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G. K. ROBERTS.

APPARATUS FOR EXTRACTING INGOTS FROM MOLDS.

(Application filed Nov. 29, 1898.)

(No Model.)

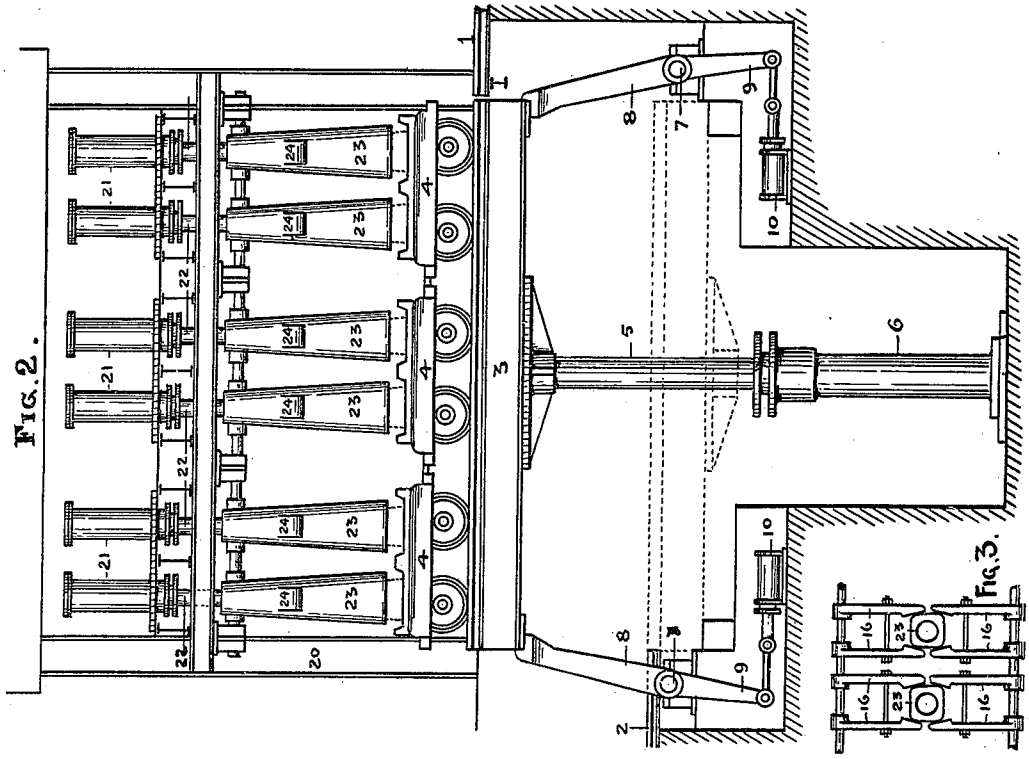


FIG. 2.

FIG. 3.

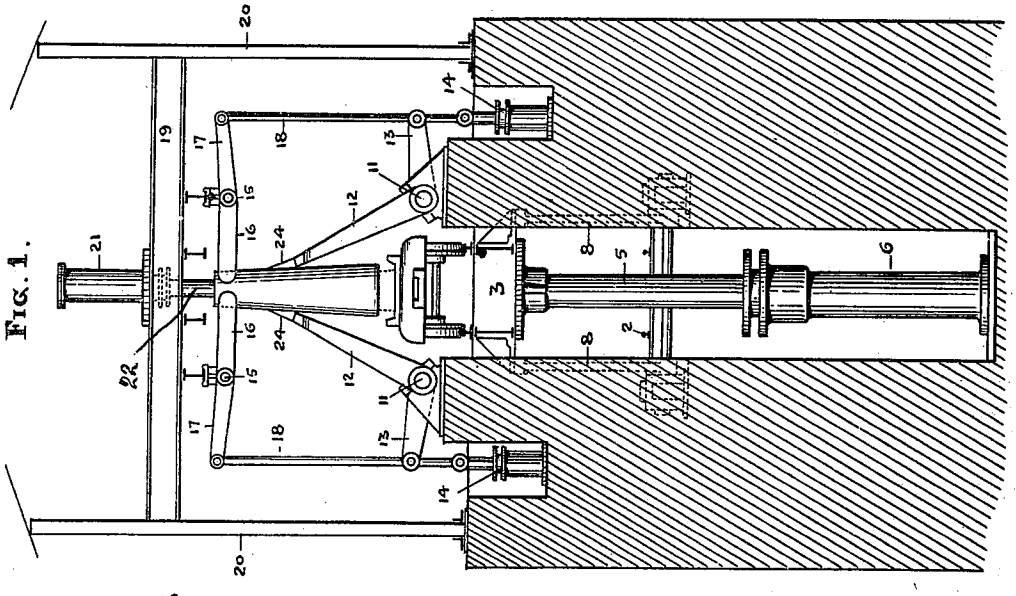


FIG. 1.

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UNITED STATES PATENT OFFICE.

GEORGE K. ROBERTS, OF JOLIET, ILLINOIS.

APPARATUS FOR EXTRACTING INGOTS FROM MOLDS.

SPECIFICATION forming part of Letters Patent No. 667,577, dated February 5, 1901.

Application filed November 29, 1898. Serial No. 697,766. (No model.)

To all whom it may concern:

Be it known that I, GEORGE K. ROBERTS, a citizen of the United States, residing at Joliet, in the county of Will and State of Illinois, have invented certain new and useful Apparatus for Extracting Ingots from Molds, of which the following is a specification, reference being had therein to the accompanying drawings and the figures thereon, which form a part of this specification.

My invention relates to the manufacture of steel ingots, and it has for its object to provide a serviceable and efficient apparatus for handling the molds and their cars or buggies and removing the ingots from the molds.

In steel manufacturing and converting plants the molten steel is poured into molds which are stationed in an upright position on cars or buggies, and when the steel has cooled sufficiently to form a solid mass the ingot is removed from the mold, the removal being effected as soon as possible after the metal becomes solidified in order to retain and utilize the heat therein in the further working of the steel. My invention is designed to effect such manipulation of the cars, molds, and ingots as will most fully meet the requirements of economical and efficient steel-manufacturing plants, and it accordingly consists of means which will be now described, reference being had to the drawings, in which—

Figure 1 is an end elevation of the apparatus embodying my invention, the supporting masonry being shown in section. Fig. 2 is a side elevation of the apparatus shown in Fig. 1. Fig. 3 is a plan view of a pair of ingot-molds and their retaining-arms.

In the apparatus shown in the drawings the railway-track 1, upon which the ingot-cars 4 are transported from the point where the molds are filled, terminates at one side of an elevator-well, a similar track 2 being located in a lower plane and terminating adjacent to the elevator-well on the opposite side from the track 1. The elevator-platform 3, which is located and operates in the well, is provided with a section of track of sufficient length to receive thereon a plurality of ingot-cars and is so arranged and operated by means of the piston 5 of a hydraulic cylinder 6 as to be moved vertically the necessary distance to bring its track into alinement with either the track 1 or the track 2.

Journaled in suitable bearings at the sides of the elevator-well are two rock-shafts 7, having rigidly fastened thereto upwardly-projecting arms 8 and downwardly-projecting arms 9, the latter of which are connected to the pistons of hydraulic cylinders 10 for the purpose of moving the upper ends of the arms 8 inward to engage the elevator-platform 3 and serve as supports therefor when said platform is in the position shown in Figs. 1 and 2 and for the purpose of moving said arms outward when it is desired to lower the platform.

Journaled in suitable bearings at the top of the elevator-well and at right angles to the shafts 7 are two rock-shafts 11, to each of which are rigidly fastened the lower ends of a set of upwardly-projecting arms 12 and the inner ends of one or more laterally-projecting arms 13, the outer ends of the latter being connected to the pistons of hydraulic cylinders 14. Two rock-shafts 15, located substantially parallel to and above the rock-shafts 11, are journaled in suitable bearings supported by cross-beams 19, forming parts of a framework 20. Each of the rock-shafts 15 is provided with a plurality of pairs of inwardly-projecting and approximately horizontal arms 16, there being one pair of these arms for each mold to be handled by my apparatus. The rock-shafts 15 are actuated by means of arms 17, the inner ends of which are rigidly attached to the said shafts and the outer ends of which are connected to the pistons of the hydraulic cylinders 14 by means of rods 18.

Supported by the bars 19 of the framework 20 are hydraulic cylinders 21, so located and arranged that their pistons 22 will operate vertically and be in position to severally enter the molds handled by my apparatus.

As indicated in the drawings, each ingot-car will support one pair of ingot-molds 23 and the elevator-platform 3 will accommodate three cars. It will be understood, however, that my invention is not limited as regards the number of cars handled at one time or the number of molds per car. In order that my apparatus may be operated in the manner intended, each mold should be provided with

some means with which the free ends of the arms 12 may engage when said arms are in position to support the molds. I have shown each mold as provided with lugs 24 on two of its opposite sides, so located as to perform the desired function; but it will be understood that other means might be employed.

In utilizing my invention for handling ingot-cars and their loads and extracting ingots from the molds the loaded cars are received by way of the track 1 from the location where they were filled with molten steel and are run upon the elevator-track, the elevator being in the position indicated in full lines in the drawings, the upper ends of the arms 8 being in engagement with the platform, so as to hold it securely in that position, and the molds being located directly under the corresponding pistons 22 of the cylinders 21. The elevator will then be preferably raised a short distance and the upper ends of the arms 12 moved inward into contact with the molds by means of their operating mechanism, so that said ends will be located beneath the lugs 24. The arms 16 will be simultaneously lowered, as indicated in the drawings, so that their ends will rest against the sides of the molds, near their upper ends, in order to serve as retainers to prevent the molds from swaying. The elevator will then be lowered to the position indicated in the drawings, and since the molds are now supported by means of the arms 12 the ingots are supported solely by the cars. In case any of the ingots stick to the molds to such an extent that the action of gravity does not effect their separation the pistons 22 of cylinders 21 may be actuated to force the ingots out of the molds and onto the cars. After all the ingots have been separated from their molds the arms 8 will be moved away from the elevator-platform and the latter lowered by means of its operating mechanism, so as to bring its track into the plane of track 2, in which position the tops of the ingots are beneath the bottoms of the molds, and the cars on which the ingots are supported may be run out upon the track 2 and the ingots unloaded therefrom by suitable means and at the point desired. After the cars are unloaded they may be returned over the track 2 to the elevator and again elevated to receive the molds, the arms 12 being moved away from the latter, so as to permit them to rest upon the cars. The cars bearing the molds may now be run out upon the track 1 and hauled to the location of the ladle, to be again filled. If desired, the apparatus may be of such dimensions that the cars may be raised to such height above the track 1, in order to bring the supporting-arms for the molds into operative engagement therewith, that when the cars are again lowered to the level of the track 1 the tops of the ingots will be beneath the bottoms of the molds.

The apparatus may also be so constructed and arranged as to dispense with the elevation of the cars above the track 1 for the purpose of enabling the free ends of the arms 12 to pass beneath the lugs on the molds.

Other variations in the form and arrangement of parts may be made without departing from the spirit and scope of my invention, and I therefore desire it to be understood that my invention is not limited as regards the specific number, location, or form of parts utilized in practicing my invention.

I claim as my invention—

1. In apparatus for extracting ingots from molds, the combination with an elevator, of movable means supported on the foundation at the sides of and adjacent to said elevator and arranged to project upwardly to support the molds against downward thrust, and means for forcing the ingots from the molds when held by said supporting means.

2. In apparatus for extracting ingots from molds, the combination with an elevator, of mold-supporting arms mounted at the sides of and adjacent to said elevator and means for moving said arms into and out of engagement with the molds.

3. In apparatus for extracting ingots from molds, the combination with an elevator adapted to receive an ingot-car and to raise and lower the same, of mold-supporting arms and mold-steadying arms and means for moving said arms into and out of engagement with the molds.

4. The combination with an elevator having a track, a track having a terminus in close proximity to the elevator-well and an ingot-car provided with ingot-molds having side lugs, of mold-supporting arms and means for rocking the arms to move their ends under the mold-lugs when the ingots are to be extracted and for rocking the arms away from the molds when the car is elevated to receive them.

5. In apparatus for extracting ingots from molds, the combination with an elevator, of ingot-cars and tracks therefor, oppositely-arranged, pivoted, mold-supporting prop-arms, horizontally-arranged, pivoted, sway-preventing arms, means for jointly actuating said arms to engage molds placed on the ingot-cars carried by the elevator, and vertically-arranged pistons stationed above the molds and adapted to be operated to eject from said molds such ingots as resist the action of gravity, substantially as specified.

6. In apparatus for extracting ingots from molds, the combination with an elevator and its actuating mechanism, of rock-shafts, arms arranged to engage the molds rigidly connected to said rock-shafts, and actuating mechanism connected to said rock-shafts to rock the same, substantially as and for the purpose set forth.

7. In apparatus for extracting ingots from molds, the combination with an elevator, of mold-supporting arms and mold-steadying arms, and actuating mechanism connected to

both sets of arms whereby they are simultaneously operated, substantially as and for the purpose set forth.

8. In apparatus for extracting ingots from molds, the combination with an elevator, of mold-supporting arms and mold-steadying arms, means for actuating said arms simultaneously, ingot-ejectors and means for actuating the same, substantially as and for the purpose specified.

9. In apparatus for extracting ingots from molds, the combination with one or more molds and an elevator for raising and lowering the same, of means for supporting the mold or molds while the elevator lowers the ingots therefrom and additional means for steadying the molds when supported in elevated position.

10. In apparatus for extracting ingots from molds, the combination with an ingot-car and molds therefor having side lugs, of an elevator for said car, adjustable supporting-arms for engagement with said lugs when the molds are in their elevated positions, steadying-arms for said molds and means for moving the said supporting-arms and said steadying-arms, simultaneously.

GEORGE K. ROBERTS.

In presence of—
PETER MERGLER,
WM. J. HUTCHINS.