Oct. 15, 1935. D. P. ANDERSON 2,017,384

APPARATUS FOR STRIPPING INGOT MOLDS

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Fig. 1.

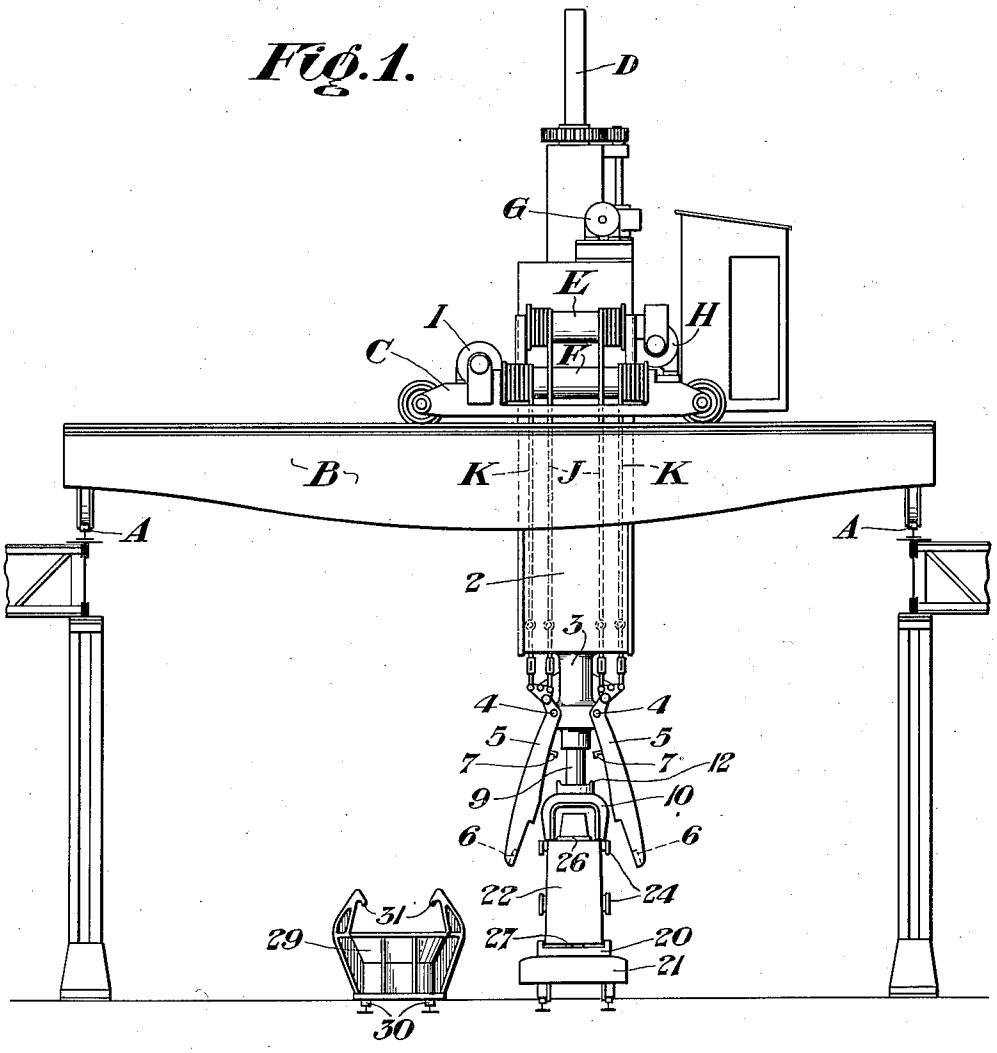

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Fig. 2.

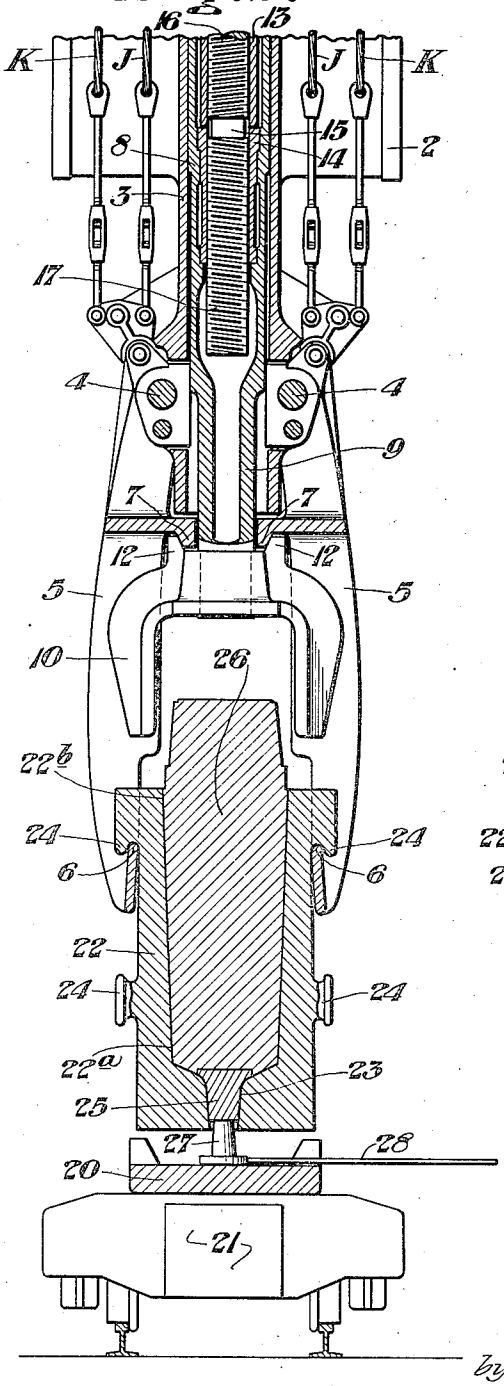

Fig. 3.

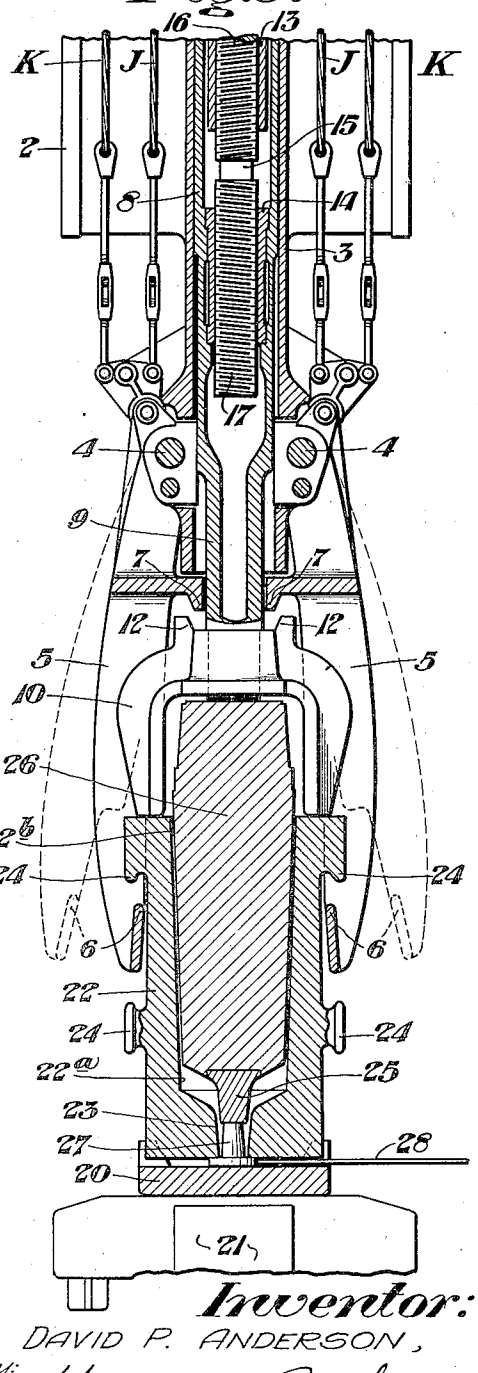

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Fig. 4.

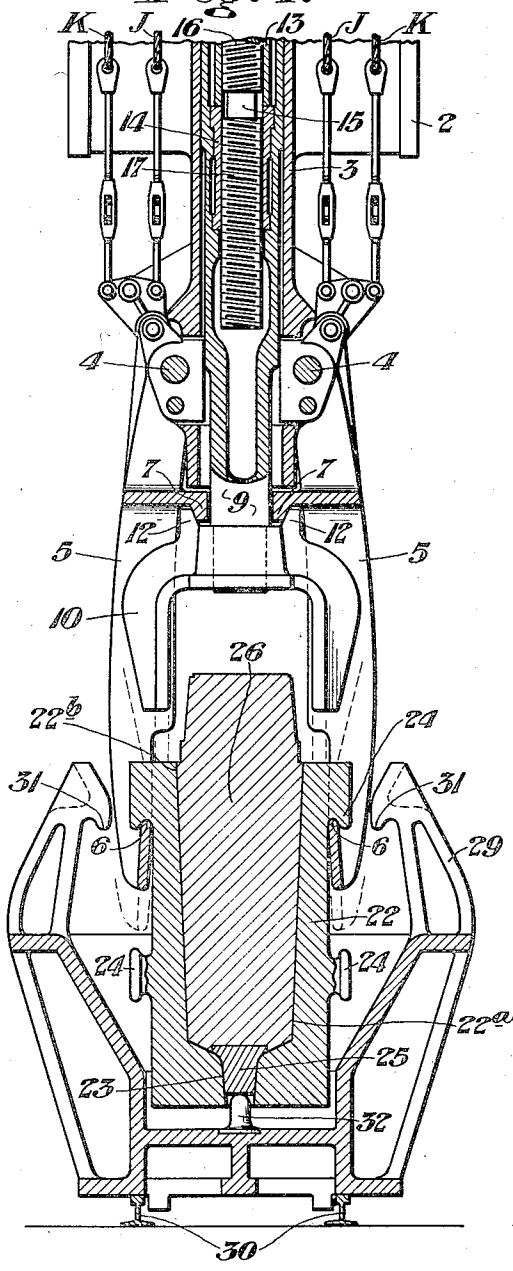
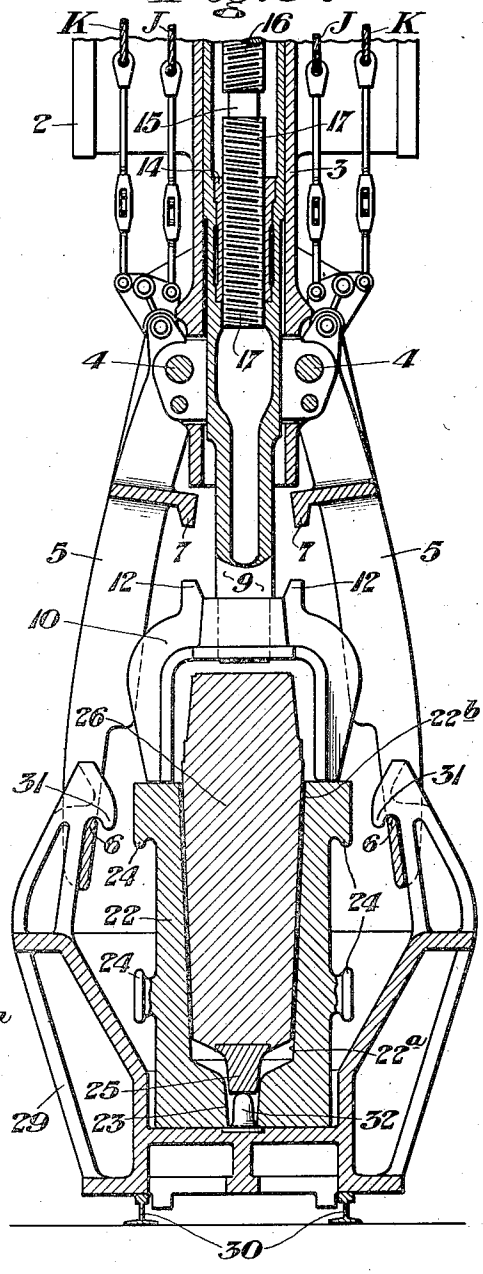


Fig. 5.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR STRIPPING INGOT MOLDS

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Application October 19, 1933, Serial No. 694,317

1 Claim. (Cl. 22—95)

This invention relates to a novel method and apparatus for stripping ingot molds, and particularly to ingot molds of the "big-end-up" type, although not limited thereto.

In the past, it has been customary in the vast majority of open-hearth steel plants to cast ingots in heavy, vertical cast-iron molds having a slight taper, with the smallest area adjacent the top, and which is open at both ends. When "teeming" or pouring the ingot, the molds are placed on flat cast-iron plates or "stools" which are mounted on especially adapted ingot mold cars. After a "heat", or ladle full of steel is "teemed" into a row of molds and the molten metal has sufficiently solidified, a train of ingot mold cars, carrying the molds and ingots, is transported to an "ingot stripper" for removal of the mold, after which the ingots are charged into a soaking pit or reheating furnace.

The conventional "ingot stripper" is in the form of an electric overhead traveling crane under which are two or more pairs of parallel tracks, on one of which the train of loaded ingot mold cars is adapted to stand. On an adjoining track a train of empty ingot mold cars carrying "stools" only is placed. The "stripping" mechanism depends from the overhead crane, and operates in such manner as to seize the molds by lugs cast on its side by means of a pair of links, lift them vertically off of the ingot and place them on the empty stools on the ingot mold cars on the adjoining tracks.

There have been several recent developments in the form of ingots and molds which are calculated to improve the soundness of the metal of the ingots. One of these developments contemplates the reversal of the taper in the mold, making it what is now known as the "big-end-up" type. Another advance has been to provide a refractory "hot top" to provide a sink-head or "shrink-head" on top of the ingot.

It is, of course, obvious to those skilled in the art that the acceptance of the superior "big-end-up" mold has necessitated the provision of new methods and apparatus for stripping and handling the ingots and molds. Due to the small reduced end of the ingot, it can no longer stand unsupported for transportation to the soaking pit or reheating furnace after "stripping", as was the usual practice. It is not feasible to "up-end" ingots or lay them down upon their sides, as the metallurgical characteristics of the ingots would be badly affected.

In view of the foregoing, it has become common practice to loosen the ingot in the mold at the ingot stripper and to then leave it in the mold for transportation to the soaking pit, where it is withdrawn and charged into the furnace. The conventional soaking pit cranes are provided with tongs for lifting purposes only, and it is therefore necessary to convey the molds and ingots to the "stripper" for "feeling" the ingot, and to force loose what are known as "stickers."

One object of the present invention is the provision of a novel apparatus for stripping ingots, together with a supplementary means for positively loosening "seized" ingots, regardless of how tightly they stick to the mold.

Another object is to provide a novel means for stripping ingot molds in a very rapid and efficient manner, together with means for preventing the dropping of the ingot mold from the apparatus during the operation.

A further object is to provide a novel apparatus of the class described which may be easily and cheaply manufactured and used in conjunction with conventional types of lifting mechanism, thereby obviating the necessity of an expensive and troublesome installation.

These and still further objects will be apparent after referring to the drawings, in which:

Figure 1 is an elevation of the apparatus of the invention.

Figure 2 is an enlarged sectional elevation.

Figure 3 is a view similar to Figure 2 of the apparatus in another stage of operation.

Figures 4 and 5 are sectional elevations of a modified form of the invention in two stages of operation.

Referring more particularly to the drawings, the letters A indicate a pair of tracks on which an overhead crane B is adapted to travel. A conventional overhead crane trolley C is adapted for movement on the crane B and supports a vertically disposed screw D and reels E and F. The screw D may be moved vertically with respect to the overhead trolley C by means of a motor G, while the reels E and F may be rotated by means of motors H and I, respectively.

A pair of cables J is secured to the reel E while a similar pair of cables K is secured to the reel F.

A carriage 2 is secured to the ends of the cables J and K in order that it may be raised and lowered by rotating the reels E and F in unison.

An extended sleeve 3 is carried by the carriage 2 and pivotally supports, as at 4, a pair of hoisting links 5. The hoisting links 5 are moved about the pivots 4 by means of the cables J and K

which are secured to the reels E and F of the overhead crane, and are provided with lug-engaging surfaces 6 on their lower ends. The intermediate portions of the hoisting links 5 carry inwardly projecting lugs 7.

An inner sleeve 8 is disposed within the carriage 2 and extended sleeve 3, and supports a ram 9 on its lower end, the latter further supporting a downwardly extending yoke 10. A pair of dogs 12 are mounted on the upper portion of the yoke 10 and serve to engage the inwardly projecting lugs 7 of the links 5 in such manner as to prevent their spreading when the yoke is raised to a predetermined position with respect to the carriage 2.

An elongated nut 13 is associated with the overhead crane and extends into the carriage 2 and extended sleeve 3. A similar elongated nut 14 is connected to the inner sleeve 8 carrying the ram 9, and is reversely threaded with respect to the nut 13.

A double acting screw 15 is provided with a threaded portion 16 for the nut 13, and a similar threaded portion 17 for the nut 14, and as before stated is rotated from the overhead crane trolley C as by means of the motor G.

A plurality of ingot mold stools 20 is disposed on the usual ingot mold cars, or buggies, 21, and support ingot molds 22 of the "big-end-up" type. That is to say, the lower portion 22^a of the ingot mold 22 is considerably smaller in area than the upper portion 22^b. The molds 22 are provided with a tapered aperture 23 in their bottoms and external lugs 24 to enable their handling. A tapered plug 25 is provided for the aperture 23 in each of the molds 22 and extends partially therethrough.

After molten metal has been "teemed" into the molds 22, the solidified ingots 26 are transported on the stools 20 and ingot mold cars 21 and, with their "hot-tops" removed, to the ingot mold stripper of the invention, where it is desired to loosen the ingots from the molds prior to their removal and transfer to the usual soaking pit, or reheating furnace.

In accordance with the teaching of the present invention, the reels E and F of the overhead crane trolley are rotated in such manner as to lower the carriage 2 until the lug-engaging surfaces 6 of the hoisting links 5 are disposed under the upper of the lugs 24 on the ingot mold 22. The reels E and F are then adjusted with respect to each other and rotated in the opposite direction in such manner as to raise the ingot mold from its stool 20. A pin 27 which is mounted on the rod 28 in order that it may be handled from a remote distance is placed on the stool 20 in such manner as to permit it to extend into the aperture 23 when the mold is again lowered by the reels E and F of the overhead crane trolley C.

After the mold is lowered, the pin 27 engages the tapered plug 25 and causes the ingot mold 22 to move downwardly with respect thereto, thereby loosening the ingot.

Due to various imperfections in the mold and the steel ingot disposed therein, the operation is sometimes insufficient to loosen the ingot.

Referring to Figures 4 and 5, a basket 29 is placed adjacent the ingot mold cars 21, and preferably on tracks 30, and is of such size and dimension as to freely accommodate an ingot mold 22. The basket 29 is provided with lugs 31 on its upper end and a centrally disposed pin 32 on the bottom thereof.

When the hoisting links 5 are engaging the lugs 24 of the ingot mold, the yoke 10 is in an upwardly retracted position such as will permit the dogs 12 to engage the inwardly projecting lugs 7 and prevent the links 5 from spreading with the consequent possibility of the release of the ingot mold.

The overhead crane trolley C raises the carriage 2 in such manner as to permit the ingot mold 22 to clear the upper portion of the basket 29, whereupon it is placed therein in such manner as to permit the pin 32 to extend into the aperture 23 and engage the bottom of the tapered plug 25. The screw 15 is rotated to permit the yoke 10 to descend and make contact with the top of the ingot mold. The cables K are lowered and cause the lug-engaging surfaces 6 of the hoisting links 5 to engage the lugs 31 of the basket. The yoke 10 further descends and serves to push the ingot mold 22 down into the basket while the links 5 are biased upwardly by raising the carriage 2 through the cables J. This action causes the ingot mold 22 to be pushed downwardly with respect to the ingot 26 regardless of how tightly it may have "frozen" therein.

It is to be understood that the overhead crane trolley C may be one of a number of conventional types, and forms no part of the present invention other than as means for operating the various elements of the ingot mold stripper, and while I have shown and described one specific embodiment of my invention, it will be understood that I do not wish to be limited thereto, since various modifications may be made without departing from the scope of my invention, as defined in the following claim.

I claim:

Apparatus for stripping an ingot mold having a plug in its bottom comprising a carriage supported by an overhead crane, a pair of hoisting links pivoted on said carriage, a pair of oppositely threaded elongated nuts slidably disposed in said carriage in vertical juxtaposition, a double acting screw in threaded engagement with said nuts, means associated with said overhead crane for rotating said screw, a ram connected to the lowermost of said elongated nuts, interlocking means on said ram and said hoisting links for restraining the latter from separation when said ram is in a predetermined position, and means for rotating said screw in such manner as to cause said ram to move downwardly when said links are moving upwardly with respect to said carriage.

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