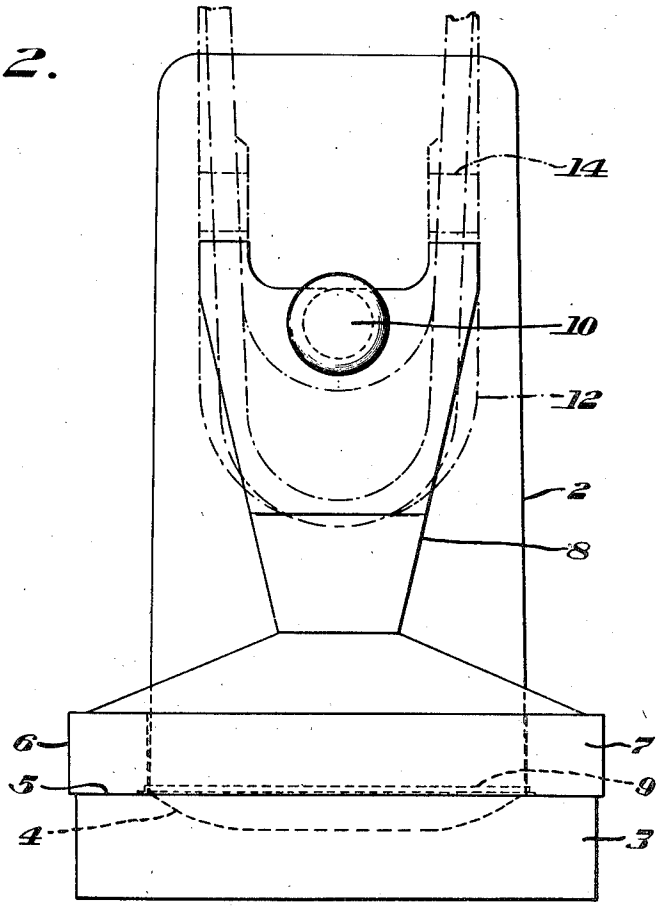
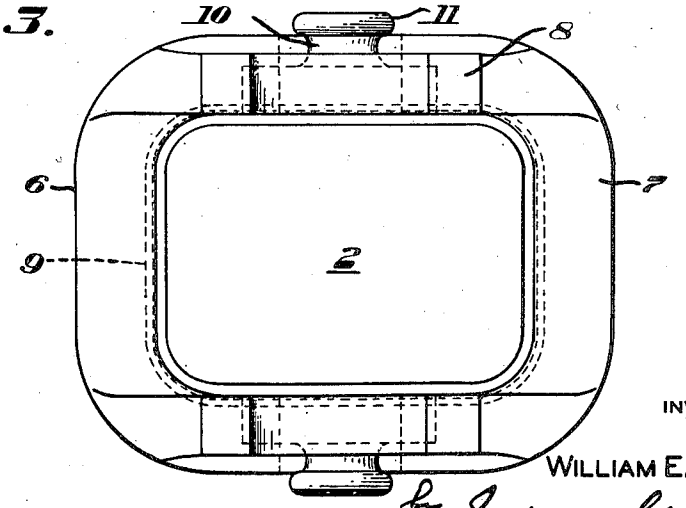


Fig. 3.



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UNITED STATES PATENT OFFICE

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METHOD OF AND APPARATUS FOR SHEARING FINS FROM INGOTS

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Application June 17, 1947, Serial No. 755,219

5 Claims. (Cl. 29—160.4)

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This invention relates to a method of and apparatus for shearing fins from ingots. It relates particularly to the shearing from ingots of fins formed between the bottom of the ingot mold and the top of the stool upon which the mold rests when the ingot is cast.

An ingot is cast by pouring molten metal into a vertically positioned generally tubular mold open at both ends and which rests upon a base known as a stool. The bottom surface of the mold and the top surface of the stool are shaped to conform to each other to confine the metal within the mold. Generally such surfaces are plane and smooth and are intended to fit closely together to prevent any substantial amount of the molten metal from flowing laterally between the bottom of the mold and the top of the stool. However, due to wear and scorification the cooperating surfaces of the mold and stool become somewhat uneven with the result that when an ingot is cast some of the molten metal flows laterally between the bottom of the mold and the top of the stool and forms fins which are integral with the ingot.

Fins formed during casting of an ingot as aforesaid are undesirable and detrimental. If an ingot having such fins on it is rolled in the blooming mill the metal of the fins will form imperfections on the rolled product resulting in the necessity of excessive cropping to remove the imperfections. This means a substantial loss of metal and consequently lowering of the economy of the process.

I provide for removing fins formed on an ingot by metal which flows between the bottom of the ingot mold and the top of the stool when the ingot is cast. I shear off such fins about the periphery of the ingot after removal of the mold so that the ingot as removed from the stool is free from such fins. I may, and, when apparatus as shown in the drawings is empolyed, preferably do, press the fins down against the top of the stool about the periphery of the ingot while the ingot is seated on the stool after removal of the mold and while so pressing down the fins raise the ingot and unseat it from the stool and shear the fins from the ingot, the fins remaining on the stool.

I provide an ingot fin shear for shearing from an ingot fins projecting laterally from the ingot formed between the bottom of the ingot mold and the top of the stool when the ingot is cast comprising a shearing member adapted to be applied downwardly about the ingot while the ingot is seated on the stool after removal of the mold and so as to rest atop the stool, the shearing member being peripherally closed and having its

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bottom shaped to closely embrace the portion of greatest transverse dimension of the ingot so that when simultaneously downward pressure is exerted on the shearing member and the ingot is raised the ingot is unseated from the stool and the fins are sheared therefrom as the ingot moves upwardly. Preferably the shearing member has substantially the same internal shape as the external shape of the ingot in the general plane of the top of the stool with its inner edge disposed in close proximity to the ingot. Desirably the shearing member has a shearing blade at its inner edge. When the ingot is raised and unseated from the stool the shearing blade which is disposed in close proximity to the ingot shears off the fins close to the ingot so that when the ingot is soaked and rolled in the blooming mill its surface will be free from imperfections caused by the originally formed fins.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof and a present preferred method of practicing the same proceeds.

In the accompanying drawings I have shown a present preferred embodiment of the invention and have illustrated a present preferred method of practicing the same in which

Figure 1 is an elevational view of a big end down ingot seated on the stool on which it was cast but with the ingot mold removed and showing an ingot fin shear in place;

Figure 2 is an elevational view similar to Figure 1 looking at the apparatus of Figure 1 from the side.

Figure 3 is the top plan view of the apparatus shown in Figures 1 and 2; and

Figure 4 is a fragmentary vertical cross-sectional view of a portion of the ingot fin shear.

Referring now more particularly to the drawings, there is shown a big end down ingot 2 which has been cast upon a stool 3, the ingot mold having been stripped and removed. The stool 3 has a central depression 4 and, in the form shown, a flat horizontal rim 5 upon which the ingot mold rests when the ingot is being cast. The bottom of the ingot mold which rests upon the surface 5 of the stool is flat and plane and is intended to lie flush against the surface 5 of the stool throughout so as to inhibit the flow of molten metal between the bottom of the mold and the surface 5 of the stool when the ingot is cast. However, through wear and scorification spaces will occur between the bottom surface of the ingot mold and the surface 5 of the stool and during

casting of the ingot small rivulets of molten metal will flow out into those spaces and upon solidifying form fins which project laterally from the ingot. The undesirability of those fins has been explained above. The purpose of the present invention is to provide for shearing off such fins so that the ingot as it passes to the soaking pit and the blooming mill is free from any substantial fins.

I provide a fin shear designated generally by reference numeral 6 and which comprises a peripherally closed bottom portion 7 carrying at opposite sides upwardly extending integral posts 8. The bottom surface of the portion 7 of the shear has in the form shown approximately the same shape as the bottom surface of the ingot mold which was used for casting the ingot except that the bottom surface of the shear is as nearly as practicable free from any depressions or irregularities such as are formed by wear and scorification in the bottom of the ingot mold. Since the shear is not applied when the metal is molten it is not subjected to the scorifying action of molten metal and hence may maintain a more perfect bottom surface than the ingot mold.

The portion 7 of the shear surrounds the ingot at the upper surface 5 of the stool, is of the same cross-sectional shape as the ingot and lies close to it throughout its periphery. The bottom surface of the portion 7 of the shear lies atop the stool in the same relationship thereto as did the ingot mold when the ingot was being cast and also lies atop or is disposed upon the fins which were formed between the surface 5 of the stool and the bottom of the ingot mold when the ingot was cast. Since the inner edge of the portion 7 of the shear lies close to the vertical wall of the ingot it is in position to shear off the fins close to the side of the ingot upon upward withdrawal of the ingot relatively to the shear.

I preferably dispose about the lower inner edge of the portion 7 of the shear a cutting or blade portion 9 shown in Figures 1, 2 and 4 as being of generally L shape in cross section. The portion 9 is preferably made of relatively hard cutting steel so that it is adapted to cut through and sever the fins close to the ingot when the ingot is drawn upwardly relatively to the shear and stool.

Each of the posts 8 has an outwardly projecting trunnion 10 of generally circular cross-section having at its outer end a flange 11, the trunnions being adapted to cooperate with wing tongs 12 of an ingot stripper which may be of any suitable construction. The shear 6 is adapted to be carried by the wing tongs through the trunnions 10. The wing tongs are provided with bearing portions 13 adapted to seat atop the posts 8 when the shear has been lowered into place about the ingot by the wing tongs and the wing tongs have been further lowered to disengage from the trunnions 10 as shown on Figure 1. Thus the mass of the wing tongs is brought to bear on the tops of the posts, the wing tongs thus holding the fin shear down in operative position atop to stool and with the portion 6 of the shear closely surrounding the lower portion of the ingot and lying on top of the fins. The ingot may be unseated and withdrawn upwardly by stripping tongs 14 which may form a part of the ingot stripper and may be of any suitable construction. Since the stripper does not constitute the present invention it is not shown in detail, the wing tongs and the operative ends of the stripping tongs being shown in chain lines in Figure 1 and the operative ends of both the wing tongs and the stripping tongs being shown in chain lines in Figure 2 purely for the purpose of explanation as to the use and practice of the invention.

After the ingot mold has been stripped from the ingot the fin shear 6 is carried by the ring tongs 12 of the stripper to a position above the ingot 2 seated on the stool 3 and is lowered into operative position as shown in Figures 1, 2 and 3. The portion 7 of the shear surrounds the ingot and has the blade 9 at its inner edge. The shape of the shear is the same as the shape of the ingot and the blade 9 lies close to the side of the ingot and upon any fins which have been formed during casting of the ingot, the fins thus being clamped between the upper surface 5 of the stool 3 and the lower surface of the portion 7 of the shear 6.

When the shear has been positioned as just described the wing tongs are lowered to seat upon the tops of the posts 8, the mass of the wing tongs thus being transferred through the posts to the portion 7 of the shear 6. Then the ingot is engaged by the stripping tongs 14 and pulled upwardly. The mass of the wing tongs plus the mass of the shear and stool causes the shear to remain in position on the stool and the stool to remain in place so that as the ingot is unseated and drawn upwardly the fins are sheared off by the blade 9. The ingot then goes to the soaking pit where it is reheated and finally passes to the blooming mill where it is rolled. The fins are virtually entirely removed by the shearing action above described, any stubs of the fins which remain being of no consequence, particularly after the ingot has been soaked prior to rolling.

While I have shown and described a present preferred embodiment of the invention and have illustrated a present preferred method of practicing same it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

I claim:

1. Apparatus for shearing from an ingot fins projecting laterally from the ingot near the bottom thereof formed during formation of the ingot comprising a stool upon which the ingot is formed and whose upper surface shapes the bottom of the ingot and which supports the ingot after the ingot mold has been removed, a shearing member adapted to be applied downwardly about the ingot while the ingot is seated on the stool after removal of the ingot mold and so as to seat atop the stool, the shearing member being peripherally closed and having its bottom shaped to closely embrace the portion of the ingot at the elevation of the upper surface of the stool and to confine between itself and the stool the fins projecting from the ingot, and means for engaging the upper portion of the ingot and raising it while the shearing member is in place as above specified whereby the ingot is unseated from the stool and the fins are sheared therefrom as the ingot moves upwardly.

2. Apparatus for shearing from an ingot fins projecting laterally from the ingot near the bottom thereof formed during formation of the ingot comprising a stool upon which the ingot is formed and whose upper surface shapes the bottom of the ingot and which supports the ingot after the ingot mold has been removed, a shearing member adapted to be applied downwardly about the ingot while the ingot is seated on the stool after removal of the ingot mold and so as to seat

atop the stool, the shearing member being peripherally closed and having its bottom shaped to closely embrace the portion of the ingot at the elevation of the upper surface of the stool and to confine between itself and the stool the fins projecting from the ingot, massive means lowerable onto the shearing member to hold the shearing member down and means for engaging the upper portion of the ingot and raising it while the shearing member is thus held down whereby the ingot is unseated from the stool and the fins are sheared therefrom as the ingot moves upwardly.

3. Apparatus for shearing from an ingot fins projecting laterally from the ingot near the bottom thereof formed during formation of the ingot comprising a stool upon which the ingot is formed and whose upper surface shapes the bottom of the ingot and which supports the ingot after the ingot mold has been removed, a shearing member adapted to be applied downwardly about the ingot while the ingot is seated on the stool after removal of the ingot mold and so as to seat atop the stool, the shearing member being peripherally closed and having its bottom shaped to closely embrace the portion of the ingot at the elevation of the upper surface of the stool and to confine between itself and the stool the fins projecting from the ingot and having a shear blade at its inner edge, and means for engaging the upper portion of the ingot and raising it while the shearing member is in place as above specified whereby the ingot is unseated from the stool and the fins are sheared therefrom as the ingot moves upwardly.

4. A method of forming and trimming an ingot comprising pouring molten metal into an open-bottomed ingot mold disposed upon a stool to form an ingot whose bottom is shaped by the upper surface of the stool and some of the metal of which forms laterally projecting fins between the bottom of the ingot mold and the stool, removing the ingot mold, leaving the ingot seated upon and adhering to the stool and with the fins projecting laterally from the ingot near the bottom thereof, applying downwardly about the ingot so as to seat atop the stool a shearing member which is peripherally closed and the bottom of which is shaped to closely embrace the portion of the ingot at the elevation of the upper surface

of the stool to thereby confine between the shearing member and the stool the fins projecting from the ingot, engaging the upper portion of the ingot and raising it while the shearing member is in place as above specified and thereby unseating the ingot from the stool and shearing the fins therefrom.

5. A method of forming and trimming an ingot comprising pouring molten metal into an open-bottomed ingot mold disposed upon a stool to form an ingot whose bottom is shaped by the upper surface of the stool and some of the metal of which forms laterally projecting fins between the bottom of the ingot mold and the stool, removing the ingot mold, leaving the ingot seated upon and adhering to the stool and with the fins projecting laterally from the ingot near the bottom thereof, applying downwardly about the ingot so as to seat atop the stool a shearing member which is peripherally closed and the bottom of which is shaped to closely embrace the portion of the ingot at the elevation of the upper surface of the stool to thereby confine between the shearing member and the stool the fins projecting from the ingot, lowering massive means onto the shearing member to hold the shearing member down, engaging the upper portion of the ingot and raising it while the shearing member is thus held down and thereby unseating the ingot from the stool and shearing the fins therefrom.

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