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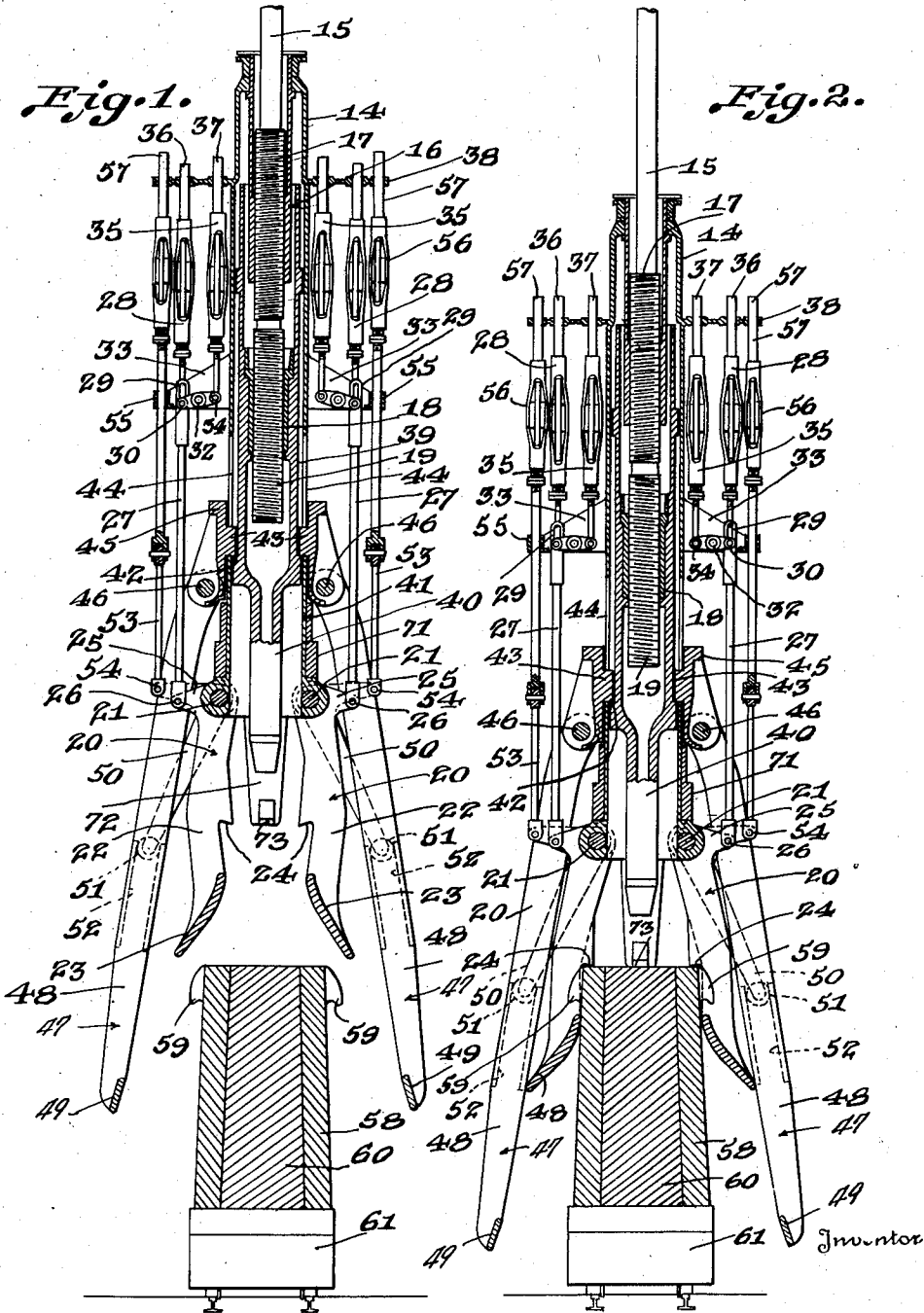
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2,063,676

INGOT STRIPPER

Filed Nov. 7, 1935

6 Sheets-Sheet 1



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Fig. 3.

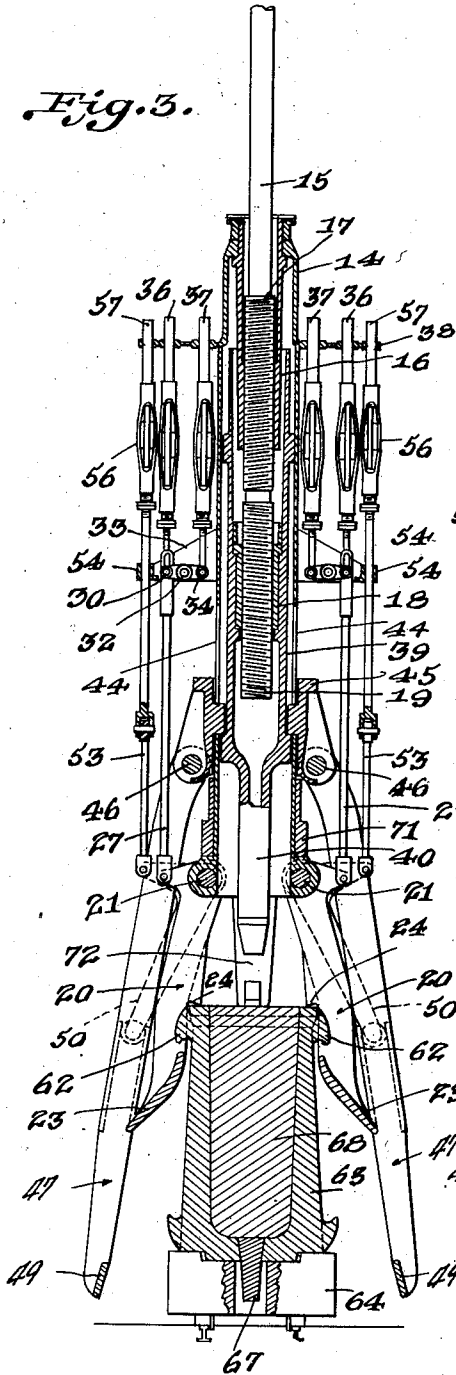
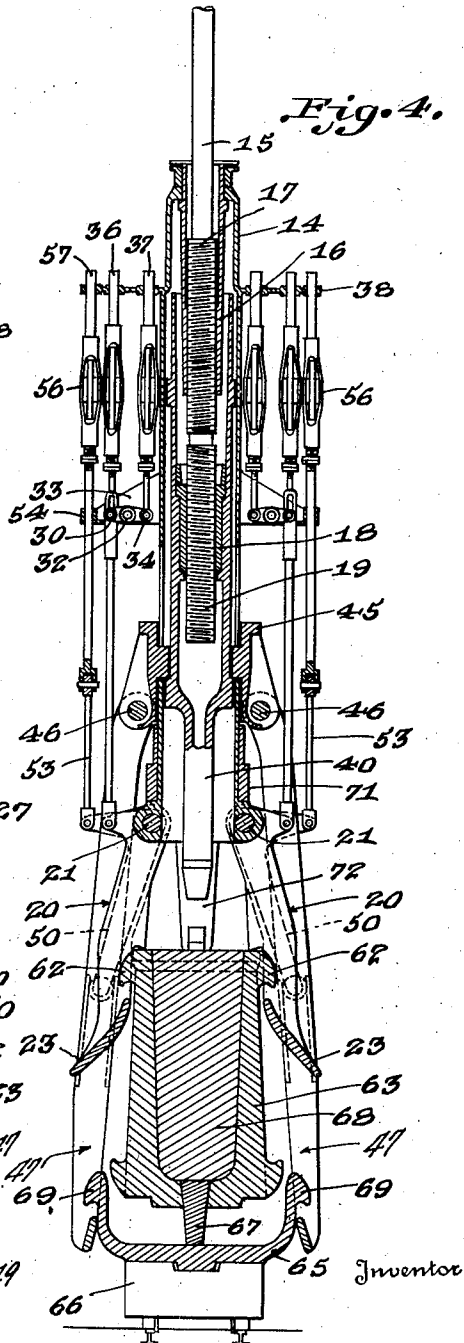


Fig. 4.



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Fig. 5.

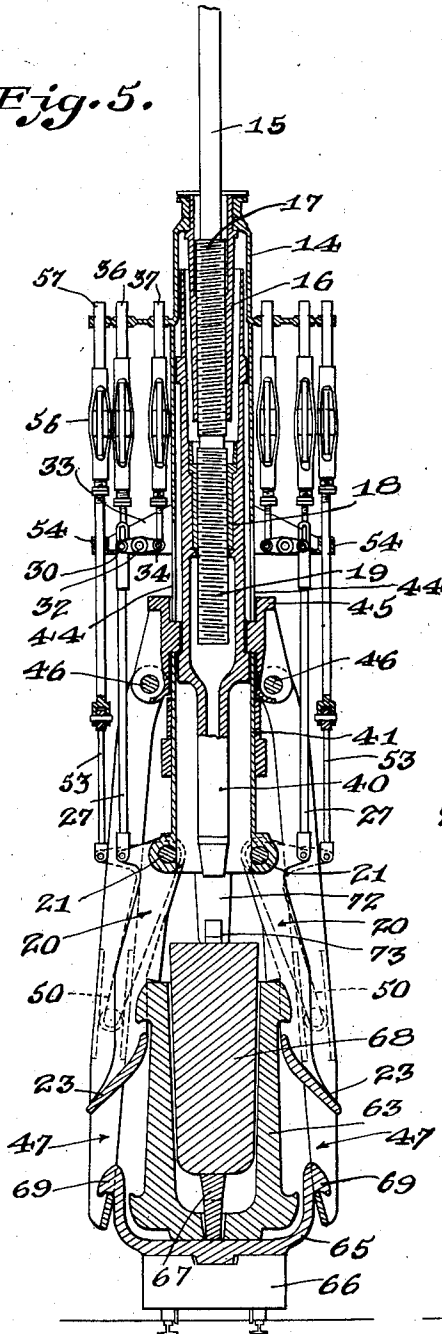
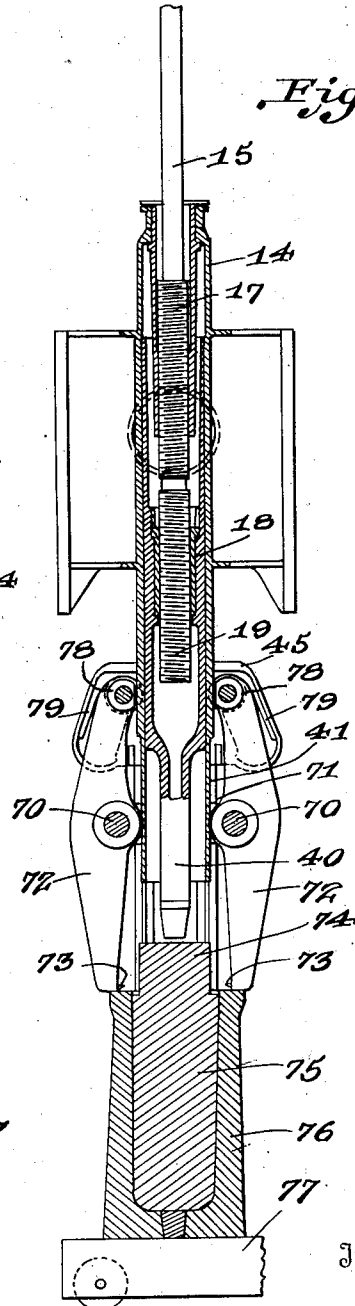


Fig. 6.



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Fig. 7.

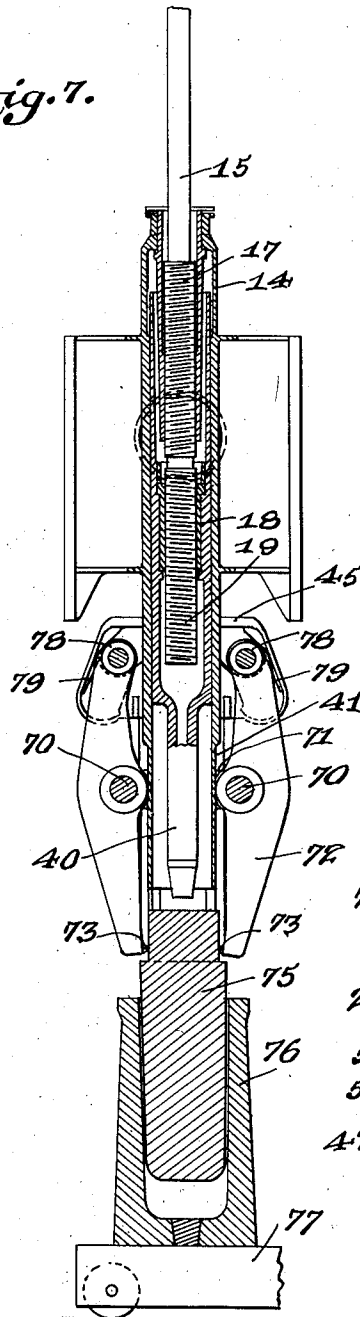
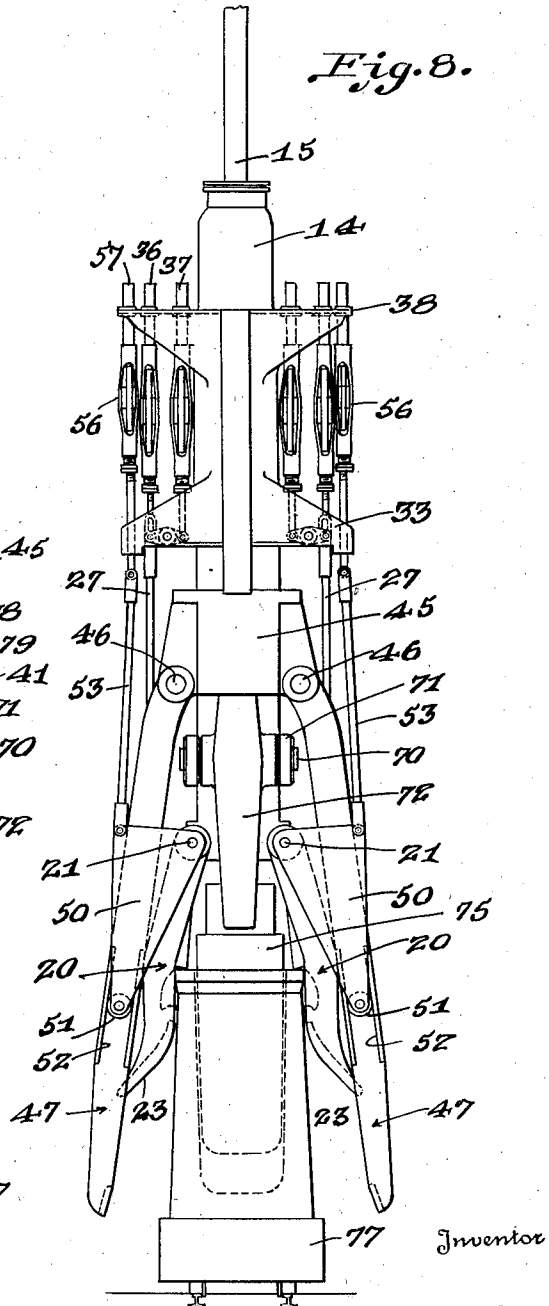


Fig. 8.



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Fig. 9.

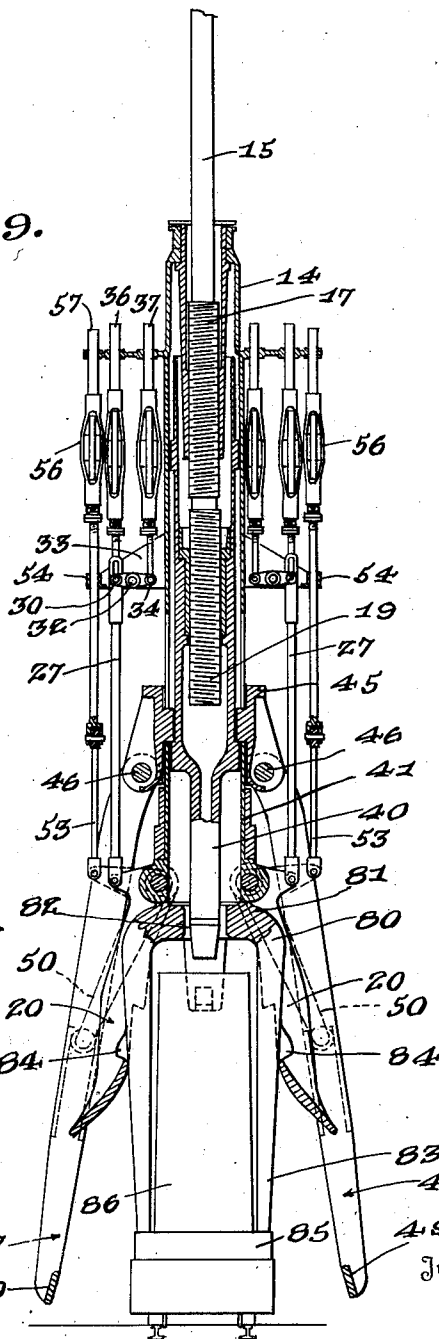
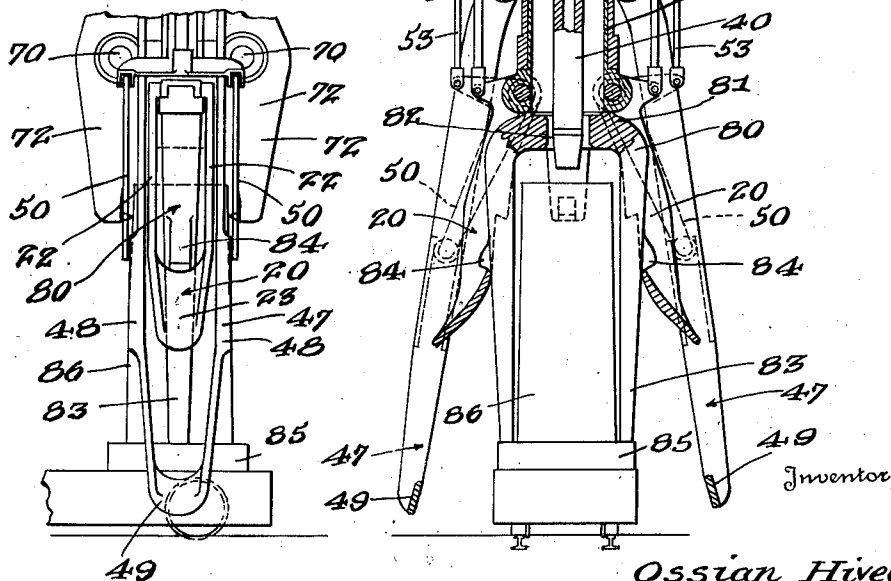


Fig. 10.



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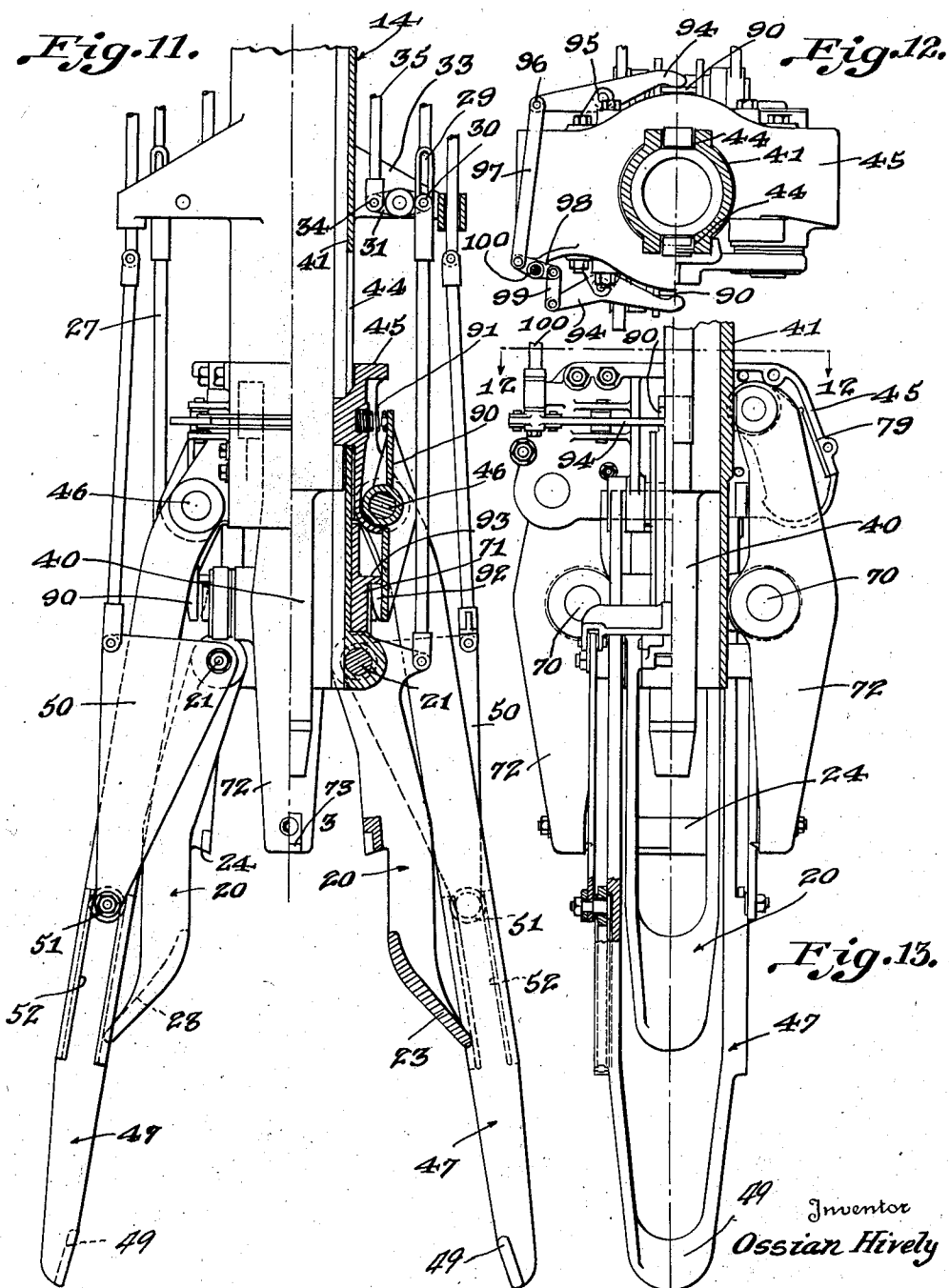
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UNITED STATES PATENT OFFICE

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INGOT STRIPPER

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Application November 7, 1935, Serial No. 48,740

16 Claims. (Cl. 22—95)

This invention relates to improvements in ingot strippers and more particularly to an ingot stripper of universal application capable of stripping standard, flush type or hot-top ingots from molds.

As is well known, there are three principal types of ingot molds used at present. First, the standard or "small-end-up" type, which has been used for a great many years and which is still used for probably 80% of the ingot output. The second type of ingot mold is what is known as the flush or "big-end-up" type. With this type the ingot must be stripped upwardly from the mold. The third type of ingot mold is what is known as the "hot-top" or "big-end-up" type, and in this case the ingot must also be stripped upwardly from the mold. The primary object of the present invention is to provide a machine which is capable of stripping all three types of ingots, without the application or the removal of any parts from the machine. All of the functioning is controlled by the cage operator and requires very little more operating mechanism than has been used heretofore.

A further object is to supply an attachment for a specific purpose. In reference to this it will be noted that after the molds have been stripped from small-end-up or standard ingots, it is found that some of the ingots have fused fast to the stools and it then becomes necessary to detach the ingots from the stools. By the use of my auxiliary attachment, such ingots may be removed from the stools.

With the foregoing objects outlined and with other objects in view which will appear as the description proceeds, the invention consists in the novel features hereinafter described in detail, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a vertical sectional view of the essential parts of my universal stripping mechanism and showing the mechanism in position to descend on a standard type mold having an ingot therein.

Fig. 2 is a similar view with the parts lowered into position to start the lifting of the mold from the ingot.

Fig. 3 is a similar view of the mechanism shown ready to lift a flush type ingot and mold from the car on which the ingot has been poured.

Fig. 4 is a like view with the ingot mold set down on a conventional basket.

Fig. 5 is a vertical sectional view of the mechanism and showing the parts in the positions which they occupy after the mold has been pushed downwardly from the ingot and with the ingot in raised position ready to be lifted out of the mold.

Fig. 6 is a vertical sectional view taken at right angles to the views shown in Figs. 1 to 5 inclusive, and showing the tongs of the mechanism ready to lift a hot-top ingot from its mold.

Fig. 7 is a similar view with the hot-top ingot partially raised from the mold.

Fig. 8 is a side elevation of the mechanism.

Fig. 9 is a vertical sectional view partly in elevation of the mechanism combined with a horse-shoe member for use when the mechanism is employed to detach an ingot from its stool.

Fig. 10 is a side elevation of a portion of the mechanism shown in Fig. 9.

Fig. 11 is an elevation partly in vertical section of the mechanism and illustrating how the tong support is held in elevated position at certain times with the tongs in open position.

Fig. 12 is a top plan view of this detail partly in horizontal section, the section being taken on line 12—12 of Fig. 13.

Fig. 13 is a view similar to Fig. 11 but taken at right angles thereto.

Referring to the drawings, 14 is a housing which is suspended by known means (not shown) from the trolley of the crane. A rotatable shaft 15 extends from the trolley into the housing and the latter contains an upper nut 16 engaging threads 17 on the shaft. Within the housing there is a second lower nut 18 engaging the threads 19 of the shaft, and as the threads 17 and 19 are oppositely pitched, it will be understood that when the shaft is turned, the housing 14 will move in one direction and the nut 18 will move in the opposite direction. By means of such instrumentalities certain parts are caused to push downwardly while other parts are lifting, in order to take care of the various types of molds.

Arms 20 are suspended from the lower end of the housing by means of pivot pins 21 and each arm consists of side members 22 joined at their lower ends by a cross member 23. Abutments 24 on the inner edges of the arms are provided for a purpose hereinafter described. Thus it will be noted that if the abutments are resting on the top of a mold and the housing 14 is moved downwardly by turning the shaft 15 in one direction, the arms 22 will have a tendency to move the mold downwardly. On the other hand if the lugs of a mold are resting on the cross members 23 of the arms and the housing 14 is raised by turning the shaft 15 in the opposite direction, the arms 20 will act to lift the mold.

The swinging of the arms may be controlled in the following way. Each arm is in the form of a bell crank lever and the upper arm 25 of this lever is pivotally connected at 26 to a link 27 carried by a sheave 28 that is suspended from a cable (not shown) depending from the crane trolley.

Of course, when the cable is wound, the sheave will be moved upwardly and this will cause the arm 20 with which it is associated to move outwardly about its pivot 21. In order to positively close the arms, each link 27 has a slot 29 through which extends a pin 30 at one end of a lever 31 pivotally mounted at 32 on a cross head portion 33 of the housing. The other end of the lever is connected at 34 to a sheave 35 that is also suspended by a cable from the crane cage and obviously if this cable is raised, the sheave 35 through the instrumentality of the lever 31 will depress the link 27 and cause the arm 20 with which it is associated to move inwardly. Guide pins or posts 36 and 37 project upwardly respectively from the sheaves 28 and 35 and they extend through guide apertures in a web 38 near the upper end of the housing.

It will be readily understood that the two sheaves 28 are to be moved in unison for opening the arms 20 and the two sheaves 25 are to be moved in unison for closing the arms.

The lower nut 18 supports the tubular extension 39 of a ram 40 which is employed in pushing downwardly on an ingot, to remove the same from a big-end-down mold. The ram reciprocates in the vertical tubular portion 41 of the housing and it is provided with a shelf 42 that supports lugs 43 extending through vertical slots 44 in the sides of the tubular portion of the housing. The lugs are rigidly united with a yoke 45 carrying pivot pins 46 for a pair of legs 47. These legs are similar to the arms 20 in that each leg consists of a pair of side members 48 joined together at their lower ends by a cross member 49 designed to act as a hook in lifting an ingot stripping basket hereinafter described. The legs are moved inwardly and outwardly by bell crank levers 50 pivotally mounted on the fulcrum pins 21. The lower end of each of these bell crank levers is provided with a roller 51 that rolls in a guideway 52 at the side of the leg. Of course, if the rollers 51 roll downwardly in the guideways 52, the lower ends of the legs 47 move toward one another, but if the rollers move upwardly, the arms spread apart. A link 53 is pivotally connected at 54 to the upper arm of each of the bell crank levers 50 and this link is guided at 55 by the cross head 33 and is connected to a sheave 56 having a guide post 57 extending through the spider 38. The sheave 56 is also suspended from a cable that is controlled from the crane cage.

The parts thus far described may be employed for stripping standard or flush type molds. For example, in stripping a standard or small-end-up mold from an ingot, as illustrated in Figs. 1 and 2, the entire stripping mechanism is lowered over the mold 58 until the arms 20 are in position to engage the lugs 59 at the sides of the mold whereupon the shaft 15 is revolved to cause the threads 17 to exert an upward force on the nut 16, it in turn on housing 14, and it in turn on the arms 20. The lower threads 19 will simultaneously cause the nut 18 to exert a pressure downward on the plunger or bull head 40, which engages the top of the ingot 60 and holds it down while the arms 20 lift the mold off the ingot car 61.

Owing to the slots 44 being shorter than the tubular portion 41 of the housing, the arms 47 will not descend with the bull head but these arms will be supported by the lugs 43 which rest on the lower ends of the slots.

In stripping a flush type or big-end-up mold from an ingot, as shown in Figs. 3 to 5 inclusive, the entire mechanism is lowered and the arms 20

are then brought into engagement with the lugs 62 of the mold 63. Then the entire mechanism is raised to lift the mold and ingot from the ingot car 64 and subsequently the mechanism is lowered (Fig. 4) so as to introduce the lower end of the mold into a basket 65 on another car 66. When the mold is lowered into the basket, a wedge pin 67 projecting from the bottom of the mold comes into engagement with the upper surface of the basket and supports the ingot 68 in an elevated position while the mold continues to descend due to its own weight. In a large percentage of molds, especially when new, the weight of the mold, through the force of gravity, is sufficient to strip the mold from the ingot. In case of a "sticker" the legs 47 are brought into engagement with lugs 69 at opposite sides of the baskets, and the abutments 24 at the inner edges of the arms 20 are brought to bear on the top of the mold. Now the shaft 15 is turned in a direction opposite to that in Figs. 1 and 2 with the result that the upper threads 17 force the nut 16, housing 14, fulcrum pins 21 and arms 20 downwardly while the lower threads 19 lift the nut 18, the bull head 40, lugs 43, yoke 45 and arms 47, to raise the basket 59 and the pin 67 while the mold is descending.

In order to handle hot-top ingots, the mechanism includes the following additional elements, see Figs. 6 to 8 inclusive. Pivot pins 70 are arranged at right angles to the pivot pins 21 and 46, and are supported by a yoke 71 that is slidably mounted on the tubular portion 41 of the housing. Tongs 72 are pivotally mounted on the pins 70 and have spurs 73 at their lower ends to engage the hot-top 74 of an ingot 75 while supported in its mold 76 on an ingot car 77. Each tong has rollers 78 at its upper end and the rollers of the tongs roll in downwardly diverging tracks or guideways 79 formed at opposite sides of yoke 45. It will be recalled that this yoke through the instrumentality of the lugs 43 is supported by the bull head 40 which in turn is actuated by the lower threads 19 of the shaft 15. Obviously then if the shaft is turned in a direction to lift the bull head, it in turn will lift the yoke 45, and owing to the divergency of the tracks 79, the spurs 73 will first be brought into engagement with the upper end of the ingot and then as the yoke 45 continues upwardly the ingot would be lifted out of the mold. For the purpose of preventing the mold from rising during this stripping action, the abutments 24 at the inner edges of the arms 20 are brought to bear on the top of the mold as shown in Fig. 8 and, of course, as the arms 20 are carried by the housing 14 and the housing is moved downwardly while the yoke 45 is rising, the mold cannot rise with the ingot.

From the foregoing, the methods of using my mechanism for stripping various types of ingots from molds may be readily understood, and in order to employ such mechanism for detaching a standard type ingot from its stool, I use an auxiliary attachment shown in Figs. 9 and 10. This attachment is in the form of a "horseshoe" 80 and the head 81 thereof has an aperture 82 to accommodate the bull head 40 while the legs 83 of the horseshoe have lugs 84 that may be engaged by the cross members of the arms 20. This horseshoe, when not in use stands in a vertical position, being held so by its legs resting in holes in a suitable support. When the horseshoe is needed, the crane is brought to a position over it, and the entire mechanism is lowered until the arms 20 are brought into position to engage the lugs 84. Then these arms are moved toward one another

other by the mechanism heretofore described, until the arms grip the lugs 84 as shown in Fig. 9.

As each arm 20 consists of two side pieces joined at their lower ends by the cross member 23 and the cross members engage the horseshoe beneath the lugs 84 and hold it up against the lower end of the housing 14, the side members of the arms will enclose the horseshoe sufficiently to keep it in vertical alignment when it is employed. In using it, the stripping action is the same procedure as pointed out in the hot-top stripping, the upper threads 17 exert a downward force on the nut 16, the housing 14 and the horseshoe 80. As the latter abuts against the ingot stool 85, of course, that stool will be prevented from rising. At the same time the lower threads 19 exert an upward force on the nut 18, ram 40 and yoke 45, and as the latter moves upwardly it will cause the diverging tracks 79 (Figs. 6, 7 and 8) to operate the tongs 72 for lifting the ingot 86 from the stool to which it has been fused during the pouring operation.

It will be evident to those familiar with the operation of stripper cranes that in stripping actions where the tongs 72 are not used, provision must be made to keep them in an open position where they will not interfere with the ingot. As already pointed out in the description of "hot-top stripping" (Figs. 6, 7 and 8), the raising of the yoke 45 causes the tongs 72 to close. However, as the legs 47 are also suspended from this yoke and in "flush top stripping" as it is necessary to raise the legs 47, it becomes necessary to hold the tongs 72 out of the way. In order not to complicate the illustration, the detail for accomplishing this is illustrated in Figs. 11 to 13 inclusive. As here shown, the yoke 71 which carries the tong fulcrum pins 70 may be latched to the yoke 45 in the following way. A pair of latches 90 are pivoted on the pivot pins 46 and their upper ends are pressed outwardly by springs 91 which are placed between the yoke 45 and the upper ends of the latches. The lower ends of the latches are equipped with detents 92 to detachably engage abutments 93 on the yoke 71. Obviously when the latches are in engagement with such abutments the yokes 45 and 71 move in unison and as the upper ends of the tongs are at this time held in the upper ends of the tracks 79, the tongs will be maintained in open position.

In order that the latches may be simultaneously released, levers 94 are provided. These levers are mounted on vertical pivot pins 95 at opposite sides of the yoke 45 and their outer ends engage the outer faces of the upper ends of the latches 90. The other end of one of the levers is pivotally connected at 96 to a link 97 that is in turn connected to a rocking lever 98. A link 99 connects one end of the rocking lever to the other end of the opposite lever 94. The rocking lever may be actuated from the crane cage by a shaft 100. Obviously when the rock shaft is turned in the proper direction, the latches will be actuated, to release the abutments 93 and then the yoke 45 can operate without raising the yoke 71, and the latter at this time will rest on the lower end of the housing 14.

It is believed that the construction, operation and advantages of my improved stripping mechanism may be readily understood from the foregoing description and it is manifest that changes may be made in the details disclosed without departing from the spirit of the invention as expressed in the claims.

What I claim and desire to secure by Letters Patent is:

1. A stripping mechanism comprising a housing, a bull head, means for simultaneously moving the housing and bull head in opposite directions, arms carried by the housing and adapted to exert either upward or downward pressure on a mold, and legs moved by the bull head and adapted to cooperate with the arms in stripping an ingot from a mold, said legs extending downwardly below the arms and having hook receiving portions at their lower ends.

2. A stripping mechanism comprising a housing, a bull head, means for simultaneously moving the housing and bull head in opposite directions, arms carried by the housing and adapted to exert either upward or downward pressure on a mold, legs movable by the bull head and adapted to cooperate with the arms in stripping an ingot from a mold, said legs extending downwardly below the arms and having hook receiving portions at their lower ends, means for moving the lower ends of the arms inwardly and outwardly, said means including a link connected to one of said arms and sheave means connected to the link.

3. A stripping mechanism comprising a housing, a bull head, means for simultaneously moving the housing and bull head in opposite directions, arms carried by the housing and adapted to exert either upward or downward pressure on a mold, legs movable by the bull head and adapted to cooperate with the arms in stripping an ingot from a mold, said legs extending downwardly below the arms and having hook receiving portions at their lower ends, means for moving the lower ends of said arms inwardly and outwardly, said means including a link connected to one of said arms, a sheave connected to the link and adapted to be raised and lowered, said link having a slot, a rocking lever mounted on the housing and having a pin engaging the slot and another sheave connected to said lever and adapted to be raised and lowered.

4. A stripping mechanism comprising a housing, a bull head, means for simultaneously moving the housing and bull head in opposite directions, arms carried by the housing and adapted to exert either upward or downward pressure on a mold, legs movable by the bull head and adapted to cooperate with the arms in stripping an ingot from a mold, said legs extending downwardly below the arms and having hook receiving portions at their lower ends, means for moving the lower ends of said arms inwardly and outwardly, said means including a link connected to one of said arms, a sheave connected to the link and adapted to be raised and lowered, said link having a slot, a rocking lever mounted on the housing and having a pin engaging the slot and another sheave connected to said lever and adapted to be raised and lowered, said sheaves being guided by said housing.

5. A stripping mechanism comprising a housing, a bull head, means for simultaneously moving the housing and bull head in opposite directions, arms carried by the housing and adapted to exert either upward or downward pressure on a mold, legs movable by the bull head and adapted to cooperate with the arms in stripping an ingot from a mold, said legs extending downwardly below the arms and having hook receiving portions at their lower ends, and means for moving the lower ends of the legs toward and away from one another, said means including a guideway on one of the legs, a rocking lever hav-

ing a guide element guided by the guideway, a link connected to the lever for moving the latter, and a sheave connected to the link and adapted to be raised and lowered.

5 6. A stripping mechanism comprising a housing, a bull head, means for simultaneously moving the housing and bull head in opposite directions, arms carried by the housing and adapted to exert either upward or downward pressure on a mold, legs movable by the bull head and adapted to cooperate with the arms in stripping an ingot from a mold, said legs extending downwardly below the arms and having hook receiving portions at their lower ends, tongs mounted on the housing and arranged at opposite sides thereof, and means for operating the tongs from the bull head.

7. In stripping mechanism of the character described a housing, a bull head, means for simultaneously moving the housing and bull head in opposite directions, said housing having slots, a member having portions projecting through the slots and normally resting on the lower ends of the slots, said bull head being engageable with said portions for lifting said member but the bull head being movable downwardly below said portions to allow the bull head to descend independently of said member, and stripping elements carried by said member.

8. In stripping mechanism of the character described a housing, a bull head, means for simultaneously moving the housing and bull head in opposite directions, said housing having slots, a member having portions projecting through the slots and normally resting on the lower ends of the slots, said bull head being engageable with said portions for lifting said member but the bull head being movable downwardly below said portions to allow the bull head to descend independently of said member, and stripping elements carried by said member, said stripping elements comprising pivotally mounted legs and means for actuating said legs.

9. In mechanism of the character described a housing and a bull head, means for simultaneously moving the housing and bull head in opposite directions, arms pivotally suspended from the housing and having mold engaging portions, and legs movable upwardly with the bull head and having ingot basket engaging portions, said legs extending downwardly below said arms.

10. In stripping mechanism of the character described a housing having a tubular portion, a bull head movable in said tubular portion, means for simultaneously moving the housing and bull head in opposite direction, a first yoke surrounding the tubular portion and mounted on the housing, tongs pivotally mounted on the yoke, a second yoke surrounding the tubular portion and mounted on the housing and movable with the bull head for actuating said tongs, and means carried by the housing for pressing downwardly on a mold while the tongs are lifting an ingot from the mold.

11. In stripping mechanism of the character described a housing, a bull head, means for simultaneously moving the housing and bull head in opposite directions, a first yoke mounted on the housing, tongs pivotally mounted on the yoke, a second yoke mounted on the housing and movable with the bull head for actuating said tongs, means carried by the housing for pressing downwardly on a mold while the tongs are lifting an ingot from the mold, and means for connecting the yokes together.

wardly on a mold while the tongs are lifting an ingot from the mold, and releasable latching means for connecting the yokes together.

12. In stripping mechanism of the character described a housing, a bull head, means for simultaneously moving the housing and bull head in opposite directions, a first yoke mounted on the housing, tongs pivotally mounted on the yoke, a second yoke mounted on the housing and movable with the bull head for actuating said tongs, means carried by the housing for pressing downwardly on a mold while the tongs are lifting an ingot from the mold, means supported by the second yoke and engageable with an ingot stripping basket, and means for latching the yokes together.

13. In ingot stripping mechanism of the character described comprising a housing, a bull head, means for simultaneously moving the housing and bull head in opposite directions, a first yoke mounted on the housing, tongs pivotally mounted on the yoke, a second yoke mounted on the housing and engaging said tongs for closing and raising the latter, said second yoke normally resting on the housing but being movable upwardly with the bull head, ingot basket engaging means carried by the second yoke, and means for latching the two yokes together whereby the first yoke may rise with the second yoke independently of the housing.

14. An ingot-stripping machine for use in stripping standard, flush or hot-top ingots from molds comprising a housing, a bull plug, means for simultaneously moving the housing and bull plug in opposite directions, mold-engaging arms pivotally suspended from the housing, means mounted on the housing for use in moving the lower ends of the arms toward or away from one another, a yoke slidably mounted on the housing and carrying ingot-engaging tongs, a second yoke slidably mounted on the housing and provided with means for actuating said tongs, said second yoke being movable upwardly with the bull head, means for latching the two yokes together whereby the tongs may be held in upward position and may be raised with the second yoke, ingot stripping basket engaging legs pivotally connected to the second yoke, and means for moving the lower ends of said legs toward and away from one another.

15. In ingot-stripping mechanism a housing, a yoke, means for simultaneously moving the yoke and housing in opposite directions, a horseshoe-shaped member depending from said housing and adapted to span a mold and rest on the stool thereof, arms depending from the housing and releasably embracing said horseshoe-shaped member and tong arms engageable with the ingot and actuated by said yoke for raising the ingot while the horseshoe-shaped member is pressed downwardly by the housing.

16. In stripping mechanism of the character described a housing, a yoke, means for simultaneously moving the housing and yoke in opposite directions, a horseshoe-shaped member depending from the housing, means carried by the housing and embracing the horseshoe-shaped member for interlocking the same with the housing, and tongs actuated by the yoke and engageable with an ingot for lifting the ingot from its stool while the latter is forced downwardly by the horseshoe-shaped member.

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